

Total No. of Questions : 8]

SEAT No. :

PA-1481

[Total No. of Pages : 2

[5926]-100

T.E. (Electronics Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - II) (304215) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Compare frequency domain characteristics of different window techniques used in FIR filter design. [6]
- b) Write steps for designing a digital filter using bilinear transformation. Obtain $H(Z)$ if $H_a(s) = 1/(S+1)^2$ if $T = 0.1$ Sec using bilinear transformation. [12]

OR

- Q2)** a) Design a low pass filter with cutoff frequency $\omega_c = \pi/2$ using frequency sampling method for $N = 15$. [10]
- b) Explain the impulse invariance technique in detail. What is drawback of it? How Bilinear transformation removes it? [8]

- Q3)** a) Compare between butterworth polynomial and Chebyshev polynomial. [6]
- b) Obtain direct form I and II realisation of a system described by.
 $Y(n) - 0.75 Y(n-1) + 0.25 y(n-2) = X(n) + 0.5X(n-1)$ [12]

OR

- Q4)** a) Draw cascade realization of
 $H(z) = (1-Z^{-1})/(1-0.2Z^{-1}-0.15Z^{-2})$ [10]
- b) What is a finite length problem? Describe effects of it. [8]

- Q5)** a) What do you understand by Multirate DSP? What is need for multirate DSP? Explain types of multirate DSP based on sampling rate. [8]
- b) Draw a block diagram of interpolator. Explain the working of an interpolator with the help of waveforms. Explain the role of anti-imaging filter. [10]

OR

P.T.O.

- Q6)** a) Draw block diagram of interpolator with interpolation factor 2 followed by decimator with factor 3. If $x[n] = [1 \ 2 \ 3 \ 2 \ 4 \ 6 \ 2 \ 4]$ is applied as input to interpolator, what is the output of interpolator and decimator. [8]
- b) A three stage decimator with decimation factor $D = 64$, input sampling frequency 3.2 MHz, pass-band ripple = 0.01 dB and stop-band ripple = 20 dB is to be designed. The highest frequency of interest after decimation is 20 KHz. Design an efficient decimator. [10]
- Q7)** a) Draw neat block diagram and explain general architecture of DSP. [8]
- b) List various applications of DSP in biomedical engineering. Explain any one application in detail by drawing a neat block diagram and appropriate waveforms. [8]

OR

- Q8)** a) What is the need for separate architecture of DSP? Elaborate the need with proper explanation. [8]
- b) Explain the architecture of DSP processor TMS320C54XX series. Draw a generalized block diagram. Mention the key features of the series. [8]



Total No. of Questions : 10]

SEAT No. :

PA-4302

[Total No. of Pages : 2

[5926]-1001

T.E.

AUTOMOBILE ENGINEERING

Automotive Electrical and Electronics

(2012 Course) (Semester - V) (316482)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary.

Q1) a) Explain positive earth and negative earth systems. [5]

b) Write a short note on multiplexed wiring system. [5]

OR

Q2) a) Explain Lead acid battery working principle with neat figures. [5]

b) Explain any two types of battery ratings. [5]

Q3) a) Explain working of any one temperature gauge with neat diagram. [5]

b) List out requirements of charging system. [5]

OR

Q4) a) Explain working of thermostatic type fuel gauge with neat diagram. [5]

b) Write a short note on Fog lamps. [5]

Q5) a) List out various position sensors used in automobile. Explain working of Throttle position (angle) sensor with neat figure. [10]

b) Explain Airflow sensor in detail. [8]

OR

Q6) a) Explain working of Positive Temperature Coefficient (NTC) Thermistor. [8]

b) Enlist types of actuators used in engine. Explain any one solenoid principle based engine actuator. [10]

P.T.O.

- Q7)** a) Explain different injection techniques used in automobile. [8]
b) Explain cold and warm start system. [8]

OR

- Q8)** a) Explain working of Electronic Ignition System with neat figure. [8]
b) What is meant by idle speed control? Explain it with neat figure. [8]

- Q9)** a) Explain working of ABS with neat layout. [8]
b) Explain working of Crash sensor. [8]

OR

- Q10)** a) Explain Supplementary Restraint System (Airbag) with neat figure. [8]
b) Write a short note on Electric Power steering. [8]



Total No. of Questions : 10]

SEAT No. :

PA-4303

[Total No. of Pages : 2

[5926]-1002

T.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING APPLICATIONS

(2012 Pattern) (Semester - I) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3, or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) Draw the block diagram of a digital signal processing system and explain the operation of each block. What additional components is required to prevent aliasing? [5]

b) Classify DT systems as Recursive v/s Non-Recursive and FIR v/s IIR system with suitable examples. [5]

OR

Q2) a) What is the necessity of quantization process after sampling? What is the use of coder in ADC? [5]

b) Use Z – Transform properties to obtain ZT of a DT signal. [5]
 $x(n) = (\frac{1}{2})^n u(-n)$ sketch the ROC.

Q3) a) State and prove the periodicity property of Fourier Transform (FT). What is the necessary and sufficient condition for the existence of FT? [5]

b) Compute 4 point Circular convolution for DT signals. [5]
 $x_1(n) = u(n) - u(n - 2)$, $x_2(n) = 2\delta(n) + \delta(n - 3)$.

OR

Q4) a) Draw the basic butterfly structure for DIT FET and DIF FET algorithm. From this, estimate the total number of multiplications and additions involved in the computation of N point DFT. [5]

b) State & prove the time shifting and Time Reversal properties of Fourier Transform. [5]

P.T.O.

- Q5) a)** What are filter structures? How the Direct form and Cascade form of FIR filters are obtained and realized? [9]
- b)** Obtain and realize Direct Form - I and Direct Form - II IIR filter structure for a system -

$$H(z) = \frac{z^2 + \frac{1}{3}z}{z^2 - \frac{3}{4}z + \frac{1}{8}} \quad [9]$$

OR

- Q6) a)** Obtain and realize Linear Phase FIR filter structure for a DT system

$$y(n) = x(n) + \frac{1}{3}x(n-1) + \frac{1}{4}x(n-2) + \frac{1}{4}x(n-3) + \frac{1}{3}x(n-4) + x(n-5)$$

- What are the advantages of this filter Structure? [9]
- b)** Derive the Direct Form-II IIR filter structure From system function $H(Z)$ and represent it using multipliers, adders and delay elements. [9]

- Q7) a)** Compare conventional Microprocessor with DSP Processor architecture. How SHARC DSP processor architecture is different than conventional DSP architecture? [8]
- b)** Explain applications of DSP with respect to following [8]
- Voice Processing
 - Biomedical

OR

- Q8) a)** Explain the following architectures with suitable block diagram. [8]
- Hardvard Architecture.
 - Von Neumann Architecture
- b)** Draw the architecture of ADSP 2106X Family SHARC DSP processor and discuss the use of DAG1 and DAG2. [8]

- Q9) a)** Draw and explain Human Speech Recognition System Model. [8]
- b)** Explain applications of DSP in image Processing. [8]

OR

- Q10) a)** What is Companding? What is its significance in audio processing? What is the impact of data rate on sound quality? [8]
- b)** Compare general purpose microprocessor with DSP processor. [8]



Total No. of Questions : 10]

SEAT No. :

PA-4304

[Total No. of Pages : 2

[5926]-1003

T.E. (Computer Engg.)

DATABASE MANAGEMENT SYSTEMS APPLICATIONS

(2012 Course) (Semester - V) (310244)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain View and Index Objects in SQL. [5]

b) Draw an ER diagram for Banking Enterprise. [5]

OR

Q2) a) Explain Normalization. Explain 1 NF with example. [5]

b) Explain Data Integrity in DBMS system. [5]

Q3) a) Consider following structure for MongoDB collections and write a query for following requirements in MongoDB. (any 3) [5]

Book (Bookname, Booktypes, Author, Publisher, Edition, Year)

- i) Write a MongoDB query to create above collections & for insertion of some sample documents.
- ii) Find the information about all books of "Database".
- iii) Find the book information of Author "Balkrishna" with Name "Fundamental C".
- iv) Display Total no. of books published in 2018.

b) Explain the concept of "BIG DATA" with example. [5]

OR

Q4) a) What are NOSQL Database Types? Explain any database type in detail. [5]

b) What is Atomicity Property of Transactions? How it is achieved in DBMS. [5]

P.T.O.

- Q5)** a) What are Parallel Database architectures explain with their advantages and disadvantages. [8]
b) Explain concept of distributed Databases. Explain 2 Phase commit protocol in Distributed transactions. [8]

OR

- Q6)** a) Explain Speed up and Scale up in Parallel Database. [8]
b) Explain 2 Tier and 3 Tier Database Architectures with example. [8]

- Q7)** a) What is XML? Explain XQuery and FLWOR with Example. [7]
b) Explain Hadoop Architecture in Detail. Explain Map Reduce with example. [10]

OR

- Q8)** a) Write XML Document for Account Data (AccountNo, AccountType, Balance, CustomerID). Write XQuery to retrieve all account information with balance > 300000. [7]
b) Write a short note on BASE properties. [5]
c) Write a short note on HDFS. [5]

- Q9)** a) What are different components of Business Intelligence Systems. [5]
b) Explain Apriori Algorithm with example. [7]
c) Differentiate OLAP and OLTP. [5]

OR

- Q10)** a) How ETL tools are important in Data Warehouse? [5]
b) Explain Clustering Algorithm with Suitable Example. [7]
c) What is Supervised Learning? Differentiate it with un-supervised learning. [5]



Total No. of Questions : 10]

SEAT No. :

PA-4305

[Total No. of Pages : 2

[5926]-1004

T.E. (Computer Engineering)

**PRINCIPLES OF CONCURRENT AND DISTRIBUTED
PROGRAMMING**

(2012 Pattern) (Semester-VI) (310249)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8 and 9 or 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain any three applications of LISP. [6]

b) Write a short note on YACC. [4]

OR

Q2) a) What do you mean by a Computation Model? Explain any two of them.[6]

b) Explain the following LISP functions - CDR, CAR, CONS, ATOM.[4]

Q3) a) Compare Inter Process Communication (IPC) with Inter Thread Communication (ITC). [6]

b) Explain various types of parallelism. [4]

OR

Q4) a) Explain various alternatives of CUDA. [6]

b) Write a note on Shore's classification. [4]

Q5) a) What is distributed computing system? Explain tightly and loosely coupled system with neat diagram. [8]

b) List and explain any two transparencies of a distributed system with a suitable example. [8]

OR

Q6) a) Explain Network Operating System and Distributed Operating System.[8]

b) Write short note on DCE Components. [8]

P.T.O.

- Q7)** a) What are the hardware-related issues that should be considered while specifying the physical systems that will host the virtual machines? [8]
- b) Explain hypervisor in detail. [4]
- c) What is memory and MMU virtualization? [4]

OR

- Q8)** a) List and explain types of virtualization. [8]
- b) What are the Advantages of Virtualization? [4]
- c) What is Parallel Virtual Machine (PVM)? [4]

- Q9)** a) What do you mean by Mobile Computing? Explain principle of Mobile Computing. [8]
- b) Write a program in CUDA for quick sort. [10]

OR

- Q10)** a) Write a CUDA program for addition of two matrices. [8]
- b) Explain following cloud computing services. [10]
- i) SAAS
 - ii) PAAS
 - iii) IAAS



Total No. of Questions : 10]

SEAT No. :

PA-4306

[Total No. of Pages : 3

[5926]-1005

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Pattern) (Semester - VI) (310250)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No. 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Write an assembly language program for ARM to add numbers 1 to 10. [6]

b) What are the qualities of Good RTOS? [4]

OR

Q2) a) What is Readers-Writers problem? [4]

b) Explain static priority and dynamic priority scheduling methods with suitable example. [6]

Q3) a) What is toolchain with respect to Linux embedded development environment? [4]

b) What is cross development environment for Linux? [6]

OR

P.T.O.

Q4) a) What is Busy Box? How to configure it? Explain its usefulness in embedded systems. [6]

b) Explain the process of Linux kernel construction. [4]

Q5) a) How to build device drivers in Embedded Linux? [5]

b) What is 'journaling'? Explain two file systems which use journaling. [6]

c) How MTD utility is useful for target boards? How to enable and use MTD services? [6]

OR

Q6) a) How DHCP/BOOTP Protocols are useful for embedded Linux development? [7]

b) What are the different types of device drivers? Explain lsmod and modprobe. [6]

c) Explain the following Linux utilities : [4]

i) e2fsck

ii) mke2fs

Q7) a) Describe DDD, GDB and CBrowser/Cscope. [7]

b) What is debugging ? How to debug a core dump using GDB? [6]

c) What is KGDB? [4]

OR

Q8) a) Explain interfacing of BBB with Stepper motor with diagram. [7]

b) Explain the steps to debug Linux kernel code? [6]

c) What are Binary utilities? Name any two binary utilities. [4]

- Q9)** a) What are various challenges faced by developer while debugging Linux kernel code. [6]
- b) How different latency periods affect the real-time process execution? [6]
- c) What are the types of real-time systems? [4]

OR

- Q10)** a) Explain the role of Zygote, system server in embedded android. [6]
- b) How desktop scheduling differs from real-time scheduling in Linux? [6]
- c) How to port Linux on target board? [4]

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Total No. of Questions : 10]

SEAT No. :

PA-4307

[Total No. of Pages : 3

[5926]-1006

T.E. (Computer Engineering)

**DATA COMMUNICATION AND WIRELESS SENSOR
NETWORKS**

(2012 Pattern) (Semester - V) (310243)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

Q1) a) Explain Framing. Detail the methods of framing.(fixed and variable size framing) [6]

b) How does Virtual Private Network work? Write applications of VPN. [4]

OR

Q2) a) 'In Adaptive delta modulation quantization error increases as slope error reduces' State true or false with proper justification. [6]

b) Explain sensor network organization and tracking? [4]

Q3) a) Explain in detail with algorithm the working of Go-Back-N ARQ protocol. [6]

b) Describe the working of Piconet. [4]

OR

P.T.O.

- Q4)** a) Ten thousand reservation stations are available for use of single slotted ALOHA channel. The average station has 18-reservation request per hour. A slot has 125 microseconds. What is approximate channel load? [6]
- b) How hidden station and exposed station problem affects the communication in wireless network. Explain in brief. [4]

- Q5)** a) Describe how does STEM protocol provide solution to idle listening problem? Explain STEM-B and STEM-T. [10]
- b) Write a note on Schedule based protocols and Contention based protocols. [6]

OR

- Q6)** a) Explain S-MAC protocol for WSN in detail. [8]
- b) LEACH, is a TDMA based MAC protocol integrated with clustering and routing -justify. Also, explain with diagram the organization of LEACH rounds. [8]
- Q7)** a) Explain data dissemination, gathering, and detail about flooding technique in wired and wireless adhoc networks. [8]
- b) Explain in detail Attribute based routing with an example attribute value event record. [8]

OR

- Q8)** a) List out the routing challenges and design issues in WSN. [6]
- b) What is the main objective behind designing SPIN routing protocol for WSN? Also, discuss its various deficiencies. [10]
- Q9)** a) Explain the role of every sensor node in information driven sensor querying (IDSQ) method. [8]
- b) Explain the Impact of anchor placement and discuss how a node with unknown position can directly communicate with anchors. [8]
- c) Explain ZigBee IEEE standard. [2]

OR

- Q10)** a) How the design of Sensor operating system (SOS) different from traditional operating system? List the issues in designing OS for WSN.[7]
- b) Comparison of Tiny OS with other OS like MATE, MAGNET and MANTIS. [7]
- c) “In future, WSNs are expected to be integrated into the “Internet of Things”. Justify the statement. [4]



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Total No. of Questions : 8]

SEAT No. :

PA-4308

[Total No. of Pages : 3

[5926]-1007

T.E. (Mechanical Engg.)

HYDRAULICS AND PNEUMATICS

(2012 Pattern) (Semester - V) (302045)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) What are the advantages of using fluid power method of transmission?[6]
- b) A ballast type accumulator with a cross section diameter of 0.25m generates a constant pressure of 100 bars. Determine the weight of the ballast used. Also what must be the stroke length to have a capacity of 200 liters? [6]
- c) A pump has a displacement volume of 98.4cm³. It delivers 0.00152m³/sec at 1000 RPM and 70 bars. If the prime mover input torque is 124.3 N-m finds: [8]
- i) Overall efficiency of the pump.
 - ii) Theoretical torque required to operate the pump.

OR

- Q2)** a) What are different types of seals? State the criteria for selection of sealing devices. [6]
- b) Explain brief Air oil Intensifier. [6]
- c) State Pascal's law and explain applied to simple hydraulic jack with analysis. [8]

P.T.O.

- Q3)** a) Draw and explain any three actuation methods used in direction control valve. [6]
- b) What is the purpose of providing pilot operated check valve in hydraulic circuit. Explain in short locked cylinder circuit using pilot check valves. [6]
- c) Draw and explain automatic cylinder reciprocating circuit using sequence valve. [6]

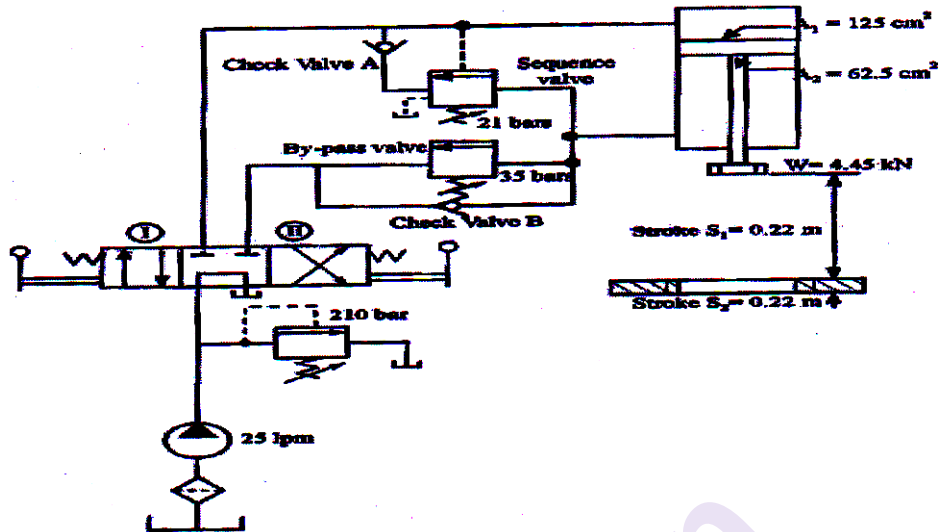
OR

- Q4)** a) Draw two methods of the regenerative circuit with labels. [6]
- b) Draw and explain functional approach of the hydraulic motor braking circuit. [6]
- c) Draw three types of speed controlling method circuits. [6]
- Q5)** a) Explain with a neat sketch the twin pressure valve and draw a typical circuit showing all parts. [6]
- b) Explain with a neat sketch the working of a pressure reducing valve. [6]
- c) What are various efficiencies of a rotary actuator? [4]

OR

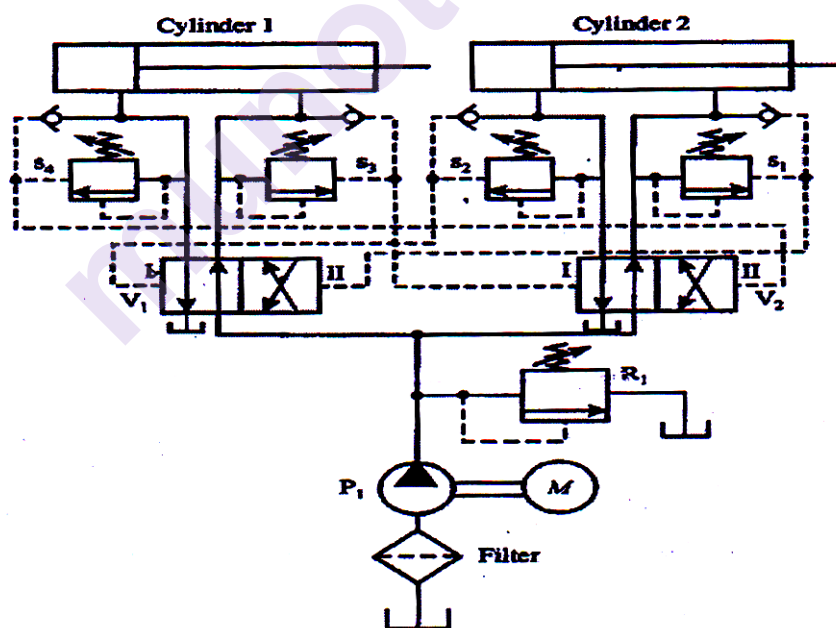
- Q6)** a) Draw circuit for [6]
- i) Hydraulic motor actuation circuit.
- ii) Draw a pneumatic circuit equivalent to OR gate.
- b) Draw a typical symbol of FRL unit and explain the working of pressure regulator. [6]
- c) Write in brief on applications of pneumatics in low cost automation. [4]

- Q7) Analyze the press circuit given below and find load and time required for press operation. [16]



OR

- Q8) Analyze the given circuit and write component name with operations. [16]



Total No. of Questions : 8]

SEAT No. :

PA-1482

[5926]- 101

[Total No. of Pages : 3

T.E. (Electronics Engg.)

FIBER OPTIC COMMUNICATION

(2019 Pattern) (Elective- II) (Semester - II) (304215)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve question Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume the suitable data, if necessary.

Q1) a) Explain the following mechanisms associated with optical fibers: [8]

- i) Scattering Loss
- ii) Bending losses

b) Describe the fiber structure to provide: [10]

- i) Dispersion shifted single mode fiber
- ii) Dispersion flattened single mode fiber
- iii) NZDSF
- iv) Polarization maintaining fibers

OR

Q2) a) Explain intramodal and intermodal dispersion in graded index fiber. [8]

- b) Explain the term critical bend radius with reference to optical fibers. Estimate the critical bend radius of curvature at which large bending losses would occur for a 62.5/125 μm MMSI fiber with core refractive index of 1.5 & $\Delta = 3\%$ and operating wavelength of 820 nm. [10]

Q3) a) Describe the common LED structures for optical fiber communication. Discuss their relative merits and drawbacks. [9]

- b) Radiative and non-radiative recombination lifetimes of the minority carriers in the active region of a DH InGaAsP-LED are 60 ns and 100 ns respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is 1.55 μm at a drive current of 40 mA. [8]

OR

P.T.O.

Q4) a) Explain the structure & the working of APD with the help of suitable diagram. Illustrate advantages & disadvantages of APD over PIN diode. [9]

b) Compare the properties of laser diode and LED's used for optical communication. Justify usage for laser as light source along with single mode fibers. [8]

Q5) a) Describe the concept of SONET/SDH. [9]

b) Explain the following WDM components: [9]

i) Multiplexer

ii) Demultiplexer

iii) Optical Isolators and Circulators

OR

Q6) a) A 2×2 biconical tapered fiber coupler has an input optical power level of $P_0 = 200 \mu\text{W}$. The output powers at the other three ports are $P_1 = 90 \mu\text{W}$, $P_2 = 85 \mu\text{W}$, and $P_3 = 6.3 \text{ nW}$. Determine Coupling ratio, Excess loss, Insertion loss and crosstalk in optical fiber. [9]

b) Explain the application of fiber bragg grating (FBG) for Multiplexing and Demultiplexing. Also describe in short Explain the Erbium doped fiber amplifier. [9]

Q7) a) Explain link power budget with the help of power loss model for point - to - point link. [9]

b) An analog optical fiber system employs an LED which emits 3dBm mean optical power into air. However, a coupling loss of 17.5 dB is encountered when launching into a fiber cable. The fiber cable which extends for 6 km without repeaters exhibits a loss of 5 dB/km. It is spliced every 1.5 km with an average loss of 1.1 dB per splice. In addition there is a connector loss at the receiver of 0.8 dB. The PIN-FET receiver has a sensitivity of -54 dBm at the operating bandwidth of the system. Assuming there is no dispersion equalization penalty, Prepare an optical power budget for the system and establish a system margin. [8]

OR

Q8) a) Explain the concept of rise time budget for optical fiber communication. [9]

- b) Components are chosen for a digital optical fiber link of overall length 7 km & operating at a 20Mbps using an RZ code. It is decided that an LED emitting at 0.85 μm with GI fiber to a PIN photodiode is a suitable choice for the system components giving no dispersion equalization penalty. An LED which is capable of launching an average of 100 μW of optical power (including connector loss into a 50 μm core diameter GI fiber is chosen). The proposed fiber cable has an attenuation of 2.6 dB/km & requires splicing every km with a loss of 0.5 dB per splice. There is also a connector loss at the receiver of 1.5 dB. The receiver requires mean incident optical power of -41 dBm in order to give the necessary BER of 10^{-10} & it is predicted that a safety margin of 6 dB will be required. Illustrate the optical power budget for the system & hence determine its viability. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1483

[5926]- 102

[Total No. of Pages : 2

T.E. (Electronics Engineering)

E - MOBILITY

(2019 Pattern) (Elective- II) (Semester - II) (304215 E)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams and waveforms must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of nonprogrammable calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain role of Ultra capacitors in energy storage system of EVs. [5]
b) Explain flywheel energy storage system. [6]
c) Explain construction & working of Nickel based batteries. [6]

OR

- Q2)** a) Explain hydraulic energy storage system. [6]
b) Explain construction & working of Lead Acid Battery. [8]
c) Compare metal air battery & Zinc Chloride battery. [3]
- Q3)** a) Explain various battery indication methods. [8]
b) Explain various requirements for a battery charger in EVs. [6]
c) Explain charge equalization process in battery. [4]

OR

- Q4)** a) Explain with diagram working of basic charger circuit. [6]
b) Explain with block diagram OFF board conductive charging. [6]
c) Standard power levels of conductive chargers. [6]

P.T.O.

- Q5)** a) Explain domestic charging infrastructure. [6]
b) Explain North American EV Plug Standards. [6]
c) Explain Occasional Charging Station. [5]

OR

- Q6)** a) Explain battery swapping station. [5]
b) Explain various types of EV charging connectors. [6]
c) Explain Combined Charging System (CCS). [6]

- Q7)** a) Explain with diagram CAN protocol? Give its applications. [8]
b) Explain with diagram Power line carrier communication. [7]
c) What is Modbus protocol? Explain where it is used. [3]

OR

- Q8)** a) What is Ethernet? Why it is used? Give its advantages & disadvantages. [8]
b) What is advanced metering infrastructure? Explain its building blocks. [6]
c) Explain ROLL & RPL. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1484

[Total No. of Pages : 2

[5926]-103

T.E. (E & TC)

DIGITAL COMMUNICATION

(2019 Pattern) (Semester - I) (304181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any one Question out of Q. No. 1 or 2, Q.3 or 4, Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data; if necessary.*

- Q1)** a) With neat schematic describe QAM transmitter and Receiver. [8]
b) Compare M-ary PSK and M-ary QAM. [9]

OR

- Q2)** a) With the help of block diagram, frequency spectrum and signal space diagram explain M-ary FSK. [8]
b) What is need of continuous PSK? With neat schematic and waveforms describe Minimum Shift Keying (MSK). [9]

- Q3)** a) With neat block schematic and waveforms explain DSSS generation and detection. [8]
b) Define: [2]
i) Processing Gain
ii) Jamming Margin
c) A coherent BPSK - DSSS is used to transmit data at 250 bps with probability of error of 5×10^{-5} . Determine minimum chipping rate, if the jamming signal is 300 times stronger than the received signal. [8]

OR

- Q4)** Write short note on (6 M each) : [18]
a) PN sequence properties.
b) FHSS.
c) Ranging using DS spread spectrum.

P.T.O.

Q5) a) Apply Shannon-Fano coding procedure for the following message ensemble to find maximum coding efficiency with $M = 2$. [8]

$[X] = [x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7 \quad x_8]$

$[P] = [1/4 \quad 1/8 \quad 1/16 \quad 1/16 \quad 1/16 \quad 1/4 \quad 1/16 \quad 1/8]$.

b) Find mutual information and channel capacity for a given channel with

$$[P(Y/X)] = \begin{bmatrix} 0.8 & 0.2 \\ 0.3 & 0.7 \end{bmatrix} \text{ and } p(x_1) = 0.6 \text{ and } p(x_2) = 0.4. \quad [9]$$

OR

Q6) a) Apply Huffman coding procedure for the following message ensemble to find maximum coding efficiency with $M = 2$. [8]

$[X] = [x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7]$

$[P] = [0.4 \quad 0.2 \quad 0.12 \quad 0.08 \quad 0.08 \quad 0.08 \quad 0.04]$

b) Define and also write mathematical expression for the following terms, [9]

i) Entropy

ii) Information rate

iii) Mutual Information

iv) Shannon Hartley theorem

Q7) a) The generator matrix for (6, 3) linear block code is given below. Find all code vector. Calculate syndrome for C_4 : [9]

i) without error

ii) if 4th bit is having error

$$G = \begin{bmatrix} 1 & 0 & 0 & : & 1 & 1 & 0 \\ 0 & 1 & 0 & : & 0 & 1 & 1 \\ 0 & 0 & 1 & : & 1 & 1 & 1 \end{bmatrix}$$

b) Explain Turbo Encoder and Decoder with neat schematic and state need of interleaver in turbo codes. [9]

OR

Q8) a) Define and Explain following terms, [10]

i) Hamming distance

ii) Hamming weight

iii) Code rate

iv) Constraint length

v) Generator polynomial

b) Write short note on, (4 M each) [8]

i) Cyclic codes

ii) LDPC Codes



Total No. of Questions : 8]

SEAT No. :

PA-1485

[Total No. of Pages : 2

[5926]-104

T.E. (E&TC Engineering)
ELECTROMAGNETIC FIELD THEORY
(2019 Pattern) (Semester-I) (304182)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of a calculator is allowed.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Region-1 is semi-infinite space in which $2x-5y>0$, While for region-2, $2x-5y<0$. Let $\mu_{r1}=3$, $\mu_{r2}=4$, $H_1'=30 \text{ ax' A/m}$. Find $|B_1'|$ and $|H_2'|$. [10]
- b) Derive an expression for energy stored and energy density in electrostatic field. [8]

OR

- Q2)** a) Derive an expression for the potential gradient $E=-\nabla V$ [8]
- b) Derive an expression for the capacitance of a parallel plate capacitor having two dielectric media. [10]

- Q3)** a) State and explain displacement current density and displacement current. Explain physical significance of displacement current. [8]
- b) Calculate displacement current through parallel plate air filled capacitor having plates if area 10cm^2 separated by a distance 2 mm connected to 300 V, 1 MHz source. [8]

OR

- Q4)** a) State and explain faraday's law and lens's law. [8]
- b) Write Maxwell equation for free space in point form and integral form. [8]

P.T.O.

- Q5) a)** What is polarization? Explain the different types of polarization in detail with. [10]
- b)** Derive the wave equation (Helmoltz Equation) for free space in terms of electric field intensity. [8]

OR

- Q6) a)** Explain the terms Depth of penetration and loss tangent in detail. [8]
- b)** Derive the parameters of propagation constant, phase constant, intrinsic impedance, and velocity for free space medium. [10]

- Q7) a)** A generator of 1 V, 1 KHz supplies power to 100 km long transmission line, terminated in Z_0 and having following parameters. $R=10.4 \Omega/\text{km}$, $L=0.00367 \text{ H/km}$, $G=0.8 \times 10^{-6} \text{ mho/km}$, and $C=0.00835 \times 10^{-6} \text{ F/km}$ calculate characteristics impedance, propagation constant, wavelength and velocity? [8]
- b)** Explain different distortions of transmission lines? What is mean by distortion less line and explain the condition of distortion less lines? [10]

OR

- Q8) a)** Explain the secondary constants ($Z_0, \gamma, \alpha, \beta$) of transmission line in detail [8]
- b)** A transmission line has a characteristic impedance 300Ω and terminated in a load $Z_L = 150 + j150 \Omega$. Find the following using smith chart. [10]
- i) VSWR
 - ii) Reflection coefficient
 - iii) Input impedance at a distance 0.1λ from the load



Total No. of Questions : 8]

SEAT No. :

PA-1486

[Total No. of Pages : 3

[5926]-105
T.E. (E & TC)
DATABASE MANAGEMENT
(2019 Pattern) (Semester - I) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Consider the following database:
Student (Roll_no; Name, motrine_no; Address)
Subject (Sub_Code, Sub_name)
Marks (Roll_no; Sub_code, marks)
Write following queries in SQL. **[6]**
- i) Average marks of each student along with Roll_no. of student.
 - ii) Find how many students have failed in the subject “DBM”.
- b) Write the syntax for following SQL commands. **[5]**
- i) Create Table
 - ii) Alter Table
 - iii) Drop Table
 - iv) DELETE
 - v) UPDATE
- c) Explain following terms with examples. **[6]**
- i) Procedure
 - ii) Function

OR

- Q2)** a) With the help of block diagram, describe PL/SQL block structure. **[5]**
- b) What are the different types of joins in SQL? Explain any one join with example. **[6]**
- c) Explain the following operations with suitable queries. **[6]**
- i) Set operations (any two)
 - ii) Aggregate functions (any two)

P.T.O.

- Q3)** a) Explain commit and Roll back operations of transaction. [6]
 b) Explain how deadlock occurs? Which are the actions required for the deadlock recovery process? [6]
 c) Define the following terms. [5]
 i) Concurrency
 ii) Timestamp
 iii) Timestamp ordering
 iv) Schedule
 v) Transaction

OR

- Q4)** a) What are ACID properties of a transaction? [6]
 b) Identify the following schedule is view serializable or not. Justify your answer. [5]

T ₁	T ₂	T ₃
R(X)		
	W(X)	
		W(Z)
W(Y)		
W(X)		
		W(X)

- c) Explain the transaction states with state diagram. [6]
- Q5)** a) Explain client server architecture with suitable database application. [6]
 b) Draw two tier architecture and describe its advantages. [6]
 c) Draw and explain memory structure of instance in oracle architecture. [6]

OR

- Q6)** a) Describe speed up attribute in parallel database architecture. [6]
 b) List the parallel database architectures and explain shaved disk architecture. [6]
 c) Explain the intra query parallelism query evaluation technique. [6]

- Q7)** a) List and explain advantages and disadvantages of distributed databases. [6]
b) Compare homogeneous and heterogeneous distributed database. [6]
c) Draw and explain client-server architecture for DDBMS. [6]

OR

- Q8)** a) Write the types of data fragmentation and explain horizontal fragmentation with one example. [6]
b) Explain the distributed database system failure modes (any two). [6]
c) Explain two phase commit protocol in distributed database. [6]



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Total No. of Questions : 8]

SEAT No. :

PA-1487

[Total No. of Pages : 2

[5926]- 106

T.E. (E & TC)

MICROCONTROLLERS

(2019 Pattern) (Semester - I) (304184)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Draw and explain the Reset functional diagram of PIC18 Fxxxx [6]
b) Explain functions of ALU in PIC18Fxxxx with example. [6]
c) Draw and explain program memory organization of PIC 18F4550. [6]

OR

- Q2)** a) Explain RUN mode of PIC 18F4550. [6]
b) State Features of PIC 18F4550 [6]
c) Draw and explain the data memory organization of PIC18Fxxxx. [6]
- Q3)** a) Draw and explain the Timer 1, 16 bit operation in details compare the Timer 0, 1, & 2. [9]
b) Write a program for 1 KHz and 10% duty cycle PWM generation, use $F_{osc} = 10\text{MHz}$ [8]

OR

- Q4)** a) Write program to generate delay of 1 ms using timer 0, 16 bit and no prescaler. [9]
b) State specification of ADC and explain with block schematic functions of inbuilt ADC of PIC 18F4550 [8]

P.T.O.

Q5) a) Draw an interfacing diagram of LCD with PIC 18F4550 to display SPPU on Line 2, Also explain function RS, RW and EN pin [9]

b) Draw and explain port structure with SFRs used in Programming. [9]

OR

Q6) a) Draw an interfacing diagram of LEDs and relay connected to port B & RA0 line and write an embedded C program for continuous flashing with Relay. [9]

b) Draw home protection system using motion detectors and Gas sensors, display the status on LED and LCD. [9]

Q7) a) State features of 12C bus & compare RS232 and RS485. [9]

b) State features of RTC, draw an interfacing diagram with PIC 18F4550.[8]

OR

Q8) a) Explain with diagram SPI mode of MSSP structure of PIC 18F4550.[9]

b) Draw and explain block diagram of UART Receiver. [8]



[5926]-107

T.E. (Electronics & Telecommunication Engineering)**DIGITAL SIGNAL PROCESSING****(2019 Pattern) (Semester - I) (Elective - I) (304185(A))***Time : 2½ Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Find the response of a linear filter with impulse response $h_{(n)} = \{1, 2, 4\}$ to the input sequence $x_{(n)} = \{1, 2\}$ using linear convolution computed through circular convolution. [8]
- b) Find $N = 5$ point DFT for $x_{(n)} = \{1, 0, 1, 0, 1\}$? [8]
- c) Explain the linear filtering using overlap save and overlap add methods? [2]

OR

- Q2)** a) Find linear convolution using overlap add method of the following sequence $x(n)$ and $h(n)$ [8]
- $x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$
- $h(n) = \{1, 2, 3\}$
- b) Find the 8-point DFT of sequence [10]
- $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT radix - 2 FFT algorithm.

- Q3)** a) Convert the analog filter with system function $H_s(s) = \frac{s + 0.2}{(s + 0.2)^2 + 9}$ into a digital IIR filter by means of impulse invariant technique Assume $T = 1$ sec. [10]
- b) Explain the concept of filter design. Elaborate the advantages and disadvantages of digital filters? [8]

OR

P.T.O.

Q4) a) The system transfer function of analog filter is given by,

$$H(s) = \frac{S + 0.1}{(S + 0.1)^2 + 16}, \text{ obtain the system transfer function of digital filter}$$

using bilinear transformation method (BLT) which is resonant at $\omega_r = \frac{\pi}{2}$.

[10]

b) A digital filter has frequency specification as :

[8]

$$\text{Passband frequency} = \omega_p = 0.2\pi$$

$$\text{Stopband frequency} = \omega_s = 0.3\pi$$

What are the corresponding specification for passband and stopband frequencies in analog domain if

- i) Impulse invariance technique is used for designing
- ii) Bilinear transformation is used for designing assume sampling time $T_s = 1$ sec.

Q5) a) Elaborate on the ideal filter requirements in terms of causality and its implications? [8]

b) List out all the windowing techniques? Describe any three with its mathematical formulas characteristics and compare them. [9]

OR

Q6) a) Design linear phase FIR Lowpass filter using Hanning Window technique for the frequency characteristics of the filter given by [9]

$$H_d(\omega) = e^{-j3\omega} \text{ for } \frac{-\pi}{4} \leq \omega \leq \frac{\pi}{4}$$

$$= 0 \quad \text{otherwise}$$

b) Obtain the coefficients of FIR lowpass filter to meet the specification given below. Use Kaiser window [8]

Passband edge frequency = 1.5 KHz.

Transition width = 0.5 KHz.

Stopband attenuation ≥ 50 dB

Sampling frequency = 8 KHz.

- Q7)** a) Speech signal is corrupted by low and high frequency noise. Explain in detail how DSP is used to remove noise with illustration. [8]
b) Explain how DSP is useful in interference cancellation in ECG. [9]

OR

- Q8)** a) Explain speech coding and compression technique. How signal processing techniques are used in this. [8]
b) Explain the application of DSP in vibration signature analysis for defective gear teeth. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1489

[Total No. of Pages : 2

[5926]-108

T.E. (E&TC)

ELECTRONICS MEASUREMENTS

(2019 Pattern) (Semester - I) (Elective - I) (304185B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right indicates full marks.
- 3) Assume the suitable data wherever necessary.

Q1) a) With the help of block diagram explain the functioning of a conventional standard signal generator. [8]

b) With the help of block diagram explain the function of microwave signal generators. [9]

OR

Q2) a) With the help of neat sketch, explain the working of a frequency selective wave analyser. [8]

b) Draw the block diagram of a function generator and explain its operation [9]

Q3) a) Illustrate the z modulation and x - y mode operation. List and explain the measurements on oscilloscope. [9]

b) Draw a neat block diagram of power oscilloscope. Describe the function of each block. Application. [9]

OR

Q4) a) Draw the block diagram of sampling oscilloscope and explain the principle. List its application. [9]

b) What is the main specification. advantages and application of using DSO. Compare CRO and DSO. [9]

P.T.O.

- Q5)** a) With the help of block diagram explain the functioning of an OLED display. [8]
b) With help of neat sketch, explain the all functional pins of a LCD display. [9]

OR

- Q6)** a) Draw and explain strip chart Recorders. [8]
b) Explain in detail internal and external acquisition cards. [9]

- Q7)** a) With the help of neat sketch, describe the all functional blocks spectrum analyzer. [9]
b) Sketch block diagram of field strength meter and state function of each block. [9]

OR

- Q8)** a) Explain in detail industrial revolution and their impact on industrial automation. [9]
b) Sketch block diagram of OTDR and state function of each block. List its applications. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1490

[Total No. of Pages : 2

[5926]-110
T.E. (E & TC)
COMPUTER NETWORKS
(2019 Pattern) (Semester-I) (304185D) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if required.

- Q1)** a) Discuss the packet switching technique. [6]
b) Discuss the network layer services. [4]
b) Explain the classful addressing in IPV4 protocol. [6]

OR

- Q2)** a) Discuss IPV6 protocol. [6]
b) Compare circuit switching Vs packet switching. [4]
c) Explain ICMPV6 protocol (ICMPv6). [6]

- Q3)** a) Explain unicast and multicast routing. [6]
b) Explain Dijkstra's algorithm for shortest path routing. [6]
c) Explain IGMP protocol (IGMP protocol) [6]

OR

- Q4)** a) Explain routing information protocol. [6]
b) Explain path vector routing. [6]
c) Discuss border gateway protocol. [6]

- Q5)** a) Explain TCP services and its features. [6]
b) Explain stream control transmission protocol. [6]
c) Explain transport layer quality of services parameters. [6]

OR

P.T.O.

- Q6)** a) Explain TCP connection establishment using three way handshaking. [6]
b) Explain UDP protocol and its features. [6]
c) Explain congesting control in TCP. [6]

- Q7)** a) Explain telnet protocol. [6]
b) Explain FTP protocol. [6]
c) Explain simple mail transfer protocol. [6]

OR

- Q8)** a) Explain internet message access protocol. [6]
b) Explain how DNS server work. [6]
c) Explain Dynamic host configuration protocol. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1491

[Total No. of Pages : 2

[5926]-111

T.E. (E&TC Engg.)

CELLULAR NETWORK

(2019 Pattern) (Semester-II) (304192)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3. or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of calculators is allowed.

- Q1)** a) Explain the concept of frequency reuse in mobile Cellular System. [6]
- b) What is Cell sectoring? How does it help to improve the capacity of mobile Cellular System? [6]
- c) Write Short note on basic radio transmission parameters of the GSM system. [6]

OR

- Q2)** a) What is Handoff? Why is it necessary in mobile Cellular System? Explain mechanism of handoff. [9]
- b) Draw a neat diagram of GSM Architecture and explain the function of each block in it. [9]
- Q3)** a) Explain the concept of Link-budget Analysis along with the expression. [8]
- b) Explain in details the Tele-traffic system model. [9]

OR

- Q4)** a) Derive the first Erlang distribution for lost call system. [8]
- b) Consider a cellular system with $N=48$ channels per cell, and blocking probability $P_B=0.02=2\%$. The traffic per user is $A_0=0.04E$. The cell radius is 1km. What is the number of users that can be supported in a city of 603 km² area? [9]

P.T.O.

- Q5)** a) Draw and explain LTE network architecture. [9]
b) Compare various IEEE 802.11(802.11, 802.11a, 802.11b, 802.11g,80.211n) standards. [7]
c) List various simulators used for simulation of wireless network. [2]

OR

- Q6)** a) With neat schematic explain open wireless architecture of 5G [9]
b) Compare all mobile standards (1G to 5G) for following parameters: [9]
Year of Implementation, standard used, technology, multiple access technique used, data rates, switching technique, frequency spectrum used, services provided, Advantages & disadvantages.
- Q7)** a) Explain the use of network coding to improve throughput, robustness, complexity, security. [8]
b) Explain the classification of scheduling algorithm, and explain the types of scheduling. [9]

OR

- Q8)** a) Explain Radio resource scheduling. [8]
b) Explain network performance parameters used to provide better quality of experience (QoE) in wireless network. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1492

[Total No. of Pages : 2

[5926]-112
T.E. (E&TC)
PROJECT MANAGEMENT
(2019 Pattern) (Semester - II) (304193)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figurers to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) What are different structures of organizations? [6]
b) What do you mean by superimposing one organizational form over another? [6]
c) What is "Diversity Management"? [6]

OR

- Q2)** a) Explain the importance of "Team Management". [6]
b) What do you mean by "Break-Even-Point"? Explain in detail with suitable example. [6]
c) List out the different project team members and their duties. [6]

- Q3)** a) What is the significance of "Project Planning"? What are the different methods of planning. [6]
b) With the suitable example explain AON network compare it with AOA network. [6]
c) Classify the projects. Explain their characteristics. [6]

OR

P.T.O.

- Q4)** a) What is Network scheduling? Explain in detail with suitable examples. [6]
b) What are the different types of activities in a Network? Explain the dummy activity. [6]
c) What are the most important informations, these are required for uploading the project during the execution? How is the frequency of updating decided. [6]

- Q5)** a) What do you understand by "Risk Analysis". [6]
b) Explain in depth, with appropriate examples how to control Risk in Project Management? [5]
c) Discuss the steps involved in Project Financial Analysis. [6]

OR

- Q6)** a) What are the different types of Risks? Explain with suitable examples. [9]
b) Explain in depth, how financial break even analysis is done. [8]

- Q7)** a) Explain in detail the [6]
i) Product development
ii) Process &
iii) Organization
b) What is Entrepreneurship? What are the characteristics required for successful Entrepreneur? Explain with suitable example. [6]
c) Explain in depth the legal issues related to product development and Entrepreneurship with suitable examples. [5]

OR

- Q8)** a) Write short note on : [6]
i) Patent
ii) Copyright
b) Explain in detail how the product development relies on the customer needs. [6]
c) What are the characteristics of successful Entrepreneur? [5]



Total No. of Questions : 8]

SEAT No. :

PA-1493

[Total No. of Pages : 2

[5926]-113

T.E. (E&TC)

POWER DEVICES & CIRCUITS

(2019 Pattern) (Semester - II) (304194)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of nonprogrammable calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain working of single phase full bridge inverter for R load with input & output waveforms. Derive an expression for rms o/p voltage. [7]
b) Compare freewheeling diode with feedback diode. [4]
c) Single phase full bridge inverter is operated from 50V dc supply, it has a resistive load of $R = 5 \Omega$. Find: [6]
i) rms o/p voltage at fundamental frequency (V_{o1})
ii) rms o/p power
iii) rms o/p voltages at second & third harmonic (V_{o2} & V_{o3})

OR

- Q2)** a) What is mean by harmonics in inverters? Explain how harmonics can be reduced. [7]
b) Compare 120° mode with 180° mode in three phase bridge inverter. [5]
c) Give the classification of inverters? Draw Three Phase voltage source inverter for balanced star R load? [5]

- Q3)** a) Explain operation of step down chopper and derive an expression for its average o/p voltage & rms o/p voltage. [10]
b) A DC step down chopper is operating on 220V dc input voltage at 2KHz chopping frequency with TRC principle. If output voltage is 170V, calculate conduction & blocking period of chopper. [4]
c) Compare step up & step down choppers. [4]

OR

P.T.O.

- Q4)** a) Give classification of choppers? Explain operation of two quadrant chopper with circuit diagram. [8]
 b) A step up chopper is used to deliver load voltage is 500V from 220V DC source. If the blocking period of thyristor is $80\mu\text{s}$, compute the turn on time. [4]
 c) Explain with block schematic working of SMPS. [6]
- Q5)** a) Explain the role of heat sink? Draw its thermal equivalent circuit. [5]
 b) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. [8]
 c) For a thyristor, Maximum junction temperature is 110°C . The thermal resistances are $\theta_{JC} = 0.16$, $\theta_{CS} = 0.08^\circ\text{C/W}$. for heat sink temperature of 60°C , calculate total average power loss in thyristor - sink combination.
 If heat sink temperature is reduced to 50°C , find new total average power loss in thyristor - sink combination. [4]
- OR
- Q6)** a) What is EMI? Explain various sources & minimizing techniques of EMI. [7]
 b) What are different over current protection techniques in power electronics? Explain any one in detail. [6]
 c) What is snubber circuit? Explain its role in power devices protection circuits. [4]
- Q7)** a) Explain operation of On-line UPS with block schematic. [6]
 b) Draw & explain single phase full wave ac voltage controller for resistive load with o/p voltage waveforms. [6]
 c) Explain single phase full converter drive for single phase separately excited dc motor. [6]
- OR
- Q8)** a) Explain working of electronic ballast with block schematic. [6]
 b) Explain various performance parameters of batteries in battery operated power systems. [6]
 c) Explain various battery charging models for EVs. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1494

[Total No. of Pages : 2

[5926]-114

T.E. (E & TC)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (304195A) (Semester - II) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Your answers will be valued as a whole.
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

- Q1)** a) Explain Laplacian Edge defector? Why LOG mask preferred over Laplacian for edge detection? [6]
- b) Explain with suitable example connectivity concept used in image processing? [6]
- c) Explain local and global thresholding in Image? [6]

OR

- Q2)** a) Explain the following edge extraction operators - [6]
- i) Sobel Edge detector
 - ii) Prewitt Edge detector
- b) What is Hough transform? How it is used for edge linking? [6]
- c) Explain Image Segmentation using - [6]
- i) Image Region Splitting
 - ii) Region Merging

P.T.O.

- Q3) a)** Calculate the efficiency of Huffman code for the following symbols whose probability of occurrence is given below, [6]

Symbol	Probability
1	0.9
2	0.06
3	0.02
4	0.02

- b) Differentiate between Lossless and Lossy compression? [6]
c) How the entropy of image is calculated? Write significance of entropy in image processing. [5]

OR

- Q4) a)** State and explain types of redundancies in image? [6]
b) What is motion Estimation? Explain in detail any two types of region of support. [6]
c) Write a short note on Video compression? [5]

- Q5) a)** Compare any three noise models in short? [6]
b) Draw and explain Image Degradation Model? [6]
c) Estimate the various degradation functions in Image Restoration? [6]

OR

- Q6) a)** Explain the use of Wiener filter in Image restoration? [6]
b) Differentiate between Image Enhancement and Image Restoration in detail? [6]
c) Explain in detail constrained least square filtering? [6]

- Q7) a)** Write a short note on structural methods? [6]
b) Explain, How deep learning using CNN is used for object recognition? [6]
c) Describe patterns and pattern classes in object recognition? [5]

OR

- Q8) a)** Describe recognition based on decision theoretic methods? [6]
b) Write a short note on image processing application as character recognition? [6]
c) What is Image classification? How it is used for object recognition?[5]



Total No. of Questions : 8]

SEAT No. :

PA-1495

[Total No. of Pages : 2

[5926]-115

T.E. (E & TC)

SENSORS IN AUTOMATION (Elective - II)

(2019 Pattern) (304195B) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicates full marks.
- 3) Draw neat diagram wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Write a short note (any three) : [12]

- i) Absolute Pressure
 - ii) Gauge and Vacuum Pressure
 - iii) Pascal to PSI - Unit Conversions
 - iv) Basic Principle of working of Bernoulli's theorem
- b) With the help of schematic diagram explain the working Ultrasonic flow measurement system. [5]

OR

Q2) a) With the help of schematic diagram explain the working of electro optical sensor. [7]

- b) What is the used of accelerometer in speed measurement system. [4]
- c) Why signal conditional circuit play an important role in automation industries? [6]

Q3) a) Which factors need to be considered in selecting a sensor for a particular application. Explain with help of suitable example. [9]

- b) Explain working principle of Strain Gauge with suitable diagram, what are different types of Strain gauge sensing elements. [9]

OR

Q4) a) What is LVDT , explain working of LVDT with suitable diagram, Write application of LVDT. [9]

- b) Explain working of Inductive and Capacitive Proximity switch. [9]

P.T.O.

- Q5)** a) Define and explain the term i) Biosensors Resonant mirror and ii) Light addressable Potentio-Metric. [8]
b) Use of Plasmon resonance in environmental studies. [5]
c) Explain in details working of LDR. [4]

OR

- Q6)** a) Explain in detail about MQ-3 Alcohol Detector and Gas Sensor Module MQ 135 Air Quality. [8]
b) What do you mean by Ph Measurement. [5]
c) Distinguish between Photo diode and Photo Transistor. [4]

- Q7)** a) What is a data acquisition system? What are different types of data acquisition systems? Explain any one DAS system. [7]
b) Explain the IOT based Greenhouse system with the help of block diagram. [5]
c) Explain I²C Interface in details using block diagram. [4]
d) Explain various application of IOT. [2]

OR

- Q8)** a) Describe the different components of IOT with the help of Block diagram. [6]
b) With the help of block diagram explain the IOT Functional blocks [6]
c) Explain Multichannel DAS System. [4]
d) State application of DAS. [2]



Total No. of Questions : 8]

SEAT No. :

PA-1496

[Total No. of Pages : 2

[5926]-116

T.E. (Electronics/E&TC)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - II) (Elective - II) (304195C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve question Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right side indicate full Marks.
- 3) Assume the suitable data, if necessary.

Q1) a) Discuss grid layout with suitable Program. [10]

b) Write a short note on : [8]

- i) Swing Component
- ii) Collection Framework in Java

OR

Q2) a) Explain about Sets, Sequence, and Map. [8]

b) What is layout Manager? Discuss any two layout managers. [10]

Q3) a) How to execute SQL Command with JDBC? [9]

b) What is callable Statement? Explain with suitable example. [8]

OR

Q4) a) What is prepared Statement? Write a code that makes use of prepared Statement for inserting data. [9]

b) Give details of JDBC Driver Types. [8]

Q5) a) Explain the concept of stub, skeleton, parameter marshalling and un-marshalling in the context of RMI. [9]

b) Write a java program to perform addition of two numbers with Client/Server Application using RMI. [9]

OR

P.T.O.

- Q6)** a) Define RMI? Explain with suitable diagram the layers of RMI Architecture? [9]
b) Explain about client/Server Application using RMI. [9]

- Q7)** a) Write Short note on : [9]
i) Cookies
ii) TCP/IP Server Socket
b) Explain in detail Life cycle of a Servlet. [8]

OR

- Q8)** a) What is Inet Address Class? Write a program to get host name and IP address. [9]
b) Explain datagram, Datagram Socket and Datagram packet. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1497

[Total No. of Pages : 2

[5926]-117

T.Y. (E & TC)

EMBEDDED PROCESSORS

(2019 Pattern) (Semester - II) (Elective - II) (304195)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Write features of UART0. Write the format of LCR Register. [5]
b) Draw interfacing diagram of GSM using UART with LPC 2148. Write algorithm to send message using GSM Module. [6]
c) Draw and explain interfacing of DHT11 with LPC2148. Write algorithm/flowchart to display temperature and humidity. [6]

OR

- Q2)** a) Draw and explain the interrupt structure of LPC 2148. [5]
b) Draw interfacing diagram of GSM using UART with LPC 2148. Write algorithm/flowchart to display location received from GPS interfaced with LPC2148. [6]
c) Draw and explain interfacing of servomotor with LPC2148. Write algorithm/flowchart to rotate the motor. [6]

- Q3)** a) Compare ARM7 and ARM Cortex. What are advantages of ARM Cortex over ARM Processor? [6]
b) Explain programmer model of ARM CORTEX M4. [6]
c) How CMSIS Standard is used for firmware development? [6]

OR

P.T.O.

- Q4)** a) Describe Memory Map of ARM CORTEX M4. [4]
b) What are different exceptions and nested Vector interrupt Controller in STM32F4xx controller? [6]
c) With the block diagram explain the STM32F4xx Architecture. [8]

- Q5)** a) What are different SFRs related with GPIO. [5]
b) Write algorithm/ flowchart to generate delay of 5ms using Timer of STM32F4xx controller. [6]
c) Enlist the features of on chip ADC of STM32F4xx controller. [6]

OR

- Q6)** a) Draw and explain interfacing diagram of seven segment display with STM32F4xx. [5]
b) Write algorithm/flowchart to transmit serially. 'NUMBER' on hyper terminal using UART of STM32F4xx. [6]
c) Draw and explain interfacing diagram of LDR and MQ3 sensor with ARM Cortex Microcontroller. [6]

- Q7)** a) Draw and explain an interfacing of STM32F4xx with Ultrasonic Sensor HC-SR04. [5]
b) Explain how PWM of STM32F4xx used to control the speed of DC motor. [5]
c) Enlist the features of CAN Bus and describe briefly sequence of transmitting and receiving character. [8]

OR

- Q8)** a) Draw and explain an interfacing of STM32F4xx with accelerometer MPU 6050. [5]
b) Write an algorithm to rotate the motor in clockwise direction using PWM of STM32F4xx. [5]
c) Write a short note on CAN Bus and describe its frame structure. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1498

[Total No. of Pages : 2

[5926]-118

T.E. (E&TC)

NETWORK SECURITY (ELECTIVE -II)

(2019 Pattern) (Semester - II) (304195(E))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figurers to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What is asymmetric key encryption? Compare symmetric and Asymmetric encryption (Any 3 points). [6]

b) Explain RSA algorithm in detail. [6]

c) Discuss the steps in the various rounds of AES. [6]

OR

Q2) a) Write a note on Diffie-Hellman key exchange protocol. [6]

b) Explain the problems with symmetric key encryption. [6]

c) Compare block cipher and a stream cipher. [6]

Q3) a) What is authentication explain with an example? What are the methods of authentication [6]

b) Explain any four fields of X. 509 digital certificate. [6]

c) Explain how kerberos works with its applications. [5]

OR

P.T.O.

- Q4)** a) What is HMAC? Discuss HMAC algorithm in detail. [6]
b) Compare MD5 with SHA. Why is SHA more secure than MD5? [6]
c) What are biometric authentication techniques? Discuss. [5]

- Q5)** a) Explain the concept of key rings in PGP. [6]
b) Describe IPsec security services. [6]
c) Write a note on S/MIME. [6]

OR

- Q6)** a) What are the basic approaches to bundling SAs? [6]
b) Describe authentication header format, also explain its modes of operation. [6]
c) What are the advantages and applications of IP security? [6]

- Q7)** a) What are limitations of firewalls? Explain any two types in details? [6]
b) Explain Honeypats Intrusion Detection System. [6]
c) What is SET? Elaborate the key participants of SET. [5]

OR

- Q8)** a) Draw SSL architecture and explain. [6]
b) Write a short note on virtual election. [6]
c) What are the four methods used by firewalls for access control and enforce a security policy. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1499

[Total No. of Pages : 3

[5926]-119

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - I) (314441)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is a Regular Grammar? Explain types of regular grammar. [5]

b) Simplify the following CFG. [6]

$S \rightarrow ABA$

$A \rightarrow aA \mid \epsilon$

$B \rightarrow bB \mid \epsilon$

c) What is ambiguous grammar? Show that the following grammar is ambiguous and find the equivalent unambiguous grammar. [7]

$E \rightarrow E + E \mid E * E \mid (E) \mid I$

$I \rightarrow a \mid b$

OR

Q2) a) Write CFG for the language $L = \{a^i b^j c^k \mid i = j + k \text{ \& } j, k \geq 1\}$. [6]

b) Check whether the given language is CFL or not $L = \{a^n b^n c^n \mid n \geq 0\}$. [6]

c) Covert the following RLG to FA. [6]

$S \rightarrow 0A \mid 1B \mid 0 \mid 1$

$A \rightarrow 0S \mid 1B \mid 1$

$B \rightarrow 0A \mid 1S$

P.T.O.

- Q3)** a) Define Post machine. [3]
- b) Design a PDA for accepting language $L = \{ w c w^R \mid w \in (a, b)^* \}$. [6]
- c) Define Push down Automata. Explain different types of PDA. Explain any two applications of PDA. [8]

OR

- Q4)** a) Design a Pushdown Automata for the following language [7]

$$L = \{ a^n c b^n \mid n \geq 1 \}$$

- b) Convert the grammar [6]

$$S \rightarrow 0S1 \mid A$$

$$A \rightarrow 1A0 \mid S \mid \epsilon$$

to PDA that accepts the same language by empty stack.

- c) Compare Finite Automata and Pushdown Automata. [4]

- Q5)** a) Write a note on Universal Turing Machine. [5]

- b) Explain post correspondence problem with a suitable example. [6]

- c) Construct a Turing machine to find 2's complement of a binary number. [7]

OR

- Q6)** a) Design a Turing Machine to increment value of binary number by one. [8]

- b) Write short notes on [6]

i) Unsolvable problems

ii) Applications of Turing Machine

- c) What are recursive and recursively enumerable languages? [4]

Q7) a) What is a Traveling Salesman Problem? Justify that it is a NP-class problem. **[8]**

b) Write short notes on **[9]**

i) A Simple Un-decidable problem

ii) Measuring Complexity

OR

Q8) a) Explain Cook's theorem in detail. **[8]**

b) Explain in detail the Node-Cover Problem. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PA-1399

[Total No. of Pages : 2

[5926]-12

T.E. (Automobile)

NUMERICAL & OPTIMIZATION METHODS

(2019 Pattern) (Semester - I) (316481)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) $\frac{dy}{dx} = \frac{x^2}{2y}$ Given at $x = 0, y = 1.2$, find y at $x = 0.4$. Take step size $h = 0.4$, using Runge-kutta 2nd order method. [9]
- b) Use Runge-kutta of fourth order method to obtain the numerical solution of $\frac{dy}{dx} = x^2 + y^2$ $y(1) = 1.5$ in the interval $[1, 1.3]$ with $h = 0.1$. [8]

OR

- Q2)** a) Solve the boundary value problem $\frac{d^2y}{dx^2} - 64y + 10 = 0$ with $y(0) = y(1) = 0$. Using finite difference method and calculate $y(0.5)$ taking step size $h = 0.25$ [9]
- b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition using explicit finite difference scheme at $t = 0, u = \sin \pi x$ ($0 < x < 1$) at $x = 0$ and $x = 1, u = 0$ for all the values of t . Taking increment in t as 0.002 and increment in x as 0.2 tabulate value of u for $t = 0$ to 0.006 and $x = 0$ to 1. [8]

- Q3)** a) Evaluate $\int_0^2 \frac{x}{\sqrt{2+x^2}} dx$ by using Trapezoidal rule with four strips. [9]
- b) Use Simpson 1/3rd Rule to estimate following integration $\int_1^2 \frac{e^x}{x} dx$. [9]

OR

P.T.O.

Q4) a) Evaluate the double integration of $f(x) = \frac{x+xy}{2y}$ for $x = 6$ to 14 and $y = 1$ to 5 by using Simpson $1/3^{\text{rd}}$ rule. Take number of strip for x and y equal to 4 . [9]

b) Find the double integration of $f(x) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5 . Use Trapezoidal rule. [9]

Q5) a) Maximize $Z = 14x + 20y$ subjected to condition, [8]

$$20x + 6y \leq 1000$$

$$\& 40x + 8y \leq 500$$

$X, y \geq 0$ Solved by using Simplex method.

b) Using golden section search method, determine the maximum value of $f(x) = 2\sin x - 0.1x^2$ in the interval $[0, 4]$. [9]

OR

Q6) a) Using Newton method calculates the maximum value of the equation $2\sin x - 0.1x^2$ take initial guess 2.5 and do 3 iterations. [4]

b) Explain Single variable unconstrained optimization. [4]

c) Find the initial basic feasible solution for the transportation problem by Vogel's approximation method. [9]

	D1	D2	D3	Supply
S1	5	1	7	10
S2	6	4	6	80
S3	3	2	5	50
Demand	75	20	50	-

Q7) a) Explain Particle swarm optimization. [9]

b) Explain Ant Colony optimization. [9]

OR

Q8) a) Explain Genetic algorithms. [9]

b) Explain Simulated annealing. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1500

[Total No. of Pages : 3

[5926]-120

T.E. (Information Technology)

OPERATING SYSTEMS

(2019 Pattern) (Semester-I) (314442)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3. or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.

- Q1)** a) What is semaphore and mutex? Explain with the help of pseudocode, how semaphore is used to solve producer consumer problem? [9]
- b) What are the four necessary conditions for deadlock? How is a deadlock detected in a system with resources having single instances? Explain with an example. [9]

OR

- Q2)** a) Define mutual exclusion, race condition, semaphore. Deadlock. [6]
- b) What is Bankers safe sequence algorithm? Apply it for finding safe sequence of execution of 5 processes in a system having Snapshot at time T₀: [12]

	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2	4 3 3	

Also determine whether following requests can be granted or not:

- i) Request for process P2: - 3 0 0 and
- ii) Request for process P3: - 0 0 1

P.T.O.

- Q3)** a) Given memory partitions of 150k, 650k, 280k, 390k and 540k (in order) how would each of the First fit, Best fit, and Worst fit algorithms place processes of 212k, 457k, 112k, 510k and 326k (in order) [9]
- b) With the help of neat diagrams, Write a short note on Buddy system. [8]

OR

- Q4)** a) Explain Belady's anomaly with suitable example. [6]
- b) Consider the following segment table: [6]

Segment	Base	Length
0	1790	350
1	2722	1050
2	520	925
3	5200	450
4	4200	655

What are the physical addresses for the following logical addresses?

- i) 0,330
 - ii) 2,525
 - iii) 4,700
 - iv) 3,400
 - v) 1,1110
- c) What are the distinctions among logical, relative and physical addresses? [5]

- Q5)** a) A disk drive has 200 tracks, numbered 0-199. The drive is currently serving the request at track no 53. The queue of pending requests in FIFO order is 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position what is the total distance that disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms. Assume that the head is moving in the increasing order of track number for SCAN and C-LOOK. [12]

- i) FCFS
 - ii) SCAN
 - iii) C-LOOK
 - iv) SSTF
- b) Explain with diagrams different I/O buffering techniques. [6]

OR

- Q6)** a) List and explain different file access methods. [9]
- b) Describe different methods of record blocking with the help of a neat diagram. [9]

- Q7)** a) What is system software? Explain any four system software in brief? [6]
- b) Explain imperative statement, declarative statement, and assembly directive of assembly language programming? [6]
- c) Discuss with example what is forward reference problem. [5]

OR

- Q8)** a) Explain ORIGIN, EQU and LTORG with an example. [6]
- b) Explain the data structures required for two PASS Assembler in detail. [6]
- c) Differentiate between literal and immediate operand. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1501

[Total No. of Pages : 4

[5926]-121

T.E. (IT)

MACHINE LEARNING

(2019 Pattern) (Semester - I) (314443)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What do you mean by coefficient of regression? Explain SSE, MSE and MAE in context of regression. [CO2, L3] [5]

b) What is multiple regression? How it is different from simple linear regression [CO2, L1] [5]

c) Consider the following data

The values of x and their corresponding values of y are shown in the table below

- i) Find values of β_0 and β_1 w.r.t. linear regression model which best fits given data.
- ii) Interpret and explain equation of regression line.
- iii) Estimate the value of y for $x = 90$.

	x	y
1	95	85
2	85	95
3	80	70
4	70	65
5	60	70

[7]

[CO2, L3]

OR

P.T.O.

- Q2) a)** Explain under fit, over fit and just fit models for Regression [CO2, L1] [5]
- b) Explain bias-variance dilemma [CO2, L2] [5]
- c) What is univariate and multivariate regression? Explain any three measures of Evaluation of performance of regression model. [CO2, L2] [7]

- Q3) a)** For the given data set apply Naïve Bayes Classifier and predict the Class for weather = Sunny and car = working. [10]

Weather	Car	Class
Sunny	Working	Go-out
Rainy	Broken	Go-out
Sunny	Working	Go-out
Sunny	Working	Go-out
Sunny	Working	Go-out
Rainy	Broken	Stay-home
Rainy	Broken	Stay-home
Sunny	Working	Stay-home
Sunny	Broken	Stay-home
Rainy	Broken	Stay-home

[CO4, L3]

- b) What is decision tree? Explain ID-3 algorithm of Decision tree in detail. [CO4, L2] [8]

OR

- Q4) a)** For the following data calculate weighted average entropy for all features.
 Length = [3,4,5] [2+, 0-] [1+, 3-] [2+, 2-]
 Gills = [Yes, No] [0+, 4-] [5+, 1-]
 Beak = [Yes, No] [5+, 3-] [0+, 2-]
 Teeth = [many, few] [3+, 4-] [2+, 1-]
 [CO4, L3]

[10]

- b) Define and Explain following terms [8]
- i) Bayesian Network
- ii) Advantages and disadvantages of Naïve Bayes Classifier [CO4, L2]

- Q5) a)** Find all association rules using apriori algorithm in the following database in the following database with minimum support = 2 and minimum confidence = 65%. **[10]**

Transactions	Data Items
T1	Pen, Pencil, Notebook
T2	Pencil, File
T3	Pen, Pencil, Notebook, File
T4	Pen, Notebook
T5	Pencil, Scale, File
T6	Pencil, Scale
T7	Pen, Pencil, Scale

[CO5, L3]

- b) What is use of K-means algorithm? Explain Centroid and medoid? Explain different types of distances measures. **[CO5, L2]** **[8]**

OR

- Q6) a)** Explain following Terms **[8]**

- i) Rule
- ii) Support
- iii) Lift
- iv) Confidence

[CO5, L2]

- b) Apply KNN on the following data and classify the new sample (3,7) to the respective class. **[10]**

X	Y	Class
7	7	Pass
7	4	Pass
3	4	Fail
1	4	Fail
4	3	Fail
6	7	Pass
3	7	?

What will be the effect on output if $k = 3$ and $k = 5$?

[CO5, L3]

- Q7) a)** With the help of suitable diagram explain Biological Neuron. **[CO6, L3]** **[6]**
- b)** What is the use of activation function in Neural Network? Explain any two activation functions in detail **[CO6, L2]** **[6]**
- c)** What is deep learning? Explain different applications of deep learning. **[CO6, L1]** **[5]**

OR

- Q8) a)** What is perceptron? Explain multilayer perceptron in detail. **[CO6, L3]** **[6]**
- b)** Write a note on following activation functions. **[6]**
- i)** Sigmoid
 - ii)** Tanh
 - iii)** ReLU **[CO6, L2]**
- c)** What is ANN? Explain McCulloch Pitts Neuron **[CO6, L2]** **[5]**



Total No. of Questions : 8]

SEAT No. :

PA-1502

[Total No. of Pages : 2

[5926]-122
T.E. (E&TC)
INFORMATION TECHNOLOGY
Human Computer Interaction
(2019 Pattern) (Semester - I) (314444)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain Goal and task hierarchy model with example. **[8]**
b) Hierarchical task analysis (HTA) is used to describe the interactions between a user & software system. Draw & explain HTA to online Movie booking system? **[9]**

OR

- Q2)** a) Differentiate User Profiles with respect to Interface design with example. **[8]**
b) How does Diagrammatic dialog design notations help designers to design better interfaces. Justify your answer with an example. **[9]**

- Q3)** a) Explain the following golden rules with example. **[9]**
i) Strive for consistency
ii) Enable frequent users to use shortcuts
iii) Offer informative feedback
b) Explain the following with reference to interface design with example **[9]**
i) Scenarios
ii) Navigation Design
iii) Screen Design

OR

P.T.O.

- Q4)** a) What is Prototyping? Explain the low-fidelity and High-fidelity designs with example. [9]
b) Consider any online digital library, draw Model -View- Controller (MVC) framework. Mention the necessary technology solutions available for each of MVC. [9]

- Q5)** a) What are the goals of evaluation? Explain Cognitive walkthrough and heuristics evaluation technique in detail. [8]
b) What is Usability testing? How will you perform Usability testing on an interactive interface? [9]

OR

- Q6)** a) Explain user interface management system (UIMS) in detail along with its architecture? [8]
b) Explain DECIDE framework with necessary diagram and an example of the same. [9]

- Q7)** a) Explain: i) Augmented Reality ii) Virtual Reality along with real life examples of both. [9]
b) Discuss in the detail the Challenges faced by designer while designing interfaces for [9]
i) Smart homes ii) Smart devices

OR

- Q8)** a) Draw and explain Design thinking in detail for any suitable application.[9]
b) In today's world finding things on web has become very easy. Discuss how the multimodal input has enriched the experience. [9]



[5926]-123

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester-I) (Elective - I) (314445A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

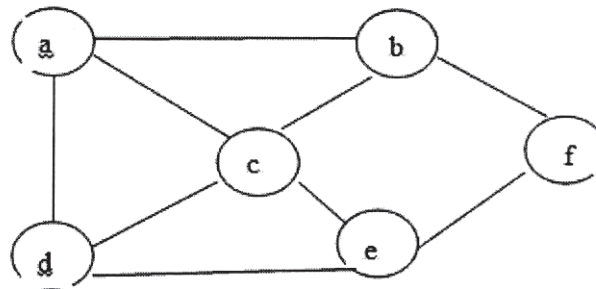
- Q1)** a) Write bellman ford algorithm to find the shortest path and analyze it. [9]
- b) Compare dijkstras algorithm and bellman ford algorithm to find Shortest Path problem? [9]

OR

- Q2)** a) Explain multistage graph problem (using forward computation) in detail? [9]
- b) Solve the following instances of knapsack problem using dynamic programming for number of object $n=4$. Knapsack capacity $m = 8$. [9]

Item	1	2	3	4
Weight	2	1	3	2
Value	\$12	\$10	\$20	\$15

- Q3)** a) Find the Hamiltonian cycle by using backtracking method in the given graph. [9]



P.T.O.

- b) Consider Knapsack problem: $n=8$, [8]
 $(w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8) = (1, 11, 21, 33, 43, 45, 55)$,
 $p = (1, 21, 31, 33, 43, 53, 55, 65)$ $m=110$. Solve the problem using backtracking

OR

- Q4)** a) Write an algorithm for graph coloring problem using backtracking method. [9]
 b) Differentiate between backtracking and branch and bound. Draw state space tree. [8]

- Q5)** a) Explain the Branch & Bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch & bound. [9]
 b) Explain the 8 – Queens problem & explain the following with respect to 8 – Queens problem. [9]

- State space tree
- Solution state
- State space
- Answer state
- Static tree
- Dynamic tree
- Live node
- Bounding function

OR

- Q6)** a) Describe the following with respect to B & B. [9]
 • The method
 • LC search
 • Control abstraction for LC search
 • Bounding function
 b) Solve the following instance of the knapsack problem by branch and bound algorithm for $W=16$. [9]

Item	Weight	Value in Rs.
1	10	100
2	7	63
3	8	56
4	4	12

- Q7)** a) Explain the Clique Problem. [9]
b) Give the relationship between P, NP, NP complete, and NP hard problem. [8]

OR

- Q8)** a) What do you mean by P, NP, NP complete and NP hard problem with example. [9]
b) What is non-deterministic algorithm. Write any one non-deterministic algorithm. [8]



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Total No. of Questions : 8]

SEAT No. :

PA-1506

[Total No. of Pages : 2

[5926]-126

T.E. (Information Technology)

INTERNET OF THINGS

(2019 Pattern) (Semester - I) (314445D) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Why 6LoWPAN plays important role in IOT. Explain in detail 6LoWPAN.[8]
b) What is advantages of Zigbee? Explain in detail Zigbee protocol stack.[9]

OR

- Q2)** a) Explain Piconet and Scatternet with Bluetooth. [8]
b) Explain data aggregation and dissemination in detail. [9]

- Q3)** a) Draw and explain interfacing of output device (Relay) using Ardiuno Uno with program. [8]
b) Why the python is the first choice for the Raspberry Pi language than C or C++? [9]

OR

- Q4)** a) Draw and explain interfacing of input device (LED) using Ardiuno Uno with program. [8]
b) What is an IOT Device? List different IOT Devices. Explain any 2 devices.[9]

- Q5)** a) Explain Data and message security and Non repudiation and availability with respect to IOT security. [9]
b) Explain Python Web Application Framework in detail. Explain How different amazon web services can be used for IOT? [9]

OR

P.T.O.

- Q6)** a) Explain Key elements of IOT Security in details. [9]
b) What is threat analysis in IOT? Explain threat analysis in detail. [9]

- Q7)** a) Explain smart city architecture with diagram also state security and privacy challenges in smart transportation in smart city. [9]
b) Explain in detail How IOT can be used in home automation? [9]

OR

- Q8)** a) Explain how you will design a smart water management system for agriculture using IOT. [9]
b) Explain in detail any two application of health monitoring using IOT. [9]

▽▽▽▽

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Total No. of Questions : 8]

SEAT No. :

PA-1507

[Total No. of Pages : 2

[5926]-127

T.E. (Information Technology)
COMPUTER NETWORK & SECURITY
(2019 Pattern) (Semester-II) (314451)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain DSDV & AODV protocol in detail. [9]
b) Write a short note on sensor network with classification of protocols used. [9]

OR

- Q2)** a) Explain design issues and design goal in adhoc network MAC layer. [6]
b) Compare sensor network with adhoc wireless network. [6]
c) Explain with diagram clustered architecture for sensor network. [6]

- Q3)** a) Explain different block cipher modes. [8]
b) Comment on security principles and security services. [9]

OR

- Q4)** a) What is importance and need of security?. [5]
b) Explain distributed Denial of service attacks. [6]
c) Explain Electronic Code block (ECB) mode. [6]

- Q5)** a) Explain difference between symmetric and asymmetric key cryptography. [9]
b) Explain Data Encryption Standards with diagram. [9]

OR

P.T.O.

- Q6)** a) Explain following terms: [9]
- i) Groups
 - ii) Rings
 - iii) Prime Numbers
- b) Explain diffie Hellman key exchange in detail. [9]

- Q7)** a) What is cyber terrorism? Write in detail example of cyber terrorism. [8]
- b) What is a man-in-the-middle attack (MIM)? Explain in detail. [9]

OR

- Q8)** a) Explain the term phishing & SQL Injection with suitable example. [8]
- b) Explain the term cyber stalking & cyber espionage with suitable example. [9]



Total No. of Questions : 8

SEAT No. :

PA-1508

[Total No. of Pages : 2

[5926]-128

T.E. (Information Technology)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester-II) (314452)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) i) Explain Google File system and its advantages. [5]
ii) Explain ETL in Big data. [5]
b) Explain Hadoop distributed file system. [8]

OR

- Q2)** a) i) Write 5 Hadoop Shell commands. [5]
ii) Explain Role Job tracker and Task Tracker in Hadoop Architecture. [5]
b) Explain Map Reduce with proper diagram for word count example. [8]

- Q3)** a) Explain different types of Big Data Analysis techniques. [8]
b) i) Explain Different Data Transformation techniques. [3]
ii) What is dataset? Explain with python syntax of 2 different types of dataset used in Big data. [6]

OR

- Q4)** a) i) Explain Mean, Mode and variance and standard deviation with suitable example. [8]
ii) Explain Data Standardization. [3]
b) Draw and explain Architecture of HIVE. [6]

P.T.O.

- Q5)** a) i) How data visualization help Big data Analytics. [4]
ii) List the conventional Data visualization tools. Explain any Two. [6]
b) Explain data visualization with the help of example? What are the advantages of data visualization? [8]

OR

- Q6)** a) Explain any 4 Types of data visualization with example. [8]
b) i) Explain different data visualization tools. [6]
ii) Explain Data Visualization with Tableau. [4]

- Q7)** a) Explain Text mining with example. [8]
b) Explain Big Data Analytics Challenges in brief. [9]

OR

- Q8)** a) Explain four Big Data use cases. [8]
b) Explain types of Mobile Analytics. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1509

[Total No. of Pages : 2

[5926]-129

T.E. (Information Technology)

WEB APPLICATION DEVELOPMENT

(2019 Pattern) (Semester - II) (414464A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) List and explain different types of structural directives in Angular. [6]
b) How would you demonstrate the term web framework? Give the reason for using a web framework. [6]
c) What is Angular JS? Explain its features. [6]

OR

- Q2)** a) List and explain the features of any three popular web frameworks. [6]
b) Explain MVC architecture with a suitable diagram. [6]
c) How would you use the term typescript? Give the advantages and disadvantages of using it. [6]

- Q3)** a) List and explain the features of advanced MongoDB. [6]
b) Explain any four methods of console object in node.js with suitable examples. [6]
c) Write a short note on PM2 microservices. [5]

OR

- Q4)** a) Explain the callbacks in node.js with a suitable example. [6]
b) What is the purpose of map reduce? Explain it with a suitable example. [6]
c) Write a short note on Mongoose ODM [5]

P.T.O.

- Q5)** a) Explain the mobile devices and desktop devices in detail. [6]
b) What is j Query? Explain its architecture in detail. [6]
c) What is CDN? How it is powerful in web development? [6]

OR

- Q6)** a) Explain the mobile devices and desktop devices in detail. [6]
b) What is j Query? Is j Query a mobile framework? If yes. explain in brief [6]
c) What is a page? Write a code to create a page in j Query mobile. [6]

- Q7)** a) What is VPC? Explain the components of VPC. [6]
b) What is cloud computing? What are the benefits of cloud computing? [6]
c) List and explain the steps to deploy the application on the elastic beanstalk. [5]

OR

- Q8)** a) What are the storage services provided by AWS? [6]
b) What is S3 bucket and how to create a bucket? [6]
c) What is PuTTY? How to connect the EC2 instance with PuTTY? [5]



Total No. of Questions : 8]

SEAT No. :

PA-1400

[Total No. of Pages : 3

[5926]-13

T.E. (Automobile)

HEAT TRANSFER

(2019 Pattern) (Semester-I) (316482)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Define local and average heat transfer coefficient. [4]
b) State some applications of heat transfer by convection. [5]
c) Discuss velocity boundary layer development in Circular pipe with sketch. [8]

OR

- Q2)** a) Discuss significance of prandtl, Nusselt and stanton number in heat transfer by convection. [6]
b) Differentiate between Biot Number and Nusselt Number. [4]
c) Water is flowing at rate of 50kg/min through a tube of inner diameter 2.5 cm. The inner surface of tube is maintained at 100°C. If the temperature of water increases from 25°C to 55°C. Find length of tube required. [7]

$$Nu=0.023 Re^{0.8} Pr^{0.4}$$

Properties of water: $\rho=977.8\text{kg/m}^3$, $k=0.6672\text{W/m}^\circ\text{C}$

$$\mu=405\times 10^{-6} \text{Ns/m}^2, C_p=4.187\text{kJ/kg } ^\circ\text{C}$$

- Q3)** a) Explain Forced convection with examples. [6]
b) Differentiate between natural convection and forced convection. [8]
c) Explain mixed convection. [4]

OR

P.T.O.

- Q4)** a) What are the modes of boiling? Explain any one boiling. [7]
b) Explain factor affecting the nucleate pool boiling. [6]
c) Differentiate between film wise and drop wise condensation. [5]

- Q5)** a) What is LMTD for a heat exchanger? Derive an expression for LMTD of parallel flow heat exchanger. [10]
b) State application of heat exchanger. [4]
c) Discuss TEMA. [4]

OR

- Q6)** a) The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2 Kg/s and 0.5Kg/s respectively. The inlet temperature on the hot and cold sides is 75°C and 20°C respectively. The exit temperature of hot water is 45°C. If the individual heat of hot water is 45°C. The individual heat transfer coefficient on the both sides are 650W/m²C. Calculate area. [10]
b) A heat exchanger is used to cool hot water from 80°C other to 60°C by transferring heat to other stream of cold water enters the heat exchanger at 20°C and leave at 40°C. Should this heat exchanger operate under parallel flow or counter flow conditions? Discuss. [4]
c) Draw shell and tube type heat exchanger. [4]
- Q7)** a) The effective temperature of a body having an area of 0.12m² is 527 °C calculate [10]
i) The total rate of energy emission
ii) The intensity of normal radiation
iii) The wavelength of maximum monochromatic emissive power.

- b) State: [7]
- i) Stefan Boltzmann law
 - ii) Kirchhoff's law
 - iii) Solid angle

OR

- Q8) a) Explain : [7]
- i) Shape factor with example.
 - ii) Radiation shields
- b) Explain properties of radiation [6]
- c) Define total emissive power and intensity of radiation. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1510

[Total No. of Pages : 2

[5926]-130

T.E. (Information Technology)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester-II) (314454-A) (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What is the need of rule-based systems? Discuss its characteristics'? [9]
b) What is Knowledge Agent? What are various types in it Explain. [9]

OR

- Q2)** a) Discuss forward chaining with suitable example. [9]
b) Considering the situation of conflict explain any one method to resolve it. [9]

- Q3)** a) Explain components of NLP. [9]
b) Explain Unification grammar with suitable example. [9]

OR

- Q4)** a) What is Conceptual Parsing? It's need in NLP. [9]
b) Discuss modelling beliefs in pragmatic process. [9]

- Q5)** a) Explain Iterative deepening with concepts. [8]
b) What do you understand by Goal stack planning? Where it applies? [9]

OR

- Q6)** a) What is constraint posting? Where it is applicable? [8]
b) Elaborate components of planning system in AI. [9]

P.T.O.

- Q7)** a) Write a short note on “Boltzmann Machines” [8]
b) Explain Architecture of Deep Network. [9]

OR

- Q8)** a) Explain in brief Tensor Flow. [8]
b) Discuss how AI is influenced by IoT? [9]



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Total No. of Questions : 8]

SEAT No. :

PA-1511

[Total No. of Pages : 2

[5926]-131

T.E. (Information Technology)

CYBER SECURITY

(2019 Pattern) (Semester-II) (314454-B) (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Que1 or Que2, Que3 or Que4, Que5 or Que6, Que7 or Que8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What is cyber forensics? Explain the challenges in cyber forensics. [9]
b) Explain Anti-forensics practices in details. [9]

OR

- Q2)** a) Explain cyber forensics investigation process. [9]
b) List and explain different Email Crimes. Explain Email forensics. [9]

- Q3)** a) Which properties of digital evidence are important in Digital Forensics? Explain in detail. [9]
b) Compare Cyber Forensics and Digital Forensics. [8]

OR

- Q4)** a) What is Digital Forensics? Explain the role of digital forensics. [9]
b) List and explain principles of Forensics Audio and Video Analysis. [8]

- Q5)** a) What is Social Engineering? Explain it with suitable example. [9]
b) Explain attack spiral model in Social Engineering. [9]

OR

- Q6)** a) Explain social engineering conceptual evolution. [9]
b) What do meant by phishing attack'? How phishing attack works'? [9]

P.T.O.

- Q7)** a) Explain the term “Cyber Law”. Explain Cyber Law with suitable example. [9]
b) Write a short note on Indian IT act 2000 and amendments in 2008. [8]

OR

- Q8)** a) What is meant by Security Audit? Explain steps in Security Audit. [9]
b) What do meant by Cyber offences? List offences under IT Act 2000.[8]



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Total No. of Questions : 8]

SEAT No. :

PA-1512

[Total No. of Pages : 2

[5926]-132

T.E. INFORMATION TECHNOLOGY
(Cloud Computing (EL-II))
(2019 Course) (Semester - II) (314454C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2,. Q3 or Q4, Q5 or Q6, Q7 or Q8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicates full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain SAML and OAuth as standards for security. [6]
b) Define Atom and RSS and differentiate between Atom and RSS. [6]
c) Write short note on Windows Azure Platform architecture. [6]

OR

- Q2)** a) Explain steps to launch an EC2 instance in AWS Cloud. [6]
b) Explain Open Cloud Consortium and Open Virtualization format. [6]
c) Define Bucket in Amazon S3 and differentiate between DynamoDB and Amazon S3 [6]
- Q3)** a) Write a Short Note on Simple DB [6]
b) What is fault tolerance. Explain characteristics of fault tolerance. [6]
c) What is disaster recovery? Explain disaster recovery methods. [5]

OR

- Q4)** a) What is Recovery time objectives (RTOs) and Recovery point objectives (RPOs) [6]
b) Draw & explain General Architecture Hadoop Distributed File System (HDFS) [6]
c) List and explain the security issues in cloud [5]

P.T.O.

- Q5)** a) Explain in detail NASA's Nebula Cloud. [6]
b) Explain Supply Chain Management. [6]
c) Explain the concept of FutureGrid. [6]

OR

- Q6)** a) Explain Social Networking site Twitter. [6]
b) Explain the different Technologies to build IOT infrastructure. [6]
c) Explain the Applications of the Internet of Things [6]
i) Inventory Management
ii) Route Generation & Scheduling

- Q7)** a) Draw the Docker architecture and explain the components [6]
b) Discuss in brief: Comet Cloud [6]
c) What's the difference between cloudlets and clouds [5]

OR

- Q8)** a) Draw the kubernetes architecture and explain the components [6]
b) Differentiate between multimedia Vs Mobile Cloud [6]
c) Write a different application of fabric and paints [5]



Total No. of Questions : 8]

SEAT No. :

PA-1513

[Total No. of Pages : 2

[5926]-133

T.E. Information Technology

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - II) (314454D)(Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2,. Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicates full marks.
- 4) Assume Suitable data if necessary.

- Q1) a)** Draw an activity diagram for a Passport Management System To get a new passport, an applicant has to apply on-line, get the appointment. He has to submit the documents in passport office on the date of appontment. In case of insufficient or incorrect documents, the applicants have to reapply and get new appointment after submission of documents, applicants verification is done by the police. On successful verification, passport is issued to the applicant. If verification is unsuccessful, applicant has to reapply for passport. Construct the activity diagram of the given description using swim lanes. **[6]**
- b) Explain the difference between sequence & collaboration diagram with examples. **[6]**
- c) Draw a state machine diagram for an automated Washing Machine. Make suitable assumptions and clearly state the assumptions made. **[6]**

OR

- Q2) a)** The project leader schedules a meeting of members of project group by using a meeting scheduler. These are some of the assumptions:
- The project leader interacts through a GUI form to schedule the meeting. A scheduler does the automated scheduling of meeting based on the free slots in the timetable. All the members involved in the meeting will get an invitation through SMS on their mobiles. The system depends on an external mobile gateway to forward SMS. Draw a sequence diagram that describes the above system. **[9]**

P.T.O.

- b) Explain the following by drawing a neat fragment on a state diagram [9]
 - i) Entry and exit actions of a state.
 - ii) History states.
 - iii) Nested states.
 - iv) Activities.

- Q3)** a) Explain object-relation mapping and capabilities to be defined. [5]
- b) What are the activities involved in access layer design process? Explain in brief. [6]
- c) List and explain the steps in view layer macro process? [6]

OR

- Q4)** a) State and explain in detail main activities involved in design process? [9]
- b) Define OCL? What do you mean by expressions? Give the syntax for some common expressions. [8]
- Q5)** a) What is a behavioural design pattern? How iterator pattern solves the problem of traversal of any type of list? [6]
- b) Explain the solution of facade pattern using UML diagram. [6]
- c) Give the solution for structural design pattern. [6]

OR

- Q6)** a) What is an iterator pattern, what is its use and how is it modelled using UML. [9]
- b) What is a design pattern? How do you categorize design pattern? Give an example for each category. [9]
- Q7)** a) Explain the need for software architectural styles. List out some of the common architectural styles in use and give examples for each style. [6]
- b) Describe the process of messaging with SOAP and Atomic transaction. [6]
- c) Write note on component base software architecture. [5]

OR

- Q8)** a) What is software architecture and Explain software design levels. [9]
- b) Examine the following [8]
 - i) Data Abstraction and Object-Oriented Organization
 - ii) Pipes and Filters.



Total No. of Questions : 8]

SEAT No. :

PA-1514

[Total No. of Pages : 2

[5926]-134

T.E. (Instrumentation & Control)

EMBEDDED SYSTEMS

(2019 Pattern) (Semester-I) (306261)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the logical instructions in 8051. **[8]**

b) Differentiate between Embedded C and Embedded Python. **[10]**

OR

Q2) a) How is time delay loops made in 8051 programming? **[10]**

b) What is Embedded Python? **[8]**

Q3) a) Draw and explain how to interface a RTD to 8051. **[8]**

b) Draw and explain how to interface a Thermocouple to 8051. **[9]**

OR

Q4) a) Draw and explain how to interface LCD display 8051. **[9]**

b) Draw and explain how to interface 7 segment LED display to 8051. **[8]**

Q5) a) Draw block diagram of temperature controller using thermocouple for 8051. **[8]**

b) What the safety interlocks used in a washing machine? **[5]**

c) How is AC motor interfaced in a washing machine? **[5]**

OR

P.T.O.

- Q6)** a) Draw interface design of AC heater for 8051. [8]
b) Explain interface design of line tracing robot for 8051. [10]
- Q7)** a) Differentiate between Operational & non-operational quality attributes of embedded system. [8]
b) What is Raspberry Pi board? [4]
c) Explain quality attributes of embedded systems. [5]

OR

- Q8)** a) Write a short note on Domain Specific processors. [8]
b) Explain multiprocessing and multitasking with example [7]



Total No. of Questions : 8]

SEAT No. :

PA-1515

[Total No. of Pages : 2

[5926]-135

T.E. (Instrumentation and control Engineering)

INDUSTRIALAUTOMATION-I

(2019 Pattern) (Semester-I) (306262)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3. or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) Explain following instructions with suitable example. [10]

- i) ADD
- ii) SUB
- iii) MUL
- iv) DIV
- v) SQR

b) Develop the ladder diagram using analog input for a multi-input tank level controller. [8]

Sequence:

- i) Add component (A) to tank up to level 20%, then add component (B) to tank up to level 50%.
- ii) Stop feeding tank. Turn ON stirrer for 10 Sec.
- iii) Open discharge valve, when level again goes to 0%.
- iv) Stop the process.

OR

Q2) a) Explain PID module with Suitable example. [8]

b) Design and explain a flow control application using analog control. [8]

c) Enlist the various makes of PLC. [2]

P.T.O.

- Q3)** a) Explain the various compare instructions with suitable examples (any four) [8]
b) Explain Move and masked move instructions. [6]
c) Explain the limit instruction. [3]

OR

- Q4)** a) Explain analog module and analog signal processing. [9]
b) Write overview of one of the following PLC. [8]
i) Allen Bradley.
ii) Schneider Electric

- Q5)** a) Explain HMI. [6]
b) Explain motion control in PLC. [6]
c) Explain Advantages and disadvantages of drives. [6]

OR

- Q6)** a) Explain need and benefits of SCADA system. [9]
b) Explain Alarm management. [9]

- Q7)** a) Explain VFD. [7]
b) Enlist the differences between SCADA and HMI. [5]
c) Explain PLC interfacing to pneumatic circuits. [5]

OR

- Q8)** a) Explain the concept of RTU and MTU. [9]
b) Write note on [8]
i) Trends in SCADA.
ii) Historical data storage.



[5926]-136

T.E. (Instrumentation & Control Engineering)**MODERN CONTROL THEORY****(2019 Pattern) (Semester-I) (306263)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates:**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of calculator is allowed.

Q1) a) Check the controllability and observability of the SISO system described by the following transfer function model. **[10]**

$$\frac{Y(S)}{U(S)} = \frac{2}{s^2 + 2s + 1}$$

b) Apply the Lyapunov function $V = x_1^2 + x_2^2$ to determine the stability of

$$\text{the } \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \quad \text{[7]}$$

OR

Q2) a) Check the controllability and observability of the SISO system described by the following transfer function model. **[10]**

$$\frac{Y(s)}{U(s)} = \frac{1}{s^2 + 5s + 6}$$

b) The state equations of the system are given below **[7]**

$$\dot{x}_1 = x_1 + x_2 + u$$

$$\dot{x}_2 = -x_2$$

Check for controllability.

P.T.O.

- Q3)** Apply Ackermann's formula and coefficient comparison method to determine the state feedback gain matrix K such that desired closed loop poles of the plant are located at $s = -2 + 4i$, $s = -2 - 4i$ and $S = -10$. The plant is given by $\dot{x} = Ax + Bu$ such that [18]

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

OR

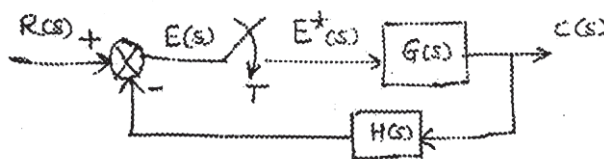
- Q4)** Apply Ackermann's formula and coefficient comparison method to determine the state feedback gain matrix K such that desired closed loop poles of the plant are located at $s = -2 + 2i$, $s = -2 - 2i$ and $S = -10$. The plant is given by $\dot{x} = Ax + Bu$ such that [18]

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

- Q5) a)** The continuous time signal $x(t) = 2 \sin(100\pi t) + \cos(50\pi t)$ is passed through an impulse sampler. Apply the sampling theorem to determine the sampling rate which can reconstruct the original signal back. [9]
- b)** Explain the sample and hold system with neat diagram. [8]

OR

- Q6) a)** Derive the magnitude and phase response equations for Zero Order Hold (ZOH) circuit. [9]
- b)** Explain the sample data control system with neat block diagram. [8]
- Q7) a)** Derive the pulse transfer function of the following discrete time system and verify that the characteristic equation is $1 + GH(z)$. [10]



- b) Determine the output $y(k)$ for $k > 0$ of the discrete time system $y(k + 2) + 0.5y(k + 1) + 0.06y(k) = -(0.5)^{k+1}$ with initial conditions $y(0) = y(1) = 0$. [8]

OR

- Q8) a) Apply the Jury's stability criterion to determine the stability of the system described by Characteristic polynomial $\Delta(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$. [10]
- b) Apply the Z-transform approach for solving the following difference equation $x(k + 2) + 3x(k + 1) + 2x(k) = 0$, with $x(0) = 0$, $x(1) = 1$. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1517

[Total No. of Pages : 2

[5926]-137

T.E. (Instrumentation and Control Engineering)

OPERATING SYSTEM

(2019 Pattern) (Semester - I) (306264)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Write a note on contiguous memory allocation and fragmentation. [8]
b) What is page fault and page replacement? Describe the steps in handling a page fault with suitable figure. [9]

OR

- Q2)** a) Explain briefly the concept of paging. Describe with neat figure the page hardware support needed for paging. [8]
b) Draw the applicable figure and determine the number of page faults for a reference string :

5, 2, 0, 2, 3, 1, 5, 4, 2, 3, 2, 4, 0, 1, 2, 0, 1

Algorithm to be used is FIFO and there are 3 frames are available which are initially empty. Also explain briefly Belady's anomaly. [9]

- Q3)** a) With neat diagram explain resource allocation graph used to describe deadlock. Also enlist necessary conditions for deadlock to occur. [9]
b) When to use deadlock detection scheme? Describe with neat diagram the detection scheme when there is single instance of each resource type. [9]

OR

- Q4)** a) Write a note on recovery from deadlock. [9]
b) Describe the role of safety algorithm and resource-request algorithm used in the Banker's algorithm for deadlock avoidance. [9]

P.T.O.

- Q5) a)** Which are the operations to be performed on directory? Explain single level directory. [8]
- b)** Define a file. What do you mean by text file, source file and executable file? Briefly explain any six file attributes. [9]

OR

- Q6) a)** Enlist approaches for free space management. Explain linked list approach. [8]
- b)** With suitable figure, explain the layered file system. Also enlist methods to allocate disk space to files. [9]

- Q7) a)** What do you mean by system protection? What are the goals? Explain the access matrix. [9]
- b)** Define virus. Describe briefly any 4 categories of virus. [9]

OR

- Q8) a)** Enlist different methods to implement access matrix. Explain any two of them. [9]
- b)** Explain One Time Password and Biometrics as tools for user authentication. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1518

[Total No. of Pages : 2

[5926]-138

T.E. (Instrumentation & Control)

MECHATRONICS AND ROBOTICS

(2019 Pattern) (Semester - I) (306265A) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) Draw a block diagram of mechatronic design Process and explain in brief [18]

- a) Sensors and Actuators
- b) First Principal Modular Mathematical Modeling
- c) Control System Design

OR

Q2) a) Enlist and explain at least three life cycle factors considered while life cycle design in mechatronic design methodology. [6]

b) Explain prototyping and hardware-in-the-loop simulation concept in mechatronic design methodology. [6]

c) Explain in brief the Conceptual design, Concept generation and Concept evaluation in mechanical design process. [6]

Q3) a) Give Classification of robots based on configurations or coordinates? Draw appropriate diagrams of them? [6]

b) Draw and Explain the principle of operation of permanent magnet single phase BLDC motor? [6]

c) Explain different safety measures for Robot? (at least four features). [6]

OR

P.T.O.

- Q4)** a) List the four types of robots anatomies or coordinate systems? Give How many number of linear axes and rotary axes are present in each case? [6]
b) Explain the working principle of one proxy (proximity) and one range sensors? [6]
c) Explain the principle of operation of dc motor along with its diagram? Enlist parts of dc motors? [6]

- Q5)** a) Write a note on Direct Kinematics? [6]
b) Define terms and draw its figures i) Degree of freedom ii) Work Volume?[6]
c) Write a short note on applications of Python Programming in Robotics?[5]

OR

- Q6)** a) Write a note on Inverse Kinematics? [6]
b) Explain the concept of state-space representation of a problem in Artificial Intelligence using Traveling Salesman's problem? [6]
c) Draw and explain working of Vacuum cups as gripper? [5]

- Q7)** a) How line following robot is to be implemented, Describe components to be used, microcontroller, algorithm, program and results? [12]
b) Write a short note on development of Robotic arm-design? [5]

OR

- Q8)** a) How remote control car is to be implemented, Describe components to be used, microcontroller, algorithm, program and results? [12]
b) Write a short note on selection of components such as motor, microcontroller and material in robotic applications? [5]



Total No. of Questions : 8]

SEAT No. :

PA-1519

[Total No. of Pages : 2

[5926]-139

T.E. (Instrumentation and Control)
306265B: Elective-I: DATA SCIENCE
(2019 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explicate the various mathematical operations that can be performed on arrays using Numpy. [9]

b) Explain different Customization of plots and Graphical representations used in Data Science. [9]

OR

Q2) a) Differentiate Data Visualization using Matplotlib Vs Seaborn. [9]

b) Explain with applications the concepts of [9]
i) append and merge
ii) loc and iloc
iii) concatenation of data

Q3) a) Example of categorical data and numerical data with examples. [8]

b) Discuss the various statistical approaches for compensating missing values in a dataset. [9]

OR

P.T.O.

Q4) a) Analyze the concept of 'Outlier' and discuss the various Outlier detection algorithms. [9]

b) Discuss on the analysis of univariate, bivariate data. [8]

Q5) a) Explain the concept of 'One Hot Encoding' with example. [9]

b) Differentiate between One Hot Encoding and Label Encoding with advantages and applications. [9]

OR

Q6) a) Explain the concept of data scaling. Discuss about Min-max scaling and mean scaling in detail. [9]

b) Discuss about the concept of feature selection and how it can affect ML modeling. [9]

Q7) a) Differentiate between traditional BI and Tableau. [8]

b) Explain the different data types and databases in Tableau. [9]

OR

Q8) a) Explain the 'live' and 'extract' connections between Tableau and database in detail. [9]

b) Discuss the different types of Charts in Tableau. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1401

[Total No. of Pages : 2

[5926]-14

T.E. (Automobile Engineering)
DESIGN MACHINE COMPONENTS
(2019 Pattern) (Semester -I) (316483)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following.
- 2) Assume suitable data if necessary.

Q1) a) Explain the different forms of threads. **[8]**

- b) The lead screw of a lathe has single start ISO trapezoidal threads of 30 mm diameter and 6 mm pitch. It drives a tool carriage and exerts an axial load of 1.5 KN on a collar of 30 mm inside diameter and 50 mm outside diameter. If the lead screw rotates 40 rpm, find the power required to drive the screw and efficiency. Take the coefficient of friction for power screw as 0.14 and for collar as 0.09. **[10]**

OR

Q2) a) Explain the types of fastenings. **[6]**

- b) A double riveted lap joint is made between 15 mm thick plates. If the ultimate stresses are 400 Mpa in tension, 620 Mpa in crushing and 330 Mpa in shear. Take the factor of safety 4. Design the joint. **[12]**

Q3) a) A steel connecting rod is subjected to a reversed axial loading 180 KN. Determine the required diameter of rod using factor of safety 2. Take ultimate stress = 363 Mpa, yield shear stress = 216 Mpa, yield stress = 470 Mpa, fatigue stress concentration factor = 1, correction factor = 0.7, surface finish factor = 1, size factor = 0.89. **[10]**

- b) The brasses of an automobile engine connecting rod have worn so as to allow play which gives shock loading equivalent to a weight 6000 N falling through a height 0.2 mm. The connecting rod is 250 mm long and has a cross-sectional area 300 mm². Determine the maximum stress induced in connecting rod, resilience in tension or compression. Take E = 200000Mpa. **[7]**

P.T.O.

- Q4) a)** A hot rolled steel rod is subjected to torsional load varying from - 110N-m to 440N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550Mpa, yield shear stress = 235Mpa, yield stress = 470Mpa, fatigue stress concentration factor = 1, load factor = 0.7 for axial and 1 for torsion, surface finish factor = 0.89, size factor = 1. Calculate the diameter of rod . **[10]**
- b)** Write a short note on Modified Goodman diagram. **[7]**

- Q5) a)** Explain the classification of gears. **[6]**
- b)** Design a pair of helical gears are to transmit 15KW at 10,000rpm of the pinion with PCD 80mm. The transmission ratio is 3 :1. Assume $\alpha = 20^\circ$ FDI, $\beta = 45^\circ$. $\sigma_d = 193.2$ Mpa, BHN = 250 for pinion and gear Check only tangential tooth load. $Y = \pi (0.154 - 0.912/Z_e)$, $C_v = 5.55/5.55 + V^{0.5}$. **[12]**

OR

- Q6) a)** Design spur gear set to transmit 20KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2$ Mpa, BHN=250 for pinion and $\sigma_d = 47.1$ Mpa, BHN=200 for gear. Check only tangential tooth load. Form factor $Y = \pi (0.154 - 0.912/Z)$, $C_v = 3.05/3.05 + V$. **[12]**
- b)** Derive lewis equation for beam strength. **[6]**

- Q7) a)** Compare involute and cycloidal teeth profile. **[5]**
- b)** Two shafts are right angles to each other are connected by 20° full depth involute teeth bevel gears. The velocity ratio is 3 : 1 The pinion transmits 37.5 KW at 750 rpm. Assume number of teeth on pinion is 20. Design the gear set. Take $\sigma_d = 233.4$ Mpa, BHN = 200 for pinion and $\sigma_d = 172.6$ Mpa, BHN = 150 for gear. Form factor $Y = \pi (0.154 - 0.912/Z_e)$, $C_v = 6.1/6.1 + V$. **[12]**

OR

- Q8) a)** What are the advantages and disadvantages of worm gear drive? **[5]**
- b)** A worm gear drive is to connect two shafts to transmit 10 KW. The transmission ratio is 20 : 1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take $\sigma_d = 207$ Mpa, for worm and $\sigma_d = 82.4$ Mpa, for worm wheel. Form factor $Y = \pi (0.154 - 0.912/Z)$. **[12]**



Total No. of Questions : 8]

SEAT No. :

PA-1520

[Total No. of Pages : 2

[5926]-140

T.E. (Instrumentation and Control)
306265C: POWER ELECTRONICS
(2019 Pattern) (Elective - I) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Obtain an expression for average dc output voltage of a 1-phase half controlled rectifier for R load with firing angle, α [9]

b) Write a short note on PWM inverter. [8]

OR

Q2) a) Illustrate how a Thyristor based 1-phase fully controlled rectifier can be used to convert ac into variable dc. Draw the waveforms of output voltage & output current for both R and RL load at $\alpha = 300$. [9]

b) Differentiate a Current source inverter from a Voltage source Inverter.[8]

Q3) a) Draw neat sketch of analog PID controller using Operational Amplifier and explain in brief. [9]

b) Compare electronics P, PI and PID controllers. [9]

OR

Q4) a) Draw op-amp. based analog comparator and discuss voltage current characteristics of an analog comparator. [9]

b) What are the advantages of digital controllers over an analog controllers.[9]

P.T.O.

- Q5)** a) Draw a neat sketch and explain block diagram of an on-line UPS system. [9]
- b) Draw neat diagram of shunt connected controllers in FACT and explain in brief. [8]

OR

- Q6)** a) What is meant by FACTS? What are the types of FACTS controllers?[8]
- b) Explain with neat diagram operation of battery system. [9]
- Q7)** a) Elaborate with neat diagram of general configuration of MPPT solar charge controller. [9]
- b) Explain basic types of solar power system. [9]

OR

- Q8)** a) What are the main features of MPPT solar charge controller. [9]
- b) Discuss with neat diagram On-Grid solar power system. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1521

[Total No. of Pages : 2

[5926]-141

T.E. (Instrumentation and Control)

BIOMEDICAL INSTRUMENTATION

(2019 Pattern) (Semester - I) (Elective - I) (306265D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) Define Heart Sounds. Draw and Discuss the working principle of Phonocardiography with neat diagram. [10]

b) Define Blood Pressure? Compare Indirect (Non-Invasive) and Direct (Invasive) Blood Pressure Measurements. [7]

OR

Q2) a) Define Cardiac Output. Draw and Discuss the working principle of Cardiac Output Measurements (Dye Dilution Method) with neat diagram. [10]

b) Describe the Working Principle of any one type of Ultrasonic Blood Flow meter with neat diagram. [7]

Q3) a) State the function of brain and its Parts. With the help of neat diagram, explain the working of Neuron and its function. [10]

b) Explain the 10-20 system of electrode placement with the help of neat diagram. [8]

OR

P.T.O.

Q4) a) List the different waves and its significance from different parts of the brain. Explain the Neuro Muscular Transmission with the help of neat diagram. [10]

b) Define myoelectric voltages. Explain the working principle of Electromyography (EMG) with the help of neat diagram. [8]

Q5) a) Elaborate the concept of Sound Conduction system with neat diagram. Explain the working of Audiometer system Bekesy with the help of neat diagram. [10]

b) With the help of neat diagram, Explain the Anatomy of Eye with the help of neat diagram. [7]

OR

Q6) a) Describe the mechanism of hearing with the help of neat diagram. Elaborate on Hearing Aids with the help of block diagram. [10]

b) Describe the Visual Acuity (Errors in Vision) and its remedy. [7]

Q7) a) With the help of neat diagram, explain the Natural Process of Breathing. Explain the working of Spirometer with the help of neat diagram. [10]

b) With the help of neat diagram, Explain the working of Infrared Gas Analyzer with the help of neat diagram. [8]

OR

Q8) a) State the function of Oxygenator. With the help of neat diagram, Explain the working of Bubble Type Oxygenators with the help of neat diagram. [10]

b) With the help of neat diagram, Explain the working of Ventilators with the help of neat diagram. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1522

[Total No. of Pages : 2

[5926]-142

T.E. (Instrumentation and control Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester-II) (306268)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3. or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain roll of platform in IoT. **[8]**

b) Discuss deployment options of IoT platforms. **[9]**

OR

Q2) a) What are different types of platform? Discuss each in brief. **[9]**

b) It is required to interface a sensor having measuring displacement form 0 mm to 10000 mm having output range is 0 to 5 V. Draw a interfacing diagram write a program to read the data and display it on serial port. Consider any suitable IoT compatible board. **[8]**

Q3) a) Explain architecture of cloud. **[9]**

b) What is identity portrayal? Explain federal and global identity management. **[9]**

OR

Q4) a) What is infrastructure as a service? Explain with suitable example. **[9]**

b) Explain hybrid and device centric identity management with suitable example? **[9]**

Q5) a) Discuss network and transport layer challenges from security view point. **[8]**

b) Discuss security framework in IoT. **[9]**

OR

P.T.O.

- Q6)** a) Explain authorization mechanism in IoT. [8]
b) Explain IoT routing attacks. [9]

- Q7)** a) Explain application of IoT in smart grid. [9]
b) Elaborate application of IoT in automobiles. [9]

OR

- Q8)** a) Discuss how IoT help to improve healthcare services with suitable example. [9]
b) What is role of IoT in building SMART cities? Explain with suitable example. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1523

[Total No. of Pages : 2

[5926] - 143

T.E. (Instrumentation and Control)

INDUSTRIAL AUTOMATION - II

(2019 Pattern) (Semester - II) (306269)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Enlist all 7 layers in OSI reference model. How many layers are required in process control network? Write the significance of these layers in detail. [10]

b) Draw architecture of Foundation field bus and explain in detail. [7]

OR

Q2) a) With the help of frame structure, programming and implementation examples, illustrate HART protocol. [10]

b) Distinguish between Divicenet and Controlnet. [7]

Q3) a) What is the significance of Human Machine Interface (HMI) in DCS system? [8]

b) Write note on DCS Operator Station and describe the need of data logging, Trend displays. [10]

OR

P.T.O.

Q4) a) Explain the importance of plant mimic and animations with suitable diagrams. [8]

b) What is alarm philosophy? [5]

c) Explain how to generate report in DCS. [5]

Q5) a) What are the basic elements of Sequential Flow Chart (SFC)? With the help neat diagram illustrate a simple example of SFC. [10]

b) How the Fuzzy logic is implemented in DCS, explain in detail? [7]

OR

Q6) a) With the help of neat diagram and main elements explain the Function Block Diagram (FBD). Give one example of Boolean equation. [10]

b) Write a short note on use of Model Predictive Control in DCS. [7]

Q7) a) What is Industry 4.0? Write a note on Industrial Internet of Things (IIoT). [10]

b) How the smart phones are connected to DCS system? What information can be shared on smart phones? [8]

OR

Q8) a) Explain application of DCS system in paper and pulp industry. [12]

b) Prepare specification sheet of DCS for cement industry. [6]



[5926]-144

**T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester-II) (306270)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of Non-Programmable Calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

UNIT - I

- Q1)** a) Find the magnitude and phase response for the given difference equation [7]

$$y(n) = \frac{1}{3}x(n) + \frac{1}{3}x(n-1)$$

- b) Explain the frequency selective filters with mathematical equations. [7]
- c) Enlist the properties of Discrete Time Fourier Series. [4]

OR

- Q2)** a) State and explain any two properties of Discrete Time Fourier 'Transform'? [6]
- b) A causal system is represented by the following difference equation. [12]

$$y(n) + \frac{1}{2}y(n-1) = x(n) + \frac{1}{2}x(n-1)$$

Find the system transfer function, impulse response and the frequency response of the system.

UNIT - II

- Q3)** a) State and explain the properties of the Discrete Fourier Transform. [6]
- i) Linearity.
 - ii) Time Shifting.

P.T.O.

- b) Find the Discrete Fourier Transform of the following sequence. [8]

$$x(n) = \{1, 0, 1, 0, 1, 0, 1, 0\}$$

- c) Explain the bit reversal concept in FFT algorithms. [3]

OR

- Q4)** a) Find the Inverse Discrete Fourier Transform of [6]

$$X(k) = \{6, -2 + 2j, 0, -2 - 2j\}$$

- b) Find the linear convolution using circular convolution method for the following sequences and compare the result with linear convolution. [11]

$$x(n) = \{1, 0, 2, 3\}$$

$$h(n) = \{2, 4, 6\}$$

UNIT-III

- Q5)** a) Using bilinear transformation method find $H(z)$, [8]

$$H(s) = \frac{1}{(s+1)(s+3)}$$

For $T = 1$ sec.

- b) Compare analog and digital filters. [6]

- c) Explain the designing steps to design digital butterworth filter. [4]

OR

- Q6)** a) Find the order and cut-off frequency of the filter with specifications given as, [9]

$$0.6 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.35\pi$$

$$|H(e^{j\omega})| \leq 0.1; \text{ for } 0.7\pi \leq \omega \leq \pi$$

- b) Explain the designing steps in digital Chebyshev filter. [6]

- c) Explain in brief the prewarping technique in bilinear transformation. [3]

UNIT-IV

- Q7)** a) Explain the Gibb's phenomenon in detail with neat diagram. [7]
b) Design a low pass FIR filter using rectangular window by taking $N = 7$, magnitude = 1 and cut-off frequency $\omega_c = 0.2\pi$ rad/sample. [10]

OR

- Q8)** a) Enlist the different types of windows with their mathematical equations. [5]
b) Design a high pass FIR filter with cut-off frequency $\omega_c = 0.8\pi$ rad/sample using hamming window for $N = 5$, with magnitude = 1. [12]



Total No. of Questions : 8]

SEAT No. :

PA-1525

[Total No. of Pages : 2

[5926]-145

T.E. (Instrumentation and Control)

BUILDING AUTOMATION

(2019 Pattern) (Semester - II) (306271A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) How does the AHU Work? What is Variable Air Volume System & Dual Duct System? [9]

b) What is function of AHU? What are the different types of air handling units? [9]

OR

Q2) a) Differentiate between Constant and Variable Air Volume Systems. [9]

b) What is the FCU? Where the FCU's are used? [9]

Q3) a) What is geothermal energy? [8]

b) What are the components of a chiller system? What is the working principle of chiller? How many types of chilled water systems are there? [9]

OR

Q4) a) What is the importance of heat exchanger? What is the working principle of heat exchanger? [8]

b) How is the traditional chiller? (Refrigeration cycle). [9]

Q5) a) What is SLC? [9]

b) Explain the conventional (Non-addressable) and addressable Types of Fire Alarm Systems. [9]

OR

P.T.O.

- Q6)** a) Explain FAS loops and classifications. [9]
b) What is the difference between conventional and addressable fire alarms? [9]

- Q7)** a) What is Video Analytics? Why Use Video Analytics? [8]
b) How does access control work? [9]

OR

- Q8)** a) What are the key Video Analytics features of a Retail Video Management Software? [8]
b) What are the types of CCTV camera? [9]

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Total No. of Questions : 8]

SEAT No. :

PA-1526

[Total No. of Pages : 2

[5926]-146

T.E. (Instrumentation Engineering Control)

(306271B): MACHINE LEARNING

(2019 Pattern) (Semester - II) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Describe in brief the concept of logistic regression and derive its equation. **[10]**

b) Derive Bayes Theorem and Naïve Bayes Theorem. **[8]**

OR

Q2) a) Explain in detail the concept of KNN along with its advantages and disadvantages. **[10]**

b) Explain the functions used in logistic regression. **[8]**

Q3) a) Explain Hyperplane, Support vectors and margin with the help of diagram. **[9]**

b) Explain kernels with application. **[8]**

OR

Q4) a) Explain the concept of SVM with application. **[9]**

b) Explain separable and non-separable data with an application to SVM. **[8]**

P.T.O.

- Q5)** a) Define the following : [10]
Root node, leaf node, Gin index, entropy, pruning
- b) Explain the working of Random Forest algorithm. [8]

OR

- Q6)** a) Explain advantages, disadvantages and applications of Random Forest algorithm. [10]
- b) Describe the steps in the implementation of Decision tree algorithm. [8]

- Q7)** a) Explain working of K means clustering algorithm. [9]
- b) Explain Silhouette method. [8]

OR

- Q8)** a) Explain model evaluation methods of unsupervised machine learning algorithms. [9]
- b) Explain categories of Hirarchical clustering. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1527

[Total No. of Pages : 2

[5926]-147

T.E. (Instrumentation and Control)
(306271C): ELECTRICAL DRIVES
(2019 Pattern) (Semester - II) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Discuss the permanent magnet motor working principle with diagram and its performance characteristics. Discuss single phase converter as a dc drive for it with waveforms. [10]

b) Draw and discuss Dual converter fed DC Drive. [6]

OR

Q2) a) Compare shunt, series, compound DC motors & their performances. [10]

b) Draw and discuss DC Drive using current loop control. [6]

Q3) a) Discuss Speed Control and braking of induction motor. [10]

b) Discuss different methods for synchronous motor speed and direction control in detail. [8]

OR

Q4) a) Discuss different methods for induction motor speed and direction control in detail. [10]

b) Discuss Cyclo-converter fed AC Drives: vector Control and Rotor side Control. [8]

P.T.O.

Q5) a) Which motor can be used in lathe machines and why? Write the selection criterias of drives required for lathe machine. [10]

b) Discuss the application of Motors and electric drives for Cranes and Hoist. [8]

OR

Q6) a) Which motor can be used in lathe machines and why? Write the selection criterias of drives required for lathe machine. [10]

b) Discuss the detail drives application for Refrigeration and Air Conditioning. [8]

Q7) a) Discuss the speed control method in electric vehicle. Discuss the drive used for it. [9]

b) Discuss DC/AC converter in detail used for electrical vehicle. [9]

OR

Q8) a) Discuss use of Permanent Magnet Synchronous Motor (PMSM) in electrical vehicle? Write detail drive control for it. [10]

b) Draw and discuss Torque–speed capabilities of induction motor. Discuss the Application of induction Motor in Electric Vehicle. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1528

[Total No. of Pages : 3

[5926]-148

T.E. (Mechanical/Mechanical-Sandwich)
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester - I) (302041)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6 and Q.7 OR Q.8
- 2) Neat diagrams must be drawn wherever necessary
- 3) Figures to the right side indicate full marks.
- 4) Use of Scientific Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) Evaluate $\int_0^1 \int_0^1 (x^2 y^2) dx dy$ by using suitable method. Take Step size in x & y as 0.25. [9]

b) Use Simpson's $\left(\frac{3}{8}\right)$ th rule to estimate integration $\int_0^\pi \frac{\sin^2 x}{e^x + \cos x} dx$. And compare result with Trapezoidal Method. [9]

OR

Q2) a) Gas is expanded according to law $pV^{1.3} = C$ from the pressure of 10 N/m^2 . Assuming the initial volume of gas 1 m^3 and final volume 7 m^3 . Calculate work done using Simpson's $\frac{1}{3}$ rule. Divide volume in 6 equal strips. [8]

b) Using Gauss-Legendre three point formula, find $\int_0^2 (e^x + 4x - 3) dx$. [5]

c) Draw Flowchart of Trapezoidal Method to evaluate Integration of a function. [5]

Q3) a) Use Newton's Forward Difference Method to find y_g at $x_g = 1.105$ and 1.56 . [8]

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	0	0.331	0.728	1.207	1.744	2.375	3.096

P.T.O.

- b) The values of Nusselt numbers (Nu) and Reynolds numbers (Re) found experimentally are given below. If the relation between Nu and Re is of type $Nu = a.Re^b$, find the values of a and b for the given values of Nu and Re. [10]

Re	3000	4000	5000	6000	7000
Nu	14.3575	16.6517	16.7353	17.6762	18.5128

OR

- Q4) a) The variations of deformation of a metal rod can be modeled as $d = aT^2 + bT + c$, where T is the Operating Temperature. Calculate the values of a, b and c from the following table : [10]

Temperature (K)	300	350	400	450	500
Deformation (mm)	0.913	0.929	0.922	0.918	0.909

- b) The following data are taken from the steam table. Find pressure and temperature, $t=142^\circ\text{C}$. Use suitable method of interpolation. [8]

Temperature $^\circ\text{C}$	140	150	160	170	180
Pressure kg/cm^2	3.685	4.854	6.302	8.076	10.225

- Q5) a) If $\sum f = 27, \sum fx = 91, \sum fx^2 = 359, \sum fx^3 = 1567, \sum fx^4 = 7343$. Find first four moments about origin. Find A.M., S.D, $\mu_1, \mu_2, \mu_3, \mu_4$. Find coefficients of skewness and kurtosis. Comment on skewness and kurtosis. [8]

- b) Compute the first four central moments, arithmetic mean, standard deviation and variance for the following frequencies : [9]

F	0-10	10-20	20-30	30-40	40-50
x	13	20	30	25	12

OR

- Q6) a) Following is the score of seven students in management accounting(X) and business statistics(Y). Calculate Karl Pearson correlation coefficient between the score in two subjects. [10]

Student No.	1	2	3	4	5	6	7
Score X	40	70	84	74	26	78	48
Score Y	64	74	100	60	50	48	80

- b) Runs scored in 10 matches of current IPL season by two batsmen A and B are tabulated as under [7]

Batsman A	46	34	52	78	65	81	26	46	19	47
Batsman B	59	25	81	47	73	78	42	35	42	10

Decide who better batsman is and who is more consistent.

- Q7) a) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times and C can hit the target 3 out of 4 times. Find the probability of [9]

- at least two hit the target
- At most two hit the target
- No one hitting the target

- b) A microchip company has two machines that produce the chips. Machine I produce 65% of the chips, but 5% of its chips are defective. Machine II produces 35% of the chips and 15% of its chip are defective. A chip is selected at random and found to be defective. A chip selected at random and found to be defective. What is the probability that it came from machine I? [8]

OR

- Q8) a) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained. [9]

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

- b) Let $F : \mathbb{R}^4 \rightarrow \mathbb{R}^3$ be the linear mapping defined by $F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$. Find a basis and the dimension of [8]

- the image of F,
- the kernel of F

x x x

Total No. of Questions : 8]

SEAT No. :

PA-1529

[Total No. of Pages : 3

[5926]-149

T.E. (Mechanical/Mechanical - Sandwich)

HEAT AND MASS TRANSFER

(2019 Pattern) (Semester - I) (302042)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Draw neat diagram wherever necessary.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data if necessary.*
- 5) *Figures to the right indicate full marks.*

- Q1) a)** The crankcase of an IC Engine measuring $0.8 \text{ m} \times 0.2 \text{ m}$ may be assumed as a flat plat. The engine runs at a speed of 25 m/s and the crankcase is cooled by the air flowing past it at the same speed. Calculate the heat loss from the crank surface maintained at 85°C to the ambient air at 15°C . Due to road induced vibration, the boundary layer becomes turbulent from the leading edge itself. **[10]**

Properties of the air 50°C ,

$$\nu = 17.95 \times 10^{-6} \text{ m}^2/\text{s},$$

$$k = 0.02824 \text{ W/mK},$$

$$\text{Pr} = 0.698$$

$$\text{Use } \text{Nu} = 0.036 (\text{Re})^{0.8} (\text{Pr})^{1/3}$$

- b) Explain the physical significance of Reynold's Number in case of Forced convection and Grashof's Number in case of Natural Convection. **[8]**

OR

- Q2) a)** A Nuclear reactor with its core constructed of parallel vertical plate 2.2 m high and 1.45 wide has been designed on free convection heating of liquid bismuth. The maximum temperature of the plate surfaces is limited to 960°C , while the lowest allowable temperature of bismuth is 340°C . Calculate the maximum possible heat dissipation from both sides of each plate. For the convection coefficient the correlation is $\text{Nu} = 0.13 (\text{Gr.Pr})^{1/3}$ Where the properties evaluated at mean film temperature of 650°C for bismuth are : **[10]**

$$\rho = 10^4 \text{ kg/m}^3,$$

$$\mu = 3.12 \text{ kg/m-h},$$

$$C_p = 150.7 \text{ J/kgK},$$

$$k = 13.02 \text{ W/mK}.$$

- b) Mention difference between Boiling and Condensation. Explain pool boiling and Regimes of pool boiling. **[8]**

P.T.O.

Q3) a) Explain the following terminology of Radiation. [12]

- i) Emissive Power
 - ii) Emissivity
 - iii) Wein's Displacement Law
 - iv) Stefan-Boltzmann law
- b) Formulate the Radiation Heat flow equation for two concentric infinitely long Cylinders. Let r_1 and r_2 radii of inner and outer cylinder, T_1 & T_2 are surface temperature inner and outer cylinder with ϵ_1 & ϵ_2 be respective emissivity. Also consider shape factor if required. [5]

OR

Q4) a) Determine the heat transfer rate per unit area due to radiation between two infinite long parallel planes. The First plane has an emissivity = 0.4 & it is maintained at 200°C . The emissivity of second plane is 0.2 and it is maintained at 30°C . A radiation shield having $\epsilon = 0.5$ is introduced between the given planes. Find the percentage reduction in the heat transfer rate & the steady state temperature attained by the radiation shield. [10]

- b) Derive relation for radiation between two finite black surface and explain term shape factor. [7]

Q5) a) State Fick's Law of Diffusion and Explain Mass diffusion coefficient. [6]

- b) Write Mass diffusion Equation in Cartesian coordinates deviation, cylindrical coordinates and Spherical Coordinates with Boundary and Initial Condition. [8]

- c) Define following Terminology: [4]

- i) Mass Diffusion velocity
- ii) Molar Diffusion velocity
- iii) Mass Diffusion Flux
- iv) Molar Diffusion Flux

OR

Q6) a) Oxygen at 25°C and pressure of 2 bar is flowing through rubber of inside diameter 25mm and wall thickness 2.5mm. The diffusion of oxygen in rubber is 3.12×10^{-3} kgmol/m³ bar. Find the loss of O² diffusion per meter length of pipe. [8]

b) Draw Phase Diagram and explain different phases. [5]

c) Write down the Physical origins of mass transfer and enlist the applications of mass transfer. [5]

Q7) a) Determine the area required in parallel flow heat exchanger to cool oil from 60°C to 30°C using water available at 20°C. The outlet temperature of the water is 26°C. The rate of flow of oil is kg/s. The specific heat of the oil is 2200 J/kgK. The overall heat transfer coefficient $U = 300$ W/m²K. Compare the area required for a counter flow exchanger. [10]

b) Derive LMTD for parallel flow heat exchanger and mention assumptions considered for derivations. [7]

OR

Q8) a) A counter flow heat exchanger is used to cool 3600 kg/hrs of oil ($C_p=2000$ J/kg K) at 150°C with the help of water ($C_p=4178$ J/kg K) flowing at the rate of 3710 kg/Hr. Water enters at 298K. The overall heat transfer coefficient is 500 W/m² and the surface area is 4.872 m². Calculate the exit temperature of oil & water by using: [12]

i) LMTD Method

ii) NTU-effectiveness Method.

b) Explain Temperature and Radiation Effects in Heat Exchanger Design.[5]



Total No. of Questions : 8]

SEAT No. :

PA-1402

[Total No. of Pages : 2

[5926]-15

T.E. (Automobile Engineering)

AUTOMOBILE ELECTRICAL AND ELECTRONICS

(2019 Pattern) (Semester - I) (316484)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicates full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Enlist different drive mechanisms of starting motor. Explain any one of them. [8]

b) What is the significance of Cam Angle and Contact point gap in coil ignition system? [9]

OR

Q2) a) What are the types of distributors? Explain any one with neat figure.[8]

b) Explain working of Vacuum spark advance. [9]

Q3) a) What is the need of detecting throttle position? Explain working of throttle angle sensor with neat figure. [9]

b) Explain working of position sensor with neat figure. Enlist its different types. [9]

OR

Q4) a) Explain working of positive Temperature Coefficient (PTC) Thermistor. [9]

b) Explain knock Sensor with neat figure. [9]

Q5) a) Explain working of two different injection methods based on spark plug location with neat figures. [8]

b) Enlist & describe the components of diesel fuel injection system. [9]

OR

P.T.O.

Q6) a) What are the different injection techniques used in SI Engine Management system? [8]

b) Explain Throttle body injection and Multipoint Fuel Injection in detail.[9]

Q7) a) Explain working of ABS with neat layout. [9]

b) What is meant by adaptive cruise control? Explain in detail. [9]

OR

Q8) a) Explain Tire pressure monitoring system in brief. [9]

b) Explain smart parking assist system with neat figures. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1530

[Total No. of Pages : 4

[5926] - 150

T.E. (Mechanical Sandwich Engg.)

DESIGN OF MACHINE ELEMENTS

(2019 Pattern) (Semester - I) (302043)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

UNIT - I

- Q1) a)** The lead screw of a lathe has Acme threads of 50 mm outside diameter and 8 mm pitch. The screw must exert an axial pressure of 2500 N in order to drive the tool carriage. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter and the lead screw rotates at 30 r.p.m. Determine [8]
- i) the power required to drive the screw; and
 - ii) the efficiency of the lead screw. Assume a coefficient of friction of 0.15 for the screw and 0.12 for the collar. Also state the condition of screw.
- b) Derive expression for torque required to raise the loads in case of square threads. [5]
- c) Derive and expression for maximum efficiency of square threads. [4]

OR

- Q2) a)** A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm², find: 1. the torque required to rotate the screw; 2. the stress in the screw; and 3. the number of threads of nut in engagement with screw. Also state the condition of screw. [8]

P.T.O.

- b) What are the advantages of trapezoidal threads over square threads? State the meaning of each term involved in designation T r40 × 14(p7). [5]
- c) Explain self-locking and over-hauling property of screw. Prove the condition for screw to be self-locking. [4]

UNIT - II

- Q3)** a) A rotating bar made of steel 45C8 ($S_{ut} = 630$ MPa) is subjected to a completely reversed bending stress. The corrected endurance limit of the bar is 315 N/mm^2 . Calculate the fatigue strength of the bar for a life of 90,000 cycles. [8]
- b) What is stress concentration? What are the causes of stress concentration? [5]
- c) Explain with neat sketch the Gerber curve, Soderberg and Goodman lines? [5]

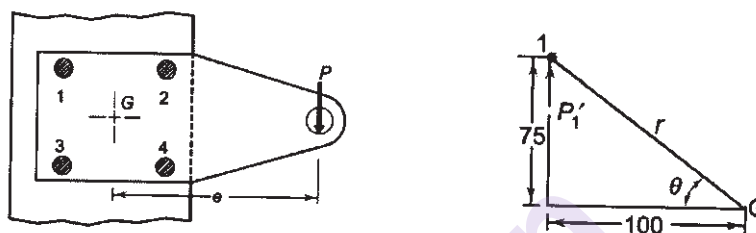
OR

- Q4)** a) A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2 . The corrected endurance limit stress for the machine component is 270 N/mm^2 . The ultimate tensile strength and yield strength of the material are 600 and 450 N/mm^2 respectively. Find the factor of safety using [8]
- i) Gerber theory
 - ii) Soderberg line
 - iii) Goodman line. Also, find the factor of safety against static failure.
- b) What is modifying factor to account for stress concentration? Explain Endurance strength Modifying factors? [5]
- c) Explain : [5]
- i) Notch Sensitivity
 - ii) Fatigue life
 - iii) Endurance limit.
 - iv) Modified Goodman diagram.

UNIT - III

- Q5) a)** The structural connection shown in Figure is subjected to an eccentric force P of 10 kN with an eccentricity of 500 mm from the CG of the bolts. The centre distance between bolts 1 and 2 is 200 mm, and the centre distance between bolts 1 and 3 is 150 mm. All the bolts are identical. The bolts are made from plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 2.5. Determine nominal diameter of the bolts.

[8]

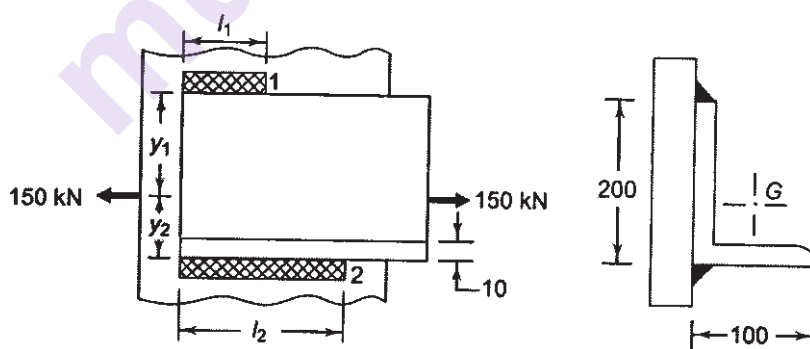


- b) Write a note on : Bolts of uniform strength. [5]
- c) Discuss the advantages and disadvantages of welded joints. [5]

OR

- Q6) a)** An ISA $200 \times 100 \times 10$ angle is welded to a steel plate by means of fillet welds as shown in Figure. The angle is subjected to a static force of 150 kN and the permissible shear stress for the weld is 70 N/mm^2 . Determine the lengths of weld at the top and bottom.

[8]



- b) Discuss in brief strength of parallel fillet welds. [5]
- c) Prove that stress on the throat is equal to the ratio of force on weld to $0.707 \times s \times l$. [5]

UNIT - IV

- Q7) a)** Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, $G = 84 \text{ kN/mm}^2$. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. [7]
- b) Explain the following terms for helical spring [6]
- i) Active and inactive coils
 - ii) Spring index
 - iii) Spring rate
- c) Explain with the neat sketch, nipping of leaf spring. [4]

OR

- Q8) a)** Design a helical compression spring for a pressure relief valve using following data; Operating pressure = 14.5 Bar; Valve lift at 18% pressure rise = 7 mm ; Diameter of valve = 37 mm ; Limiting mean coil diameter = 36 mm ; Maximum shear stress = 465 MPa ; $G = 85 \text{ GPa}$, Clash clearance = 15 % of Maximum deflection of spring, End style of spring is square and ground std. Take spring wire diameter 6, 6.5, 7, 7.5, 8, 8.5 (mm). [7]
- b) What is mean by spring surge and what is its effect? [5]
- c) Explain shot peening. [5]

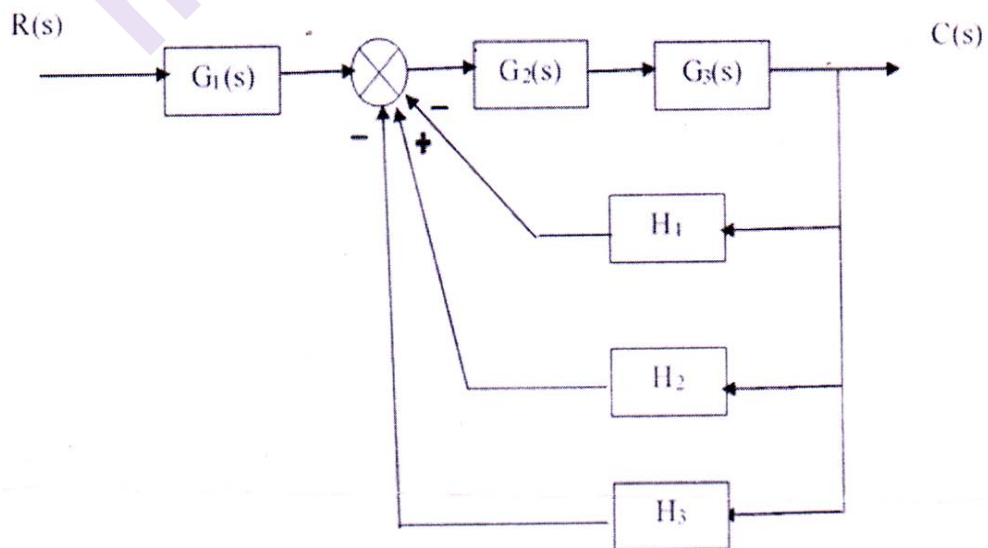


[5926]-151

T.E. (Mechanical/Mechanical- Sandwich)**MECHATRONICS****(2019 Pattern) (Semester - I) (302044)***Time : 2½ Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- 2) Use of drawing instruments, electronic pocket calculators are allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

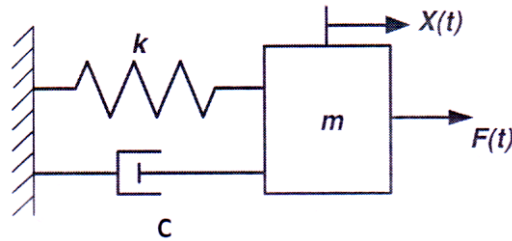
- Q1)** a) Explain application of mechatronics: Anti-lock Breaking System (ABS). [5]
- b) Compare open loop and close loop control system with block diagram and applications. [5]
- c) Reduce the block diagram and find the transfer function of the following Figure. [8]



OR

P.T.O.

- Q2)** a) Find the transfer function of the given system for $F(t)$ input and $X(t)$ output from the following Figure. [5]



- b) Explain washing machine as an application of mechatronics system. [5]
- c) By using Routh Herwitz criterion, determine the range of K that would confirm closed loop stability of system given by Transfer Function

$$\frac{1}{S^4 + 3S^3 + 3S^2 + 2S + K} \quad [8]$$

- Q3)** a) Explain transient response specification and define delay time, rise time, peak time. [5]
- b) Explain Bode plot with magnitude plot and phase plot. [5]
- c) For the system with transfer function $\frac{1}{(S + 5 + 5j)(S + 5 - 5j)}$. Draw the pole and zero plot and find damping ratio, natural frequency, peak time, maximum overshoot. [7]

OR

- Q4)** a) Explain frequency response specifications such as resonant peak, resonant frequency, band width. [5]
- b) Compare time response and frequency response analysis. [5]
- c) $\frac{C(s)}{R(s)} = \frac{4s + 6}{s^2 + 4s + 6}$ For the transfer function of second order system presented by above equation, determine : [7]
- location of poles and zeros
 - damping factor
 - comment of stability.

- Q5)** a) Distinguish between P1 controller and PID controller. [5]
- b) Explain Proportional-Derivative controller with a block diagram. [5]
- c) An integral controller is used for speed control with a set point of 15 rpm within a range of 10 to 20 rpm. The controller output is 23% initially. The constant $K_1 = -0.15$ % controller output per second per percentage error. If the speed jumps to 12.5 rpm, calculate the controller output after 3 sec for constant e_p . [8]

OR

- Q6)** a) State the advantages and application of PID controller. [5]
- b) Explain ON-OFF controller action with block diagram along with neutral zone. Also state the suitable application of ON-OFF controller. [5]
- c) For a proportional controller, the controller variable is a process temperature with a range of 50°C to 130°C and a set point of 73.5°C. Under nominal conditions, the set point is maintained with an output of 50%. Find the controller output having proportional gain of 2, if the temperature is : [8]
- i) 61°C
 - ii) 122°C and
 - iii) A ramping temperature of $(82 + 5t)$ °C.

- Q7)** a) What is the Internal Architecture in any PLC? [5]
- b) Explain the selection criteria of PLC. [5]
- c) Draw a ladder diagram for the following operation : Two push buttons PB_1 and PB_2 are used to operate Red and Yellow light. [7]
- i) When PB_1 is pushed Red lamp should be ON and it will continue to be ON till PB_2 is pushed.
 - ii) When PB_2 is pushed, Yellow light should be ON and it will continue to be ON till PB_1 is pushed.
 - iii) If PB_1 and PB_2 is pushed simultaneously, no lamp should be ON

OR

- Q8)** a) Explain counters in PLC with a neat sketch and explain UP and DOWN counters. [5]
- b) Explain Input module and output module in PLC. [5]
- c) Write ladder logic for a simple traffic light controller for the following sequence of operations : [7]
- i) Turn Green ON for 45 seconds
 - ii) Turn Yellow ON for 5 seconds
 - iii) Turn Red ON for 50 seconds
 - iv) Repeat the sequence

Total No. of Questions : 8]

SEAT No. :

PA-1532

[Total No. of Pages : 2

[5926]-152

T.E. (Mechanical / Automobile)

ADVANCED FORMING AND JOINING PROCESSES
(2019 Pattern) (Semester - I) (Elective - I) (302045A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain the following points in relation to HAZ. [9]
- i) Definition
 - ii) Causes
 - iii) Effects
 - iv) Reduction of HAZ formation
- b) What is Weld ability? Elaborate the various factors affecting weld ability. [8]

OR

- Q2)** a) What are the various criteria's for the characterization of the weld. Explain them in detail. [9]
- b) What are the factors affecting weld thermal cycles. [8]

- Q3)** a) Explain with neat sketch construction & working of Ultrasonic Welding. [9]
- b) Discuss various steps to be followed during adhesive bonding. [9]

OR

- Q4)** a) Explain with the sketch basic principle of friction stir welding. [9]
- b) Explain with the sketch how explosive welding is carried out. [9]

P.T.O.

- Q5)** a) Explain the process of underwater welding. [8]
b) Explain working of Laser beam welding with neat sketch. [9]

OR

- Q6)** a) Explain the process of Electron Beam welding along with its applications. [8]
b) Write a short note on Robotic Welding. [9]

- Q7)** a) What is sustainable manufacturing and what are the drivers for sustainable Manufacturing practices. [9]
b) Explain the basic stages of conducting a Life Cycle Assessment. [9]

OR

- Q8)** a) List and Explain about the major factors that influence sustainability. [9]
b) Explain the five core elements of ISO 14000. [9]

Total No. of Questions : 8]

SEAT No. :

PA-1533

[Total No. of Pages : 2

[5926]-153

T.E. (Mechanical/Automobile)

MACHINING SCIENCE & TECHNOLOGY

(2019 Pattern) (Semester - I) (302045B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of electronic pocket calculator IS : 800-2007 and steel table allowed.*
- 6) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) What is grinding wheel? Draw figure of various grinding wheel shapes used with names and applications. [10]
- b) Explain the burnishing process with neat sketch and state its applications. [8]

OR

- Q2)** a) What are abrasives? Explain the common types of abrasives used with their properties. [10]
- b) Explain the nomenclature of the Grinding wheel and describe the following 25 – C – 70 – M – 9 – V – 23. [8]

- Q3)** a) Define jigs and fixtures. State its advantages and limitations. [5]
- b) State various types of clamping devices used in jigs and fixtures and explain any two with neat sketch. [12]

OR

- Q4)** a) Describe the concept of degree of freedom and explain the six point location principle with help of suitable sketches. [12]
- b) State various types of jigs and explain channel jig with neat sketch.[5]

P.T.O.

Q5) a) How to determine most economical process for manufacture of product. [8]

b) Prepare the process planning sheet to manufacture a small diameter hollow piston pin from seamless tube. [10]

OR

Q6) a) Define process planning and discuss purpose and steps involved in process planning. [8]

b) Prepare a process chart for manufacture of bushes in moderate quantity of 60 per batch. [10]

Q7) a) Explain subroutine and Do loop using Canned cycle. [5]

b) Write a program to machine 40mm diameter stock to $\phi 30$ mm for a length of 30mm. [12]

OR

Q8) a) Explain the part program in CNC with steps involved in developing it. [5]

b) Write a program for milling $\phi 40$ mm and 6 mm deep circular pocket in a 75 mm \times 90 mm billet of 30 mm thickness using canned cycle. [12]



Total No. of Questions : 8]

SEAT No. :

PA-1534

[Total No. of Pages : 3

[5926]-154

T.E. (Mechanical Engineering)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester - II) (302049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data wherever necessary.

Q1) a) Explain following terms: **[6]**

- i) Accuracy
- ii) Precision
- iii) Recall
- iv) F-1 Score

b) Explain the procedure to find out the optimum value of K in K-means clustering? **[5]**

c) What is over-fitting in decision tree? Explain the techniques to avoid over-fitting. **[6]**

OR

Q2) a) Explain the steps in KNN algorithm. **[6]**

b) What is SVM? How does it work? **[5]**

c) Explain the evaluation parameters for regression model. **[6]**

P.T.O.

- Q3)** a) Explain the steps involved in development of ML model. [7]
- b) Quality Engineer wants to solve a two-class classification problem for predicting whether a product is defective. The actual number of products containing no defect are 950 (Truly predicted positives = 900), the actual number defective products are 150 (Truly predicted negatives = 130). So, calculate accuracy, precision, recall and f1 score. [4]
- c) Explain hyperparameter tuning in decision tree. Why is it required? [7]

OR

- Q4)** a) What are the different cross validation techniques? Explain K-fold cross validation with neat sketch. [7]
- b) A sugar factory produces 3 sizes of sugar from three different nets. Daily 1000 tons of sugar produced from net-1, 3000 tons produced from net-2 and 2000 tons produced from net-3. The last year season experience shows that 1.5% of the total sugar produced from net 1 is waste sugar. The corresponding fractions of waste sugars for the remaining nets are 2.5% and 2% respectively. A certain amount of sugar is taken as a sample at random and is found to be waste sugar. Find out the probability that it is produced from : [4]
- i) Net 1
 - ii) Net 2
 - iii) Net 3
- c) What are the different classification algorithms? Explain logistic regression with neat sketch. [7]
- Q5)** a) Explain the concept of Reinforcement learning with suitable example. Define following terms in Reinforcement learning: [8]
- i) Agent
 - ii) State
 - iii) Environment
 - iv) Reward

- b) Define Markov property. Explain why Markov property is most applicable in solving Reinforcement learning problems. [6]
- c) The transfer function of neuron on one layer of a neural network is assumed to be of sigmoid form. Evaluate the output of neuron corresponding to input $x = 0.62$. How is the nature of sigmoid function? (Justify the answer with plot). [4]

OR

- Q6)**
- a) Explain Convolution Neural Network (CNN) using neat flow diagram. Explain padding and striding in CNN. [8]
 - b) Explain Q-learning algorithm with flow diagram. [6]
 - c) A neuron with 4 inputs has the weights 1, 2, 3, 4 and bias 0. The activation function is linear, say the function $f(x) = 2x$. If the inputs are 4, 8, 5, 6 compute the output. Draw a diagram representing the neuron. [4]

- Q7)**
- a) How deep learning can be used for image classification? [6]
 - b) Explain human-machine interaction with suitable examples. [5]
 - c) Explain in detail various applications of AI in mechanical engineering. [6]

OR

- Q8)**
- a) How ML can be used in predictive maintenance? [6]
 - b) Explain use of AI in fault detection. [5]
 - c) Explain applications of AI in healthcare sector. [6]



[5926]-155

T.E. (Mechanical Engineering)
COMPUTER AIDED ENGINEERING
(2019 Pattern) (302050) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

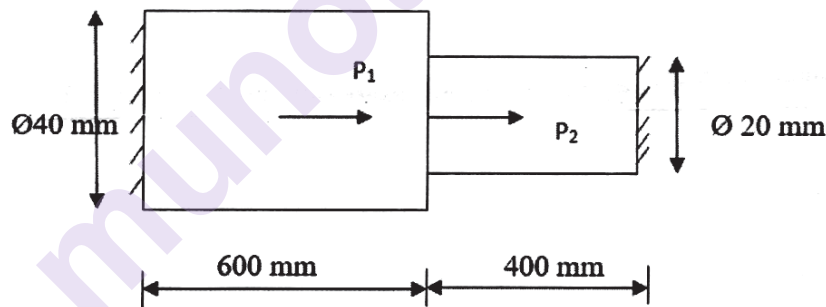
Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Draw neat diagram wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Figure shows the stepped bar subjected to load P_1 (at center) and P_2 using 1-D element. [9]

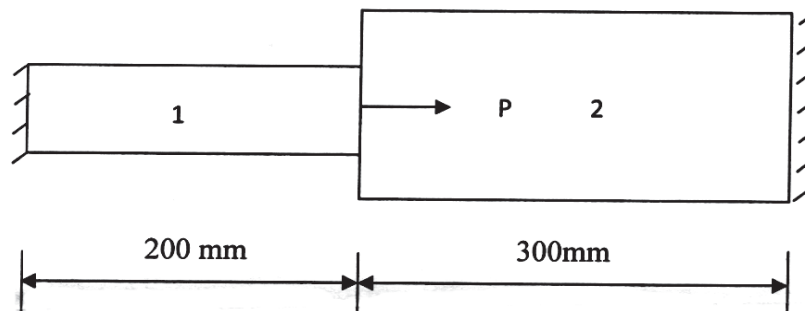
$E = 200 \text{ GPa}$, $P_1 = 50 \text{ KN}$, $P_2 = 20 \text{ KN}$. Find

- i) Nodal displacement
- ii) Stresses in each element



b) An axial load $P = 300 \times 10^3 \text{ N}$ is applied at 20°C to the rod as shown in figure. The temperature is then raised to 60°C . [8]

- i) Assemble the K and F matrices
- ii) Determine the nodal displacement and element stresses

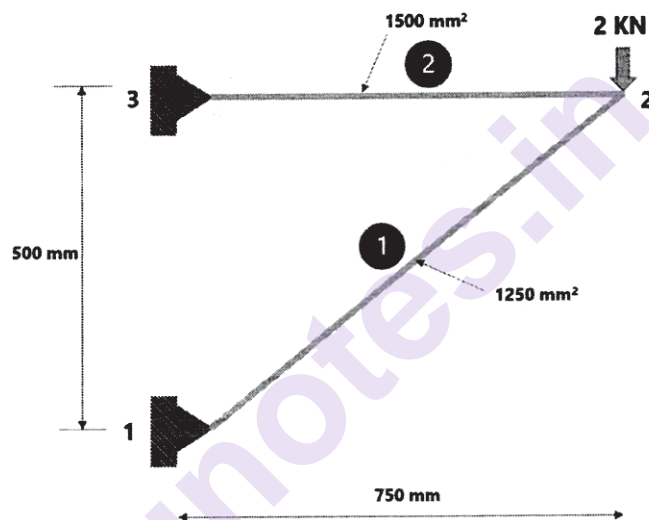


P.T.O.

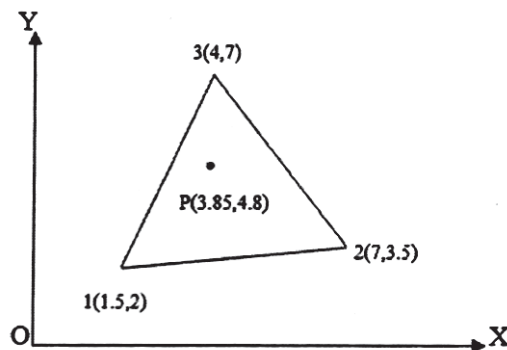
Aluminium	Steel
$E_1 = 70 \times 10^9 \text{ N/m}^2$	$E_2 = 200 \times 10^9 \text{ N/m}^2$
$A_1 = 900 \text{ mm}^2$	$A_2 = 1200 \text{ mm}^2$
$\alpha_1 = 23 \times 10^{-6} \text{ per } ^\circ\text{C}$	$\alpha_2 = 11.7 \times 10^{-6} \text{ per } ^\circ\text{C}$

OR

- Q2) a)** Derive element stiffness matrix for two and three noded (linear) bar element connected in series. [7]
- b)** Determine the nodal displacements, stresses in each element and reaction at support in the following truss elements. $E = 85 \text{ GPa}$. [10]

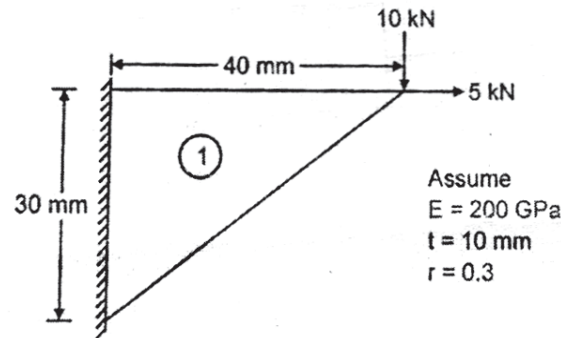


- Q3) a)** A constant strain triangular element is defined by three nodes 1(1.5,2), 2(7,3.5) and 3(4,7). Evaluate the shape functions N_1 , N_2 and N_3 at the interior point $P(3.85,4.8)$. Also determine the Jacobian of the transformation J . [7]



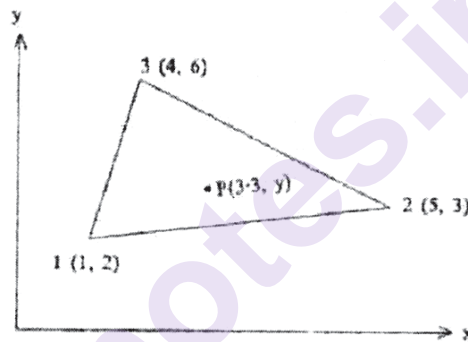
- b) In a plane stress condition of a CST element shown in figure. Determine element stiffness matrix and nodal displacement. [10]

$E = 200 \text{ GPa}$, Thickness = 10mm and poisons ratio = 0.3



OR

- Q4) a) The nodal coordinate of triangular element are shown in the figure. At the interior point 'P' the x-coordinate is 3.3. $N_1 = 0.3$. Determine N_2 , N_3 and the y-coordinate of point P. [7]



- b) The triangular metallic plate ($E = 200 \times 10^3 \text{ N/mm}^2$, $\nu = 0.25$) of thickness 10 mm is used to machine assembly. The coordinates of three vertices of the plate are shown in figure. The deflections observed at three nodes are:

$$U_1 = 0.01 \text{ mm}$$

$$V_1 = -0.04 \text{ mm}$$

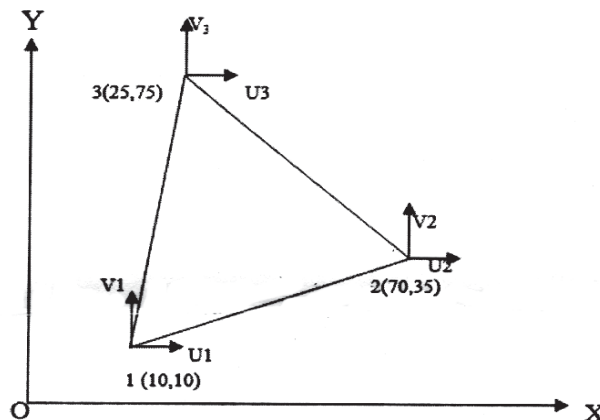
$$U_2 = 0.03 \text{ mm}$$

$$V_2 = 0.02 \text{ mm}$$

$$U_3 = -0.02 \text{ mm}$$

$$V_3 = 0.05 \text{ mm}$$

Assuming the plate as CST element, determine the strains and stresses. [10]



- Q5)** a) Give comparison of Linear and Nonlinear Analysis CAE Problems with respect to its characteristics features. [6]
b) What are the different kinds of geometric non-linearities in CAE Project? Explain with figures. [6]
c) Write a general procedure for Non-linear static analysis project. [6]

OR

- Q6)** a) Explain difference between static analysis and dynamic analysis. [6]
b) Explain free and forced vibration. Applications in consideration with CAE. [6]
c) What is natural frequency? How it is evaluated in CAE? Why it is necessary to evaluate? [6]

- Q7)** a) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. [6]
b) Discuss the concept of FEA for structural dynamics and acoustics used in NVH analysis. [6]
c) Enlist the CAE software used for different application of CAE. Write at least software with their applications. [6]

OR

- Q8)** a) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle and infinite fatigue life. [6]
b) Write the comparison of Explicit and implicit method for following criteria : [6]
i) Common software
ii) Stability
iii) Computational speed/cost
iv) Maximum size of computational problem
v) Numerical scheme
vi) Handling nonlinearity
vii) Filtering of frequencies
c) How to validate and check accuracy of the CAE results and how to view and interpret the CAE results? Explain with computation accuracy and correlation with actual testing. [6]



[5926]-156
T.E. (Mechanical)
DESIGN OF TRANSMISSION SYSTEM
(2019 Pattern) (Semester-II) (302051)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Four questions from the following
- 2) Draw neat labeled diagrams wherever necessary
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

- Q1)** a) Explain the following terms Hydrodynamic Bearing and Hydrostatic Bearing with neat sketch. [5]
- b) State the assumptions and write the Reynold's equation for 2-D flow and explain the significance of each term in it? [6]
- c) A single row deep groove ball bearing subjected to following work cycle. If $L_{10h} = 13000$ hrs. Find dynamic load carrying capacity; average speed of bearing and system reliability if such four bearings are there? [6]

F_r (kN)	F_a (kN)	X	Y	Race Rotating	C_s	Speed rpm	% Time
5	1.5	0.56	1.1	Inner	1.25	960	30
3.7	0.73	0.56	1.3	outer	1.40	1440	40
---	---	---	---	outer	---	720	30

OR

- Q2)** a) Explain the designation of rolling contact bearings with neat sketch. [5]
- b) A single row deep groove ball bearing is subjected to $F_r = 8$ kN, $F_a = 3$ kN, $X = 0.56$, $Y = 1.4$ and $N = 1200$ rpm. Diameter of shaft is 75 mm, Bearing number 6315 with $C=112000$ N Find i) L_{10} for 90% reliability; ii) reliability for $l=20000$ hrs. [6]

P.T.O.

- c) Explain the following terms; [6]
- i) Dynamic load carrying capacity
 - ii) Equivalent bearing load
 - iii) Load life relationship

- Q3)** a) Explain self-energizing block brake and self-locking block brake. [4]
- b) With neat sketch explain Block brake with long shoe? Write the equation for Maximum pressure acts on brake, Frictional Force and Braking torque for the same. [6]
- c) Draw neat sketch diagram of Cone clutch and explain construction and working. State the advantages, disadvantages and applications of Centrifugal clutch? [7]

OR

- Q4)** a) What are the advantages, disadvantages and applications of Centrifugal clutch? [4]
- b) Draw neat sketch for single plate clutch and multi plate clutch. What is difference between single plate clutch and multi plate clutch? [6]
- c) Draw a figure for is internal expanding shoe brake and write the assumptions on which its analysis depends? State the observations made when the vehicle will be travelling in 'reverse' for anti-clockwise rotation of brake drum? [7]

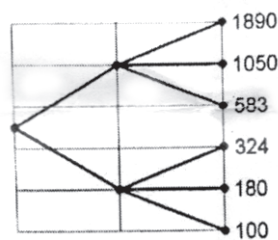
- Q5)** a) State the law of Arithmetic progression used in machine tool gearbox design. State its advantages and disadvantages. [4]
- b) Explain any four parameters considered in kinematic design of multi-speed gear box? [4]
- c) A four speed gear box is to be used for a machine tool drive. The spindle speeds range between 200 rpm to 820 rpm. Design the gear box. [10]

OR

- Q6)** a) Explain the term: Maximum loss of economic cutting speed. [4]
- b) Explain the terms [4]
- i) Range ratio with reference to machine tool gear box design.
 - ii) Transmission range with reference to machine tool gear box.

c) Read the structure diagram given below and answer the following questions: [10]

- i) What is geometric progression ratio and range ratio of this gear box?
- ii) Write structure formula for this gearbox;
- iii) What is the speed of input shaft of the gear box?
- iv) Draw schematic layout diagram of the gearbox and calculate number of teeth on each gear by assuming 20 teeth on smallest gear of each stage.



- Q7)** a) Explain Hybrid Electric Vehicle with the help of block diagram? What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
- b) Explain the important factors considered in the design of Hybrid Electric Vehicles components? [6]
- c) Explain any six components of Hybrid Electric Vehicles? [6]

OR

- Q8)** a) Explain Parallel Configuration of Hybrid Electric Vehicles with the help of Block diagram? [6]
- b) Explain Power Split Device with neat sketch? [6]
- c) Define Degree of Hybridization. Explain in details Full Hybrid and Plug-in Hybrid. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1537

[Total No. of Pages : 3

[5926]-157

T.E. (Mechanical)

COMPOSITE MATERIALS (Theory)

(2019 Pattern) (Semester - II) (Elective - II) (302052A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- 2) Figures to the right side indicate full Marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

- Q1)** a) What is diffusion bonding? Explain the metal matrix composites produced using diffusion bonding techniques? [7]
- b) Explain the Squeeze casting process of fabrication of a metal matrix composite in detail. [7]
- c) Give the advantages and drawbacks of metal matrix composites over polymer matrix composites. [4]

OR

- Q2)** a) Explain the spray forming process of fabrication of a metal matrix composite in detail. [7]
- b) Explain in detail that metal matrix composites are fabricated using a powder metallurgy process. [7]
- c) State the advantages of metal matrix composites over monolithic metals. [4]

- Q3)** a) A glass/epoxy lamina consists of a 70% fiber volume fraction. The density of fiber is 2500 kg/m³ and the Density of matrix is 1200 kg/m³. Determine : [7]
- i) Density of lamina
 - ii) Mass fractions of the glass and epoxy
 - iii) The volume of composite lamina if the mass of the lamina is 4 kg
 - iv) Volume and mass of glass and epoxy in part (3)

P.T.O.

- b) What is meant by optimum design of composite materials? State the various steps involved in it. [6]
- c) Write a short note on large particle composites. [4]

OR

- Q4)**
- a) What is the void fraction? What properties did it affect? Derive the relation between theoretical density and experimental density. [7]
 - b) Write a note on flexural testing of composites of unidirectional composites. [6]
 - c) What do you mean by micro-mechanics and macro-mechanics of lamina? [4]

- Q5)**
- a) Explain fatigue testing of unidirectional composites according to ASTM standards. [7]
 - b) What is the significance of Bond strength / Ply Adhesion? Explain the ASTM F904 method. [7]
 - c) What do you understand by test environments? [4]

OR

- Q6)**
- a) Explain the Following Non-destructive testing methods for a composite material with a neat sketch : [7]
 - i) X - Ray Radiography
 - ii) Ultrasonic Testing.
 - b) Explain compression testing of unidirectional composites according to ASTM standards. [7]
 - c) What is thermographic testing of Composite? [4]

- Q7)**
- a) Explain in details Light Combat Aircraft (LCA) and Light Combat Helicopter (LCH). [7]
 - b) Write a short note on Rapid Prototyping in composite used in the automobile industry. [6]
 - c) List & describe the applications of composite for the Sports Industry. [4]

OR

- Q8)** a) Explain the “Multimaterial” concept used in the automobile industry with example. [7]
- b) What are the applications of Composite for Infrastructure and Building Applications? [6]
- c) List & describe the applications of composite for the Energy Sector. [4]

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Total No. of Questions : 8]

SEAT No. :

PA-1538

[Total No. of Pages : 3

[5926]-158

T.E. (Mechanical)

SURFACE ENGINEERING

(2019 Pattern) (Semester - II) (Elective - II) (302052B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.*
- 2) *Figures to the right side indicate full Marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) What is importance and scope of Plasma Nitriding? Explain with suitable application? [6]
- b) How carburizing atmosphere is important in carburizing? Which surface properties affected because of atmosphere? [6]
- c) Explain Briefly : [6]
- i) Carbonitriding
 - ii) Flame Hardening

OR

- Q2)** a) With neat sketch and related process parameters differentiate between Carburizing Nitriding? [6]
- b) How do we quantify the rate of diffusion? State Fick's first law of diffusion. [6]
- c) Explain Briefly : [6]
- i) Nitrocarburising
 - ii) Laser Hardening.

P.T.O.

- Q3)** a) Explain with application process of dielectric coatings of Si-C alloy films. [5]
- b) What is coating for corrosion resistance? List various methods of corrosion resistance methods. Describe compound coating method. [6]
- c) Describe Sol-gel coating. List its advantages and limitations? Also mention Sol-gel applications. [6]

OR

- Q4)** a) Discuss with suitable example need of surface modification processes. [5]
- b) Write short note on laser surface alloying. [6]
- c) What is coating for wear resistance? List various methods of wear resistance methods. Describe carbon nitride thin films. [6]
- Q5)** a) What is metal, inorganic, and organic coating? Explain with suitable example its significance. [6]
- b) Explain : [6]
- i) Electro deposition Coating
- ii) Antidust Coating
- c) Explain the Coatings for high temperature. List suitable application. [6]

OR

- Q6)** a) Differentiate between Organic coating and Inorganic Coating. Give Examples of Organic coating and Inorganic Coating. [6]
- b) Explain : [6]
- i) Metal Cladding
- ii) Hot dipping
- c) Briefly describe applications of Coatings for aerospace and aircrafts with reference to properties required. [6]

- Q7)** a) Describe requirement and use of Spectroscopic analysis of modified surfaces. With related application. [6]
- b) Briefly describe any two defects of the following : [6]
- i) Flooding
 - ii) blistering
 - iii) orange peel
- c) Describe Working of Atomic force microscopy. [5]

OR

- Q8)** a) Explain Coating failure. What are the causes of Coating failure? [6]
- b) With suitable example explain porosity and adhesion of surface coating. [5]
- c) Briefly describe any two processes of the following : [6]
- i) Analysis of surface roughness
 - ii) Measurement of residual stress
 - iii) Measurement of coating thickness

[5926]-159

T.E. (Mechanical Sandwich)

**FUNDAMENTALS OF COMPUTER AIDED
ENGINEERING**

(2019 Pattern) (Semester - I) (302061)

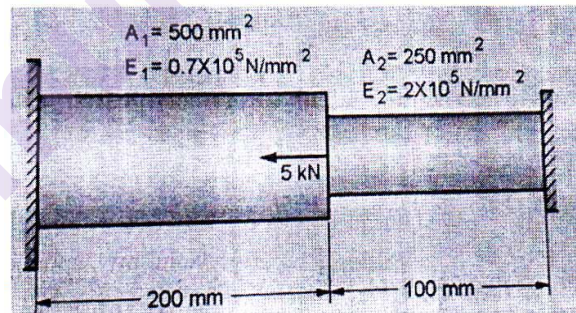
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume suitable data if necessary.
- 5) Use of non-programmable scientific calculator is allowed.

- Q1)** a) Determine the nodal displacements, element stresses, and support reactions for the stepped bar shown in the below figure using finite element analysis. [12]



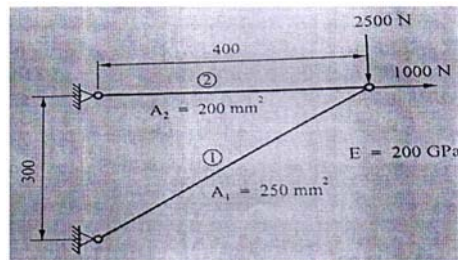
- b) The 1-D element has a length of 200mm. The temperatures at nodes 1 and 2 are 100°C and 40°C respectively. Evaluate the shape functions associated with nodes 1 and 2, if the temperature is to be estimated at point P within the element, situated at 150mm from node 1. Also, calculate the temperature at point P. [5]

OR

- Q2)** a) The arrangement of the truss element is shown in the below figure. Using the finite element method, determine : [12]

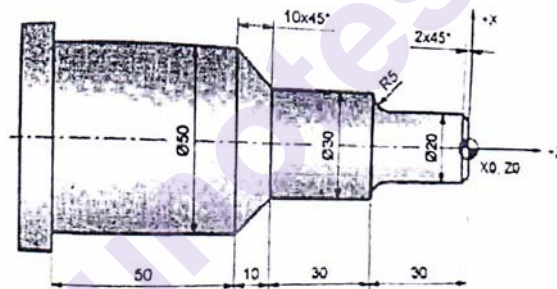
P.T.O.

- i) Nodal displacements
- ii) Stress in each element
- iii) Reaction force at the support



- b) The CST element is defined by three nodes located at (1, 1), (4, 2), and (3, 5). For a point P located inside the element, the shape functions N_1 and N_2 are 0.15 and 0.25 respectively. Determine X and Y coordinates of point P. [5]

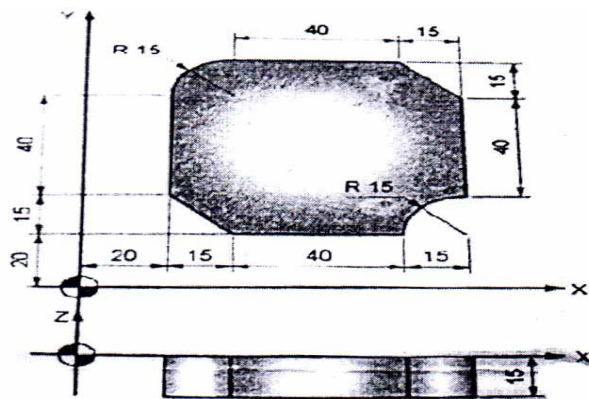
- Q3) a)** Write an NC program for the part shown in the figure. Take spindle speed as 200 RPM and feed rate 0.25 mm/rev. [12]



- b) Explain the classification of CNC machines according to the type of tool motion control. [5]

OR

- Q4) a)** Develop a part program for the part as shown in Fig. The part is 15mm thick. Use end mill cutter diameter of 15mm, cutting speed of 700 RPM, and feed rate of 100 mm/min. [12]



- b) Write a short note on tool length compensation and cutter radius compensation. [5]

- Q5)** a) List different types of end effectors and explain hook and scoop types of end effectors in detail. [7]
b) Explain four islands of automation of computer integrated manufacturing. [7]
c) State limitations of automation. [4]

OR

- Q6)** a) Explain Group Technology and its advantages over process layout. [7]
b) Explain various types of robot joints. [7]
c) Compare hydraulic and Pneumatic actuators based on the following criteria : [4]
i) Payload capacity;
ii) Accuracy and Precision;
iii) Reliability and Maintenance;
iv) Compactness

- Q7)** a) How the CAE results are validated and checked for accuracy? Explain in brief. [7]
b) Describe the three dimensions of fluid dynamics. [7]
c) Explain the Stress life (S-N) approach for durability analysis. [4]

OR

- Q8)** a) What are the common mistakes made by CAE Engineers? [7]
b) Explain the implicit integration scheme for crash analysis. [7]
c) Write a short note on CAE Reports. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1540

[Total No. of Pages : 2

[5926]-160

T.E. (Mechanical - Sandwich)

PROCESS PLANNING & TOOL SELECTION (Self - Study - I)

(2019 Pattern) (Semester - II) (302066)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary and mention it clearly.*

Q1) a) What causes of work-piece variations? [5]

b) Explain with neat sketches geometric control for :- [6]

i) Long cylinders

ii) Short cylinders

c) What do you mean by major operations, critical operations? How to identify critical operations. [6]

OR

Q2) a) How can supporting operation be distinguished from auxiliary operation? [5]

b) What are the rules for locating long cylinder and short cylinder? Explain with neat diagram. [6]

c) What are the rules for combating tool forces and holding forces? [6]

Q3) a) Distinguish between General Purpose Machine (GPM) and Special Purpose Machine (SPM). [6]

b) What do you know about 3-2-1 principle? Explain with figure. [6]

c) Compare jigs and fixtures. State its importance. [6]

OR

P.T.O.

- Q4)** a) Which are the various cutting tool materials employed during manufacturing? How do you select tool material? [6]
b) What are the design considerations of jigs and fixtures? [6]
c) What is meant by tooling economics, How it is applied in process engineering? [6]

- Q5)** a) What do manufacturing organizations use financial information for? [5]
b) What costs are associated with manufacturing? [6]
c) What are the process variables considered in calculation of machining time? How do you calculate machining time for drilling operation? [6]

OR

- Q6)** a) What is variable and fixed costs involved in producing a product? [5]
b) Write a note on 'Economics of Process Planning'. [6]
c) What is a 'make or buy'? Decision? Explain with flow chart. [6]

- Q7)** a) Discuss various steps involved in manual process planning. [6]
b) What information is provided on process picture sheet? [6]
c) Explain the benefits of Computer Aided Process Planning (CAPP). [6]

OR

- Q8)** a) Which process symbols used while making process pictures? [6]
b) What information is provided on operation route sheet? [6]
c) Explain the Automatic Time Standard System (ATS) in CAPP. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1541

[Total No. of Pages : 2

[5926]-161

T.E. (Mechanical Sandwich)

**ADVANCED MATERIALS AND MANUFACTURING
(2019 Pattern) (Semester - II) (302067) (Self-Study - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

Q1) a) With neat sketch explain squeeze casting of MMC along with advantages & disadvantages. [9]

b) State different interface measurement techniques for composites. Explain pull out test. [9]

OR

Q2) a) Briefly explain spray process of MMC. (Construction & working). State the advantages & limitations. [9]

b) Write a short note on Rule of mixtures in regards with composites. Elaborate with suitable examples. [9]

Q3) a) With neat sketch explain high energy rate forming process along with its advantages and limitations. [9]

b) Briefly explain the principle and working of hydroforming process. State it's applications. [8]

OR

Q4) a) Explain the process of isostatic pressing. Discriminate between hot and cold isostatic pressing. [9]

b) Elaborate with the applications, advantages and limitations laser beam forming process. [8]

P.T.O.

- Q5) a)** With neat sketch explain working of atomic hydrogen welding process, advantages and limitations. **[10]**
- b)** Differentiate between electron beam and laser beam welding. **[8]**

OR

- Q6) a)** State the principle of friction stir welding process and explain the construction and working. **[10]**
- b)** Write a short note on welding automation in aerospace, nuclear and transport vehicle area with examples. **[8]**

- Q7) a)** Briefly explain the principle and working of ultrasonic machining process. State its advantages and limitations. **[9]**
- b)** State and explain the advantages of non-conventional machining processes over conventional machining processes. **[8]**

OR

- Q8) a)** Comment on Material removal rate of various non-conventional machining processes. Explain the influence of tool material, geometry, dielectric fluid and process parameters on machining characteristics. **[9]**
- b)** Explain the construction and working of Electrochemical machining process. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-1542

[Total No. of Pages : 2

[5926]-162

T.Y. (Biotechnology)

ANALYTICAL TECHNIQUES

(2019 Pattern) (Semester-I) (315461)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of a Calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) Write the working principle of Horizontal Agarose gel electrophoresis. Explain the process with the required components of the system. **[18]**

OR

- Q2)** a) How proteins are different from DNA? What modifications are expected in designing electrophoresis method for proteins in comparison to DNA? **[9]**
- b) Write a note on Agarose. How percentage of agarose affect the migration of DNA molecules, explain. **[9]**

- Q3)** a) Write the expression for the conventional filtration process. **[10]**
- b) Write a note on the theory of centrifugation. **[7]**

OR

- Q4)** a) Give an account of the working of a continuous rotary vacuum filter. **[10]**
- b) Define the following terms: **[7]**
- i) Slurry
 - ii) Filter medium
 - iii) Filter cake
 - iv) Filtrate

P.T.O.

- Q5) a)** Give an introduction to Spectrophotometry and explain Beer-Lambert's Law. [10]
- b)** How many types of wavelength selectors are used in spectrophotometers? Explain any one type in detail. [8]

OR

- Q6) a)** Write notes on: [10]
- i) Phosphorescence
- ii) Sample containers (Cuvettes) used in the spectrophotometer
- b)** Differentiate between Spectrophotometry and Spectrofluorometry. Draw an energy diagram and explain the concept of Fluorescence. [8]
- Q7)** Draw a labeled diagram of 'Instrumentation parts of Infrared (IR) Spectroscopy and explain the process in detail for the identification of functional group of molecules. [17]

OR

- Q8) a)** How many types of movements of functional groups are expected in molecules and how these movements are used to identify the groups in Infrared (IR) Spectroscopy? Explain. [10]
- b)** 'NMR Spectroscopy: A unique spectroscopic tool' -Justify the statement. [7]



[5926]-163

T.E. (Biotechnology)

MATERIAL BALANCES AND STOICHIOMETRY

(2019 Pattern) (Semester - I) (315462)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a) A stream of carbon dioxide flowing at a rate of 100 kmol/h is heated from 298 K to 383 K, Calculate the heat that must be transferred using C_p^0 data, $C_p^0 = a + bT + cT^2 + dT^3$. [6]

Gas	a	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$
CO ₂	21.3655	64.2841	-41.0506	9.7999

- b) Explain Phase change Operation and Write Energy Balance during Phase Change. [6]
- c) Temperature of Oxygen is raised from 350 K to 1500 K. Calculate the amount of heat that must be supplied for raising the temperature of 1 kmol oxygen using C_p^0 data, $C_p^0 = a + bT + cT^2 + dT^3$. [6]

Gas	a	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$
O ₂	26.0257	11.7551	-2.3426	-0.5623

OR

- Q2) a) A natural gas has the following composition on mole basis : [9]

CH₄ = 84%, C₂H₆ = 13% and N₂ = 3%

Calculate the heat to be added to heat 10 kmol of natural gas from 298 K to 523 K using heat capacity data given below $C_p^0 = a + bT + cT^2 + dT^3$.

Gas	a	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$
CH ₄	19.2494	52.1135	11.973	-11.3173
C ₂ H ₆	5.4129	178.0872	-67.3749	8.7147
N ₂	29.5909	-5.141	13.1829	-4.968

P.T.O.

- b) Define : [3]
- i) Sensible Heat
 - ii) Latent Heat
 - iii) Heat Capacity
- c) Methane gas heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol methane using C_p^0 data given below, [6]

Data : $C_p^0 = a + bT + cT^2 + dT^3$ (kJ/kmol.K)

Gas	a	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$
Methane	19.2494	52.1135	11.973	-11.3173

- Q3)** a) In synthesis of ammonia, the fresh feed containing 24.75% nitrogen, 74.25% hydrogen and 1% inerts (on mole basis) is mixed with recycle feed. Mixed feed enters into reactor resulting into 25% conversion of ammonia. The product mixture is passed through condenser, where ammonia gets condensed and the remaining gases are recycled after purging small portion of gas stream to avoid built up inerts. The recycle stream contains 12.5 mole % inerts. Calculate: [11]
- i) Recycle ratio
 - ii) Purge ratio
 - iii) Combined Feed ratio
- b) Write a short notes on : [6]
- i) Stoichiometric coefficient
 - ii) Limiting Reactant
 - iii) Yield

OR

- Q4)** a) In a textile industry, it is desired to make 24% solution (by weight) of caustic soda for a mercerization process. Due to very high heat of dissolution of caustic soda in water, the above solution is prepared by two step process. First, in a dissolution tank, caustic soda is dissolved in the correct quantity of water to produce 50% (by weight) solution. After complete dissolution and cooling, the solution is taken to dilution tank where some more water is added to produce 24% solution assuming no evaporation loss of water in dissolution tank. Calculate the weight ratio of water fed to dissolution tank to by passed water to dilution tank. [11]
- b) Write a short notes on : [6]
- i) Stoichiometric ratio
 - ii) Excess Reactant
 - iii) Selectivity

- Q5) a)** Calculate the standard heat of formation of chloroform gas from its elements using Hess's law. [9]

Data :

$\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$	$\Delta H_1 = -393.51 \text{ kJ/mol}$
$\text{H}_2(\text{g}) + 0.5\text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O(l)}$	$\Delta H_2 = -285.83 \text{ kJ/mol}$
$0.5 \text{H}_2(\text{g}) + 0.5 \text{Cl}_2(\text{g}) \rightarrow \text{HCl(aq.)}$	$\Delta H_3 = -167.57 \text{ kJ/mol}$
$\text{CHCl}_3(\text{g}) + 0.5\text{O}_2(\text{g}) + \text{H}_2\text{O(l)} \rightarrow \text{CO}_2(\text{g}) + 3\text{HCl(aq)}$	$\Delta H_c^0 = -509.95 \text{ kJ/mol}$

- b)** Calculate the heat of formation of liquid ethyl acetate at 298 K. [9]

Data:

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O(l)} = -285.83 \text{ kJ/mol}$

Standard heat of combustion of liquid ethyl acetate

$$\text{C}_4\text{H}_8\text{O}_2 = \Delta H_c^0 = -2230.91 \text{ kJ/k mol}$$

OR

- Q6) a)** Calculate the standard heat of formation of n-propanol liquid using the following data: [9]

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O(l)} = -285.83 \text{ kJ/mol}$

Standard heat of combustion of n-propanol liquid = -2028.19 kJ/mol

- b)** Calculate the heat of formation of benzoic acid crystals ($\text{C}_7\text{H}_6\text{O}_2$) at 298.15 K using following data: [9]

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O(l)} = -285.83 \text{ kJ/mol}$

Standard heat of combustion of benzoic acid crystals = -3226.95 kJ/mol

- Q7) a)** Write a note on Calorific values of fuels. [7]
- b) The GHV of gaseous n-butane is 2877.40 KJ/mol at 298 K. Calculate its NHV in KJ/mol and KJ/kg. [10]

OR

- Q8) a)** Calculate the theoretical number of moles of oxygen that must be supplied for combustion of one mol of gas and the heating value in KJ/mol of a gas having following composition by volume : CO_2 : 5.4%, H_2 : 39.9%, CO = 32.9%, N_2 : 2.6%, O_2 : 0.7%, $\text{C}_{2.73}\text{H}_{4.22(\text{unsaturates})}$: 8.4% and $\text{C}_{1.14}\text{H}_{4.28(\text{paraffins})}$: 10.1% [8]

Data :

Heating value of H_2 : 285.83 KJ/mol

Heating value of CO : 283.18 KJ/mol

Heating value of unsaturates : $411.14A + 118.06B + 120.6$ (Where A is number of carbon atoms and B is number of hydrogen atoms)

Heating value of paraffins = $661.93 N + 229$ where N is the number of carbon atoms

- b) A coal having 68.1% total carbon is burned to produce gases having the following composition by volume on the moisture free basis: [9]

CO_2 : 12.4%, CO : 1.2%, O_2 : 5.4%, and N_2 : 81%

Data : Heating value of coal = 28273.5 KJ/kg

Heating of combustion of CO = -283.18 KJ/mol

Calculate the standard heat of reaction in kJ/kg of coal burned.



Total No. of Questions : 8]

SEAT No. :

PA-1544

[Total No. of Pages : 2

[5926]-164

T.Y. B.Tech. (Biotechnology)

GENETIC ENGINEERING

(2019 Pattern) (Semester - I) (315463)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) Write a note on :

- a) Colony PCR. [9]
- b) Blue White Selection. [9]

OR

Q2) a) Describe the construction of a genomic library, what are the applications? [9]

- b) What is cDNA cloning? How a foreign DNA is inserted in a host cell? What are the steps involved? [9]

Q3) a) A Human gene is 1MB. Choose an ideal vector to clone this gene and also describe the construction and screening principles of that vector, What is the significance of YAC? [9]

- b) What are YAC vectors? Draw a details diagram and explain its applications. [8]

OR

P.T.O.

Q4) a) A gene encoding for a novel protein needs to be expressed in *E.coli* strain DH5 α . Develop rDNA process for this objective and explain how do you select positive recombinants? How is this different in *Saccharomyces cerevisiae*? [10]

b) What are broad host range plasmids? What is their significance? What is copy number? [7]

Q5) a) Infer on agrobacterium tumefaciens mediated gene transfer in plants. [9]

b) Discuss the gene transfer methods using gene gun method. Add a note on their applications. [9]

OR

Q6) Write a short note on :

a) Electroporation. [9]

b) Liposome mediated gene transfer. [9]

Q7) a) What are vaccines? What are the different types of vaccines? [9]

b) Summarize the idea of “Biopharming” of plants and animals for production of recombinant proteins. [8]

OR

Q8) a) How is recombinant DNA technology used for developing of biotic stress resistant plants? Explain with an example. [8]

b) Write note on : [9]

i) Challenges in Gene Therapy.

ii) Microbial Biotechnology for clearing oil spills.



Total No. of Questions : 8]

SEAT No. :

PA-1545

[Total No. of Pages : 2

[5926]-165

T.E. B.Tech. (Biotechnology)

INTRODUCTION TO IMMUNOLOGY

(2019 Pattern) (Semester - I) (315464)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Write note on Hapten and Adjuvants in detail. [6]

b) Describe in details about adaptive immunity and humoral immunity. [6]

c) Explain the details process involved in hybridoma technology. [6]

OR

Q2) a) What are antigens? Explain about chemical nature, types and properties of antigens. [6]

b) Describe about clonal selection theory for antibody production. [6]

c) Write in detail about generation in antibody diversity. [6]

Q3) a) Explain about graft rejection and Graft-versus-Host involved in transplantation Immunology. [9]

b) Describe in detail about complement system mechanism. [8]

OR

Q4) a) What is MHC? Explain the antigen processing and presentation by MHC. [9]

b) Write note on cell mediated immunity and cytokines. [8]

P.T.O.

- Q5) a)** Write in detail about immunodeficiency and autoimmune diseases. [8]
- b)** What is hypersensitivity? Explain about type I to IV hypersensitivity. [10]

OR

- Q6) a)** Explain in detail about allergy test and organ specific autoimmunity. [10]
- b)** Write note on Anaphylaxis and delayed type of hypersensitivity. [8]

- Q7) a)** Explain in detail about ELISA and RIA. [8]
- b)** Describe in detail about Immuno-electrophoresis and RID. [9]

OR

- Q8) a)** Describe in detail about agglutination test and precipitation test. [8]
- b)** Write in detail about DNA vaccines. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1546

[Total No. of Pages : 2

[5926]-166

T.E. B.Tech. (Biotechnology Engg.)

ENZYME TECHNOLOGY

(2019 Pattern) (315465-A) (Elective - I) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) Answer the following :

[18]

- a) Give examples of any one coenzymes, its vitamin derivative and its role in specific reaction.
- b) Differentiate between 1. Biotin and PLP 2. Coenzyme A and Thiamine pyrophosphate.

OR

Q2) Explain the reactions catalyzed by the following coenzymes.

[18]

- a) Biotin
- b) Pyridoxal phosphate

Q3) What is the significance of enzyme inhibition? Depict the Lineweaver Burk plot for competitive, uncompetitive and non-competitive type of inhibition. Comment on K_m and V_{max} .

[17]

OR

Q4) Differentiate between a. feedback inhibition and allosteric inhibition
b. Competitive and Noncompetitive type of inhibition

[17]

P.T.O.

Q5) Answer the following : [18]

- a) What is enzyme immobilization? What are the advantages and disadvantages of immobilized enzymes?
- b) Differentiate between 1. Adsorption and covalent binding. 2. Entrapment and Encapsulation.

OR

Q6) Answer the following : [18]

- a) Write a short note on immobilization of enzyme by encapsulation and copolymerization
- b) Enlist the different natural polymers applied for enzyme immobilization. What are the advantages of natural polymers over synthetic polymers for enzyme immobilization

Q7) Answer the following : [17]

- a) What are the advantages and disadvantages of enzyme immobilization in food industry?
- b) Enlist pharmaceutical application of immobilized enzymes and explain any one in detail.

OR

Q8) Enlist any seven pharmaceutical applications of immobilized enzymes and explain enzyme action of any one in detail. [17]



Total No. of Questions : 8]

SEAT No. :

PA-1547

[Total No. of Pages : 2

[5926]-168

T.Y. B.Tech. (Biotechnology Engg.)

AGRICULTURAL BIOTECHNOLOGY

(2019 Pattern) (315465 C) (Elective - I) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume Suitable data if necessary.*

- Q1)** a) Write principle, methods and applications of micropropagation. [9]
b) Define and explain Embryo culture and embryo rescue techniques with its applications. [9]

OR

- Q2)** a) With a diagrammatic presentation explain the methodology of shoot tip culture. And add a note on applications of shoot tip culture. [9]
b) Briefly describe the application of plant tissue culture in crop improvement. [9]

- Q3)** a) Briefly describe randomly amplified polymorphic DNA sequence (RAPD) markers for crop improvement. [9]
b) Short note on gene mapping. [8]

OR

- Q4)** a) Explain the concept of structural and functional genomics. [9]
b) Compare between AFLP and SNP. [8]

- Q5)** a) Give examples of biopesticides, biofertilizers, biostimulants and bio oxidants used in agriculture. [8]
b) Define microbial biofertilizers and explain different types with its applications. [10]

P.T.O.

OR

- Q6)** a) Write in structure, function and role of nif gene in nitrogen fixation.[10]
b) Describe the concept of symbiotic nitrogen fixation with example.[8]

- Q7)** a) Enlist the competent authorities with their roles in regulatory framework of GMO in India. [8]
b) Write short note on : [9]
GMO Act 2004, UPOV Act 1978 and Patents

OR

- Q8)** a) Briefly describe the role of the Genetic Engineering Appraisal Committee (GEAC). [8]
b) Write short note on Recombinant DNA advisory committee (RCGM) [9]



Total No. of Questions : 8]

SEAT No. :

PA-1548

[Total No. of Pages : 2

[5926]-169

T.Y. (Biotechnology)

FERMENTATION TECHNOLOGY

(2019 Pattern) (Semester - II) (315471)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) Describe the production process of Citric acid in detail. **[18]**

OR

Q2) a) Describe the production process of ethanol in brief. **[9]**

b) Draw the structure of Penicillin and explain its working principle. **[9]**

Q3) a) Explain the process of single-cell production. **[10]**

b) Describe the process for industrial production of the protein of fungal origin. **[7]**

OR

Q4) What is microbial Transformation? Explain the process with the help of a Case study. **[17]**

Q5) Draw the diagram of Stirred tank reactor (CSTR) and explain the design and properties of parts of CSTR in detail. **[18]**

OR

P.T.O.

Q6) Explain the design and functional importance of the following bioreactors:[18]

- a) Plug Flow Bioreactor
- b) Fluidized bed Bioreactor

Q7) a) What are the principles of Scale-up? Explain the concept when it applies to the design and development of the sterilization process for the industrial-scale production process. [10]

- b) How scale up techniques can be applied to inoculum development? Describe. [7]

OR

Q8) a) Explain the relationship between product recovery, purity and yield of the fermentation process. [10]

- b) What do you understand by 'Fermentation Efficiency'? Explain the concept with any one case example. [7]



Total No. of Questions : 8]

SEAT No. :

PA-1549

[Total No. of Pages : 2

[5926]-170

T.Y. B.Tech. (Biotechnology)

315472: MASS TRANSFER

(2019 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What are solubility curves? Explain solubility curves for any salt and water solution. [9]

b) Give classification of crystallizers and write a short note on Swenson walker crystallizer. [9]

OR

Q2) a) Write mass balance equation for batch crystallizer. [9]

b) What is the effect of impurities in crystal formation? How can we reduce impurities in crystal formation? [9]

Q3) a) Draw fractionating column. Give major units of the column and explain in detail continuous distillation process. [9]

b) Define terms: [8]

- i) Equilibrium
- ii) Raoult's Law
- iii) Dalton's Law
- iv) Relative Volatility

P.T.O.

OR

Q4) a) Draw and explain boiling point temperature diagram showing vapour-liquid equilibrium curve. [8]

b) Write Short note on : [9]

i) Molecular Distillation

ii) Steam Distillation

Q5) a) Explain Mc Cabe – Thiele Method. [9]

b) Write a short note on partial condenser. [9]

OR

Q6) a) What is feed plate and feed line and how thermal conditions of the feed are introduced based on q-value? Show graphical representation. [9]

b) What are azeotropes? Explain types of azeotropes? [9]

Q7) a) What is the importance of operating line in absorption? Explain how L_{\min}/G is decided based on the slope of operating line. [9]

b) Define and explain – i) Raoult's Law ii) Henry's Law. When these laws can be used? [8]

OR

Q8) a) What is absorption? Explain it with neat diagram and give two examples. [9]

b) How packing height is transformed into NTUs? Give equations for gas and liquid phase. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1550

[Total No. of Pages : 2

[5926]-171

T.Y. (Biotechnology)

BIOSEPARATION ENGINEERING
(2019 Course) (Semester - II) (315473)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicates full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Differentiate between pressure and temperature swing adsorption with one example each. [9]
- b) What are the different types of adsorption isotherms? Draw profiles and give equation explaining each isotherm. [9]

OR

- Q2)** a) What is reversible and irreversible adsorption? Explain the phenomena using appropriate examples. [9]
- b) Draw and explain adsorption breakthrough curve in fixed beds? Highlight bed exhaustion portion in breakthrough curve and write its significance. [9]
- Q3)** a) Explain the terms and write significance: [9]
- a) Resolution
 - b) Plate height
 - c) Capacity factor
- b) Discuss the basic principle of gas chromatography. What is the importance of carrier gas in elution of the sample? Draw chromatograms of slow and fast eluting components and explain [8]

OR

P.T.O.

- Q4)** a) What are the different types of detectors? Describe FID in detail. [8]
b) What is size exclusion chromatography? Explain its importance in proteins separation with one example. [9]

- Q5)** a) Write a note on two different membrane modules with particle size with one application. [9]
b) Enlist the factors affecting the performance of membranes? How are they minimized? [9]

OR

- Q6)** a) Write a short note on porous membranes with any two applications. [9]
b) What is membrane fouling? Explain it with diagram. How to avoid it?[9]

- Q7)** a) Write a short note on reactive extraction? What is the difference between reactive extraction and distillation? [9]
b) Write a short note on protein precipitation methods. [8]

OR

- Q8)** a) What is the principle of adductive crystallization? When is it applied? Give 1-2 examples. [9]
b) What is the purpose of using mass spectrometry in combination with GC? Explain it with one case study of GC-MS. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1551

[Total No. of Pages : 2

[5926]-173

T.E. B.Tech. (Biotechnology)

FOOD BIOTECHNOLOGY (Elective - II)

(2019 Pattern) (Semester - II) (315474B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

Q1) a) Write a note on HTST treatment and its application in food. [9]

b) What are the different Low temperature techniques of food preservation? [9]

OR

Q2) a) What is its significance of canning industry? What is the procedure of Canning? [9]

b) Enlist the advantages and disadvantages of food processing. [9]

Q3) a) Which microorganisms are commonly used in the food industry? Give examples and the food in which they are used. [7]

b) Give the detailed steps in cheese making. What are the different types of cheese made give a brief description. [10]

OR

Q4) a) What are the different types of products made using yeast? [7]

b) Describe Bread Making and give details of every step. [10]

P.T.O.

- Q5)** a) Describe the role of enzymes in the food industry. [9]
b) Which enzymes are predominantly used in the vegetable and fruit processing? Discuss. [9]

OR

- Q6)** a) Discuss the importance of enzymes in the meat processing industry. [9]
b) Describe the discuss any four microbial enzymes other than amylase used in the food processing industry with their applications. [9]

- Q7)** a) What are physical and chemical waste disposal methods for food waste. [9]
b) Describe any two liquid waste treatment methods. [8]

OR

Q8) Write notes on :

- a) Anaerobic process for treatment of food processing waste. [9]
b) Chemical methods of waste disposal. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1552

[Total No. of Pages : 3

[5926]-175

T.E. (Printing Engineering)

PRINT STATISTICS

(2019 Pattern) (Semester-I) (308281)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of electronic pocket calculator is allowed.

Q1) From the given data, arrange the data, prepare frequency distribution table and draw the Histogram only and comment on the same. **[17]**

0.912 0.910 0.904 0.905 0.910 0.911
0.914 0.912 0.910 0.913 0.908 0.914
0.907 0.909 0.913 0.912 0.909 0.913
0.902 0.906 0.909 0.907 0.906 0.908
0.915 0.909 0.910 0.911 0.912 0.909
0.910 0.909 0.908 0.910 0.909 0.907

Note 1 : From G Chart, the recommended number of groups should be 7 for Number of measurements between 30 to 40.

And divide the range of the data by number of groups (7), to findout the class interval, and round it off to 3rd decimal value to form the groups

OR

Q2) Explain the following.

[17]

- a) Measures of Accuracy or Centering
- b) Measures of Precision or Spread
- c) Normal Distribution

P.T.O.

Q3) Prepare X bar S chart from the given data on graph paper.

[18]

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note : Round off all the values as per standard rule

Shewhart's Constants : $A_3 = 1.427$, $B_3 = 0$, $B_4 = 2.089$.

OR

Q4) Make two Pareto Charts for the data given in the following table, one for the number of defectives and one for dollar loss. In each case, include a cumulative percentage graph as well.

[18]

Department	Defectives	Dollar Loss
A	20	100
B	120	60
C	80	800
D	100	500
E	50	200
F	30	90

Q5) Describe in detail the Normal Distribution and 3SD and its role in monitoring and controlling the process with suitable diagrams.

[17]

OR

Q6) From the following data, draw appropriate diagrams and also comment on the same (any two) [17]

- a) Target 22 mm, Tolerance ± 2 mm, process mean 23 mm, LCL 20 mm, UCL 26 mm
- b) Target 530, process μ 532, standard deviation 8, LSL 505, USL 560.
- c) Design specification 5.5, $s = 1.5$, μ 6, specification width 8

Q7) Calculate the Process Capability Index for Density on an Offset Press. USL : 1.55 and LSL : 1.35, $d_2 = 2.326$. [18]

Sample No.	Shift	1Shift 2	Shift 3
1	1.5	1.4	1.5
2	1.32	1.42	1.44
3	1.3	1.2	1.55
4	1.6	1.39	1.54
5	1.41	1.51	1.62

OR

Q8) Explain in detail the objectives and implementation of SPC. [18]



Total No. of Questions : 8]

SEAT No. :

PA-1553

[Total No. of Pages : 1

[5926]-176

T.E. (Printing Engineering)

OFFSET PRINTING TECHNIQUES

(2019 Pattern) (Semester - I) (308282)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagram must be drawn wherever necessary.
- 5) Use of electronic pocket calculator is allowed.

Q1) Explain in detail the electronic line shaft system of a web press. **[18]**

OR

Q2) Compare a flying splicer and zero speed splicer. **[18]**

Q3) Describe contact and non-contact type of dampening systems. **[17]**

OR

Q4) Describe the role of pH and conductivity in a dampening solution. **[17]**

Q5) Explain the different types of folders used in the web-fed offset press. **[18]**

OR

Q6) Explain the IR and UR drying systems used in the web-offset press. **[18]**

Q7) a) Mention the various tension drives used in a web-offset press. **[7]**

b) Calculate the Rewind Tension with the following specifications: **[10]**

Tension in the previous zone : 0 lb.

Nip Roll Velocity : 102 fpm.

Rewind Velocity : 104 fpm

Elasticity* Cross-sectional Area of the Material : 500 lbs.

Also, calculate the error in tension for a 0.25% error in speed.

OR

Q8) Explain in detail the registration control system on a web press. **[17]**



Total No. of Questions : 8]

SEAT No. :

PA-1554

[Total No. of Pages : 3

[5926]-177

T.E. (Printing)

COLOR SCIENCE AND MEASUREMENT

(2019 Pattern) (Semester - I) (308283)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Describe the Munsell Color model system. [6]
b) Define saturation and explain out of 2 same samples, which attribute will visually show higher degree of difference. [6]
c) Describe the CIE 1931 Yxy System. [5]

OR

- Q2)** a) Explain the 3 basic perceptual attributes of color. [6]
b) Draw a neat diagram of a color wheel indicating the different colors. [5]
c) Explain the L*a*b color system. [6]

- Q3)** a) Density is not a CIE-type color metric and therefore densitometry is only indirectly used in color management, Justify. [12]
b) Draw a neat diagram of spectrum of the sample which the spectrophotometer considers during measurement. [5]

OR

- Q4)** a) Densitometers can be used to measure film, printing plates and press sheets, explain this application in detail. [12]
b) Compare following 2 measurement conditions : M0 and M1 in spectrophotometers. [5]

P.T.O.

Q5) a) Solve following using delta Eab equation between Sample 1& 2 And Sample 3 & 4 [6]

Sample 1

$L1*56.2$

$a1*-32.5$

$b1*4.9$

&

Sample 2

$L2*56.0$

$a2*-45.7$

$b2*5.7$

Sample 3

$L3*60.3$

$a3*33.0$

$b3*64.3$

&

Sample 4

$L4*41.0$

$a4*33.2$

$b4*25.5$

b) State role of spectrophotometer in measurement of color difference. Why is it important to measure color difference with a device and not visually. [12]

OR

Q6) a) Compare any 2 color difference equations. State their differences. [6]

b) Draw a neat diagram of $L^*C^*h^*$ that shows a color difference in hue and chroma. Explain any other 2 versions of color difference. [12]

- Q7)** a) Two objects can look the same under one illuminant but different under another light source, explain this phenomenon. [12]
- b) Explain the Colour IndexTM Classification and Overview. [6]

OR

- Q8)** a) Explain the term lightfastness and how are dyes and pigments having these different properties. [6]
- b) Explain particle size of colorants. Why is it important in ink making. [6]
- c) What are the causes of metamerism. [6]

Total No. of Questions : 8]

SEAT No. :

PA-1555

[Total No. of Pages : 2

[5926]-178

T.E. (Printing)

INK TECHNOLOGY

(2019 Pattern) (308284) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Figures to the right indicates full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What is Newtonian behavior? [6]
b) Define viscosity and explain how viscosity of liquid ink is measured? [6]
c) What is shear thickening? State 2 examples of shear thickening. [5]

OR

- Q2)** a) What is shear rate and shear stress? [6]
b) Comment on litho printing ink rheological behavior. [5]
c) How to measure viscosity of paste ink? [6]

- Q3)** a) Explain drying mechanism of liquid inks used for flexo/gravure printing. [6]
b) How quickset ink dries? [6]
c) Comment on UV ink drying mechanism. [6]

OR

- Q4)** a) Explain EB curing. [6]
b) Comment on oxidation polymerization process of ink drying. [6]
c) Discuss various inks used for drying and curing inks. [6]

P.T.O.

- Q5)** a) Explain steps of ink preparation. [6]
b) Comment on wetting of pigment particles. [6]
c) Write typical formulation of offset printing ink. [5]

OR

- Q6)** a) Comment on ink mixing and milling operation. [6]
b) Describe working of three roll mill with neat labeled diagram. [5]
c) Discuss handling, storage and transportation of offset printing inks. [6]

- Q7)** a) Explain Method of ink component analysis. [6]
b) Discuss quality control tests for paste inks. [6]
c) How to measure mottle? [6]

OR

- Q8)** a) How to measure ink solid content? [6]
b) What is COF? [6]
c) Comment on ink VOC. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1556

[Total No. of Pages : 2

[5926]-179

T.E. (Printing)

CYBER SECURITY

(2019 Pattern) (Semester - I) (Elective - I) (308286A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain the difference between a virus and malware? [6]
b) What are the different types of booting methods? What is a virtual machine? What are its advantages and disadvantages? [12]

OR

- Q2)** a) Define the terms- Malware, Trojan, and Ransomware [6]
b) What is Metasploit framework? How is an android device hacked using the Metasploit framework? [12]

- Q3)** a) What are the various phases of hacking? Name a few tools used for each of these phases. [10]
b) Explain in brief any 1 method for windows password cracking [7]

OR

- Q4)** a) What security measures can be taken by an individual to stay safe from android hacking? [8]
b) Do hackers need physical access to a computer in order to infect it with malware? If not, explain the other options are available to them. [9]

- Q5)** a) Define Social Engineering. How can you identify such attacks? [10]
b) What is SEToolkit? How can you use this tool to simulate a phishing attack? [8]

P.T.O.

OR

Q6) a) Define the following terms - [12]

- Smishing
- Vishing
- Spear - Phishing
- Whaling

b) Name and explain any 6 points to identify a phishing email. [6]

Q7) a) Define and discuss various IT Act clauses related to cyber crimes. [12]

b) Discuss the need for having a legal framework like the IT ACT 2000 to deal with cybercrimes. [5]

OR

Q8) a) What is Cybercrime? How is it different from other types of crimes?[7]

b) What is stalking? What are the legal actions which can be taken against stalking as per the IT ACT in India? [6]

b) Explain Cyber Terrorism Cyber bullying. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1403

[Total No. of Pages : 3

[5926]-18

T.E. (Automobile)

AUTOMOTIVE REFRIGERATION & AIR CONDITIONING

(2019 Pattern) (Semester-II) (316485)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of steam table & psychrometric chart is allowed.

- Q1)** a) Explain AC ducts with its classification in brief. [6]
b) Explain air management and heater systems. [6]
c) Explain cool down performance of vehicle. [6]

OR

- Q2)** a) What are the factors affecting human comfort? Explain comfort chart. [6]
b) State air distribution modes & explain any three modes. [6]
c) State functions & types of fans. Explain axial and centrifugal fans. [6]

- Q3)** a) Define: [8]
i) Humidity Ratio
ii) Degree of saturation
iii) WBT
iv) DPT
b) Atmospheric air at 0.965 bar enters the adiabatic saturator. The wet bulb temperature is 20°C and dry bulb temperature is 31 °C during adiabatic saturation process, Determine : 1. Humidity ratio of the entering air 2. Vapour pressure and relative humidity at 31 °C & 3. Dew point temperature. [9]

OR

P.T.O.

Q4) a) State Daltons law of partial pressure. Explain Adiabatic saturation temperature with neat sketch. [7]

b) The atmospheric air at 760 mm of Hg, dry bulb temperature 15°C and wet bulb temperature 11°C enters a heating coil whose temperature is 41°C . Assuming by pass factor of heating coil as 0.5, Determine dry bulb temperature, wet bulb temperature and relative humidity of the air leaving the coil. Also determine the sensible heat added to the air per kg of dry air. [10]

Q5) A restaurant with a capacity of 100 persons is to be air conditioned with the following conditions: [18]

Outside conditions = 30°C DBT and 70% RH

Desired inside conditions = 23°C DBT and 55% RH

Quantity of air supplied = $0.5\text{ m}^3/\text{min}/\text{person}$

The desired conditions are achieved by cooling dehumidifying and then heating. Determine.

- a) Cooling of coil in tonnes of refrigeration.
- b) Capacity of heating coil.
- c) Amount of water removed by dehumidifier.
- d) Bypass factor of the heating coil if its surface temperature is 35°C

OR

Q6) A hall is to be maintained at 24°C dry bulb temperature and 60% relative humidity under the following conditions: [18]

Outdoor conditions = 38°C DBT and 28°C WBT

Sensible heat load in the room = 46.4 kW

Latent heat load in the room = 11.6 kW

Total infiltration air = $1200\text{ m}^3/\text{hr}$

Apparatus dew point temperature = 10°C

Quantity of recirculated air from the hall = 60%

If the quantity of recirculated air is mixed with the conditioned air after the cooling coil, find the following.

- a) The condition of air leaving the conditioner coil & before mixing with the recirculated air
- b) The condition of air before entering the hall
- c) The mass of air entering the cooler
- d) The mass of total air passing through the hall
- e) The bypass factor of the cooling coil
- f) The refrigeration load on the cooling coil in tonnes of refrigeration.

- Q7)** a) Explain refrigerant Recovery, recycle and charging. [6]
b) Write note on automotive AC components removing and replacing. [6]
c) Write short note on Initial vehicle inspection. [5]

OR

- Q8)** a) Explain leak detection methods and leak detectors in automotive AC. [6]
b) Explain refrigerant safety and its handling in AC. [6]
c) Write short note on compressor servicing. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1557

[Total No. of Pages : 2

[5926]-180

T.E. (Printing Engineering)

**WOOD, GLASS AND METAL BASED PACKAGING
(2019 Pattern) (Semester - I) (Elective - I) (308286B)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of electronic pocket calculator is allowed.*

Q1) a) Explain manufacturing of glass. [9]

b) Give brief introduction of glass Packaging. [9]

OR

Q2) a) Write down about modern trends in glass packaging. [9]

b) Explain standards of glass packaging. [9]

Q3) a) Explain about USP glass types and testing procedures. [9]

b) Write down the concept of gauging. [8]

OR

Q4) a) What is requirement of testing in glass packaging. [8]

b) Explain 2 physical test of glass packaging. [9]

Q5) a) Explain manufacturing of aluminium foil. [9]

b) Write down properties of aluminium foil. [9]

OR

Q6) a) Explain Tin Plate Characteristics. [9]

b) Explain Manufacturing of Black Plate [9]

P.T.O.

- Q7)* a) Explain about Drums. [8]
b) Explain about closures. [9]

OR

- Q8)* a) Write down types of drums. [8]
b) Explain Manufacturing of Drums. [9]



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Total No. of Questions : 8]

SEAT No. :

PA-1558

[Total No. of Pages : 2

[5926]-182

T.E. (Printing Engineering)

FLEXO PRINTING TECHNIQUES

(2019 Pattern) (Semester - II) (308289)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) How to prepare a conventional photopolymer plate for flexo press. [9]
b) Discuss Environmental concerns in flexo industry. [4]
c) Explain UV light source used in plate making process. [4]

OR

- Q2)** a) Discuss Standardization of Conventional Flexo Plate. [9]
b) Why we use developing solution and explain different type of washout solution. [4]
c) Explain term : Post Exposure and Light Finishinig. [4]

- Q3)** a) How to printability effects by varying dots. [6]
b) Discuss difference between digital plate and conventional plate. [6]
c) Define laser Ablation technique. [6]

OR

- Q4)** a) Explain Digital Workflow in detail. [6]
b) Explain Flat dot and Round dot on flexo plate. [6]
c) What is digital file format and its type? Discuss in detail. [6]

P.T.O.

- Q5)** a) Explain wide web press in detail with diagram. [9]
b) Explain UV dryer in detail with diagram. [4]
c) Explain flexography process with diagram. [4]

OR

- Q6)** a) Explain narrow web press in detail with diagram. [9]
b) Explain EB dryer in detail with diagram. [4]
c) Discuss on flexography product and application. [4]

- Q7)** a) Explain different method of anilox engraving. [6]
b) Discuss anilox volume carrying capacity and cell count. [6]
c) Explain different method of Anilox cleaning. [6]

OR

- Q8)** a) Describe the anilox maintenance and storage. [6]
b) Explain different ink metering system used in flexography. [6]
c) Explain Doctor Blade in flexography with diagram. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1559

[Total No. of Pages : 2

[5926]-183

T.E. (Printing)

COLOR MANAGEMENT

(2019 Pattern) (Semester - II) (308290)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Comment on LCD display Technology. [6]
b) Why to set white point of Monitor? [6]
c) Discuss monitor gamma setting and importance. [5]

OR

- Q2)** a) Explain CRT display technology. [6]
b) Comment on environment setting for monitor display. [5]
c) How display profiling is done? [6]

- Q3)** a) How to construct Printing device profile? [6]
b) What are output devices? [6]
c) What is importance of printer profiling? [6]

OR

- Q4)** a) How to ensure consistency of gravure press? [6]
b) List the parameters to be considered for offset printing press. [6]
c) State importance of rendering intents. [6]

P.T.O.

- Q5)** a) Define merits of device link. [6]
b) When to use device link? [6]
c) Explain hard proofing Procedure. [5]

OR

- Q6)** a) How do you profile your proofing device? [6]
b) Discuss extended gamut printing. [5]
c) Explain disadvantages of using device link. [6]

- Q7)** a) How to do color evaluation of Print? [6]
b) What parameters affect visual color evaluation? [6]
c) Comment on illumination for visual evaluation. [6]

OR

- Q8)** a) Comment on role of halftone in color reproduction. [6]
b) Why gray balance setting is important in color management? [6]
c) Comment on TRC. [6]

Total No. of Questions : 8]

SEAT No. :

PA-1560

[Total No. of Pages : 4

[5926] - 184

T.E. (Printing Technology)

DESIGN OF EXPERIMENTS

(2019 Pattern) (Semester - II) (308291)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) An LED firm manufactures light bulbs that have a length of life that is approximately normally distributed, with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 775 hours. [6]
- b) Explain central limit theorem. [6]
- c) Describe F-test. [5]

OR

- Q2)** a) If a certain machine makes electrical resistors having a mean resistance of 40 ohms and a standard deviation of 2 ohms, what is the probability that a random sample of 36 of these resistors will have a combined resistance of more than 1458 ohms? [6]
- b) What is the significance of continuous factors? [5]
- c) Define following terms : independent variables and dependent variables. [6]

P.T.O.

- Q3) a)** A pollution control officer has reported average fine of 250 printing presses that he has to deal with during a month amount to Rs. 16,000/- with a standard deviation of Rs. 5,000/-. Assuming that the fine in these businesses are normally distributed, find.
- The number of businesses the fine is over Rs. 20,000. [6]
 - The percentage of business the fine is likely to range between Rs. 21,000 and Rs. 31,000. [6]
- b)** Explain background variables and primary variables. [6]

OR

- Q4) a)** A UV Coating manufacturer is experimenting on time required for Coating on paper. Its is of interest for the researcher to study the effects of following factors : types of laser diodes and the coating type. Each factor is run at 3 levels. The setup is that of a completely randomized design. The data are given in table. The time measured is in microseconds. [12]

Factors	Coating Type	
Laser Power in Watt	A	B
60	39.5	47.4
	45.7	43.5
	49.8	39.8
	50.2	36.1
	63.8	41.2
80	33.5	44
	36.7	41.2
	42	47.3
	38.1	45.3
	31.2	42.7

Prepare ANNOVA Table [4]

- b) i) What effect does coating type have on the time to image?
 ii) What effect does power have on the time to image?
 iii) Do both coating types behave in the same manner in the two different power types.

[6]

Q5) a) Consider a 2^2 factorial with factors A and B and n experimental observations per factor combination. Prepare a geometric view and in tabular form of the 2^2 . Define Contrast A, B and AB among treatment totals. [6]

b) Find the F value for the following two observations : [6]

1, 3, 5, 7, 9 and 5, 9, 3, 8, 3?

c) The following two sets of data are given : [5]

4, 2, 5, 1, 3 and 8, 3, 9, 0, 1.

Calculate the Standard deviation.

OR

Q6) a) In 2^k series consider following factors polymer 1 and polymer 2. Each run at 2 levels low and high indicating concentration of the polymers. These experiments are conducted to test additives to inks. Data given is change in plastic viscosity which is a rheological measure reflecting the change in thickness of the ink. Various polymers are added to the ink to increase the viscosity.

Prepare and display treatment combinations in graphical form.

	Polymer 1			
Polymer 2	Low		High	
Low	3	3.5	11.3	12.0
High	11.7	12.0	21.7	22.4

Calculate main effect and interaction effect. [11]

b) Write a short note on full factorial and fractional factorial. [6]

- Q7) a)** Examine the reasons behind high dot gain in offset machine - 2 color. Describe through cause effect diagram. **[10]**
- b)** Calculate the values for the central line and control limits for mean chart and range chart and then comment on the state of control. **[8]**

OR

Q8) a)

345	530	556	354	590
395	515	479	494	420
563	444	629	440	485
505	604	490	445	605
402	406	730	506	516
472	475	610	586	523
691	520	465	468	545
523	582	570	578	505
461	575	420	605	527
624	440	585	420	384

Construct a frequency distribution table with appropriate class limits and class boundaries. With reference to G chart divide the measurement scale into 8 groups. **[6]**

- b)** Draw histogram to represent the above frequency distribution. **[6]**
- c)** Comment on the results. **[6]**



Total No. of Questions : 8]

SEAT No. :

PA-1561

[Total No. of Pages : 2

[5926]-185

T.E. (Printing)

**MAINTENANCE MANAGEMENT OF PRINTING MACHINES
(2019 Pattern) (308293A) (Elective - II) (Semester - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Prepare a Annual Preventive Maintenance check sheet for Flexo Press? [6]

b) What are is the need of Preventive Maintenance? [6]

c) Important Steps for Establishing a Corrective Maintenance Program.[5]

OR

Q2) a) Write a Brief Note on Corrective Maintenance. [6]

b) What are the Elements of Preventive Maintenance? [6]

c) Write a brief note on Types Lubricants and Lubrication. [5]

Q3) a) What is Condition Based Monitoring. [6]

b) Explain in detail about Air Leakage testing for Offset Press. [6]

c) Explain any 3 Instruments used for Different Condition Monitoring. [6]

OR

Q4) a) Describe in Detail the Predictive Maintenance with respect to Air Compressor used For Gravure Printing Press. [6]

b) Describe in Detail the Predictive Maintenance with respect to chiller used for Offset Printing Press. [6]

c) Explain Condition Based Monitoring for the dryer unit in offset. [6]

P.T.O.

- Q5)** a) What is OEE, Explain with respect to Quality. [6]
 b) What is the Need for Effectiveness Maintenance. [6]
 c) What are the Key Performance Indicators for Offset Maintenance. [5]

OR

- Q6)** a) What are the Safety Measures taken during Offset Maintenance. [6]
 b) What is significance of 5s in Maintenance Management. [6]
 c) What is MTTR and MTBF. [5]

- Q7)** a) Describe the Replacement or Repair Decision Making Policy with respect to LCC Model Technique. [6]
 b) What is Kaizen. Explain with suitable example from maintenance management. [6]
 c) Conclude Replacement or Repair Decision by Calculating Average Maintenance Cost for a Single Gravure Offset Machine & Write a Statement Considering Below Mentioned Data for Calculation. [6]

Year	1	2	3	4	5	6	7	8
Maintenance Cost	100/-	120/-	140/-	180/-	230/-	280/-	340/-	400/-
Resale Value	300/-	150/-	75/-	30/-	20/-	20/-	20/-	20/-

OR

- Q8)** a) What is TPM. Explain with respect to Single color Offset Press. [6]
 b) What are the Pillars of TPM. Explain with suitable example. [6]
 c) What is Critical Spares. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1562

[Total No. of Pages : 2

[5926]-186

T.E. (Printing Engineering)

**BASIC COMMUNICATION SYSTEMS AND
ELECTRONIC INSTRUMENTATION**

(2019 Pattern) (Semester - II) (Elective - II) (308293 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume Suitable data if necessary*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) What is RFID? Explain the working of RFID and state its various applications. **[18]**

OR

Q2) a) Explain the block diagram of Wi-Fi communication system. **[9]**
b) Describe FHSS and DSSS. **[9]**

Q3) Explain the dynamic characteristics of measurement system. **[17]**

OR

Q4) a) Explain the basic requirements of transducer used in printing industry. **[9]**
b) Define the following terms. **[8]**
i) Accuracy of measurement system
ii) Resolution
iii) Drift
iv) Response time

Q5) Mention the application of optical sensors and Transducer in printing industry. **[18]**

OR

P.T.O.

- Q6)** a) Explain the working of capacitive sensor. [9]
b) Describe the working of LVDT. [9]

Q7) Describe the working of RTDs and its applications in printing industry. [17]

OR

Q8) Explain the types of temperature sensors used in printing industry. [17]



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Total No. of Questions : 8]

SEAT No. :

PA-1563

[Total No. of Pages : 2

[5926]-187

T.E. (Printing)

ELECTRONICS PUBLISHING

(2019 Pattern) (Semester - II) (308293-C) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Explain 10 types of Computing with examples. **[18]**

OR

Q2) What is Web Technologies Development. Explain Web 1.0, 2.0. 3.0 and its features. **[18]**

Q3) What is DBMS and its need. Explain with the example of Library Management system. **[17]**

OR

Q4) Explain in details and with diagram levels of Database and its purpose and functionality. **[17]**

Q5) Explain Web Graphics Guidelines and various file formats. **[18]**

OR

P.T.O.

Q6) What is Image optimization and its importance? Also discuss various methods used for image optimization. **[18]**

Q7) What is interaction Design? Explain 7C's of Effective Communication. **[17]**

OR

Q8) Create a questionnaire of 10 questions for Usability testing for newly launched mobile application of CIELAB Color Measurement. **[17]**

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Total No. of Questions : 8]

SEAT No. :

PA-1564

[Total No. of Pages : 2

[5926]-188

T.E. (Production)

ENGINEERING METROLOGY & INSTRUMENTATION

(2019 Pattern) (Semester-I) (311081A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume Suitable data if necessary.

Q1) a) Define Quality and explain in detail cost of Quality. [8]

- b) In automobile filling process 550 gms. of certain liquid was to be filled in plastic bags. The permissible variation is ± 4 gms. For investigating the process capability, 6 bags were taken at random from each batch for 10 successive batches and results were plotted as follows. [10]

Batch	1	2	3	4	5	6	7	8	9	10
Mean, gms.	552	552	548	549	551	550	552	549	548	554
Range	2	3	1	4	2	3	2	4	2	3

Find out control limits for x-bar chart.

Take $A_2 = 0.483$, $D_3 = 0$, $D_4 = 2.004$, $d_2 = 2.534$. Will the process be able to meet the specifications?

OR

Q2) a) Explain with neat sketch Operating characteristics (O.C.) curve. [8]

- b) A subgroup of 6 items is taken from the manufactured items. After 25 subgroups the values of \bar{x} and R were found to be $\sum \bar{x} = 250$ and $\sum R = 5.6$. The specification limits for the part are 15.5 ± 0.30 . Assuming the process is in control, what conclusion would you draw about the ability of the process to produce the items within the specified limits? Take $A_2 = 0.483$, $D_3 = 0$, $D_4 = 2.004$, $d_2 = 2.534$ for subgroup size of 6. [10]

P.T.O.

- Q3) a)** What is Quality circle? What are it's objectives? [9]
- b) Describe the contributions of Juran in the area of total quality management. [9]

OR

- Q4) a)** Explain with neat sketch Cause and effect diagram. [9]
- b) Explain in detail 5S in KAIZEN practice. [9]
- Q5) a)** What are the stages in generalized measuring system? [7]
- b) Explain in detail Readout-Recording stage in generalized measuring system. [10]

OR

- Q6) a)** Explain the following features of measuring instrument. [10]
- i) Sensitivity
- ii) Accuracy
- b) Differentiate between active and passive sensors with example. [7]

OR

- Q7) a)** Explain with neat sketch temperature measuring Arrangement using Thermocouple. [8]
- b) Define Force. Explain in detail Direct and Indirect methods of force measurement. [9]

OR

- Q8) a)** What is vibration and explain with neat sketch any one vibration measuring instrument. [8]
- b) What are the different types of dynamometers? Explain with neat sketch Prony Brake type dynamometer in Torque measurement. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1565

[Total No. of Pages : 3

[5926]-189

T.E. (Production)

MATERIAL FORMING TECHNOLOGY

(2019 Pattern) (Semester - I) (311082A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) The following is the data related to wire drawing operation, **[10]**

Initial diameter = 1.55 mm; Final diameter = 1.40 mm;

Radius of drum (bull block) = 125 mm

Yield strength of material, $\sigma_0 = 250$ MPa

Die angle = 16° ; Coefficient of friction, $\mu = 0.15$;

Speed of bull block = 200 rpm

Calculate,

- i) Drawing stress
 - ii) Drawing load
 - iii) Drawing speed
 - iv) Motor power required
- b) What role does tube drawing play? Describe various tube drawing processes with neat sketch. **[8]**

OR

Q2) a) Explain the various wire drawing and rod drawing processes along with a sketch of each setup. **[12]**

b) Describe the different zone and die materials used in wire drawing dies. **[6]**

P.T.O.

Q3) a) Explain the following term in rolling process. [10]

- i) Neutral plain
 - ii) Forward slip
 - iii) Backward slip
 - iv) Angle of bite
- b) Discuss various problems cause due to elastic deformation in rolling.[8]

OR

Q4) a) In rolling process 25 mm thick plate is rolled to 20 mm in four high rolling mills. Determine coefficient of friction if this is maximum reduction possible. The roll diameter is 500 mm. Find neutral plane section, its position, backward and forward slip and maximum pressure. $\sigma_o = 100\text{N/mm}^2$. [9]

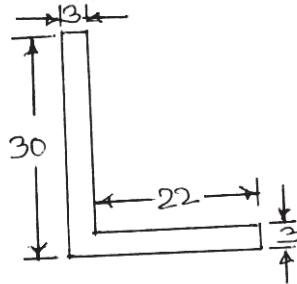
- b) Briefly describe any three of the following rolling mills with sketch. [9]
- i) Two high rolling mill
 - ii) Planetary rolling mill
 - iii) Sendzimir cluster rolling mill
 - iv) Four high rolling mill

Q5) a) Explain the differences between direct and indirect extrusion. [8]

- b) Describe the Ugine-Sejourment process of lubrication in extrusion. [5]
- c) Describe hydrostatic extrusion process. [4]

OR

- Q6) a)** Explain the various type of tube extrusion with neat sketch. [8]
- b)** An Aluminum billet of 50 mm diameter and 1m long is extruded to the final shape shown in fig. Calculate: [9]



- i) Extrusion Ratio
- ii) CCD
- iii) Shear (Shape) Factor
- iv) Work done

The flow stress of Aluminum is 60N/mm^2 and coefficient of friction between billet and container is 0.2.

- Q7) a)** Explain types of Explosive forming process with neat sketch. [10]
- b)** Explain stretch forming process with neat sketch. [7]

OR

- Q8) a)** Explain the effect of following factor on the efficiency of electro-hydraulic system, [12]
- i) Electrode gap width
 - ii) Stand-off distance
 - iii) Charge energy
 - iv) Hydrostatic head
 - v) Initiating wire
 - vi) Electrode material
- b)** Explain metal spinning with neat sketch. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1404

[Total No. of Pages : 1

[5926]-19

T.E. (Automobile Engineering)

AUTOMOTIVE CHASSIS AND TRANSMISSION

(2019 Pattern) (Semester - II) (316486)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw the neat sketches wherever required.*

Q1) a) Explain the major components of Tyre construction in detail. **[10]**

b) Explain the Tyre performance parameters. **[8]**

OR

Q2) a) Explain Hydraulic Brake system & write the importance of air bleeding. **[10]**

b) Differentiate between radial & bias ply tyre. **[8]**

Q3) a) What are the requirements of clutch? Explain the Diaphragm spring clutch. **[10]**

b) Explain about Centrifugal clutch. **[7]**

OR

Q4) a) Draw & explain about the synchromesh gear box. **[10]**

b) Explain the performance characteristics of typical gear box. **[7]**

Q5) a) Write the need of differential & Explain about Locking of Differential. **[10]**

b) List out the types of Axle & Explain Semi-Floating axle. **[8]**

OR

Q6) a) Draw & explain real axle with types of load acting on rear axle. **[10]**

b) Explain Hotchkiss Drive with neat sketch. **[8]**

Q7) a) Explain about Automatic Transmission. **[10]**

b) Discuss the construction and working of fluid flywheel. **[7]**

OR

Q8) a) Explain Continuous Variable Transmission with advantages & disadvantages. **[10]**

b) Explain the construction and working of Torque convertor. **[7]**



Total No. of Questions : 8]

SEAT No. :

PA-1566

[Total No. of Pages : 2

[5926]-190

T.E. (Production Engineering)
MACHINING SCIENCE AND TECHNOLOGY
(2019 Pattern) (Semester - I) (311083A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain various direct tool failure criterias in metal cutting with suitable sketches. [9]

b) Discuss selection of cutting fluids in metal cutting. [9]

OR

Q2) a) A tool cutting at 40 m/min has a life of 2 hours when used for a rough cut. What will be probable tool life when engaged on light finish cut. Take $n = 0.125$ for rough cut, $n = 0.1$ for finish cut. [9]

b) Discuss formation of primary and secondary shear zone in metal cutting with suitable sketches. [9]

Q3) a) What are the types of tool damages? Describe any two type of tool damage with suitable sketch. [9]

b) Explain effect of tool geometry on tool life. [8]

OR

Q4) a) Explain adhesive wear and abrasive wear mechanisms with suitable sketches. [9]

P.T.O.

- Q5) a) Describe ANSI specification system for insert tool holder. [9]**
b) List various shapes of inserts used in metal cutting. Explain any two shapes of inserts with suitable sketches and comment on their strength. [9]

Q6) a) Describe a ten digit ANSI method of insert specification. [9]
b) Design a single point cutting tool to turn a MS bar with a linear cutting speed of 30 m/min on a lathe equipped with a 8KW motor. Safe stress for tool material is 280 MPa and efficiency of machine tool is 75%. [9]

- OR

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□ □ □

Total No. of Questions : 8]

SEAT No. :

PA-1567

[Total No. of Pages : 3

[5926]-191

T.E. (Production Engineering)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - I) (311084(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.

- Q1)** a) Explain why uniform velocity follower motion is not practicable at high speed unless it is modified. How it is modified? [7]
- b) A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion : [10]
- i) Follower to move outwards through a distance of 30 mm during 120° of cam rotation
 - ii) Follower to dwell for 60° of cam rotation;
 - iii) Follower to return to its initial position during 90° of cam rotation ; and
 - iv) Follower to dwell for the remaining 90° of cam rotation.

The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.

OR

- Q2)** a) What is punching press? Describe with neat sketch the operation of flywheel in punching press. [7]
- b) A 5 kW motor running at 900 rpm operates a riveting machine. It has flywheel fitted to it of mass 100 kg and radius of gyration 0.4 m. Each

P.T.O.

riveting takes 1 second and required 10 kW. Determine i) Number of rivets closed per hour ii) Fall in the speed of flywheel after riveting operation. [10]

- Q3)** a) Explain modified Goodman's diagram for axial and bending fluctuating stresses. [8]
- b) A cantilever beam of circular cross section, made of steel with ultimate tensile strength of 540 N/mm^2 , is fixed at one end and subjected to a completely reversed force of 10 kN at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 100 mm. The construction of cantilever is such that there is no stress concentration. The corrected endurance limit is 160.96 N/mm^2 . If the diameter of beam is 35 mm, determine life of beam. Assume factor of safety is 1. [10]

OR

- Q4)** a) Explain stress concentration along with its causes. [6]
- b) A transmission shaft made of steel having corrected endurance limit 204 N/mm^2 and tensile yield strength 380 N/mm^2 is subjected to a fluctuating torque which varies from 800 Nm clockwise to 200 Nm anticlockwise. Factor of safety is 2. Assuming that there is no stress concentration, determine diameter of shaft for infinite life. Use distortion energy theory of failure. [12]

- Q5)** a) Explain design based on factor of safety and design based on reliability. [7]
- b) The mean tensile strength and the standard deviation of 250 nuts are 310 N/mm^2 and 35 N/mm^2 respectively. Determine: i) The number of nuts expected to have a strength less than 270 N/mm^2 ii) The number of nuts expected to have a strength between 270 N/mm^2 and 360 N/mm^2 .

The areas below standard normal distribution curve from $Z = 0$ to Z are as follows. [10]

Z	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Areas	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

OR

- Q6)** a) What is standard variable? Explain the concept of three sigma limit. [7]
 b) A shaft and hole assembly of nominal diameter 40mm have the following dimensions

$$\text{Shaft diameter} = 40_{-0.15}^{-0.1} \text{ mm} \quad \text{Hole diameter} = 40_{+0.0}^{+0.1} \text{ mm}$$

Assuming shaft and hole diameters are normally distributed, determine the percentage of assemblies having clearance less than 0.15 mm.

The areas below standard normal distribution curve from $Z = 0$ to Z are as follows. [10]

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Areas	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713

- Q7)** a) Explain with example, what are functional requirements and undesirable effects in design of mechanical system. [6]
 b) A tensile bar of length 400mm is subjected to constant tensile force of 4000 N. If the factor of safety is 2, design the bar with objective of minimizing the material cost out of following material. What will be the cost of bar. [12]

Material	Mass density Kg/m ³	Material cost per unit mass, Rs/kg	Yield strength N/mm ²
Plain Carbon Steel	7800	28	400
Alloy steel	7850	150	900
Aluminium Alloy	2800	140	150
Titanium Alloy	4500	2200	800

OR

- Q8)** a) Explain the guidelines to be followed in the design of forging parts. [8]
 b) Explain the concepts of design for assembly and design for manufacture. [10]



[5926]-192

T.E. (Production Engineering)
FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - I) (311085(A)-1) (Elective - I)

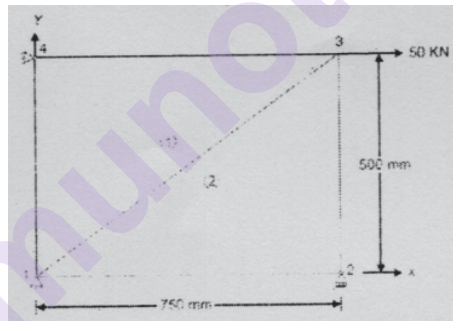
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.
- 4) Use of Non-programmable scientific calculators is allowed.
- 5) Figures to the right indicate full marks.

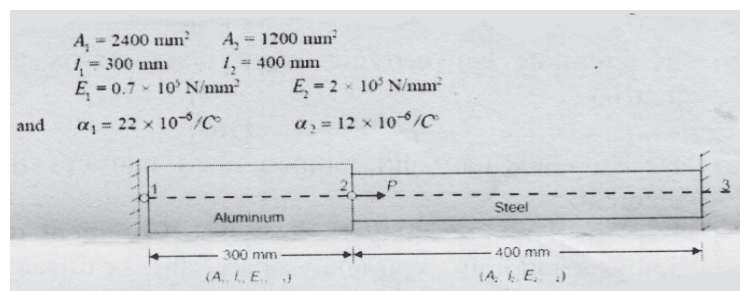
- Q1) a)** Determine the nodal displacements and element stresses in the propped beam shown in Fig. Idealize the beam into two CST elements as shown in the figure. Assume plane stress condition. Take $\mu = 0.25$, $E = 2 \times 10^5$ N/mm², Thickness = 15 mm. **[10]**



- b) Determine the stresses and strains for the 2D CST element. **[8]**

OR

- Q2) a)** Determine the nodal displacements at node 2, stresses in each material and support reactions in the bar shown in Fig., due to applied force $P = 400 \times 10^3$ N and temperature rise of 30°C. Given : **[12]**



P.T.O.

- b) Explain LST element and write its stiffness matrix. [6]

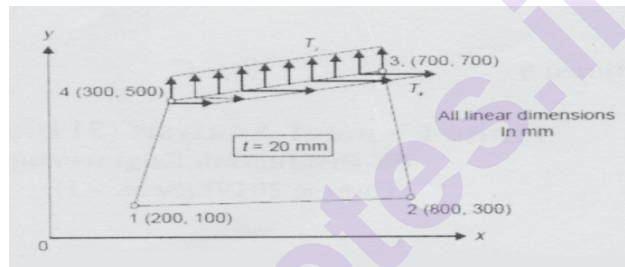
Q3) a) Write a note on Pascal's Triangle for identification of 2D element interpolation function. [9]

- b) Explain CST element and write its stiffness matrix. [9]

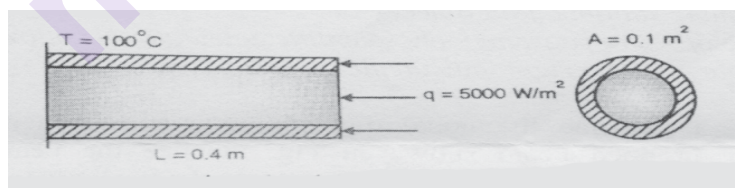
OR

Q4) a) Compare CST, LST and QST Elements with sketch. [6]

- b) The quadrilateral element shown in Fig. is 20 mm thick and is subjected to surface forces T_x and T_y . Determine expressions for its equivalent nodal forces. If $T_x = 10 \text{ N/mm}^2$ and $T_y = 15 \text{ N/mm}^2$ determine the numerical values of the nodal forces. [12]



Q5) a) The fin shown in fig. is insulated on the perimeter. The left end has a constant temperature of 100°C . A positive heat flux of $q = 5000 \text{ W/m}^2$ acts on the right end. Let $K_{xx} = 6 \text{ W/m}^\circ\text{C}$ and cross sectional area $A = 0.1 \text{ m}^2$. [10]



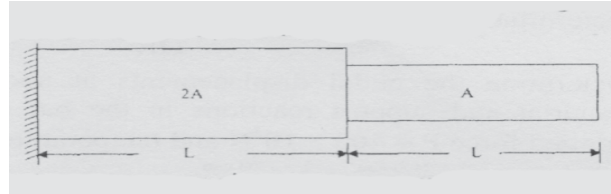
- b) Write notes on steps involved in processing step, to solve 1D heat transfer problem using FE problem. [8]

OR

Q6) a) Derive the element stiffness matrix formulation for 1D steady state heat conduction problems. [10]

- b) Write short notes on boundary conditions that prevail in 1D steady state heat conduction. [8]

- Q7) a)** Find the natural frequencies of longitudinal vibration of the constrained stepped shaft of area A and $2A$ and of equal lengths (L) shown in fig. Compare the results obtained using lumped mass matrix and consistent mass matrix approach. [12]



- b) Differentiate between consistent mass matrix and lumped mass matrix. [6]

OR

- Q8) a)** Derive consistent and lumped mass matrices for bar and beam element. [10]
- b) Explain dynamic analysis, its types. Comment on "does dynamic analysis and non-linear analysis are same or different?" [8]



Total No. of Questions : 8]

SEAT No. :

PA-1569

[Total No. of Pages : 2

[5926]-193

T.E. (Production Engineering)

**ADVANCES IN MANUFACTURING PROCESSES
(2019 Pattern) (Semester-I) (311085(A-II)) (Elective-I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of Non-Programmable scientific calculators is allowed.
- 5) Figures to the right indicate full marks.

- Q1)** a) Outline of production steps in a typical sand-casting operation. [6]
- b) Explain why squeeze casting produces parts with better mechanical properties, dimensional accuracy and surface finish than do expendable-mold processes. [6]
- c) Describe the differences between expendable and permanent molds. [6]

OR

- Q2)** a) Explain with neat sketch the principle of working, advantages and applications of evaporative-pattern casting. [6]
- b) Explain with neat sketch the principle of working, advantages and applications of ceramic-mold casting. [6]
- c) Explain with neat sketch the principle of working, advantages and applications of vacuum-mold casting. [6]

- Q3)** a) A single full penetration weld pass is made on steel using the following parameters $E = 20 \text{ V}$, $I = 200 \text{ A}$, $v = 5 \text{ mm/s}$, $T_0 = 25^\circ\text{C}$, $T_m = 1510^\circ\text{C}$, $\rho_c = 0.0044 \text{ J/mm}^3$, $t = 5\text{mm}$, $f_l = 0.9$, $H_{\text{net}} = 720 \text{ J/mm}$.
Calculate the peak temperatures at distances of 1.5 and 3.0 mm from the weld fusion boundary. [9]

P.T.O.

- b) Discuss the types of joints used in the welds. State the factors which are considered in the design of welded joints. [8]

OR

- Q4)** a) Find the best welding speed to be used for the welding of 6 mm steel plates with an ambient temperature of 30°C with the welding transformer set at 25 V and the current passing is 300 A. The arc efficiency is 0.9 and possible travel speeds are 6 to 9 mm/s. The limiting cooling rate for satisfactory performance is 6°C/s at a temperature of 550°C. [9]
- b) Classify the measurement methods for residual stresses in weldments. Explain any one method in brief. [8]

- Q5)** a) Explain with neat sketch the effect of duty cycle on percentage decrease in surface roughness. [8]
- b) Explain the constituents of magnetorheological fluids. Explain with cause and effect diagram of process parameters of magnetorheological abrasive flow finishing process. [9]

OR

- Q6)** a) Explain with neat sketch the principle of working, equipment, mechanism of material removal, process parameters, performance characterization, applications of magnetic abrasive finishing process. [8]
- b) Explain with neat sketch the principle of working, equipment, mechanism of material removal, process parameters, performance characterization, applications of magnetorheological abrasive flow finishing process. [9]
- Q7)** a) Explain gear shaving with sketch of gear shaving cutter. [6]
- b) What is thread rolling? Explain its advantages. [6]
- c) List the various gear grinding methods. Explain in brief the gear grinding process with neat sketch. [6]

OR

- Q8)** a) Sketch the tool shape of broach and write briefly about its elements. [3]
- b) Explain the principle of gear shaping. List advantages and limitations of gear shaping. [6]
- c) Explain various types of broaching machines with neat sketches. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1570

[Total No. of Pages : 2

[5926] - 194

T.E. (Production)

MECHATRONICS

(2019 Pattern) (Semester - I) (Elective - I) (311085 (A) - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) What is basic logic gates? [6]
- b) State the rules of Boolean algebra. [6]
- c) Describe binary octal and hexadecimal numbering systems. [6]

OR

- Q2)** a) Explain the working of Analog-to-digital convertor. [6]
- b) Explain Digital to analog convertor in brief. [6]
- c) What is the largest value of output voltage from an 8-bit DAC that produces 1.0 V for a digital input of 00110010? [6]

- Q3)** a) Which are the five basic elements of a process control system? [6]
- b) What are Dead Time Responses in Laplace form? [6]
- c) Write note on Laplace transform. [6]

OR

P.T.O.

- Q4)** a) Describe Process Dynamics Laplace. [6]
b) Which are the types of Second-Order Response in Laplace transform? [6]
c) Explain Lag Responses in Laplace Form. [6]

- Q5)** a) What is a Controller? [6]
b) Which are the different types of Controllers? [6]
c) Describe Proportional Controllers. [5]

OR

- Q6)** a) Describe Proportional plus Integral plus Derivative Controller (PID Controller). [6]
b) State general guidelines for designing a PID Controller. [6]
c) Which are the advantages and disadvantages of Proportional Controller? [5]

- Q7)** a) Explain the Ladder language of PLC programming. [6]
b) State ladder relay instructions of PLC programming. [6]
c) Explain Timer Instructions with example in PLC. [5]

OR

- Q8)** a) Describe programmable logic controller with sample ladder logic program. [6]
b) Describe five basic programming models of PLC. [6]
c) Explain an SFC program for tank level control using PLC. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1571

[Total No. of Pages : 2

[5926]-195

T.E. (Production)

SUPPLY CHAIN MANAGEMENT

(2019 Pattern) (Semester - I) (311085(A)-IV) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Non-programmable scientific calculators is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain the major functions of the stores. [5]
b) Explain principles of transport management. [6]
c) Write the advantages and limitations of material handling. [6]

OR

- Q2)** a) Explain Stores System in detail. [5]
b) Explain the importance of Warehouse Management System (WMS). [6]
c) Explain Value Analysis in detail. [6]

- Q3)** a) Explain the factors influencing distribution network design. [7]
b) Explain models for facility location and capacity allocation. [5]
c) Explain network design decisions using decision trees. [6]

OR

- Q4)** a) Explain design options for a distribution network. [5]
b) What are the roles of distribution network? [6]
c) What are the factors affecting network design decisions? [7]

P.T.O.

- Q5)** a) What is cycle inventory? Why is cycle inventory important? [5]
b) Explain four “R” strategy of revenue management. [6]
c) Explain selective inventory control techniques. [6]

OR

- Q6)** a) Explain managing inventory for short life cycle products. [6]
b) How supply chain risk pooling works. [5]
c) Explain with examples where risk pooling should be considered when making decisions. [6]

- Q7)** a) Explain supply chain integration. [6]
b) Explain the Bullwhip effect. [6]
c) Explain the coordination in supply chain. [6]

OR

- Q8)** a) Explain countermeasures to the Bullwhip effect. [6]
b) Explain Collaborative Planning, Forecasting and Replenishment (CPFR). [6]
c) Explain the role of information in supply chain. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1572

[Total No. of Pages : 2

[5926]-196

T.E. (Production Engineering)

PRODUCTION TOOLING

(2019 Pattern) (Semester - II) (311088(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) To design a drawing die for a component as shown in figure no.1 calculate following values for a sheet of thickness 3 mm and yield strength 280 MPa. **[10]**

- i) Blank size
- ii) Percentage reduction
- iii) Number of draws required
- iv) Cup diameter and height in each draw
- v) Die and punch dimensions in each draw
- vi) Press capacity required in each draw

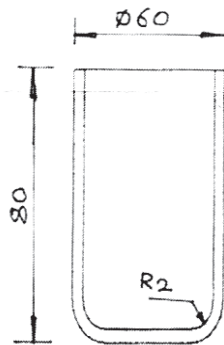


Figure No.1. All dimensions in mm

- b) Calculate bending force required for 90 degree bending of steel plate of thickness 5 mm in a V die. The die opening can be taken as twelve times the thickness. The length of bent part is 3 meter and UTS is equal to 410 MPa. **[8]**

OR

P.T.O.

- Q2) a)** Discuss various empirical relations used for calculation of blank size in drawing operation. [10]
b) With suitable example, explain use of Area Method in calculation of blank size. [8]

- Q3) a)** Describe the rules of upset forging with suitable sketches. [10]
b) What are the types of inserts used in forging die? Explain use of any three types of inserts with suitable sketches. [7]

OR

- Q4) a)** Discuss various guidelines to be used for designing ribs, webs and drafts in forging die design with suitable sketches. [10]
b) What is the purpose of edging operation in forging? With suitable example explain design of edging impression in forging die design. [7]

- Q5) a)** Explain classification of dies in die casting. [10]
b) Which metals and alloys are used for submerged plunger type hot chamber die casting machines? Explain working of submerged plunger type hot chamber die casting machine with suitable sketches. [8]

OR

- Q6) a)** Explain types of ejector systems used in die casting with suitable sketches. [10]
b) State various rules of die lubrication. [8]

- Q7) a)** Explain fan gate, pin point gate and film gate with suitable sketches. [10]
b) Discuss types of sprue pullers with suitable sketches. [7]

OR

- Q8) a)** Determine : [10]
i) Minimum cycle time
ii) Number of cavities for a mould by plasticising capacity method for a given data. Material = Acrylic, Mass of the component = 45 g., Overall cycle time = 27 sec. Plasticising rate with Acrylic material = 30 kg/h.
b) Explain types of runners used in plastic molding with suitable sketches. [7]



Total No. of Questions : 8]

SEAT No. :

PA-1573

[Total No. of Pages : 2

[5926]-197

T.E. (Production Engineering)

PRODUCTION AND OPERATIONS MANAGEMENT

(2019 Pattern) (Semester - II) (311089A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) List the types of production systems. Differentiate between any three types of production systems. [9]

b) Explain in brief decision making in production system. [9]

OR

Q2) a) Write a short note on Product Life Cycle. [9]

b) Write principles of PPC used in any manufacturing industry. [9]

Q3) a) List and explain with diagram basic types of Plant Layout. [8]

b) What is the need of Material Handling in a manufacturing industry? Explain importance of selecting material handling equipment. [9]

OR

Q4) a) Explain the meaning and significance of plant location. How will you decide the location of a mini steel plant in India? [9]

b) Write a short note on Relationship Chart. [8]

P.T.O.

Q5) a) Explain in detail fixed period system and fixed quantity system of Inventory control. [8]

b) A manufacturer purchases items in lots of 800 units which is a four months requirement. The cost per unit is Rs. 100 and the ordering cost is Rs. 120 per order. The inventory carrying cost is estimated as 20% of the average inventory investment. [9]

i) Determine the annual variable cost managing the inventory.

ii) How much saving can be obtained from the EOQ purchases?

OR

Q6) a) Describe briefly the ABC, HML, VED analysis in selective inventory control method. [8]

b) A company needs 2000 units per month. Cost of placing an order is Rs. 40. In addition to Rs. 0.50 the carrying costs are 10% per unit of average inventory per year. The purchase price of Rs. 10 per unit. Find the economic lot size to be ordered and the total minimum cost. [9]

Q7) Write a short note on : [18]

a) Enterprise resource planning (ERP)

b) Manufacturing Resource Planning (MRP II)

OR

Q8) Write a short note on : [18]

a) Lean Production

b) Green Manufacturing



Total No. of Questions : 8]

SEAT No. :

PA-1574

[Total No. of Pages : 2

[5926]-198

T.E. (Production)

PROCESS ENGINEERING AND RESOURCE PLANNING
(2019 Pattern) (Semester - II) (311090(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

Q1) a) What do you mean by Importance of work piece control? [8]

b) What are causes of work piece Variation? [9]

OR

Q2) a) Write short notes on - (Any Two) [8]

- i) Equilibrium theory.
- ii) Principal process operations.
- iii) Mechanical Control.

b) What are variables influencing work piece control. [9]

Q3) a) What are factors to be considered while selecting the tooling? [9]

b) Explain the term operation rout sheet. [8]

OR

Q4) a) What are factors to be considered while selecting the Machine or equipment? [9]

b) Explain the term process sheet design. [8]

P.T.O.

Q5) a) Explain factors affecting process selection. [9]

b) What is mean by capacity planning? [9]

OR

Q6) a) What are factors for effective capacity. [9]

b) What do you mean by OEE. [9]

Q7) a) How the CAPP (Computer Aided Process Planning) is useful in Industry. [9]

b) What is Generative process planning? [9]

OR

Q8) a) What are advantages of CAPP over manual process planning? [9]

b) Explain Knowledge based process planning. [9]

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PA-1575

[Total No. of Pages : 2

[5926]-199

T.E. (Production Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2019 Pattern) (Semester - II) (Elective - II) (311091(A) -I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain technology push & high risk type of product. [10]
b) Sketch Spiral & generic product development process flow. [6]

OR

- Q2)** a) Explain Fundamentally new product types of product development project with example. [10]
b) What are the benefits of stage gate system in generic product development process. [6]

- Q3)** a) What is the role of reverse engineering in establishing the engg. characteristics? Explain with suitable example. [10]
b) Enlist the Voice of customer (VOC's) methods. [8]

OR

- Q4)** a) How the customer requirement are fit to the product development process. [10]
b) Explain how to reduce the cost component? [8]

- Q5)** a) Explain how to estimate the manufacturing cost. [12]
b) Explain in details the product life cycle. [6]

OR

P.T.O.

- Q6)** a) Short note on Quality Function Deployment. [6]
b) Select one product from following list that you intend design & answer the questions. [12]

Sr.No.	Name of Product
1.	Pen
2.	Nail Clipper
3.	Pressure cocker

- i) Identify' primary function of the product.
ii) Develop the correlation matrix for the selected product.
iii) Construct the house of quality for the selected product.

- Q7)** a) List the Design for Manufacturing guidelines & explain the Design for forging. [12]
b) Explain the guideline of Design for Assembly (DFA). [6]

OR

- Q8)** a) What is PLM? Explain the key components of PLM. [12]
b) Explain the scope of product life cycle management (PLM) [6]



Total No. of Questions : 8]

SEAT No. :

PA-1405

[Total No. of Pages : 4

[5926]-20

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2019 Pattern) (Semester - II) (316487)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Design an exhaust valve for a horizontal diesels engine using the following data: **[9]**

Cylinder bore = 150 mm

Length of strokes = 275mm

Engine speed = 500 rpm

Maximum gas pressure = 3.5 Mpa

Seat angle = 45°

Calculate:

- i) Diameter of valve port
- ii) Diameter of valve head
- iii) Thickness of valve head
- iv) Diameter of valve stem
- v) Maximum lift of the valve

P.T.O.

- b) Design a rocker arm for the exhaust valve of four stroke engine using the following data: [8]

Effective length of each arm = 180 mm

Angle between two arms = 135°

Diameter of valve head = 75 mm

Lift of valve = 25 mm

Mass of valve = 0.5 kg

Engine speed = 600 rpm

Back pressure when exhaust valve opens = 0.4 Mpa

Maximum suction pressure = 0.02 Mpa below atmosphere

The valve opens 33° before the outer dead centre and closes 1° after the inner dead centre. The motion of the valves is SHM without dwell in the fully opened condition. Assume suitable data and state the assumption you make.

OR

Q2) a) What is the criterion for design of push rod? [9]

b) Explain the Selection of lubricating oil. [8]

Q3) a) What is function of flywheel and application of flywheel? [9]

b) What is Maximum Fluctuation of energy & coefficient of fluctuation of energy? [9]

OR

Q4) a) A machine is driven by a motor which exerts a constant torque. The resisting torque of the machine increase uniformly from 500 N-m to 1500 N-m through 360° rotation of the driving shaft and drops suddenly to 500 N-m again at the beginning of the next revolution. The mean angular velocity of the machine is 30 rad/s and the coefficient of speed fluctuations is 0.2. A solid circular steel disk, 25 mm thick, is used as flywheel. the mass density of steel is 7800 kg/m^3 while poissons ratio is 0.3 calculate outer radius of the flywheel disk and the maximum stresses induced in it. [9]

- b) The intercepted areas between the output torque curve and the mean resistance line of a turning moment diagram for a multi cylinder engine, taken in order from one end are as follows:

$-35, + 410, -285, + 325, - 335, + 260, -365, + 285, -260 \text{ mm}^2$.

The diagram has been drawn to a scale of $1 \text{ mm} = 70 \text{ N-m}$ and $1 \text{ mm} = 4.5^\circ$. The engine speed is 900 r.p.m. and the fluctuation in speed is not to exceed 2% of the mean speed. Find the mass and cross-section of the flywheel rim having 650 mm mean diameter. The density of the material of the flywheel may be taken as 7200 kg / m^3 . The rim is rectangular with the width 2 times the thickness. Neglect effect of arms, etc. [9]

- Q5)** a) List the basic assumptions used in the theory of hydrodynamic lubrication. [4]
- b) What are the commonly used materials for sliding contact bearings? [4]
- c) Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20 000 N; Speed of the journal 900 r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at $55^\circ\text{C} = 0.017 \text{ kg / m-s}$; Ambient temperature of oil = 15.5°C ; Maximum bearing pressure for the pump 1.5 N / mm^2 . Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C . Heat dissipation coefficient = $1232 \text{ W/m}^2/^\circ\text{C}$. [9]

OR

- Q6)** a) What are rolling contact bearings? Discuss their advantages over sliding contact bearings. [4]
- b) Define the following terms as applied to rolling contact bearings: [4]
- i) Basic static load rating
- ii) Static equivalent load
- c) What is procedure for selection of roller bearing from manufacturer's catalogue? [9]

- Q7)** a) Write a short note on Oscilloscope engine analyzers. [6]
- b) Write a short note on Exhaust gas CO and HC analyzer. [6]
- c) Write a short note on Mechanical fuel pump testing. [6]

OR

- Q8)** a) Write a short note on Selection of engine type on the basis of Stroke and Bore. [6]
- b) Write a short note on Cylinder arrangement. [6]
- c) Write a short note on considerations of combustion chamber. [6]

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Total No. of Questions : 8]

SEAT No. :

PA-1576

[Total No. of Pages : 2

[5926]-200

T.E. (Production)

NANO MANUFACTURING

(2019 Pattern) (Semester-II) (311091(A-II)) (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What are the different energy sources used in nonconventional machining processes? [10]
- b) Which non-conventional machining process has highest material removal rate? [6]

OR

- Q2)** a) What is the reason for using unconventional or advanced machining? [10]
- b) What are the needs of unconventional manufacturing process? [6]
- Q3)** a) What are the different types of nano finishing process? [10]
- b) What is the need for nano finishing process? [8]

OR

- Q4)** a) What is the purpose of nano finishing process? [10]
- b) Why finishing is necessary on metal surface? [8]
- Q5)** a) What are the difference between bottom-up fabrication and top-down fabrication? [12]
- b) What are the key issues in the synthesis of nanomaterials? [6]

OR

P.T.O.

- Q6)** a) What are the two fundamental approaches to nanomanufacturing? [12]
b) What are the approaches used in nano fabrication? [6]

- Q7)** a) Which device can be used for nano measurement? [12]
b) What is importance of Nanometrology? [6]

OR

- Q8)** a) What are the different methods of measurement of nano materials? [12]
b) What is the role of size in nanomaterials? [6]



Total No. of Questions : 8]

SEAT No. :

PA-1577

[Total No. of Pages : 2

[5926]-201

T.E. (Production)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester-II) (311091(A)-III) (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Describe various types of errors in short. [9]

- b) Evaluate error in the volume V of tank given by $V = (\pi/4) d^2 l$ at $d = 1.5\text{m}$ and $l = 2.25\text{m}$ if error in measurement of dia. d is $\pm 0.015\text{m}$ & l is $\pm 0.017\text{m}$. [9]

OR

Q2) a) Discuss flow chart for Newton Raphson method. [9]

- b) If $u = 4x^2y^3/z^4$ and errors in x, y, z be 0.001 , compute the relative maximum error in u , when $x = y = z = 1$ [9]

Q3) a) Explain exponential curve fitting method in detail. [9]

- b) It is known that tensile strength of plastic increases as a function of the time when it is heated. The following data is collected. What is the value of tensile strength at time 70minute? [8]

Time(minute)	10	20	30	40	50	60
Tensile strength (N/mm ²)	14.3575	16.6517	16.7353	17.6762	18.5128	104.8

OR

P.T.O.

Q4) a) How power equations are fitted? Discuss in detail. [9]

b) In some determinations of the values v of CO_2 dissolved in a given volume of water at different temp θ , the following pairs were obtained. [8]

θ	0	5	10	15
v	1.80	1.45	1.18	1.00

Obtain by method of least square, a relation of the form $v = b + a\theta$ which best fits to these observations. Also find the value CO_2 dissolved in volume of water at temp. 25°C .

Q5) a) The following are co-ordinates of a set of point. Find x at $y = 2$. [9]

x	0	1	2	3
y	0	1	7	25

b) Use Simpson's 3/8 rule to evaluate

$$\int_0^{\pi/2} \sqrt{\sin x + \cos x} dx = \int_0^{\pi/2} (\sin x + \cos x)^{1/2} dx. \text{ (Consider only one strip i.e. 3 sub strips).} \quad [9]$$

OR

Q6) a) Use Simpson's 3/8 rule to evaluate $\int_{0.5}^{0.7} \sqrt{x} e^x dx$ (Consider only one strip i.e. 3 sub strips). [9]

b) From following table. Calculate $f(3.5)$ using forward difference formula. [9]

x	2	3	4	5	6
y	19	48	99	178	291

Q7) a) What is manufacturing optimization? Discuss with case study. [9]

b) Discuss Genetic Algorithm (GA) with its applications in manufacturing. [8]

OR

Q8) a) What is Steepest descent method of optimization? Explain in detail. [9]

b) Discuss classical optimization and multiple optimization. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1578

[Total No. of Pages : 6

[5926] - 202

T.E. (Production Engineering)

FINANCIAL MANAGEMENT AND COSTING

(2019 Pattern) (Semester - II) (Elective - II) (311091 (A) - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is the effect of credit policy and price level changes on working capital? **[6]**

- b) Hi-tech Ltd. plans to sell 30,000 units next year. The expected cost of goods sold is as follows :

A (Per Unit)

Raw material	100
Manufacturing expenses	30
Selling, administration and financial expenses	20
Selling price	200

The duration at various stages of the operating cycle is expected to be as follows :

Raw material stage	2 months
Work-in-progress stage	1 month
Finished stage	1/2 month
Debtors stage	1 month

Assuming the monthly sales level of 2,500 units, estimate the gross working capital requirement. Desired cash balance is 5% of the gross working capital requirement and working progress in 25% complete with respect to manufacturing expenses. **[6]**

P.T.O.

- c) Is there a difference between the project's and the firm's cost of capital? Explain. [5]

OR

- Q2)** a) Find out the effective rate of interest, if nominal rate of interest is 12% and is quarterly compounded. [6]
- b) What are the dangers of excessive and inadequate working capital? [6]
- c) What is the opportunity cost of capital? Is it same as the required rate of return? [5]

- Q3)** a) What are the important methods of Costing? Describe each of them briefly. [6]
- b) From the records of an oil distributing company, the following summarized information is available for the month of March 1996 : [6]

Sales of month : Rs. 19,25,000

Opening Stock as on 1.3.1996 : 1,25,000 litre @ 6.50 per litre

Purchases (including freight and Insurance) :

March 5 150,000 litre @ Rs. 7.10 per litre

March 27 100,000 litre @ Rs. 7.00 per litre

Closing stock as on 31.3.96 : 1,30,000 litres.

General administrative expenses for the month; Rs. 45,000

On the basis of the above information, work out the following using :

FIFO methods of inventory valuation assuming that pricing of issues is being done at the end of the month after all receipts during the month :

- i) Value of closing stock as on 31.3.96
- ii) Cost of goods sold during March 1996
- iii) Profit or loss for March 1996

- c) Ramesh Ltd. has three production departments A, B and C and six service departments. The following figures are extracted from the records of the company : [5]

Production Departments		Service Departments	
A	A 16,000	Stores	A 2,000
B	A 10,000	Timekeeping	A 3,000
C	A 12,000	Maintenance	A 1,000
	A 38,000	Power	A 2,000
		Welfare	A 1,000
		Supervision	A 2,000
		Total	A 49,000

The other information available in respect of the production departments :

Particulars	Production Departments		
	A	B	C
No. of Employees	40	30	20
No. of Stores Requisition	30	20	10
Horse Power of Machines	500	500	600
Machine Hours	2500	1500	1000

You are required to apportion the costs of various service departments to production departments.

OR

- Q4) a)** What are the important techniques of costing? Explain each one. [6]
- b) Calculate the earnings of workers A and B under Straight Piece Rate System and Taylor's Differential Piece Rate System from the following particulars : [6]
- Standard time allowed 50 units per hour.
- Normal time rate per hour A 100.
- Differentials to be applied.
- 80% of Piece rate below standard.
- 120% of Piece rate at or above standard.
- In a day of 8 hours A produced 300 units and B produced 450 units.
- c) Following information is made available from the costing records of a factory : [5]
- i) The original cost of the machine : A 1,00,000
- Estimated life : 10 years
- Residual Value : A 5,000
- Factory operates for 48 hours per week : 52 weeks in a year.
- Allow 15% towards machine maintenance down time. 5% (of productive time assuming unproductive) may be allowed as setting up time.
- ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.
- iii) Repair and maintenance cost is A 500 per month.
- iv) Two operators attend the machine during operations along with two other machines. Their total wages including fringe benefits, amounting to A 5,000 per month is paid.
- v) Other overheads attributable to the machine are A 10,431 per year. Using above data, calculate machine hour rate.

Q5) a) Define Standard Costing. What do you understand by Standard Cost and Standard Costing? [6]

b) Discuss the preliminary steps for determination of Standard Cost. [6]

c) Calculate Material Cost Variance from the following information : Standard Price of material per kg = A 4 [6]

Standard Usage of materials = 800 kgs

Actual Usage of materials = 920 kgs

Actual Price of materials per kg = A3

Actual Cost of materials A 2,760

Standard cost of material for actual production A 3,200

OR

Q6) a) What are the differences between Standard Costing and Estimated Costing? [6]

b) Explain the different types of Material Cost Variance. [6]

c) From the following particulars, calculate Labour Variance : [6]

Standard hours = 200

Standard rate for actual production = A 1 per hour

Actual hour = 190

Actual Rate = A 1.25 per hour

Q7) a) What do you understand by Marginal Costing? Define Marginal Costing. Briefly explain the features of marginal costing. [6]

b) What are the merits and demerits of process costing? [6]

- c) From the following information, calculate the amount of profit using marginal cost technique : [6]

Fixed cost A 3,00,000

Variable cost per unit A 5

Selling price per unit A 10

Output level 1,00,000 units

OR

- Q8) a) What is meant by Cost Driver? Explain role of Cost Driver in tracing costs to products. [6]

- b) Write Short notes on : [6]

i) Normal Process Loss.

ii) Abnormal Process Loss.

iii) Abnormal Gain.

- c) In Process A, 1,000 units were introduced at a cost of A 20,000, the other expenditure incurred in the process were materials A 10,000 and wages A 5,000. 10% is the normal loss during production and possess a scrap value of A 3 each. The output of process A was only 800 units. Find out the value of Abnormal Loss. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1579

[Total No. of Pages : 2

[5926]-203

**T.E. (Production Engineering/Sandwich)
MANUFACTURING TECHNOLOGY (Self Study)
(2019 Pattern) (Semester-I) (311122A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicates full marks.*
- 2) *Neat Diagram must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

Q1) a) Differentiate between Preventive Maintenance and Breakdown Maintenance. [9]

b) What do you understand the term reliability? [8]

OR

Q2) a) Write a short notes on wear debris analysis. [9]

b) What is availability? What is the function of availability? Explain the types of availability? [8]

Q3) a) What is the main aim of JIT principle? What are the 3 elements of JIT? How does JIT improve quality? [9]

b) What are standard 14 points for quality transformation given by Dr.W. Edward Deming? [8]

OR

Q4) a) How does QFD help in decision making? Explain Quality Function Deployment with relevant case study/example. [9]

b) What is Concurrent Engineering? What is the main goal of concurrent engineering? What are some challenges in implementing concurrent engineering? [8]

P.T.O.

- Q5) a)** What happens when there is demand, but no supply? Explain with example. [9]
- b) Differentiate between MRP-I and MRP-II [9]

OR

- Q6) a)** Explain Material Resource Planning with example? How can the use of MRP contribute to productivity? [9]
- b) What does capital market mean? How does the company raise funds in capital market? [9]
- Q7) a)** What do you mean by Depreciation? List out and explain different Methods of depreciation. [9]
- b) Write down objectives & functions of cost estimation. [9]

OR

- Q8) a)** What are the Principle factors of estimating cost? Elaborate with example. [9]
- b) How is machining time estimated? Which are major factors that govern machining time? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1580

[Total No. of Pages : 3

[5926]-204

T.E. (Production - Sandwich)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - II) (311084(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Assume Suitable data if necessary.
- 5) Use of Logarithmic Table, Slide rule and pocket calculator is allowed.

Q1) a) Define the following terms as applied to cam with neat sketch: **[8]**

- i) Base Circle
- ii) Pitch Circle
- iii) Pressure angle
- iv) Stroke of the follower

- b) The turning moment diagram for a petrol engine is drawn to the following scales turning moment 1 mm = 5 N-m; crank angle 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order, are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m. **[10]**

OR

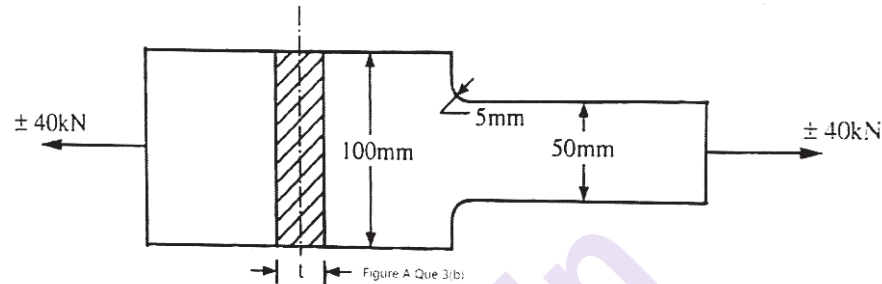
Q2) a) Sketch different types of cams and follower and name it. **[6]**

- b) A riveting machine is driven by a constant torque 3 kW motor. The moving parts including the flywheel are equivalent to 150 kg at 0.6 m radius. One riveting operation takes 1 second and absorbs 10000 N-m of energy. The speed of the flywheel is 300 r.p.m. before riveting. Find the speed immediately after riveting. How many rivets can be closed per minute? **[12]**

P.T.O.

Q3) a) Explain the Modified Goodman Diagram for fluctuating axial/bending stresses with neat sketches. [8]

b) A plate made of plain carbon steel 40C8 ($S_{ut} = 580 \text{ N/mm}^2$), shown in Fig. (A), is subjected to a completely reversed axial force of 40 kN. The theoretical stress concentration factor at the change in the cross-section is 2.27 and the notch sensitivity is 0.8. The surface finish factor and the size factor are 0.75 and 0.85 respectively. The load factor is 0.923. The expected reliability is 90%, for which the reliability factor is 0.897. If the required factor of safety is 2, determine the plate thickness for infinite life. [9]



OR

Q4) a) Define the following terms: [8]

- Notch sensitivity
- Endurance Limit
- Stress Concentration

b) A steel bar of 50 mm diameter is subjected to a completely reversed bending stress of 250 N/mm^2 . The ultimate tensile strength of steel is 600 N/mm^2 . The surface finish factor and size factor are 0.43 and 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration, determine the life of the bar. [9]

Q5) a) What is the significance of the 'normal distribution curve' in engineering statistical analysis? State its limitations. [8]

b) The bolt diameters are normally distributed with a mean of 10.01 mm and a standard deviation of 0.015 mm. The tolerance specified by the designer for the bolt diameter is $10 \pm 0.025 \text{ mm}$. Calculate the percentage of bolts likely to be rejected. [10]

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
Z	1.8	1.9	2.0	2.1	2.0	2.1	2.2	2.3
Area	0.4641	0.4713	0.4772	0.4821	0.4772	0.4821	0.4861	0.4893
Z	2.4	2.5	2.6	2.7				
Area	0.4918	0.4938	0.4953	0.4965				

(Use linear interpolation for values in between.)

OR

- Q6) a)** Explain the difference between ‘design tolerance’ and ‘natural tolerance’.[6]
- b)** A shaft and hole assembly have the following dimensions. [12]

Shaft diameter = 40 ± 0.18 mm

Hole diameter = 40.2 ± 0.24 mm

Assuming the shaft and hole diameters are normally distributed. Determine the probability of interference fit between the shaft and the hole.

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
Z	1.8	1.9	2.0	2.1	2.0	2.1	2.2	2.3
Area	0.4641	0.4713	0.4772	0.4821	0.4772	0.4821	0.4861	0.4893
Z	2.4	2.5	2.6	2.7				
Area	0.4918	0.4938	0.4953	0.4965				

Use linear interpolation for values in between.

- Q7) a)** What is design for manufacture (DFM) Explain the general principles to be followed while designing the parts for manufacture. [8]
- b)** Explain desirable, undesirable effects and functional requirement parameter in optimum design. State various step involved in optimum design for normal specification. [9]

OR

- Q8) a)** Explain the guidelines to be followed in the design of casting process.[8]
- b)** What is concurrent engineering? What is its significance in the product design? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1581

[Total No. of Pages : 3

[5926]-205

T.E. (Production Sandwich Engineering)

311124A: MATERIAL FORMING AND MOULD DESIGN

(2019 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary mention it clearly.
- 5) Use of non-programmable calculator is allowed.

- Q1)** a) A 0.1% carbon steel strip is 50 mm wide and 5 mm thick was rolled in one pass to 3.5 mm at 1060 °C. When the homogeneous yield stress was 1.05 kN/mm². The roll diameter was 340 mm. find magnitude of rolling load, taking into account roll flattening, if rolls were made up of CI. Assume young's modulus (E) = 1.005 MN/mm² and Poissons ratio (r) = 0.35. [8]
- b) Explain briefly Electromagnetic forming with neat sketch. [5]
- c) Explain briefly with neat sketch Electro-Hydraulic forming. [5]

OR

- Q2)** a) Explain neat sketch Automatic gauge control in Rolling (AGC). [5]
- b) Explain with neat sketch Electro-Hydraulic forming. [5]
- c) Determine maximum possible reduction for cold rolling a 300 mm thick slab when coefficient of friction is 0.08 and roll diameter is 600 mm. What is maximum reduction on same mill when coefficient of friction is 0.5 for hot rolling processes. [8]

P.T.O.

- Q3)** a) Explain Pouring basin, Sprue, Sprue base well, Runner and Gate in sand casting with neat sketch. [6]
- b) Explain following in case of Die casting. [6]
- i) Draft
 - ii) Parting line shape & location
 - iii) Die wear Die lubricants
- c) Explain about the various methods available for trapping slag in pouring basin. [6]

OR

- Q4)** a) For a slab casting $500 \times 250 \times 50$ mm which to be made in cast iron calculate the choke area. Take density of material as 7.86 gms/cm^3 , fluidity of iron as 22 inches, mass density of molten metal (d) as 6.09 gms/cm^3 , efficiency factor (c) as 0.85. Assume top gating system with 100 mm cope height. [8]
- b) Explain following in case of sand casting with sketch. [10]
- i) Pouring time
 - ii) Choke area
 - iii) Chovornov's rule
 - iv) Gating ratio
- Q5)** a) Define formability and explain various forgability test. [6]
- b) Explain various forgin design factors in detail. [6]
- c) Explain various forging operations to be carried out in multi-impression die with neat sketch. [5]

OR

- Q6)** a) Explain following for forging operations with neat sketch. [8]
- i) Fullering
 - ii) Edging
 - iii) Blocking
 - iv) Finishing

- b) Explain following : [9]
- i) Liquid metal forging.
 - ii) Isothermal forging.

- Q7)** a) Explain stripper plate ejection technique for injection moulding with suitable sketch. [8]
- b) Explain following in case of injection mould with sketch. [9]
- i) Core & Cavity
 - ii) Sprue bush

OR

- Q8)** a) Explain in detail any two types of gates used in injection moulding. [8]
- b) Explain following in case of injection mould. [9]
- i) Guide pillar & guide bush
 - ii) Register ring



Total No. of Questions : 8]

SEAT No. :

PA-1582

[Total No. of Pages : 2

[5926]-206

**T.E. (Production Sandwich Engineering)
METROLOGY AND QUALITY CONTROL
(2019 Pattern) (Semester - II) (311125(A))**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Classify measurement system in detail? Explain with detail. [9]
b) Elaborate constructional features of CMM with neat diagram. [8]

OR

- Q2)** a) Explain basic concepts of machine vision system. [9]
b) State and explain types of probes with neat sketch. [8]

- Q3)** a) How are the major and minor diameters of thread measured? [9]
b) What are the various methods used for measuring the gear tooth thickness? [8]

OR

- Q4)** a) Name the various stylus probe instruments used for surface finish measurement. [9]
b) What is meant by “Best size wire” in screw thread measurement? [8]

- Q5)** a) Describe the construction of a hydraulic dynamometer and explain how it is used for power measurement. [9]
b) State any two principles of force measurement. [9]

OR

P.T.O.

- Q6)** a) How are end standards derived from line standard? Explain. [9]
b) With suitable example, explain the difference between precision and accuracy. [9]

- Q7)** a) Discuss frequency distribution in Statistical quality control. [9]
b) Explain details about “X” and “R” chart. [9]

OR

- Q8)** a) Explain single sampling plan with suitable example. [9]
b) Classify control chart patterns. Explain anyone. [9]



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Total No. of Questions : 8]

SEAT No. :

PA-1583

[Total No. of Pages : 3

[5926] - 207

T.E. (Production S/W)

STATISTICS AND NUMERICAL OPTIMIZATION METHODS

(2019 Pattern) (Semester - II) (311088 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.
- 5) Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.

Q1) a) Determine the root of the given equation $X = Xe^x$ using bisection method and correct to four decimal places. [9]

b) Find a root of an equation $f(x) = X^4 - X = 10$ correct to three decimal places using Newton Raphson method. [8]

OR

Q2) a) Solve following equation using gauss elimination method. [8]

$$X + 2Y + 3Z - U = 10$$

$$2X + 3Y - 3Z - U = 1$$

$$2X - Y + 2Z + 3U = 7$$

$$3X + 2Y - 4Z + 3U = 2$$

b) Solve following equation using gauss Seidal method upto three approximations. [9]

$$10X - 2Y - Z - U = 3$$

$$-2X + 10Y - Z - U = 15$$

$$-X - Y + 10Z + 2U = 27$$

$$-X - Y - 2Z + 10U = -9$$

P.T.O.

Q3) a) Fit a curve $y = ab^x$, using least square method to the following data : [8]

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

b) Evaluate $f(9)$ by Using Lagrange's Interpolation formula from the following data : [9]

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

OR

Q4) a) State the order of the polynomial which might be suitable for the following Function. Calculate $f(3)$ using Newton Forward Difference Method. [9]

x	-0.75	-0.5	-0.25	0
y	-0.0718125	-0.02475	0.3349375	1.10100

b) Fit a straight line $y = ax + b$, using least square method to the following data : [8]

x	6	7	7	8	8	8	9	9	10
y	5	5	4	5	4	3	4	3	3

Q5) a) State the order of the polynomial which might be suitable for the following function. Calculate $f(1.5)$ using Newton Divided Difference Method. [9]

i	0	1	2	3	4
x	1	2	3	4	5
f(x)	0	7	26	63	124

- b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal Method and Simpson's 1/3rd Rule corresponding to six intervals. [9]

OR

- Q6) a) Find the value of y at x = 8 and x = 15 by Using Newton Divided Difference Method formula from the following data : [9]

x	4	5	7	10	11	13
y	48	100	294	900	1210	2028

- b) Use Simpsons 1/3rd rule to evaluate $\int_0^1 \frac{x^2}{1+x^3}$ corresponding to four intervals. [9]

- Q7) a) Describe in brief classical optimization and multiple optimization. [9]
 b) Explain the Steepest Decent Method used in Information Technology. [9]

OR

- Q8) a) Write in brief implantation of Genetic Algorithm with suitable example. [9]
 b) Brief on : Generalized reduced gradient Method. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1584

[Total No. of Pages : 2

[5926]-208

T.E. (Production Engineering S/W)

ADVANCED MATERIAL

(2019 Pattern) (Semester-II) (311126 A-I) (Elective-II)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.
- 5) Assume Suitable data, if necessary.

Q1) a) Explain dual phase steel with application and microstructure. **[9]**

b) Explain High Strength Low alloy with its properties. **[8]**

OR

Q2) a) Explain Maraging Steel with its microstructure. **[9]**

b) Discuss Micro alloyed steels with its application. **[8]**

Q3) a) Classification of Composite material with Advantage and Disadvantage. **[9]**

b) Explain Natural composite with its application? **[8]**

OR

Q4) a) Explain Metal matrix composite with its diverse application. **[9]**

b) What is metal matrix composites? Explain with advantage and disadvantage. **[8]**

Q5) a) Explain with neat diagram Autoclave manufacturing process. **[9]**

b) Draw schematic diagram of Shape memory alloys. Explain with application. **[9]**

OR

P.T.O.

- Q6)** a) Explain Nanomaterial in comparison with bulk material. [9]
b) Explain the bio metallic alloys like: Ni-Ti, Co-Cr-Mo alloys with Application. [9]

- Q7)** a) Why to Aluminum is used in the aero plane Industry. [9]
b) Explain Iron base, nickel base and cobalt base super alloys. [8]

OR

- Q8)** a) Explain biocompatibility in the biomedical industry. [9]
b) Explain cobalt base super alloys [9]



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[5926]-209

T.E. (Production Engineering S/W)
COSTING AND COST CONTROL

(2019 Pattern) (Semester-II) (311126 A-II) (Elective-II)

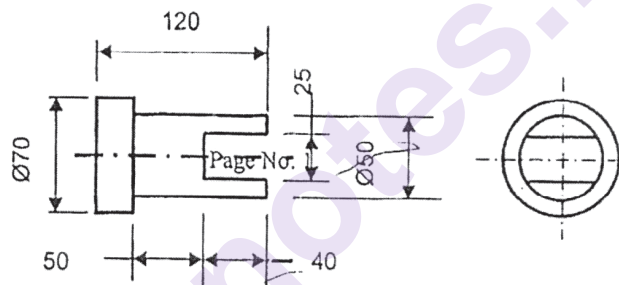
Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of Logarithmic Table, Slide rule or Electronic pocket calculator is allowed.
- 5) Assume Suitable data, if necessary.

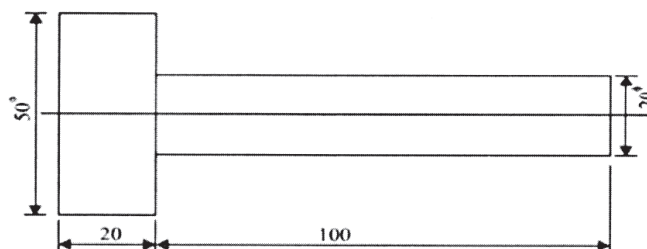
Q1) a) Estimate the weight of the component shown in fig. the material is CI. [8]



- b) Market price of a CNC lathe is Rs. 50,000 and discount is 20% of market price. Here Factory cost is 4 times selling cost and 1:4:2: is ratio of material, labour and overhead charges. Material cost is Rs. 4,000. What is profit value? [10]

OR

- Q2) a)** Explain the different items involved in the estimation of arc welding cost of job. [8]
- b) 150 components, as shown in Fig. are to be made by upsetting a dia. 20 mm bar. Calculate the net weight, gross weight and length of dia. 20 mm bar required. The density of material may be taken as 7.86 gms/cc. [10]



P.T.O.

- Q3)** a) What are overheads? How should overheads be classified? To what extent will you include overhead charges in your valuation of [9]
i) Work- in progress, and
ii) Finished goods?
b) Distinguish between allocation, apportionment and absorption in connection with factory overhead expenses. [9]

OR

- Q4)** a) Discuss the reasons for overheads being analysed into fixed and variable components. [9]
b) What are different stages by which overhead expenses are analysed, collected and charged to product? [9]

- Q5)** a) What is cost sheet? In what respect it differs from production account?[7]
b) What is Job Costing? Discuss the nature of contract costing and explain how costs are recorded in contracts. [10]

OR

- Q6)** a) What is operating or service cost? State the industries where is it to be used. [7]
b) What is meant by process costing? State the industries where is it to be used. Distinguish between 'Job Costing' and 'Process Costing' & 'Job Costing' and 'Contract Costing'. [10]

- Q7)** a) What is budgetary control? Discuss the various preliminaries required for adoption of a system of budgetary control. [8]
b) What are the main steps in budgetary control? State the main objectives of budgetary control. [9]

OR

- Q8)** a) What do you understand by master budget? Into what sections is it usually divided, and what are the purposes of the divisions? [8]
b) Write a note on [9]
i) Zero base budget and
ii) Performance budget.



Total No. of Questions : 8]

SEAT No. :

PA-1406

[Total No. of Pages : 2

[5926]-21

T.E. (Automobile)

AUTOMOTIVE AERODYNAMICS AND BODY ENGINEERING

(2019 Pattern) (Semester - II) (316488-A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) What are the limitations of simulation? Explain in detail. [9]

b) Explain wind noise. Write mechanism of the generation of wind noise. [9]

OR

Q2) a) What is CFD (Computational Fluid Dynamics)? Explain in detail. [9]

b) Differentiate between open type and closed type wind tunnel. [9]

Q3) a) Draw labeled diagram of single decker bus with details. [9]

b) Differentiate between saloon car and sedan car. [8]

OR

Q4) a) Explain car body construction in details. [9]

b) Differentiate between single decker and double Decket Bus. [8]

Q5) a) Explain light construction vehicle body types with example. [8]

b) Write a note on flat platform types of bodies. [9]

OR

Q6) a) What is the difference between Drop side and fixed side body construction. [8]

b) Write a note on Design of chassis frame. [9]

P.T.O.

- Q7)** a) Explain load distribution on vehicle structure. [9]
b) Differentiate between Bucket seat and Bench seat in a car. [9]

OR

- Q8)** a) Write the importance of Bumpet in Automobile. [9]
b) What are the different types of seat Belts in Automobile? Explain any one. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1586

[Total No. of Pages : 2

[5926]-210

T.E. (Production Sandwich)

ADVANCED JOINING TECHNOLOGY

(2019 Pattern) (Semester - II) (Elective - II) (311126(A) -III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) What is cold welding? State its advantages, disadvantages, and applications of the process. **[10]**

b) Explain principle and working of Forge welding. State its advantages, disadvantages, and applications of the process. **[8]**

OR

Q2) a) Explain Ultrasonic Welding stating its advantages, disadvantages, and applications of the process. **[9]**

b) Explain Friction Welding stating its advantages, disadvantages, and applications of the process. **[9]**

Q3) a) Explain Thermit Welding with neat sketch? Stating its advantages, disadvantages, and applications of the process. **[9]**

b) Describe the concept of cold Metal Transfer and its applications. **[8]**

OR

Q4) a) Explain Friction stir welding stating its advantages, disadvantages, and applications of the process. **[9]**

b) Write short notes on: **[8]**

- i) Cold Metal Transfer Joining
- ii) Welding automation in aerospace

P.T.O.

- Q5) a)** Describe various types of joints used in welding with sketch in short.[9]
b) Describe in short, the Magnetic Particle Testing of weldments. [9]

OR

- Q6) a)** Write short notes on : [9]
i) Radio graphs of weldments
ii) Life assessment of weldments
b) Describe in short, the liquid penetration test of weldments. [9]

- Q7) a)** Write Short notes on : [8]
i) Weld thermal cycles and their effects
ii) concept of HAZ
b) What do you understand by weldability? Explain how weldability is assessed in short. [9]

OR

- Q8) a)** Explain the following weld defects ,their causes and remedies. [9]
i) Lack of penetration
ii) cracks
iii) Lack of fusion
b) Explain pre and post weld heat treatments in welding? [8]



Total No. of Questions : 8]

SEAT No. :

PA-1587

[Total No. of Pages : 2

[5926]-211

T.E. (Production Sandwich)

WORLD CLASS MANUFACTURING

Production Engineering

(2019 Pattern) (Semester-II) (311126(A)) - IV (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figure to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is meant by "Cellular Manufacturing"? Explain in detail the single-linkage clustering algorithm used for cell formation. [9]

b) What is production flow analysis? List the steps involved in carrying out PFA. [8]

OR

Q2) a) Explain in details the Optiz classification system. [9]

b) Differentiate between hierarchical codes and attribute code structure?[8]

Q3) a) What is TPM? State and explain importance of pillars. [9]

b) What are the four steps of Jidoka? What are the four steps of Jidoka?[8]

OR

Q4) a) How does a heijunka board help to reduce the waiting time for a project? What are the key principles of heijunka? [9]

b) How do we measure effectiveness of TPM? Explain PQCDSDM in TPM concept? [8]

Q5) a) Explain in detail-Drum-Buffer-Rope Approach. [9]

b) What is 5S methodology? State and explain in details steps in 5S Methodology. [9]

OR

P.T.O.

- Q6)** a) What is visual management? What is the difference between visual displays and visual controls? What are types of visual displays? [9]
- b) Define Throughput Accounting. What are the steps to be followed to increase the Throughput? [9]

- Q7)** a) Define IOT. Discuss IOT barriers. Explain the applications of IOT in manufacturing. [9]
- b) What is meant by smart industry? What are the components of smart factory? What Technologies are used in a Smart Factory? [9]

OR

- Q8)** a) How does Industry 4.0 work? Explain, Drivers and Enablers of Industry 4.0? What are the risks of an Industry 4.0 solution? [9]
- b) What is the lean practitioner's approach to solving healthcare process problems? What are the steps involved, and how is quality improvement executed? [9]



[5926]-212

T.E. (Automation & Robotics)
DESIGN OF ROBOT ELEMENTS
(2019 Pattern) (Semester - I) (302521)

Time : 2½ Hours]

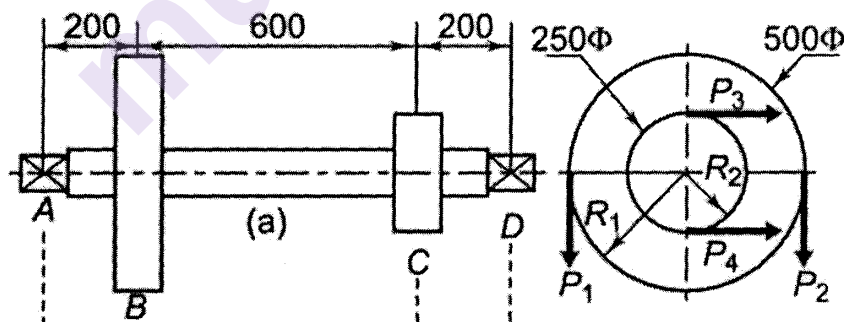
[Max. Marks : 70

Instructions to the candidates:

- 1) Draw neat labeled diagrams wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Use of non programmable electronic calculator is permitted.
- 4) Assume Suitable/Standard data if necessary.

- Q1) a)** The layout of a transmission shaft carrying two pulleys B and C and supported on bearings A and D is shown in Figure. Power is supplied to the shaft by means of a vertical belt on the pulley B, which is then transmitted to the pulley C carrying a horizontal belt. The maximum tension in the belt on the pulley B is 2.5 kN. The angle of wrap for both the pulleys is 180° and the coefficient of friction is 0.24. **[13]**

The shaft is made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 3. Determine the shaft diameter on strength basis.



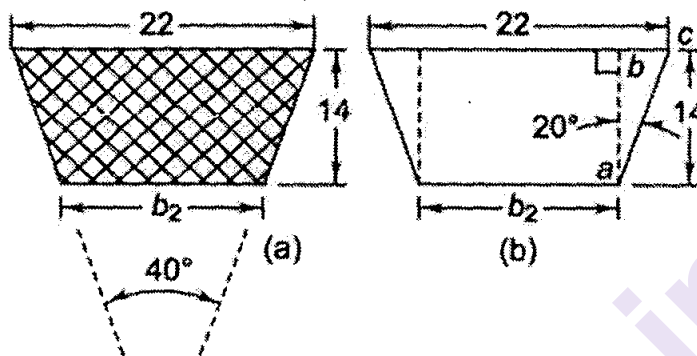
- b) Explain design of shaft design using ASME code. **[5]**

OR

- Q2) a)** The following data is given for a V-belt drive connecting a 20 kW motor to a compressor. The centre distance between pulleys is 1 m and the dimensions of the cross-section of the belt are given in Figure. The density of the composite belt is 0.97 g/cc and the allowable tension per belt is 850 N. How many belts are required for this application? **[11]**

P.T.O.

	Motor-pulley	Compressor-pulley
Pitch diameter (mm)	300	900
Speed (rpm)	1440	480
Coefficient of friction	0.2	0.2



- b) Derive equations for center distance, length of belt for crossed belt drive.[7]

Q3) a) Write basic design process of gripper. [9]

- b) Write a note on using tools as end effectors. [8]

OR

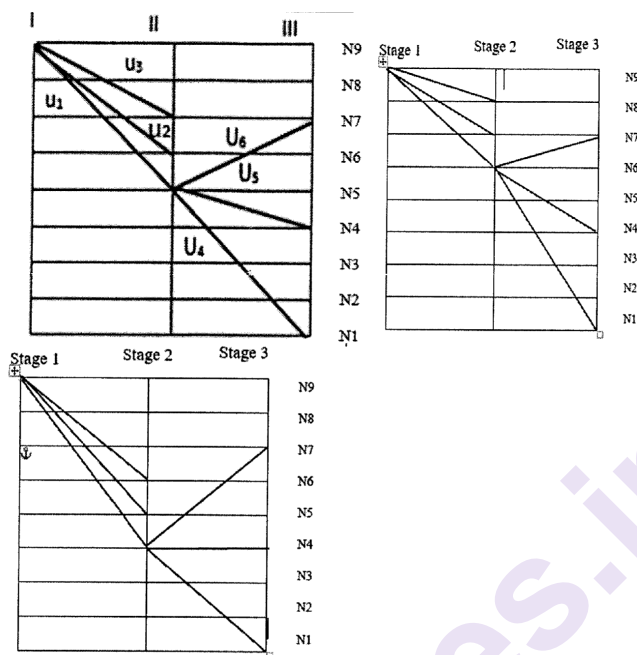
Q4) a) What do you mean by payload in the design of robots. Explain payload force analysis with neat diagram and mathematical equations. [9]

- b) Explain in detail with examples and diagrams elements required for the physical support of the end effector. [8]

Q5) Design a nine-speed gear box having $N_{\min} = 100$ rpm and $N_{\max} = 630$ rpm. Assume motor speed 1400 rpm. The design should include structural diagram, ray diagram, speed chart, gearing diagram and number of teeth of the gear.[18]

OR

- Q6) a)** A 3×3 Gear box is transmitting a power of 10 KW. Choose the best ray diagram based on minimum summation of shaft diameters made of same material with permissible shear stress of 36 N/mm^2 . Use GP ratio of 1.26 and Lowest speed $N_1 = 100 \text{ RPM}$ [10]



- b) Write a note on general recommendation for developing the gearing diagram. Explain with suitable example. [8]

- Q7) a)** A taper roller bearing has a dynamic load capacity of 26 kN. The desired life for 90% of the bearings is 8000 h and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. [5]
- b) Explain load life relationship in rolling contact bearing. [5]
- c) A ball bearing is operating on a work cycle consisting of three parts-a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10 000 h. Calculate the dynamic load carrying capacity of the bearing. [7]

OR

- Q8) a)** Derive Petroff's Equation for sliding contact bearing. [7]
- b) Design a full hydrodynamic journal bearing with the following specification for machine tool application: journal diameter = 75 mm, radial load = 10 kN, journal speed = 1440 rpm, minimum oil film thickness = 22.5 microns, inlet temperature = 40°C , bearing material = babbitt. Determine the length of the bearing and select a suitable oil for this application. Assume permissible bearing pressure for the application is 2 MPa. [10]

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Total No. of Questions : 8]

SEAT No. :

PA-1589

[Total No. of Pages : 2

[5926]-213

T.E. (Automation and Robotics)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester - I) (302522)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of non programmable electronic calculator is permitted.*
- 5) Assume Suitable/Standard data if necessary.*

Q1) a) Explain the general properties of solution for robot. **[9]**

b) Derive the equation for three link robot considering the inverse kinematics with geometric method. **[9]**

OR

Q2) a) Evaluate the inverse kinematics of four axis SCARA robot. **[9]**

b) Explain the concept of tool configuration of 5 axis robot in details. **[9]**

Q3) a) Explain workspace analysis. State their importance. Also explain joint space work envelop. **[9]**

b) Differentiate between Manipulator and Mobile Robot. **[8]**

OR

Q4) a) What is Trajectory Planning? Write difference between path and trajectory. **[9]**

b) Explain Work Envelop for Four axis SCARA Robot with tool configuration vector. **[8]**

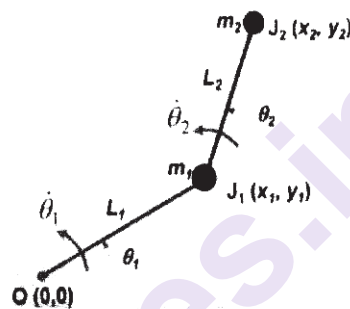
P.T.O.

- Q5)** a) State the lagrange's equation in Manipulator dynamics. [9]
- b) Explain the link inertia tensor. [9]

OR

- Q6)** a) Find the equation of motion for following by using lagrangian formulation method. [9]

A planar 2R serial manipulator



- b) Explain the concept of "Gravity" in manipulator dynamics. [9]
- Q7)** a) What are the Robot Control considerations to be considered in robot design? [9]
- b) Explain the concept of Computational Speeds. [8]

OR

- Q8)** a) Explain the hardware architecture system in details. [9]
- b) What are the different types of sensors used in robot control systems? Explain in details. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1590

[Total No. of Pages : 3

[5926]-214

T.E. (Automation and Robotics)
COMPUTER AIDED ENGINEERING AND
MANUFACTURING
(2019 Pattern) (Semester - I) (302523)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) The CST Element is defined by three nodes located at (1,1), (4,2), (3,5). For a point P located inside the element ,the shape functions N1 and N2 are 0.15 and 0.25 respectively. Determine the X and Y coordinates of point P. **[10]**
- b) Explain constant strain triangle and write an equation of stiffness matrix. **[8]**

OR

- Q2)** a) A CST element has nodal coordinates (10, 10), (70,35) and (70,25) for nodes 1, 2 and 3 respectively. The element is 2 mm is thick and is of material with properties $E = 70\text{GPa}$ and Poisson's Ratio is 0.3. Upon loading of model, the nodal deflections were found to be **[15]**
- $u_1 = 0.01 \text{ mm}$, $u_2 = 0.03 \text{ mm}$, $u_3 = - 0.02 \text{ mm}$ and
 $v_1 = - 0.04 \text{ mm}$, $v_2 = 0.02 \text{ mm}$, $v_3 = - 0.04 \text{ mm}$
- Determine :
- i) Strain displacement relationship
 - ii) The Strain
 - iii) The Stresses
- b) Distinguish between plain stress and plain strain condition. **[3]**

P.T.O.

- Q3) a)** Write a complete part program using G code and M code for the job as shown in Fig. 1. Assume suitable speed and feed for machining.
 Billet Size : Diameter = 60 mm and Length = 90 mm
 Major Dia. = 20mm Minor Dia.+ 17mm Pitch = 2.5 mm Groove
 Width = 5mm [12]

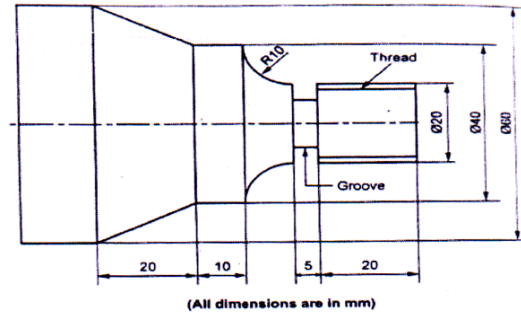


Fig.1

- b) Write a short note on Industry 4.0. [5]

OR

- Q4) a)** Write a CNC part program to manufacture the component as shown in Fig.2. Use canned drill cycle for drilling operations and use right cutter compensation. Take thickness of plate is 20mm. Assume suitable data. [12]

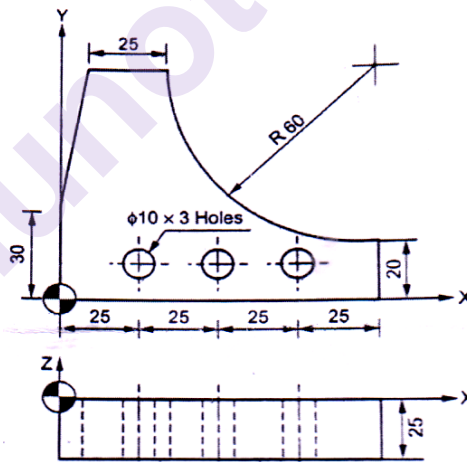


Fig.2

- b) Explain the cutter radius compensation with suitable G Code. [5]

- Q5) a)** Distinguish Conventional Manufacturing versus Lean Manufacturing. [6]

- b) Explain Basic elements of lean manufacturing. [6]

- c) Explain the five phases of six sigma in details. [6]

OR

- Q6)** a) Discuss in details eight Pillars of Total Productive Maintenance (TPM). [10]
- b) What is Just-in-time (JIT)? Is “Just-In-Time” a philosophy or just a collection of techniques? Explain your answer. [8]

- Q7)** a) Give a procedure for planning for the manufacturing of a component in machine shop. [7]
- b) The following information is obtained from ABC co. Ltd. in a certain year : [10]

Sales = Rs 2,00,000/-

Variable cost = Rs 1,20,000/-

Fixed cost = Rs 60, 000/-

i) Find :

- 1) P/V ratio
- 2) Breakeven point
- 3) Margin of safety at this level.

ii) Calculate the effect of :

- 1) 20% increase in selling price
- 2) 10% decrease in selling price
- 3) 5% decrease in sales volume

OR

- Q8)** a) What are the factors influencing process selection and write down the process selection parameters. [7]
- b) A T-slot is to be cut in C.I. slab as shown in fig.7a. Estimate the machining time. Take cutting speed 25 m/min, feed is 0.25 mm/rev. Diameter of cutter for channel milling is 80 mm. Assume suitable data if required with justification. [10]

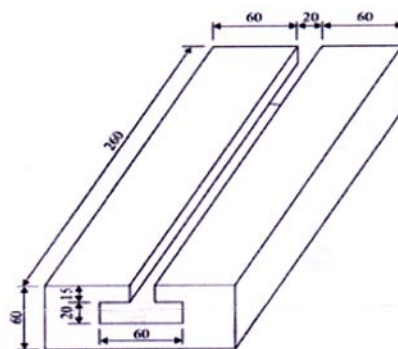


Fig. 7a



Total No. of Questions : 8]

SEAT No. :

PA-1591

[Total No. of Pages : 2

[5926]-215

T.E. (Automation and Robotics)

SIGNAL PROCESSING AND CONDITIONING

(2019 Pattern) (Semester - I) (302524)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer four questions from the following.
- 2) Draw neat labelled diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume suitable/standard data, if necessary.

Q1) a) With the help of neat diagrams explain sampling theorem and Aliasing effect. [8]

b) Explain signal communication and the types of data transmission. [9]

OR

Q2) a) Draw a suitable block diagram and explain the working of a DAQ system with its components. [8]

b) A 4-bit SAR type ADC has reference voltage of 16 volts. If the ADC is supplied with an analog input of 11.2 volts, determine the equivalent digital output with the help of neat circuit diagram. Also draw a graph of output waveform. [9]

Q3) a) Draw and explain Architecture of PLC. [9]

b) Write at least 9 aspects to be considered while selection of a PLC for the application. [9]

OR

Q4) a) Draw and explain Ladder Logic programming for any three logic gates.[9]

b) Explain a PLC ladder diagram for Bottle filling machine with the help of neat diagram of this system. [9]

P.T.O.

- Q5) a)** A mass spring damper system is mounted on and massless cart as shown in below figure. Derive the transfer function between output y and input u . [8]

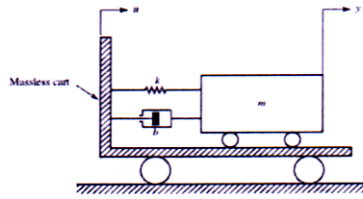
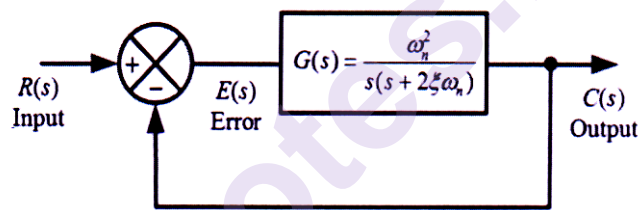


Figure : A spring-mass-dashpot system

- b) Write a short note on Bode Plot, Gain margin and Phase margin with the help of neat diagram. [9]

OR

- Q6) a)** Using Suitable diagram explain Unit step response analysis via transient response specifications. [8]
- b) Draw pole zero map for following second order control system. [9]



- Q7) a)** Explain Proportional (P), Integral (I) and Derivative (D) control actions. [9]
- b) Explain Manual tuning of PID control with variation in different values of control parameters and plot the respective graphs. [9]

OR

- Q8) a)** Draw and explain PD and PID control systems in parallel form. [9]
- b) Explain Linear Quadratic Control (LQR) with equations. Also draw a block diagram for robot application using LQR Controller. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1592

[Total No. of Pages : 3

[5926]-217

T.E. (Automation and Robotics)

OPTIMIZATION TECHNIQUES

(2019 Pattern) (Semester - I) (Elective - I) (302525 (B))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Use of electronic calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) What is Integer Programming? State its types. [5]

b) Solve the following Integer LP problem using Gomory's Cutting Plane method. [12]

$$\text{Max } Z = x_1 + x_2$$

$$\text{Subject To: } 3x_1 + 2x_2 \leq 5$$

$$x_2 \leq 2$$

$$x_1, x_2 \geq 0 \text{ and are integers}$$

OR

Q2) a) Define simulation. Explain Monte Carlo Techniques of Simulation. [5]

b) Solve the following integer programming problems using the branch and bound method. [12]

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to constraints } 6x_1 + 5x_2 \leq 25$$

$$x_1 + 3x_2 \leq 10$$

$$x_1, x_2 \geq 0 \text{ and integers}$$

P.T.O.

Q3) a) Explain the concept of Particle Swarm Optimization. [5]

b) A company produces motorcycle seats. The company has two production lines. The production rate for line 1 is 50 seats per hour and for line 2 it is 60 seats per hour. The company has entered into a contract to daily supply 1,200 seats daily to another company. Currently, the normal operation period for each line is 8 hours. The production manager of the company is trying to determine the best daily operation hours for the two lines. He has set the priorities to achieve his goals, as given below: [10]

P1 : Produce and deliver 1,200 seats daily.

P2 : Limit the daily overtime operation hours of line 2 to 3 hours.

P3 : Minimize the underutilization of the regular daily operation hours of each line. Assign differential weights based on the relative productivity rate.

P4 : Minimize the daily overtime operation hours of each line as much as possible. Assign differential weights based on the relative cost of overtime. It is assumed that the cost operation is identical for the two production lines.

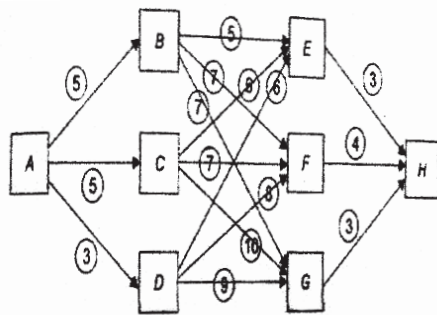
Formulate this problem as a Goal Programming model and then solve it by using the graphical method.

c) Name basic concepts involved in dynamic programming. [3]

OR

Q4) a) State applications of simulated annealing. [6]

b) A sales manager is planning a business tour from Mumbai to Kolkata. He intends to cover one town from each of the company's different marketing zones on the route. The network shows the three intermediate stages and three possible choices of route at all but the last cities. The travel time between the two cities inclusive of the working time is given below the arrows between the cities. Which intermediate cities should he visit to minimize the time required to get from A to H. [6]



c) Give generalized model for goal programming. [6]

- Q5)** a) Explain SAW method with stepwise procedure in detail. [8]
b) List down methods of MCDM and also explain any two methods briefly? [9]

OR

- Q6)** a) Discuss in detail about Analytic Hierarchy Process (AHP)? [6]
b) What is PROMTHEE? Enlist various applications. [6]
c) Write the steps of analytical network process. [5]
- Q7)** a) Define and discuss modern optimization techniques? List its applications. Also write disadvantages of ANN. [9]
b) Enlist modern optimization techniques and elaborate any two with suitable examples. [9]

OR

- Q8)** a) Explain the concept of Ant Colony Optimization. [6]
b) How the Fuzzy Optimization technique is applied on any engineering system? [6]
c) Explain the mutation in Genetic Algorithm. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1593

[Total No. of Pages : 2

[5926]-218

T.E. (Electronics and Computer Engineering)

DATABASE MANAGEMENT SYSTEMS

(2019 Pattern) (Semester-I) (310341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Compare DELETE and TRUNCATE queries in SQL. [6]
b) Explain any six numeric functions in SQL. [6]
c) What is SQL? Explain CREATE, ALTER and DROP queries with proper syntax. [8]

OR

- Q2)** a) What is mean by constraint in SQL? Explain any two constraints with suitable example. [6]
b) Compare stored functions and stored procedure in SQL. [6]
c) Explain the following set operations. [8]
i) UNION
ii) UNION ALL
iii) INTERSECT
iv) MINUS

- Q3)** a) Explain concept of Schedule. With the help of transaction state diagram Explain different types of states in DBMS transactions. [8]
b) Explain need of concurrency control in DBMS. Explain lock based concurrency control protocol. [8]

OR

- Q4)** a) Explain concept of serializable schedule with example. Explain conflicts serializable and view serializable schedule. [8]
b) With the help of neat diagram explain deadlock in DBMS. Explain deadlock detection and deadlock prevention. [8]

P.T.O.

- Q5)** a) Explain the parameters throughput, response time, speed-up and scale-up related to parallel database. [8]
- b) Explain two tier and three tier database architecture. Compare two tier and three tier database architecture. [8]

OR

- Q6)** a) With the help of diagram explain distributed database system. List features of distributed database. State the advantages of distributed databases. [8]
- b) What are the design considerations for distributed databases? Explain. [8]
- Q7)** a) Explain the difference between SQL and NoSQL. [6]
- b) Explain MapReduce operation in MongoDB with suitable example. [6]
- c) Explain CREATE, READ and UPDATE in MongoDB with examples. [6]

OR

- Q8)** a) Explain any three aggregation functions using MongoDB with suitable example. [6]
- b) List different NoSQL data Models and explain Document based Data Model. [6]
- c) Enlist CRUD operations in MongoDB database with syntax. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1594

[Total No. of Pages : 2

[5926]-219

T.E. (Electronics and Computer Engineering)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - I) (310342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
- 2) Figures to the right indicates full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Explain how to generate following components in Swing: **[8]**
- i) Text Fields
 - ii) Push Buttons
 - iii) Checkbox Group
 - iv) Scroll Panes
- b) Explain the use of `getDocumentBase()` and `getCodeBase()`. **[4]**
- c) Explain the mechanism of parameter passing in applets. **[5]**

OR

- Q2)** a) Write a applet program to display simple login page (title, username, password & submit button) using Swing components. **[8]**
- b) What are limitations of AWT? **[4]**
- c) What is HTML? Explain any 5 tags used in HTML. **[5]**

- Q3)** a) What is Event Handling? Explain delegation event model. **[6]**
- b) Explain different types of layout managers in java. **[6]**
- c) Explain the mechanism of handling keyboard events in java. **[6]**

OR

P.T.O.

- Q4)** a) What are adapter classes? [6]
b) Explain the mechanism of handling mouse events in java. [6]
c) State the difference between AWT & Swing. [6]

- Q5)** a) Define GUI in java. What are components & containers in Java GUI programming. [8]
b) Write a frame program for login page (title, username, password & submit button). Also display welcome message in dialog window. [9]

OR

- Q6)** a) Explain the following: [8]
i) Lists
ii) Queue
iii) Set
iv) Maps
b) Explain hashing mechanism used in collection framework. [4]
c) Draw the hierarchy of collection framework. [5]

- Q7)** a) What are the steps to connect to the database in java? [6]
b) What are the JDBC API components? [6]
c) Write a java program to update a field into table using JDBC. [6]

OR

- Q8)** a) Explain the different types of JDBC statements. [6]
b) What is batch processing? Explain how to execute batch using JDBC. [6]
c) What is the difference between prepared statement and callable statement? Explain. [6]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P1407

[5926]-22

T.E. (Automobile)

AUTOMOTIVE MATERIALS

(2019 Pattern) (Semester - II) (316488 B) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicates full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain hand lay-up and spray-up processes with neat sketch. **[9]**

b) Give the difference between Fibre Reinforced plastics and Glass fibre reinforced plastics. **[8]**

OR

Q2) a) Explain the resin transfer moulding process with neat sketch. **[9]**

b) Define composites. Explain processing method used for making the car bodies, bonnet and alloy wheels. **[8]**

Q3) a) What is tempering of glass? Explain the various approaches used to improve toughness and shatter resistance of glass. **[9]**

b) Define automotive paint and explain the importance of Nano-particle in paint technology. **[9]**

OR

Q4) a) What are the different components of paint. Explain Nano-Coating process in paint technology. **[9]**

b) What is scratch resistant paint? Explain the function of Extenders, Solvents and diluents in paint manufacturing? **[9]**

Q5) a) Explain the working of magneto-rheological fluid suspension system. **[9]**

b) Explain the working of fuel injector with neat sketch. **[8]**

OR

P.T.O.

- Q6)** a) Write a short notes on: [9]
- i) Automotive Smart Materials.
 - ii) Use of Electro-Rheological Engine mount.
- b) What is powder metallurgy process? Explain its importance in making the disc brake pads. [8]

- Q7)** a) What are the factors to be considered while selecting automotive material for automotive component? [9]
- b) Explain in detail the various types of materials used in making the different systems in automobiles. [9]

OR

- Q8)** a) Explain Ashby chart with neat sketch. [9]
- b) Explain material development process in automotive industry. [9]



SEAT No. :

PA-3995

[Total No. of Pages : 3

[5926]-220

T.E. (Electronics and Computer Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - I) (310343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of calculator is allowed.

- Q1)**
- a) Explain QPSK signal generation with neat block diagram. [6]
 - b) With the help of block diagram and waveforms, explain generation of coherent BFSK. [6]
 - c) It is required to transmit 2.08×10^6 binary digit per second with $P_b \leq 10^{-6}$. Two possible schemes are considered. [8]
 - i) BPSK
 - ii) 16-Ary PSK

The channel noise PSD is $S_n(\omega) = 10^{-8}$. Determine the transmission bandwidth and the signal to power required at receiver input in each case.

Given : $\text{erf}(0.99999) = 3.3$

OR

- Q2) a)** Compare the performance of modulation schemes, BPSK, BFSK, QPSK, DPSK, M-ary PSK, M-ary FSK w.r.t. **[6]**
- i) Variable characteristics in o/p carrier
 - ii) BW
 - iii) Symbol duration
 - iv) Probability of Error.
 - v) Bit per symbols
 - vi) Applications
- b)** Explain generation. Detection of BPSK system with neat block diagram. **[6]**

P.T.O.

- c) Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2MHz find signal power required at the receiver input so that bit error probability is less than 10^{-5} . [8]

Given : $M = 16$ and $M = 32$ and Noise PSD $\frac{N_0}{2} = 10^{-8}$ Watt / Hz,
 $\text{erf}(0.99995) = 3.2$.

- Q3) a)** State and explain properties of PN sequence. State the advantages of PN sequence. [8]
b) Explain the following frequency of spread spectrum systems with help of relevant diagrams. [8]
- Slow frequency hopping
 - Fast frequency hopping

OR

- Q4) a)** Draw the block diagram of DSSS BPSK transmitter and receiver system and explain various blocks. [8]
b) Differentiate between DHSS and FHSS w.r.t. [8]
- i) Definition
 - ii) Chip rate
 - iii) Modulation techniques
 - iv) Processing gain
 - v) Error probability
 - vi) Acquisition time
 - vii) Effect of distance
 - viii) Applications

- Q5) a)** Define Mutual Information? List properties of Mutual information? [8]
b) State & Explain [8]
- i) Shannons channel coding theorem
 - ii) Shannon's Information capacity theorem

OR

- Q6) a)** Compare Shannon - Fano - and Huffman coding techniques. [8]
b) A source emits 1000 symbols per second from a range of 5 symbols, with probabilities $\left\{ \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16} \right\}$ find source entropy and information rate. [8]

- Q7) a)** What is stop - and - wait ARQ? Explain. [6]
- b)** For a systematic LBC, the three parity check digits C4, C5 and C6 are given by [6]
- $$C4 = d1 \oplus d2 \oplus d3$$
- $$C5 = d1 \oplus d2$$
- $$C6 = d1 \oplus d3$$
- i) Construct generator matrix.
- ii) Construct code generated by this matrix.
- iii) Determine error correcting capability.
- c)** Define systematic, non-systematic code and Explain properties of linear block code. [6]

OR

- Q8) a)** Define the following : [6]
- i) Code rate
- ii) Word length
- iii) Hamming distance
- iv) Minimum hamming distance
- v) Block length
- vi) Constraint length
- b)** For a systematic LBC, the parity check bits are [6]
- $$C_1 = M_1 \oplus M_2 \oplus M_3$$
- $$C_2 = M_2 \oplus M_3 \oplus M_4$$
- $$C_3 = M_1 \oplus M_2 \oplus M_4$$
- Find
- i) Generator matrix.
- ii) Error detecting & correcting capabilities.
- iii) Parity Check Matrix.
- iv) Corrected code word for received code word [1101001].
- c)** Comment whether following code is perfect code or not, with necessary justification. [6]
- i) (7, 4) LBC
- ii) (6, 3) LBC



Total No. of Questions : 8]

SEAT No. :

PA-1595

[Total No. of Pages : 2

[5926]-221

T.E. (Electronics and Computer Engineering)
MICROCONTROLLER AND APPLICATIONS
(2019 Pattern) (Semester - I) (310344)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Interface relay with 8051 Microcontroller. Write an Embedded C program to ON and OFF relay with a delay of 1 second. [6]
b) Explain the term opto-isolators. What are advantages of opto-isolators. Draw interfacing diagram of opto-isolator with 8051 Microcontroller. [6]
c) Draw interfacing of DAC to 8051 Microcontroller and write an Embedded C program to generate square wave form. Also draw its flowchart. [8]

OR

- Q2)** a) Interface buzzer with 8051 Microcontroller. Write an Embedded C program to turn ON and OFF buzzer. [6]
b) Explain in detail data transmission and reception process in 8051 Microcontroller. [6]
c) Draw interfacing diagram of Temperature sensor (LM35) with 8051 microcontroller using ADC 0808/0809. Write an Embedded C program for the same. [8]

- Q3)** a) Explain in brief along with block diagram on chip peripherals of MSP430 Microcontroller. [8]
b) State any 4 differences between MSP430×2x, MSP430×4x, MSP430×5x. [8]

OR

- Q4)** a) Explain in detail register set used in MSP430 Microcontroller. [8]
b) Explain in brief System clocks of MSP430 Microcontroller. [8]

P.T.O.

- Q5) a)** Explain the following GPIO registers of MSP430 Microcontroller. [8]
i) P×DIR
ii) P×IN
iii) P×OUT
iv) P×SEL

- b) List the features of ADC of MSP430 Microcontroller. Draw and explain the block diagram of ADC 10 of MSP430 Microcontroller. [8]

OR

- Q6) a)** Explain UART and I2C communication protocol in detail. [8]
b) Draw interfacing diagram of IR sensor with MSP430 Microcontroller. Also write the Embedded C program for the same. [8]

- Q7) a)** Explain with neat block diagram DAS using 8051 Microcontroller. [6]
b) Design water level monitoring and control system using 8051 Microcontroller and write the algorithm for the same. [6]
c) Draw the home automation system using MSP430 Microcontroller. Also write an embedded C program for same. [6]

OR

- Q8) a)** Design frequency counter using 8051 Microcontroller and display the result on LCD. [6]
b) Design environment monitoring system using MSP430 Microcontroller. [6]
c) Design soil monitoring system for agriculture using MSP430 Microcontroller. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1596

[Total No. of Pages : 2

[5926]-222

T.E. (Electronics and Computer Engineering)

DISTRIBUTED SYSTEM

(2019 Pattern) (Semester - I) (Elective - I) (310345 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Define Peer to Peer systems. Explain in detail the working of Peer to Peer Systems with suitable diagram. [6]
- b) What is pastry? Explain the pastry's algorithm with pseudo code. [6]
- c) Explain the following in detail. [8]
- i) Napster and its legacy.
 - ii) Peer to Peer middleware.

OR

- Q2)** a) Explain the requirements of distributed file system. [6]
- b) What is distributed file system? What are the characteristics and requirements distributed file system? [6]
- c) What is name service? What are its requirements? What is name resolution? Explain the different ways of resolving names. [8]
- Q3)** a) What is clock skew and clock drift? What is clocks drift rate? Explain International Atomic Time and Coordinated Universal Time? [8]
- b) Explain the different ways of synchronizing physical clocks. Explain the two modes of synchronization? Write their format? [8]

OR

- Q4)** a) What is mutual exclusion? How is the performance of algorithms of mutual exclusions evaluated? Explain an algorithm using multicast and logical clocks for mutual exclusion. [8]
- b) What is concurrency control? Explain Timestamp ordering concurrency control and Optimistic concurrency control. [8]

P.T.O.

- Q5) a)** Explain process migration. What are the different steps involved in process migration? What are the desirable features of a good process migration mechanism? [8]
- b)** How to implement thread package? Explain the different ways of Remote execution of thread? What is the component of faults. [8]

OR

- Q6) a)** What is load balancing? What is the goal of load balancing algorithms? What are the rules of load balancing operation? What is static load balancing? [8]
- b)** What is Global Scheduling? With the help of neat diagram explain Global scheduling Architecture. [8]

- Q7) a)** What is distributed file system? Explain features distributed file system.[6]
- b)** What is main purpose of Coda distributed file system? State the features of Coda distributed file system. [6]
- c)** With the help of neat diagram explain structure of distributed file system. [6]

OR

- Q8) a)** What are the different types of distributed file systems? Explain Network File System (NFS) in detail. [6]
- b)** Draw and explain the architecture of Google File System. [6]
- c)** With the help of neat diagram explain working of distributed file system. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1597

[Total No. of Pages : 2

[5926]-223

T.E. (Electronics & Computer Engineering)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (310345 (B))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What is cryptography? Explain cryptography primitives in detail. [6]
b) What is Hash function? Explain in detail. Also, explain the features of Hash functions. [6]
c) What are the limitations of MAC. Explain other authentication methods.[4]

OR

- Q2)** a) Explain symmetric and Asymmetric key cryptography? [6]
b) What is Message Authentication Code (MAC)? Describe process of MAC for authentication. [6]
c) Explain Hashing in blockchain mining. [4]

- Q3)** a) What is ethereum? Explain working of ethereum. [4]
b) What is Hashing in data structure? Write types of hashing in data structure. [6]
c) What is consensus? Explain consensus Mechanism in blockchain Technology? [8]

OR

- Q4)** a) What is ethereum Virtual Machine and explain how it works. [6]
b) How does Hashing in data structure works? Explain with example. [6]
c) List out the ethereum development tools. Explain any two. [6]

- Q5)** a) What is Bitcoin? Explain working of bitcoin. [6]
b) Explain the terms Bitcoin Address, Bitcoin Transactions, Bitcoin Network. [6]
c) Explain Bitcoin Transaction process in detail. [6]

OR

P.T.O.

- Q6)** a) What is Merkle Trees in blockchain technology? How it works? Explain significance of Merkle Tree. [8]
- b) Explain the terms Bitcoin Supply and Bitcoin Payments in Brief. [4]
- c) Draw and explain Bitcoin block structure. [6]

- Q7)** a) What is the role of blockchain in cloud computing? Explain advantages of integrating blockchain into cloud computing. [6]
- b) Explain why the future Internet of Things (IoT) depends on Blockchain technology. [6]
- c) Compare Blockchain Technology, Cloud computing and Artificial Intelligence. [6]

OR

- Q8)** a) Explain in detail, how Blockchain and Artificial Intelligence integration is changing the business process. [6]
- b) Explain how RPA and Blockchain can function together. Explain advantages of using RPA in conjunction with Blockchain Technology. [8]
- c) Differentiate between Blockchain and Machine Learning. [4]



[5926]-224

T.E. (Electronics & Computer)
DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (310345C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail Impulse Invariance technique for IIR filter design. What are its drawbacks? [10]
 b) Apply Bilinear Transformation to following function and find $H(z)$ [8]

$$H(s) = \frac{2}{(s+1)(s+2)} \text{ with } T = 1 \text{ sec}$$

OR

- Q2)** a) Explain in detail frequency sampling method of FIR filter design. [9]
 b) Convert the following analog filter into digital filter using impulse invariance method [9]

$$H_a(s) = \frac{s+0.1}{(s+0.1)^2 + 9}$$

- Q3)** a) Obtain direct form I and II structures for the following systems. [9]
 i) $y(n) = -0.1y(n-1) - 0.72y(n-2) + 0.7x(n) - 0.2x(n-2)$
 ii) $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{3}x(n-1)$
 b) What is the Finite word length effect and how it affects the FIR filter performance? [8]

OR

P.T.O.

Q4) a) Draw cascade and parallel realization for the system given by [9]

$$H(z) = \frac{1}{1 + 2z^{-1} - z^{-2}}$$

b) Explain Lattice-Ladder structure of IIR filter. [8]

Q5) a) What is sampling rate conversion? What is multirate DSP? Why is it required? [4]

b) Explain decimation by a factor 'D' and obtain the expression for the decimated signal at the output. [7]

c) With the help of neat waveform and diagram explain sampling rate conversion by noninteger factor. [7]

OR

Q6) a) What is the role of anti-aliasing and anti-imaging filters in a Decimator and interpolator respectively? [6]

b) Explain interpolation by a factor 'I' and obtain the expression for the interpolated signal at the output. [8]

c) Draw block schematic for interpolation and Decimation. [4]

Q7) a) Give the architectural features of DSP processor. [6]

b) How the DSP is useful in speech processing. Explain any application of speech processing using DSP. [6]

c) Explain how DSP is useful in Interference cancellation in ECG. [5]

OR

Q8) a) Explain the following related to Digital Signal Processor. [9]

i) Mac Unit

ii) ALU

iii) VLIW Architecture

b) Compare the features of DSP processor and microprocessor with respect to architecture. [8]



SEAT No. :

PA-1598

[Total No. of Pages : 2

[5926]-225

T.E. (Electronics and Computer Engineering)

SENSORS AND APPLICATIONS

(2019 Pattern) (Semester - I) (Elective - I) (310345 D) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Define flow and flow rate. Explain different types of flows. Explain basic principle of flow meter. [6]
- b) Draw neat diagram of float type liquid level sensor and explain it in detail. [6]
- c) Define differential flow meter/obstruction type flow meter. Explain Orifice, venture and flow nozzle type differential transducer for flow measurement. [8]

OR

- Q2)**
- a) With the help of neat diagram explain working of Electromagnetic flow meter. [6]
 - b) Draw neat diagram Ultrasonic type liquid level sensor and explain it in detail. [6]
 - c) With the help of neat diagram explain capacitance Level Sensor for the following. [8]
 - i) Conductive liquid
 - ii) Non-conductive liquid

- Q3)** a) Explain operating principle of PIR sensor. With the help of neat diagram explain working of optoelectronics Motion Sensor. [8]
- b) Explain the following type accelerometer. [8]
- i) Capacitive accelerometer
 - ii) Thermal accelerometer
 - iii) Piezoelectric accelerometer
 - iv) Piezoresistive accelerometer

OR

P.T.O.

Q4) a) With the help of neat diagram explain Rotary /Angular incremental optical Encoder. [8]

b) Draw neat construction diagram of LVDT. Explain working and characteristics of LVDT. State its advantages and disadvantages of LVDT. [8]

Q5) a) With the help of neat construction diagram explain Hall Effect Magnetic field sensors. Explain working of PZT sensors and actuators. [8]

b) Explain Bulk Micromachining process and surface Micromachining process and compare them. [8]

OR

Q6) a) Draw neat block diagram Smart sensor and explain functioning of each block. State the advantages and disadvantages of Smart Sensor. [8]

b) With the help of neat diagram explain the following. [8]

i) Micro Resonator

ii) Hot wire anemometer micro miniature temperature sensor.

Q7) a) With the help of neat diagram explain solenoid operated spool valve.[6]

b) Explain poppet bidirectional Control Valve. Compare finite position valve and infinite position value. [6]

c) Draw construction of a DC motors and explain its operating principle.[6]

OR

Q8) a) Explain the following w.r.t valve characteristics. [6]

i) Linear flow characteristics

ii) Equal percentage

iii) Quick opening

b) Explain single acting cylinder and double acting cylinder with suitable diagram and compare them. [6]

c) Draw relay driver circuit using transistor and explain design of relay driver circuit using transistor. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1599

[Total No. of Pages : 3

[5926]-226

T.E. (Mechatronics Engineering)

MACHINE DESIGN

(2019 Pattern) (Semester - I) (317541)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary.

- Q1)** a) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm², find: i) the torque required to rotate the screw; ii) the stress in the screw; and iii) the number of threads of nut in engagement with screw. **[10]**
- b) Why are the square threads preferable to V threads for power transmission? **[4]**
- c) Explain the differential screw with neat sketch. **[4]**

OR

- Q2)** a) In a machine tool application, the tool holder is pulled by means of an operating nut mounted on a screw. The tool holders travels at a speed of 5m/min. The screw has a single start square thread of 48 mm nominal diameter and 8 mm pitch. The operating nut exerts a force of 500 N to drive the tool holder. The mean radius of friction collar is 40 mm. If the coefficient of friction for thread and collar surface is 0.15, calculate:
- i) The power required to drive the screw
 - ii) The efficiency of the mechanism. **[10]**
- b) Derive the formula for torque required to raised the load by a square threaded power screw. **[4]**
- c) What is self-locking property of threads and where it is necessary? **[4]**

P.T.O.

- Q3) a)** A circular bar, made of steel, is subjected to an axial load which varies from -300 kN to 700 kN. The endurance limit is 265 MPa, while tensile yield strength is 350 MPa. The stress concentration factor is 1.8. If the required factor of safety is 2.0, determine the diameter of rod. [10]
- b)** Write short note on : [8]
- Stress Concentration
 - Endurance strength
 - Notch Sensitivity
 - Surface Finish Factor

OR

- Q4) a)** A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design. [10]
- b)** What are the various methods to reduce stress concentration? [4]
- c)** Explain the Soderberg and Goodman's diagram for fluctuating stresses. [4]
- Q5) a)** A rectangular cross-section bar is welded to a support by means of fillet welds as shown in Fig. Determine the size of the welds, if the permissible shear stress in the weld is limited to 75 MPa. [8]

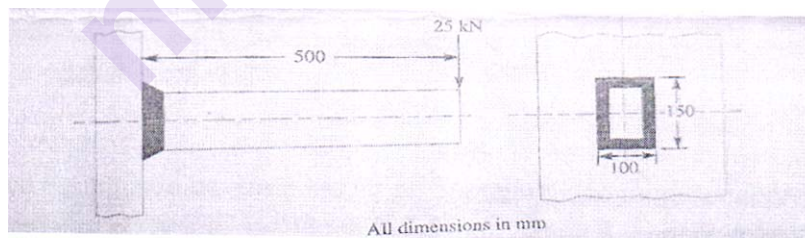


Fig.1

- b)** What do you understand by the single start and double start threads? [5]
- c)** Define the following terms : [4]
- Major diameter
 - Minor diameter
 - Pitch, and
 - Lead

OR

- Q6) a)** A steel bracket is fixed to the vertical support by three bolts of size M20, two at the top and one at the bottom, as shown in fig ; 2. If the permissible tensile stress for the bolt is 60N/mm^2 , determine the maximum load that can be supported by bracket at 350 mm from the vertical support.

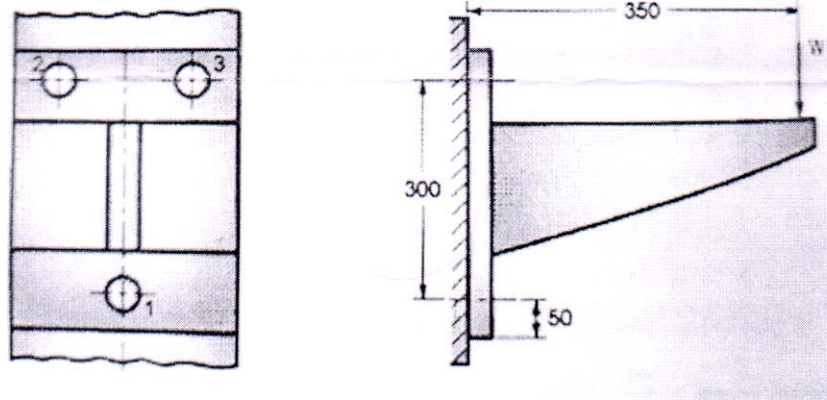


Fig.2

- b) What is an eccentric loaded welded joint? Discuss the procedure for designing such a joint. [7]
- Q7) a)** Two helical springs are arranged in concentric manner with one inside the other. Both the Springs have same free length and carry a total load of 5500 N. The outer springs has 8 coils with mean coil diameter of 128 mm and wire diameter 16 mm. The inner spring has 12 coils with mean coil diameter of 84 and wire diameter 12 mm. Calculate : [8]
- Maximum load by carried by each springs.
 - Maximum stress in each soring.
 - Total deflection of each spring. Assume $G = 84 \times 10^3 \text{ N/mm}^2$.
- b) Explain one method of avoiding the tendency of a compression spring to buckle. [4]
- c) Explain leaf spring with neat sketch. [5]

OR

- Q8) a)** A helical valve spring is to be designed for an operating load range of approximately 90 to 135 N. The deflection of the spring for the load range is 7.5 mm. Assume a spring index of 10. Permissible shear stress for the material of the spring = 480 MPa and its modulus of rigidity = 80 kN/mm^2 . Design the spring. [7]
- b) Explain different types of stresses induced in the helical spring. [6]
- c) Write short notes on : [4]
- Free Length
 - Spring index
 - Spring rate
 - Stress factor



Total No. of Questions : 8]

SEAT No. :

PA-1600

[Total No. of Pages : 2

[5926]-227

T.E. (Mechatronics Engineering)
MANUFACTURING PROCESSES
(2019 Pattern) (Semester - I) (317542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No.1 or Q. No.2, Q. No.3 or Q. No.4, Q. No.5 or Q. No.6, Q. No.7 or Q.No.8.
- 2) Neat Diagram must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figure to the right indicates full marks.
- 5) Assume suitable data if necessary.

- Q1) a)** The following values related to a cutting test under orthogonal cutting conditions for machining aluminium, Forces as determined by dynamometer F_H and F_V are 1500 N and 100 N respectively. $\alpha = 10^\circ$, $r = \frac{t_1}{t_2} = 0.37$. Determine as per merchants theory, the cutting forces N_H , F_s , N and F_f and also determine the coefficient of friction at the chip tool interface. **[10]**
- b) Explain the single tool point cutting tool geometry with sketch. **[4]**
- c) What is tool life? What are the factors affecting tool life. **[4]**

OR

- Q2) a)** A lathe is used to machine a steel bar of 100 mm diameter at 900 rpm. The cutting force applied by the tool to work is 600 N. Determine: **[10]**
- i) Initial cutting velocity.
 - ii) Cutting velocity when the bar is reduced to half the size.
 - iii) Power consumed in both the cases.
- b) What is tool wear? What are its types? Describe each in brief. **[4]**
- c) Set the dividing head to mill 30 teeths on a spur wheel blank by simple indexing method. **[4]**

P.T.O.

- Q3)** a) Explain with a neat sketch of oxy-acetylene gas welding. Describe the types of flame with a sketch. [8]
b) What is the difference between welding, brazing, soldering process. [5]
c) What precautions are necessary in handling an oxy acetylene cylinder? [5]

OR

- Q4)** a) What is forge welding? What are its types? What are the factors influencing the quality of a large weld. [5]
b) Discuss the causes and cures for : [8]
i) Porosity ii) Penetration iii) Warpage
iv) Distortion v) Poor fusion vi) Undercutting
c) What do you mean by adhesive bonding? What are its types? What are its application. [5]

- Q5)** a) What are the applications of ultrasonic machining? Why can very hard material be cut better by ultrasonic machining than soft ones. [5]
b) Explain the construction and working principle of EDM with neat sketch. [7]
c) What are the advantages and limitations of plasma arc machining. [5]

OR

- Q6)** a) Explain with neat sketch the principle of working of ECM what are the advantages of ECM. [7]
b) What do you understand about LASER? What are its application in production technology. [5]
c) Write short notes on: [5]
i) Fundamentals of rapid prototyping
ii) Stereolithography

- Q7)** a) Explain with neat sketch of processing sequence for silicon based ICs. [5]
b) What is PCB structure? What are its types? Explain in brief. [5]
c) Explain diffusion process in I.C. Fabrication with neat sketch. [7]

OR

- Q8)** a) Write short note on: [7]
i) Layer processes used in IC fabrication
ii) IC packaging
b) Explain digital Integrated circuit with neat sketch. [5]
c) What is ICs and its types? Which material is used in ICs? [5]



[5926]-228**T.E. (Mechatronics Engineering)****CONTROL SYSTEM****(2019 Pattern) (Semester - I) (317543)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

- 1) Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary.

Q1) a) Investigate the stability of system with characteristic equation **[4]**

$$Q(s) = s^4 + 6s^3 + 15s^2 + 5s + 3 = 0$$

b) What are the effects of adding open loop poles and zero on the nature of root locus and on system? **[8]**

c) The open loop transfer function of a unity feedback control system is

given by $G(s) = \frac{K}{s(1 + sT_1)(1 + sT_2)}$. Applying Routh-Hurwitz criterion,

determine value of K in terms of T_1 and T_2 for the system to be stable. **[6]**

OR**Q2) a)** Define stable, unstable, marginally stable and conditionally stable systems. **[8]**

b) Investigate the stability of a system having closed loop characteristic equation : **[6]**

$$Q(s) = s^3 + 7s^2 + 10s + K = 0 \text{ and find } K_{mar} \text{ and } \omega_{mar}.$$

c) Explain The terms : i) Centroid ii) Breakaway point. **[4]**

Q3) a) Explain Nyquist stability criterion. **[6]**

b) Define the terms : i) Bandwidth ii) gain Margin iii) Phase cross over frequency. **[6]**

c) For the system with closed loop transfer function

$$G(s) = \frac{400}{s^2 + 20s + 400}, \text{ determine resonant peak, resonant frequency,}$$

damping factor and natural frequency. **[4]**

OR**P.T.O.**

- Q4)** a) Explain advantages and limitations of frequency domain approach. [6]
 b) For the system with closed loop transfer function

$$G(s) = \frac{25}{s^2 + 6s + 25}, \text{ determine resonant peak, resonant frequency, damping factor and natural frequency.} \quad [4]$$

- c) Note on correlation between time domain and frequency domain for second order system. [6]

- Q5)** a) State the advantages of Bode plot. [4]

- b) What are asymptotic Bode plot? How correction can be applied to accurate Bode plot? [6]

- c) For the unity feedback system with open loop transfer function [8]

$$G(s) = \frac{50}{s(s+2)(s+10)}, \text{ sketch Bode plot. Determine gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also investigate the stability.}$$

OR

- Q6)** a) Discuss the nature of bode plot of : i) pole at origin ii) simple pole iii) Simple zero iv) Quadratic pole. [8]

- b) Explain steps to sketch Bode plot. [4]

- c) Explain the procedure to obtain gain margin and phase margin from the Bode plot. [6]

- Q7)** a) A proportional controller is employed for the control of temperature in the range 50 degree celsius to 130 degree celsius with a set point of 73.5 degree celsius. The zero error controller output is 50%. What will be the offset error resulting from a change in controller output to 55%? The proportional gain is 2% per percentage. Find the offset in degree celsius. [6]

- b) Why derivative mode is called anticipatory control mode. [6]

- c) What is a PID controller? Explain in detail. [6]

OR

- Q8)** a) Using Ziegler Nicholas method design a PID controller for the system

$$\text{with unity feedback and } G(s) = \frac{1}{s(s+1)(s+5)}. \quad [8]$$

- b) What is integral control mode? State its characteristics. [5]

- c) Explain concept of industrial automation. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1602

[Total No. of Pages : 2

[5926]-229

T.E. (Mechatronics)

(317544): DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Obtain DTFT of Rectangular pulse $x(n) = A; 0 \leq n \leq L-1=0$. [6]

b) State & prove time shifting and frequency shifting property of DTFT. [6]

c) Obtain DTFT of a unit step signal, $u(n)$ [6]

OR

Q2) a) Find the Fourier transform of : [6]

i) $x(n) = \delta(n-3) + \delta(n+3)$

ii) $x(n) = u(n-4) + u(n+4)$

b) Obtain DTFT & sketch the magnitude spectrum for $x(n) = u(n) - u(n-4)$. [6]

c) State & prove Linearity & time reversal property of DTFT. [6]

Q3) a) Define DFT & State and explain properties of DFT. [5]

b) Perform circular convolution on given two sequences. [5]

$x_1(n) = \{1, 2, 3, 4\}$, $x_2(n) = \{4, 1, 1, 2\}$

c) Find 8-point DIT of the sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT radix 2 FFT. [8]

P.T.O.

OR

Q4) a) Explain the relationship between DTFT and DFT. [5]

b) Compute DFT using Matrix method $x(n) = \cos \frac{n\pi}{4}$ for $n = 0, 1, 2, 3$. [5]

c) Compute DFT of sequence given as $X(n) = (-1)^n$ for i) $N = 3$ ii) $N = 4$. [8]

Q5) a) Explain concept of filtering & specification of filter. [5]

b) Comparison between Butterworth & Chebyshev filter. [4]

c) Design an analog butterworth filter that has a -2dB passband attenuation at a frequency of 20 rad/sec and at least -10dB stopband attenuation at 30 rad/sec. [8]

OR

Q6) a) Explain with diagrams ideal frequency selective filters. [5]

b) Compare Analog & Digital filters. [4]

c) For the analog transfer function $H(s) = \frac{2}{(s+1)(s+2)}$ determine $H(z)$ using impulse invariance method Assume $T = 1$ sec. [8]

Q7) a) Explain Gibbs Phenomenon. [5]

b) Draw basic structure of direct form for FIR system. [6]

c) State DSP applications & explain Harmonic measurement. [6]

OR

Q8) a) Compare IIR & FIR filters. [5]

b) Discuss interference cancellation in ECG using DSP. [6]

c) Design linear phase FIR low pass filter using Hanning Window for the frequency characteristic of the filter given as, [6]

$$H_d(\omega) = \begin{cases} e^{-j3\omega}; & \text{For } -\frac{n}{4} \leq \omega \leq \frac{n}{4} \\ 0; & \text{otherwise} \end{cases}$$



Total No. of Questions: 8]

SEAT No. :

PA-1408

[5926]-23

[Total No. of Pages : 3

T.E. (Chemical)

MASS TRANSFER-I

(2019 Pattern) (Semester-I) (309341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain Choice of Solvent for Gas Absorption? [8]

- b) A packed tower is designed to recover 98% CO₂ from a gas mixture containing 10% CO₂ & 90% air using water. The equilibrium relation is given as $Y=14X$.

Where $Y=\text{kgCO}_2/\text{kg dry air}$ & $X=\text{kg CO}_2/\text{Kg water}$. The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if (HTU) OG = 1m. [9]

OR

Q2) a) What is Absorption factor? Explain minimum L/G ratio and Stripping factor? [8]

- b) 5,000 kg/hr of a SO₂- air mixture containing 5% by volume SO₂ is to be scrubbed with 2,00,000 kg/hr. of water in a packed tower. The exit concentration of SO₂ is reduced to 0.15% The tower operates at 1 atm. The equilibrium relationship is given by $Y=30X$ Where, $Y=\text{Mole SO}_2/\text{Mole air}$ & $X=\text{Mole SO}_2/\text{Mole water}$. If the packed height of the tower is 420 cm, estimate the height of transfer unit (HTU)? [9]

Q3) a) Write a short note on Adiabatic Saturation temperature in Humidification operation? [8]

P.T.O.

- b) The air in a room is at 26.7°C & a pressure of 101.325KPa & contains water vapor with a partial pressure 2.76 kPa . Calculate [9]
- Absolute Humidity
 - Molal Humidity
 - Saturation humidity
 - Percentage humidity
 - Percentage Relative humidity
 - Relative humidity
 - Humid Heat
 - Humid volume

Data: Vapour pressure of water at 26.7°C is 3.5 KPa

OR

- Q4)** a) Explain HTU, NTU concept in connection with cooling tower? [8]
- b) A gas (B)-Benzene (A) mixture is saturated at 1std.atm 50°C Calculate the absolute humidity if B is [9]
- Nitrogen
 - Carbon dioxide and
 - Oxygen (Data: $P_A=0.362\text{ std. atm.}$)

- Q5)** a) What are the various equipment's used for gas-liquid contact. With neat sketch explain Venturi Scrubber? [9]
- b) Explain the different types of Column in detail with figures? [9]

OR

- Q6)** a) Explain mechanically agitated vessels with different types of impellers [9]
- b) What is Tray efficiency? Explain types of Tray efficiencies? [9]
- Q7)** a) Explain experimental determination of Rate of drying curve? [8]
- b) A porous dry solid was dried under constant drying conditions in a batch dryer. It took 6 hrs to reduce the moisture from 50% to 10% All the moisture content on dry basis. How long will it take to dry a sample of the above solid to dry from 60% to 6% under the same drying conditions? [10]

OR

- Q8) a)** Explain time required for Drying? Derive the equation to calculate total time for Drying? [8]
- b)** A batch of solid for which the following table of data applies is to be dried from 25% to 6% (wet basis) moisture under conditions identical to those for which the data were tabulated. The initial weight of the wet solid is 200 kg & the drying surface is 1 m²/8 kg dry weight Determine the time for drying? [10]

X Kgmoisture/ kg dry solid	0.35	0.25	0.2	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
R Kg moisture hr.m ²	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.025



Total No. of Questions : 8]

SEAT No. :

PA-1603

[Total No. of Pages : 2

[5926]-230

T.E. (Mechatronics)

MICROCONTROLLERS

(2019 Pattern) (Semester - I) (317545)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain the timer structures of 8051 with TMOD register. [6]
b) Write in brief about C data types used in 8051 Programming. [6]
c) Generate square wave of 2 kHz on port pin P2.1 generate delay using timer 0 in mode 1. Assume crystal frequency of 11.0592 MHz. Also write the program. [6]

OR

- Q2)** a) List different timer modes of 8051 microcontroller and describe mode 2 with neat sketch. [6]
b) Write an 8051 C program to toggle all the bits of port P1 continuously with some delay in between. Use Timer 0, 16-bit mode to generate the delay. [6]
c) Find the value of TH1 if the timer 1 is used in timer mode2 to generate a baud rate of 4800. Assume appropriate oscillator frequency. [6]

- Q3)** a) With neat diagram explain the ADC interface to 8051. [5]
b) Name the five interrupt sources of 8051? [5]
c) Write an 8051 C program to switch “ON” OR “OFF” A LED connected on P 1.3 Complement the LED whenever the switch is connected on P 3.2 is pressed. [8]

OR

- Q4)** a) Write a note on Programming of External hardware interrupts in C. [5]
b) Give different steps followed by 8051 in response to interrupt. Explain with an example. [5]
c) Explain IE and IP register. [8]

P.T.O.

- Q5)** a) Explain SBUF register of 8051. [5]
b) Draw & explain PCON register format of 8051. [5]
c) Explain the function of RS232C pins of DB-9 connector. [7]

OR

- Q6)** a) Describe the baud rate in UART 8051. On which factors it depends. [5]
b) List the advantages of serial communication over parallel communication. [5]
c) Draw the format of SCON register & explain the function of each bit. [7]

- Q7)** a) Draw the interfacing of stepper motor and write a program to rotate in anticlockwise direction. [10]
b) Draw and explain temperature measurement using 8051. [7]

OR

- Q8)** a) Draw and explain interfacing of LED in different configurations. Use a suitable delay to blink LED connected at port P2.1 and write a program in C. [10]
b) Draw interfacing of 16×2 LCD with 8051 and state the function of EN and RS of LCD. [7]



Total No. of Questions : 8]

SEAT No. :

PA-1604

[Total No. of Pages : 2

[5926]-231

T.E. (Robotics & Automation Engineering)

311501(A): EMBEDDED SYSTEMS IN ROBOTICS

(2019 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Assume suitable data, if necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is serial communication? Explain Bluetooth in detail. **[9]**

b) Explain wireless sensor network in detail. Enlist the applications. **[9]**

OR

Q2) a) Write short note on : **[9]**

i) CAN

ii) USB

b) Explain zig-bee in detail. Enlist its applications. **[9]**

Q3) a) Write a short note on : **[8]**

i) Functions

ii) System Software

b) Define data types. Explain all in detail. **[9]**

OR

P.T.O.

- Q4)** a) Explain SFR in detail. [8]
b) Explain serial communication and its types. [9]

- Q5)** a) What is RTOS? Explain need of RTOS with example. [8]
b) Define kernel. Explain architecture of kernel. [9]

OR

- Q6)** a) Define operating system. Explain RTOS services in contrast with traditional OS. [8]
b) Explain foreground and background system in detail. [9]

- Q7)** a) Write a short note on : [8]
i) LINUX Fundamentals
ii) Pieces of Linux (any 4):
b) Write any five commands from Linux with description [10]

OR

- Q8)** a) What is device driver? Explain types of device drivers. [8]
b) Write a short note on : [10]
i) Kernel module.
ii) Advantages and Disadvantages of Linux.



Total No. of Questions : 8]

SEAT No. :

PA-1605

[Total No. of Pages : 2

[5926]-232

T.E. (Robotics & Automation)
HYDRAULICS & PNEUMATICS
(2019 Pattern) (Semester - I) (311502(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicates full marks.
- 3) Neat Diagram must be drawn wherever necessary.
- 4) Assume Suitable data if necessary.
- 5) Use of Calculator is allowed.

Q1) a) Draw ISO symbols for the following Hydraulic and Pneumatic Components. **[8]**

- i) F-R-L unit detailed symbol
- ii) 5/2, Solenoid Operated, Spring Return DCV
- iii) 4/3, Float Centre, Lever Operated, detent control DCV

b) Classify different types of Pressure control valves used in the hydraulic circuits. Draw ISO symbol for each. **[9]**

OR

Q2) a) Draw neat sketch and explain the following with their applications in circuit. **[8]**

- i) Three Way, Two Position Direction Control Valve
- ii) Four Way, Three Position Direction Control Valve (Closed Centre)

b) Explain shuttle valve with a neat sketch. State its application with a typical circuit. **[9]**

Q3) a) Draw a regenerative circuit by using 4/3 DCV and explain its application. **[9]**

b) Explain counter balance valve circuit with neat sketch. **[9]**

OR

Q4) a) Differentiate between meter in circuit and meter out circuit. **[9]**

b) Draw a neat sketch of Pump unloading circuit. State function of unloading valve. **[9]**

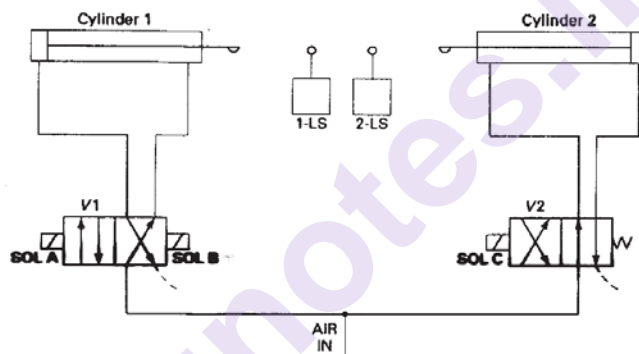
P.T.O.

- Q5) a)** Explain with neat sketch working of “AND” valve and with the help of circuit diagram explain any one typical application of it. [9]
- b)** Draw a typical circuit showing control of a double acting cylinder operated through use of an air pilot actuated direction control valve and explain working of the circuit. [9]

OR

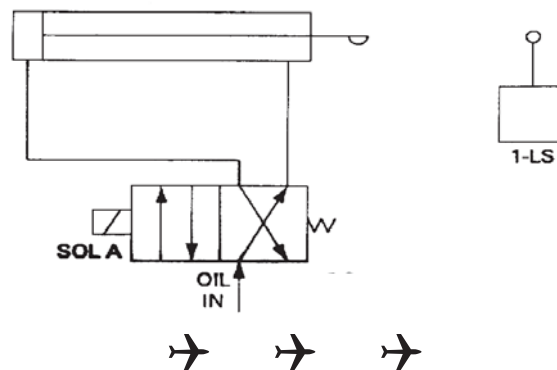
- Q6) a)** Draw and explain a typical sketch for sequencing of two double acting cylinders in respect of pneumatics. [9]
- b)** Draw circuit for : [9]
- Controlling speed of pneumatic double acting cylinder.
 - Speed control of a pneumatic motor.

- Q7) a)** Explain an Electro-hydraulic servo system with neat sketch? [8]
- b)** Explain the complete operation of the system shown in fig. [9]



OR

- Q8) a)** What is a programmable logic controller? State the main function of each of the following elements of a PLC: [8]
- CPU
 - Programmer/monitor
 - I/O module
- b)** Explain the complete operation of the system shown in fig. [9]



[5926]-233

T.E. (Robotics and Automation Engineering)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester-I) (311503-A)

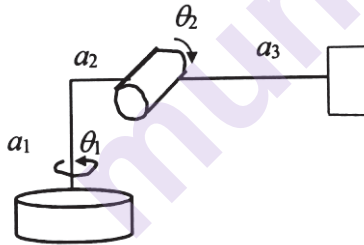
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain the steps of steepest descent algorithm to solve inverse kinematics problem. [6]
- b) For the robot shown in Figure, use inverse kinematics to obtain the joint parameters θ_1 and θ_2 to bring the robot end effector to the position (23, 16, -10). Consider $a_1 = 20$ cm, $a_2 = 10$ cm, $a_3 = 35$ cm. [12]



OR

- Q2)** a) Determine the gradient of a function $3x_1^2x_2 - 5x_2 + 8$ at $x_1 = 2$ and $x_2 = 1$. [4]
- b) Perform one iteration of pattern search method to minimize $x_1x_2 + 2x_1^2 - 5$. Consider initial solution as (1, 1) and increment of 0.5. [10]
- c) What are the input and output parameters for inverse kinematics of SCARA robot? [4]

P.T.O.

- Q3)** a) What are criteria for selection of appropriate actuator for grippers? [6]
- b) A pneumatic gripper has a cylinder of piston diameter 30 mm and required stroke length is 65 mm. If the gripper force is 425 N, determine the motor power required in HP if it runs with 80 rpm. [6]
- c) Write short note on: Vacuum grippers. [6]

OR

- Q4)** a) A mechanical gripper having two fingers is used to hold the part weighing 8 kg. The coefficient of friction between the fingers and the part surface is 0.15. The g factor to be used in force calculations should be 3.0. Compute the required gripper force. [6]
- b) Following data operates for an electromagnetic gripper: [6]
- Number of turns of coil = 150
 - Average length of each turn of coil = 4 cm
 - Permeability of core = 2000
 - Magnetic path length = 10 cm
 - Operating Current = 1.2 amp
- Calculate the maximum retention force.
- c) Explain with suitable example the concept of reconfigurable grippers. [6]

- Q5)** a) A robot arm with revolute joint follows cubic polynomial $25 + 2.109t^2 - 0.175t^3$. Determine the final angular position of the arm and the time taken by the arm to move from initial position to final position. [9]
- b) What is inverse robot dynamics? What are input and output parameters for inverse dynamics? [8]

OR

- Q6)** a) For the robot link the gripper force (N) = $[0, -65, 0]$, mass of the link = 20 Kg, Angular velocity of link (ω) = 5 rad/s, Angular acceleration of link = -12 rad/s^2 , Length of link = 1.5 m with CG located at 0.5 m from joint. Determine the resultant joint reaction force in base co-ordinate system for angular position of 50° . [12]
- b) Explain Lagrangian formulation for manipulator dynamics. [5]

- Q7)** a) Why is balancing of rotating parts necessary for high speed engines? Discuss how a single revolving mass is balanced by two masses revolving in different planes. [7]
- b) Write a short note on primary balancing and secondary balancing. [10]

OR

- Q8)** a) Discuss the balancing of V-engines. [7]
- b) A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. [10]



Total No. of Questions : 8]

SEAT No. :

PA-1607

[Total No. of Pages : 2

[5926]-234

T.E. (Robotics & Automation Engineering)
(311504(A)): SENSOR TECHNOLOGY
(2019 Pattern) (Semester - I) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6. and Q.7 or Q.8.
- 2) Assume suitable data, if necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain the term : **[8]**
- i) Thermoelectric Effect
 - ii) Gas Thermometers.
- b) Explain Resistance-Temperature Detectors (RTD) with respect to Sensitivity, Response Time, Construction and Signal Conditioning. **[9]**

OR

- Q2)** a) Explain four characteristics of each : **[8]**
- i) Thermistor
 - ii) Thermocouple
- b) Define Temperature and explain following terms : **[9]**
- i) Thermal Energy
 - ii) Absolute and Relative Temperature.

- Q3)** a) Explain : **[8]**
- i) Shock and Vibration Sensors
 - ii) Variable-Reluctance Sensors

P.T.O.

- b) Explain Point type and Continuous type Level Sensors with suitable diagram also state the advantages and application of the same. [9]

OR

Q4) a) With neat sketch, explain the working of Piezoelectric Accelerometer.[8]

b) Explain the following Sensors : [9]

- i) Resistive Sensor
- ii) Capacitive Sensor
- iii) Inductive Sensor

Q5) a) With the help of neat circuit diagram explain operation of Metal Strain Gauge also state the advantages and application of the same. [9]

b) Explain different Applicable Standards for Strain Gauge Circuits. [9]

OR

Q6) a) Explain Standards Strain Gage Sensors also state the advantages and application of the same. [9]

b) With the help of neat circuit diagram explain operation of Semiconductor Strain Gauge also state the advantages and application of the same. [9]

Q7) a) Explain Construction and Working of Biosensor with suitable example.[9]

b) Explain Nanotechnology in detail how nanotechnology plays important role in Sensor Technology. [9]

OR

Q8) a) Explain in detail Photo Sensors and its type. [9]

b) Explain in detail : [9]

- i) Position and motion Sensors.
- ii) Thermal Detectors.



Total No. of Questions : 8]

SEAT No. :

PA-2668

[Total No. of Pages : 3

[5926]-235

T.E. (Robotics & Automation)

(Elective - I) STATISTICS & NUMERICAL METHODS

(2019 Pattern) (311505(A)-I) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicates full marks.*
- 2) *Neat Diagram must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 & Q.7 or Q.8.*
- 5) *Use of Calculator is allowed.*

Q1) a) Three approximate value of number $1/3$ are given as 0.30, 0.33 and 0.34 which of these three is the best approximation? [8]

b) Find the positive root of $x^3 - x = 1$ correct to four decimal places by bisection method? [9]

OR

Q2) a) Explain in short : [8]

- i) Round off Error
- ii) Truncation Error
- iii) Absolute Error
- iv) Relative Error

b) Use Gauss Elimination to solve the system [9]

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

Q3) a) Certain experimental values of x & y are given below :

$(0, -1), (2, 5), (5, 12), (7, 20)$, if the straight line $Y = a_0 + a_1X$ is fitted to the above data, Find the approximate values of a_0 and a_1 . [9]

P.T.O.

- b) Find the Lagrange interpolating polynomial of degree 2, approximating the function $y = \ln x$ defined by the following table of values. Hence determine the value of $\ln 2.7$. [9]

x	y = $\ln x$
2	0.69315
2.5	0.91629
3	1.09861

OR

- Q4)** a) Find the cubic polynomial which takes the following values : [9]

x :	0	1	2	3
F(x) :	1	2	1	10

Evaluate $f(4)$.

- b) The function $y = \sin x$ is tabulated below: [9]

x	y = $\sin x$
0	0
$\pi/4$	0.70711
$\pi/2$	1.0

- Q5)** a) Evaluate - correct to three decimal places, using Trapezoidal rule with $h = 0.5, 0.25$ and 0.125 . [9]

$$I = \int_0^1 \frac{1}{1+x} dx$$

- b) Given $dy/dx = y - x$ where $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ correct to four decimal places. [9]

OR

- Q6)** a) Evaluate- correct to three decimal places, using Simpson's $1/3^{\text{rd}}$ rule. with $h = 0.5, 0.25$ and 0.125 . [9]

$$I = \int_0^1 \frac{1}{1+x} dx$$

- b) Given $dy/dx = 1 + y^2$, where $y = 0$ when $x = 0$, find $y(0.2)$, $y(0.4)$ and $y(0.6)$. [9]

- Q7) a)** Find the minimum of the following function using simulated annealing :

$$f(X) = 500 - 20x_1 - 26x_2 - 4x_1x_2 + 4x_1^2 + 3x_2^2$$
 [8]
- b)** How is an inequality constrained optimization problem converted into an unconstrained problem for use in GAs? What are the basic operations used in GAs? [9]

OR

- Q8) a)** Steel plates are available in thicknesses (in inches) of

$$\frac{1}{32}, \frac{1}{16}, \frac{3}{32}, \frac{1}{8}, \frac{5}{32}, \frac{3}{16}, \frac{7}{32}, \frac{1}{4}, \frac{9}{32}, \frac{5}{16}, \frac{11}{32}, \frac{3}{8}, \frac{13}{32}, \frac{7}{16}, \frac{15}{32}, \frac{1}{2}$$

from a manufacturer. If the thickness of the steel plate, to be used in the construction of a pressure vessel, is considered as a discrete design variable, determine the size of the binary string to be used to select a thickness from the available values. [8]

- b)** What is the physical basis of SA? Can you consider SA as a zeroth-order search method? [9]



Total No. of Questions : 8]

SEAT No. :

PA-2669

[Total No. of Pages : 4

[5926]-236

T.E. (Robotics and Automation Engineering)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - I) (311505) (A) - II (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*
- 4) *Assume Suitable/Standard data if necessary.*
- 5) *Use of calculator is allowed.*

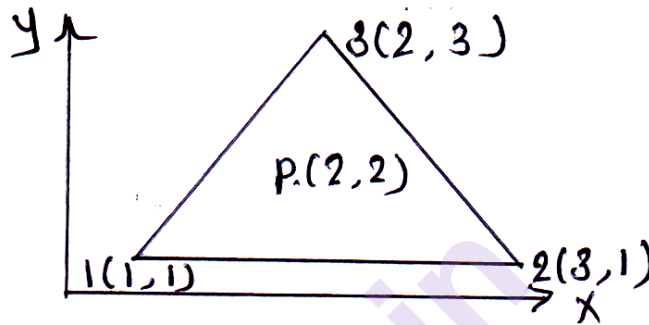
- Q1)** a) What is meant by Banded and Skyline Matrix methods and how these are used for reduction in memory required to simulation in FEA? [6]
- b) Write a note on Pascal's Triangle for identification of 2D element interpolation function. [4]
- c) The triangular element has nodal coordinates (10, 10) (40, 20) and (30, 50) for nodes 1,2 and 3 respectively for a point 'p' inside triangle. Determine the x and y coordinates if shape functions N_1 and N_2 are 0.15 and 0.25 respectively. [8]

OR

- Q2)** a) What are the characteristics of shape function? [4]
- b) Write short note on CST element and LST element. [4]

P.T.O.

- c) For the triangular element shown, the nodal values of displacement in x and y directions respectively are $u_1 = 2.0$, $u_2 = 3.0$, $u_3 = 5.0$ and $v_1 = 1.0$, $v_2 = 2.0$, $v_3 = 3.0$. Find out for plane stress conditions : [10]
- Displacement of point P,
 - Strain-displacement relationship
 - Element stress
 - Strains

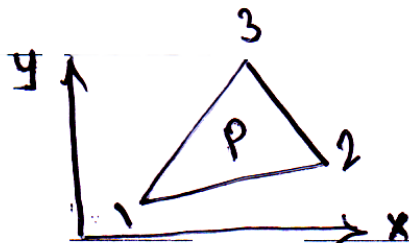


- Q3) a) Write short notes on [8]
- Uniqueness of mapping of isoparametric elements.
 - Jacobian matrix
 - Gaussian quadrature integration technique.
- b) The coordinates and function values at the three nodes of a triangular linear element are given below. Calculate the function value at (20,6). [9]

Node 1 Coordinates (13, 1) Function value 190

Node 2 Coordinates (25, 6) Function value 160

Node 3 Coordinates (13, 13) Function value 185



OR

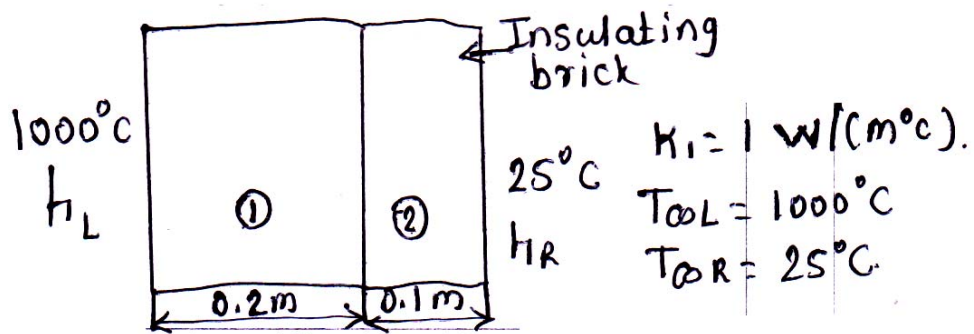
- Q4) a) What are the Condition for Axisymmetric Problem? [4]
- b) Explain the terms isoparametric, subparametric and superparametric elements. [5]

- c) Triangular elements are used for stress analysis of a plate subjected to in plane load. The components of displacement along x and y axes at the nodes i, j and k of an element are found to be $(-0.001, 0.01)$, $(-0.002, 0.01)$ and $(-0.002, 0.02)$ cm respectively. If the (x, y) coordinates of the nodes i, j and k are (20, 20), (40, 20) and (40, 40) in cm respectively, find : [8]
- The distribution of the two displacement components inside the element and
 - Components of displacement of the point $(x_p, y_p) = (30, 25)$ cm.

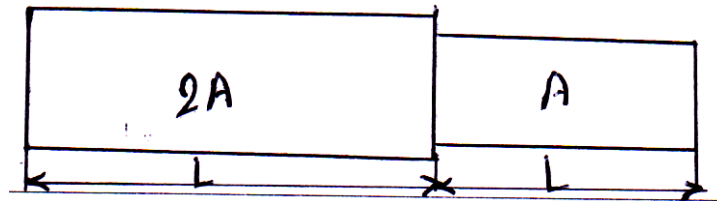
- Q5) a) Derive FEA stiffness matrix for pin fin heat transfer problem. [7]
- b) A metallic fin. with thermal conductivity $360 \text{ W/m}^\circ\text{C}$. 0.1 cm thick and 10 cm long extends from a plane wall whose temperature is 235°C . Determine the temperature distribution and amount of heat transferred from the fin to the air at 20°C with heat transfer coefficient of $9 \text{ W/m}^2\text{C}$. Take the width of the fin to be 1 m . [10]

OR

- Q6) a) Determine the steady state temperature distribution within the wall and also the heat flux through the wall. Use two elements and obtain the solution. [7]
- b) A composite wall as shown in fig. is composed of two homogeneous slabs in contact. Let thermal conductivities be $K_1 = 1 \text{ W/m}^\circ\text{C}$ for firebrick slab 1 and $K_2 = 0.3 \text{ W/m}^\circ\text{C}$ for insulating slab2. The left side is exposed to an ambient temperature of $T_{\infty L} = 1000^\circ\text{C}$ inside the furnace with heat transfer coefficient of $h_1 = 10 \text{ W/m}^\circ\text{C}$. The right side ambient temperature is $T_{\infty R} = 25^\circ\text{C}$ outside of the furnace with heat transfer coefficient of $h_R = 3 \text{ W/m}^2\text{C}$. The thickness of the slabs is $L_1 = 0.2 \text{ m}$ and $L_2 = 0.1 \text{ m}$. Determine the temperature at the left edge point between the two slabs and right of the composite wall. [10]

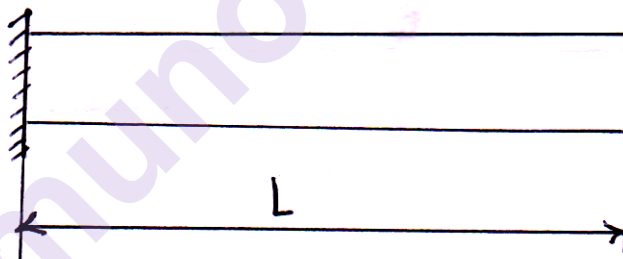


- Q7)** a) What is meant by Eigen Values and Eigen vector? How it is related to Modal analysis of structures? [8]
- b) Find the natural frequencies of longitudinal vibrations of the same steppe shaft of areas $A = 12000 \text{ mm}^2$ and $2A = 2500 \text{ mm}^2$ and of equal length ($L = 1\text{m}$), when it is constrained at one end, as shown below : [10]



OR

- Q8)** a) Write a dynamic equation and explain each term. Convert this into Eigen value problem and explain its significance. [8]
- b) Find the natural frequency of longitudinal vibration using consistent and lumped mass matrix method with one element of bar as shown in fig. Take $E = 2 \times 10^{11} \text{ N/m}^2$, $\rho = 7800 \text{ kg/m}^3$, $L = 1\text{m}$. [10]



Total No. of Questions : 8]

SEAT No. :

PA-2670

[Total No. of Pages : 2

[5926]-237

T.E. (Robotics and Automation)
INDUSTRIAL ROBOTICS AND MATERIAL HANDLING
SYSTEMS
(2019 Pattern) (Semester - I) (Elective - I) (311505(A)-III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) With the help of sketches, discuss the common robot configurations. **[9]**
- b) Write a short note on Load handling capacity of an Industrial Robot. **[9]**

OR

- Q2)** a) Define speed of response. Describe briefly the various types of motion controls possible in robots. **[9]**
- b) Explain in detail the use of robot in manufacturing industry to transfer the material. **[9]**

- Q3)** a) What are the advantages and disadvantages of magnetic grippers? **[8]**
- b) What are the characteristics of end-of-arm tooling? **[5]**
- c) List the advantages and disadvantages of vacuum grippers. **[4]**

OR

P.T.O.

Q4) a) Explain the following with a sketch : **[9]**

i) Magnetic grippers

ii) Vacuum grippers

iii) Mechanical grippers

b) A conical vacuum suction cup has a diameter of 5 cm and air is evacuated to an under pressure of 0.1 bar. Determine the power consumption. **[8]**

Q5) a) Write a short note on Pick and place Robot used in manufacturing industry. **[8]**

b) Write a short note on Arc Welding Robots used in manufacturing industry. **[9]**

OR

Q6) a) Write a short note on Assembly and mega-assembly Robots. **[8]**

b) Explain Robotic vision systems. **[9]**

Q7) Write a short note on : **[18]**

a) Lee's Algorithm for obstacle avoidance.

b) Military Robots.

OR

Q8) Write a short note on : **[18]**

a) Medical applications of Robots

b) Underwater applications Robots



Total No. of Questions : 8]

SEAT No. :

PA-1608

[Total No. of Pages : 3

[5926]-238

T.E. (Robotics and Automation)

INTELLIGENT MANUFACTURING SYSTEM

(2019 Pattern) (Semester - I) (Elective - I) (311505 A - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) The spring back (S) in bending operations depends on sheet thickness (t , mm), sheet orientation (θ , degrees), and punch tip radius (r , mm) and their relationship can be mathematically expressed as: **[12]**

$$S = -24.7 + 13.3t + 9.19r - 4.06t.r + 0.0073r.\theta + 0.941t^2 - 0.607r^2.$$

Perform two iterations of simulated annealing algorithm to minimize S considering bounds of variables as:

$$0.5 \leq t \leq 1 \text{ mm},$$

$$0 \leq \theta \leq 90 \text{ degrees}$$

$$2 \leq r \leq 5 \text{ mm}$$

b) Explain applications of fuzzy logic in manufacturing automation. **[6]**

OR

P.T.O.

Q2) a) What is the probability of accepting new solution(2.4, 3.1) over current solution of (1.8, 2.6) at temperature 300°C for minimizing the function $x_1^2 + 3x_2^2 - 8x_1x_2 + 360$ with $1 \leq x_1, x_2 \leq 4$ using simulated annealing? [9]

b) Draw flow chart of Simulated annealing and explain the algorithm steps for applications to inventory control. [9]

Q3) a) Apply rank order clustering technique to arrange the parts (J) and machines (M) into groups from the following part machine incidence matrix. [9]

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆	J ₇	J ₈
M ₁	1		1			1		
M ₂		1		1	1			
M ₃				1		1	1	1
M ₄		1		1	1	1		
M ₅			1				1	1

b) Explain Similarity Coefficient (SC) method for grouping of parts and machines. [8]

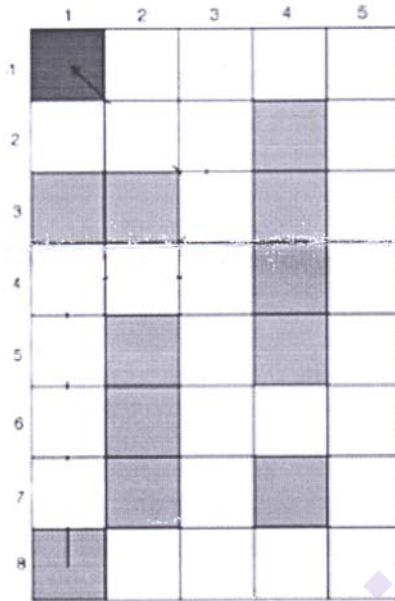
OR

Q4) a) Apply row and column masking algorithm for grouping of the parts (P) and machines (M) from the following part machine incidence matrix.[9]

	M ₁	M ₂	M ₃	M ₄	M ₅	M ₆	M ₇
	64	32	16	8	4	2	1
P ₁	1			1		1	
P ₂		1	1		1		
P ₃				1		1	
P ₄		1	1				
P ₅			1				1
P ₆		1			1		1

b) Explain the 'Weighted Minkowski metric' method for group technology.[8]

- Q5) a)** Use A* algorithm for path planning to avoid the obstacles indicated by blocked cells. The starting point is cell [8, 1] while the terminating cell is [1, 1]. [9]



- b) With suitable example, explain cell decomposition method for robot path planning. [8]

OR

- Q6) a)** With suitable example, explain Artificial potential methods for robot path planning. [8]
- b) Write short note on : Path planning robot control in dynamic environment.[9]

- Q7)** Explain the following algorithms and their applications to flexible manufacturing system. [18]

- a) Random forest.
- b) Naive Bayes.
- c) K-Nearest Neighbors.

OR

- Q8)** Write short notes on : [18]

- a) Route optimization algorithm for AS/RS.
- b) Real time scheduling in FMS.
- c) Building blocks of FMS.



Total No. of Questions : 8]

SEAT No. :

PA-2652

[Total No. of Pages : 2

[5926]-24

T.E. (Chemical)

CHEMICAL TECHNOLOGY - II

(2019 Pattern) (Semester - I) (309342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.

Q1) a) Explain the process of manufacturing of Portland cement. Write the different types of Portland cement. [9]

b) Draw and explain coke oven construction with its applications. [9]

OR

Q2) a) Describe carbonization of coal and the effect of temperature on the products obtained? [9]

b) Explain construction and working of Blast furnace. [9]

Q3) a) Explain production of Producer gas and its applications. [9]

b) Explain Mechanical and optical properties of surface coatings. [8]

OR

Q4) a) Explain the manufacturing process of dyes with unit operations and unit processes involved in it. [9]

b) Discuss production of oxygen gas with its major engineering problems. [8]

Q5) a) Explain properties and applications of Varnishes. [9]

b) Write short note on agrochemicals and their applications. [9]

OR

P.T.O.

- Q6)** a) Describe manufacturing of penicillin with major engineering problems. [9]
b) Enlist Antibiotics with their properties and applications. [9]
- Q7)** a) Explain manufacturing of ethylene dichloride (EDC) with major engineering problems. [9]
b) Explain production of methanol by catalytic hydrogenation of carbon monoxide. [8]

OR

- Q8)** a) Explain production of vinyl chloride production from ethylene dichloride. [9]
b) Explain production of phenol by cumene process. [8]

Total No. of Questions : 8]

SEAT No. :

PA-4018

[Total No. of Pages : 2

[5926]-240

T.E. (Artificial Intelligence and Data Science)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (317521)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Write short note on Network Address Translation. **[10]**

b) Explain the concept of Class Full and Class less Addressing. **[7]**

OR

Q2) a) Compare Static and Dynamic Routing. **[7]**

b) Describe in short, the importance and working of ARP Protocol, what is ARP cache. **[10]**

Q3) a) Explain TCP Handles Error control and Flow Control. **[10]**

b) Explain Different elements of Transport Protocol. **[8]**

OR

Q4) a) Draw and Explain TCP Segment Header. **[8]**

b) Discuss the Quality-of-Service Parameter in Computer Network. **[10]**

Q5) a) Write Short Note on SNMP. **[9]**

b) Explain in Brief about Telnet **[9]**

OR

P.T.O.

- Q6)** a) Explain Simple mail Transfer Protocol. [10]
b) Write Short Note on SNMP. [8]

- Q7)** a) Differentiate between Pure ALOHA and Slotted ALOHA. [7]
b) Explain Binary Exponential Backoff Algorithm [10]

OR

- Q8)** a) Explain Various Frame Formats. [8]
b) Write Short note on IEEE 802.15 and IEEE 802.16. [9]



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Total No. of Questions : 8

SEAT No. :

PA-1609

[Total No. of Pages : 2

[5926]-241
T.E. (AI & DS)
WEB TECHNOLOGY
(2019 Pattern) (Semester-I) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Write a servlet program to display “Hello world”. [5]
b) What is session management? Explain different techniques of session management. [8]
c) Explain life cycle of servlet with neat diagram. [5]

OR

- Q2)** a) What is DTD? Explain with example. [5]
b) How to apply style in XML? Explain with proper example. [8]
c) Explain the working of AJAX. [5]

- Q3)** a) What are the differences between Servlet and JSP? [5]
b) What are different JSP Directives? explain with example. [5]
c) Explain MVC Architecture with respect to JSP. [7]

OR

- Q4)** a) Write differences between SOAP and REST. [5]
b) Draw and explain neat diagram which depicts MVC to the struts architecture. [5]
c) Explain SOAP header with diagram. [7]

P.T.O.

- Q5)** a) Write a PHP script for login form and get user name and password from user. [8]
b) Explain in detail WAP Architecture. [5]
c) Write a note on ASP.Net. [5]

OR

- Q6)** a) Write a short note on [8]
i) .NET framework
ii) C#
b) Explain overview of Node JS. [5]
c) Explain different types of arrays in PHP. [5]
- Q7)** a) Explain different data types in RUBY. [5]
b) How the development is faster using RUBY with Rails. [5]
c) What is EJB? Explain types of EJB. [7]

OR

- Q8)** a) Explain how forms are processed in Rails. [7]
b) What are differences between session beans and Entity beans? [5]
c) What are the string operation available in RUBY. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1610

[Total No. of Pages : 2

[5926]-242

T.E. (Artificial Intelligence and Data Science)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - I) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.*
- 2) *Figures to the right side indicate full Marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What are the issues that need to be addressed for solving CSP efficiently? Explain the Solutions to them. [9]

b) Explain heuristic function that can be used in cutting off search in detail. [9]

OR

Q2) a) Explain Alpha-Beta Tree search and cutoff procedure in detail with an example. [9]

b) Define constraints in CSPs. Explain any two types of Constrains in detail. [5]

c) What are the limitations of Game search algorithms? [4]

Q3) a) What are the various approaches to knowledge representation? Explain in detail. [9]

b) Detail the algorithm for deciding entailment in proposition logic. [8]

OR

Q4) a) Differentiate propositional logic with First order logic. List the Inference rules along with suitable examples for first order logic. [8]

b) Explain Knowledge representation structures and compare them. [9]

P.T.O.

- Q5)** a) Explain Unification algorithm with suitable example. [9]
b) What is knowledge engineering? Explain ontology of situation calculus. [9]

OR

- Q6)** a) Explain the forward chaining process and efficient forward chaining with example. State its usage. [8]
b) What are the reasoning patterns in Propositional logic? Explain them in detail. [7]
c) Write a note on: categories and objects. [3]

- Q7)** a) Explain time, schedules and resources in temporal domain with an example. [9]
b) Discuss AI and its ethical concerns. Explain Limitations of AI. [8]

OR

- Q8)** a) Analyze various planning approaches in detail. [9]
b) Explain AI Architecture with a suitable diagram. [8]

Total No. of Questions : 8]

SEAT No. :

PA-2671

[Total No. of Pages : 2

[5926]-243

T.E. (Artificial Intelligence and Data Science)

EMBEDDED SYSTEMS AND SECURITY

(2019 Pattern) (Semester - I) (317522(A)) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.No. 1 or Q.No.2, Q.No.3 or Q.No.4, Q.No..5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Draw and Explain typical embedded system and development environment.

[9]

b) Discuss the function of pin select register.

[9]

OR

Q2) a) Discuss Embedded firmware design approaches.

[9]

b) Draw and Explain High Level Language to Machine Language conversion process along with its limitations.

[9]

Q3) a) What is Process? Explain process structure and process life cycle with suitable diagram.

[9]

b) What is multiprocessing and multitasking? Explain Types of Multitasking.

[9]

OR

Q4) a) Explain ucos-II along with its features and applications.

[9]

b) Define types of RTOS with example.

[9]

P.T.O.

- Q5)** a) Draw and explain Embedded Linux System architecture. [9]
b) Explain concepts of device driver along with its architecture. [8]

OR

- Q6)** a) Discuss Embedded Linux development environment. [9]
b) Explain Embedded Linux hardware and software components. [8]

- Q7)** a) Explain various attacks in Embedded system devices. [10]
b) What are the effects of attack on Embedded system. [7]

OR

- Q8)** a) What are security threats? Explain challenges of security threats in ES. [10]
b) Explain the counter measures to be used for prevention of attacks on ES. [7]

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PA-1611

[5926]-245

T.E. (AI & DS)

PATTERN RECOGNITION

(2019 Pattern) (Semester-I) (Elective-I) (317522B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Clarify the Chomsky Normal form with suitable example? [9]
b) Describe the Grammar Based Approach and its Application in detail.[8]

OR

- Q2)** a) Describe any two examples of String Generation as Pattern Description?[9]
b) Give an Abstract view of parsing problem? [8]

- Q3)** a) Compare Homomorphism and Isomorphism? [9]
b) Analyze different application of Relational Graph to Pattern Recognition?[8]

OR

- Q4)** a) Describe Clique finding algorithm with suitable example? [8]
b) Describe Canonical definite finite state grammar (CDFSG) with suitable example? [9]

- Q5)** a) Explain CAM & other Neural Memory Structure? [9]
b) Describe Neural Networks as a Black Box Approach? [9]

OR

P.T.O.

- Q6)** a) Describe with neat diagram Artificial Neuron Activation and output characteristics? [9]
- b) What are the different reasons to adopt a Neural Computational Architecture? [9]

- Q7)** a) Explain the structure of a Multiple Layer Feedforward Network? [9]
- b) Draw & explain how to train the feedforward network using Generalized delta Rule? [9]

OR

- Q8)** a) Describe how the character classification is done with pattern Associator?[9]
- b) Draw & Explain Summary of the Back Propagation learning Procedure?[9]



Total No. of Questions : 8]

SEAT No. :

PA-1612

[Total No. of Pages : 2

[5926]-246

T.E. (Artificial Intelligence and Data Science)

HUMAN COMPUTER INTERFACE

(2019 Pattern) (Semester-I) (Elective-I) (310245B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption whenever necessary.

- Q1)** a) List the interaction styles and explain command line interfaces in detail.[6]
b) Explain the Direct Manipulation interaction style with example [6]
c) How does Menu selection interaction style impact on better user interface/Explain with example. [6]

OR

- Q2)** a) Explain any three Principles of User interface of design in detail. [6]
b) What are the important aspects of Graphics to be considered in any web page interface designs? [6]
c) Explain Usability Engineering in detail. [6]

OR

- Q3)** a) Explain GOMS model with an example. [6]
b) Compare and explain the Formative and Summative Evaluation methods.[6]
c) Explain the Heuristic Evaluation concept with example. [5]

- Q4)** a) Write a note on “Model based analysis”. [6]
b) Write a note on DECIDE framework. [6]
c) Write a note on “Usability testing in Laboratory”. [5]

P.T.O.

- Q5)** a) Write a note on “Sensor based and context aware Interaction” in HCI.[6]
b) What are the important factors in Data Retrieval in HCI? Give example.[6]
c) Explain the five stage search framework. [6]

OR

- Q6)** a) What is Hypertext? Explain with example. [6]
b) What is the role of Pattern Recognition in HCI? Explain with example.[6]
c) Write a note on “Machine learning and its importance in HCI”. [6]

- Q7)** a) Explain the basic anatomy of mobile app. [6]
b) Explain the comparison between a handheld device user interface and a computer based user interface with example. [6]
c) What are the important aspects to be considered when designing help screens in a mobile app? [5]

OR

- Q8)** a) Explain the interface constraints of Mobile apps. [6]
b) Explain the Navigation and Toolbars used in mobile apps. [6]
c) Write a short note on “Sorting and Filtering” in mobile apps. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1613

[Total No. of Pages : 3

[5926]-247

T.E. (Artificial Intelligence and Machine Learning)

DESIGN AND ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (318541)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) What is Travelling salesman problem? Explain with example travelling salesman problem using Dynamic Programming. [8]
- b) Explain Dynamic Programming method. State Principle of optimality. [6]
- c) Solve the following instance of the 0/1 knapsack problem by Dynamic programming, Capacity $W = 6$. [4]

Item	1	2	3
Weight	2	3	4
Profit	1	2	5

OR

- Q2)** a) Write an algorithm for Warshal's and Floyd's Algorithm. State it's time complexity. [8]
- b) Find the optimal binary search tree for the key and probabilities given below. [10]

$N = 4$, $q_1, q_2, q_3, q_4 = (\text{do, if, int, while})$ and the values for P's and Q's are given as $P(1 : 4) = (3, 3, 1, 1)$ and $Q(0 : 4) = (2, 3, 1, 1, 1)$.

P.T.O.

- Q3)** a) Solve the following instance of the knapsack problem by the backtracking algorithm. The Knapsack's capacity $W = 16$. [7]

Item	1	2	3	4
Weight	2	5	10	5
Profit	40	30	50	10

- b) Explain the following : [6]
- State space tree
 - Implicit Constraints
 - Solution State
- c) Draw state space tree for 4-Queen's problem. [4]

OR

- Q4)** a) Write an algorithm to find Hamiltonian path using backtracking method. [7]
- b) Write an algorithm to find Sum of subset using backtracking. Explain with example. [6]
- c) Discuss graph coloring using backtracking with the help of example. [4]

- Q5)** a) Write an algorithm for LC Branch and Bound. [8]
- b) Explain following term : [6]
- Branch and
 - Bound
 - FIFO Search
- c) Difference between backtracking and branch & bound. [4]

OR

- Q6)** a) Write an algorithm for FIFO Branch and Bound. [8]
- b) Find the solution of the following Travelling salesman problem using branch and bound method. [10]

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

- Q7)** a) Prove that Clique Decision problem is NP-complete. [7]
b) Explain in detail Parallel Computing. [6]
c) Differentiate between NP complete and NP Hard. [4]

OR

- Q8)** a) Explain the following : [7]
i) Decision Problem
ii) Polynomial Time algorithm
iii) Deterministic- nondeterministic Algorithm.
b) Explain Vertex Cover Problem in detail. [6]
c) Explain Pointer Doubling Algorithm. [4]

Total No. of Questions : 8]

SEAT No. :

PA-1614

[Total No. of Pages : 2

[5926]-248

T.E. (Artificial Intelligence and machine learning)

IOT WITH ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester-I) (318542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain in brief Application layer protocols and compare MQTT and CoAP protocol. **[8]**

b) State and describe various characteristics of LoRaWAN technology. **[6]**

c) Explain 6LoWPAN protocol. **[4]**

OR

Q2) a) Discuss Constrained nodes and Constrained networks. **[8]**

b) What is SCADA Software System? Describe features supported by SCADA. **[6]**

c) Compare IEEE 802.11 ah and 802.15.4 protocol. **[4]**

Q3) a) List and explain IoT frameworks. **[7]**

b) Differentiate between Data Warehouse and Data Lake? **[6]**

c) Explain four basic components of IoT frameworks. **[4]**

OR

Q4) a) What is Authentication and Authorization? Describe three types of Authentication and Authorization. **[7]**

b) Explain KAA and ZETTA IoT frameworks. **[6]**

c) Explain Data Acquisition in IoT. **[4]**

P.T.O.

- Q5)** a) List and explain challenges in data analytics. [8]
b) Explain Data categorization for storage. [6]
c) Distinguish between Structured and unstructured data. [4]

OR

- Q6)** a) Describe security concerns for Data in Motion and Data at Rest. [8]
b) Compare Data Analytics and data Science. [6]
c) List advantages and disadvantages of structured data. [4]

- Q7)** a) Explain Industrial Automation in IoT and state its advantages and disadvantages. [7]
b) Explain Amazon web services for IoT and its features. [6]
c) State and explain IoT data analytics application. [4]

OR

- Q8)** a) Discuss Asset management in IoT and its benefits. [7]
b) What is the Smart grids? Discuss how Smart cities are adopting Smart grid technology. [6]
c) Explain in brief IoT cloud platforms. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1615

[Total No. of Pages : 2

[5926]-249

T.E. (Artificial Intelligence and Machine Learning)

WEB TECHNOLOGY

(2019 Pattern) (Semester - I) (318543)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain angular project structure.State and explain any 4 components and modules of Angular JS. [8]
- b) Explain angular forms with example. [6]
- c) What is CLI? Explain any 4 Commands in angular CLI. [4]

OR

- Q2)** a) What are webframeworks? Explain advantages of web framwork. What are the different types of web frameworks? [8]
- b) What is typescript? Explain variables and Modules in TS. [6]
- c) What are routers? Explain the steps to create angular routers. [4]

- Q3)** a) What is Node. JS? Explain the steps to execute program in Node. JS. [7]
- b) Explain the any two file operations in Node. JS with proper syntax and example. [6]
- c) Write a note on Micro services - PM2. [4]

OR

P.T.O.

- Q4)** a) What is mongo DB? How to establish connection between MongoDB and Node.JS [7]
b) What are the HTTP Methods? [6]
c) Explain Node.JS functions with proper syntax and example. [4]

- Q5)** a) Explain any four form components in JQuery Mobile. [8]
b) Explain any six JQuery methods to create animation effects. [6]
c) Explain the following widgets in JQuery mobile : [4]
i) Flip Switch widget
ii) Footer widget

OR

- Q6)** a) What is basic structure of jQuery Mobile page? Name the CDN files which are used with jQuery Mobile? [8]
b) Explain multipage template in JQuery mobile. [6]
c) List and explain any four CSS classes used in JQuery mobile. [4]

- Q7)** a) What is amazon VPC? Name all the components of amazon VPC and explain any four components of amazon vpc. [7]
b) What is AWS storage service? List of the main storage services available on the AWS Cloud. [6]
c) What is ELB? How does it work? [4]

OR

- Q8)** a) Explain how to launch an application using AWS elastic Beanstalk. [7]
b) Write a short note on : [6]
i) Application loadbalancer
ii) Network load balancer
c) Explain the advantages of amazon AWS. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1409

[Total No. of Pages : 2

[5926]-25

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2019 Pattern) (309343) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data, if necessary.

Q1) a) Use least-squares regression to fit a straight line to : [8]

x	1	2	3	4	5	6	7
y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

b) Use a Lagrange interpolating polynomial of the second order to evaluate $f(2)$ on the basis of the data given : [9]

x	1	4	6
F(x)	0	1.386	1.792

OR

Q2) a) Use least-squares regression to fit a parabola to : [10]

x	5	10	15	20	25	30	35	40	45	50
y	17	24	31	33	37	37	40	40	42	41

b) Find the integration of $(3x + 4)$ in the limits 2 to 5 by Trapezoidal rule using six steps. [7]

Q3) a) Solve the following initial value problem over the interval from $t = 0$ to $t = 2$

where $y(0) = 1$ using Euler's method with $h = 0.25$ $\frac{dy}{dx} = yt^2 - 2y$. [10]

b) Given that $\frac{dy}{dx} = x + y^2$ and $y = 0$ when $x = 0$, determine the value of y when $x = 0.3$, correct to four places of decimals using Picards method. [8]

OR

P.T.O.

Q4) a) Solve the following problem using second order RK method from $t = 0$ to 1 taking $h = 0.5$ $\frac{dy}{dt} = -y + t^2$ $y(0) = 1$. [10]

b) Obtain the approximate solution $y(t)$ of IVP using Taylor series method. Obtain approximate solution at $t = 0.1$ correct to 4 places of decimal $\frac{dy}{dt} = 1 + ty$ $y(0) = 1$. [8]

Q5) Use the explicit method to solve the temperature distribution of a long thin rod with a length of 10 cm and the following values : $k' = 0.49$ cal/(s.cm. °C), $\Delta x = 2$ cm and $\Delta t = 0.1$ s. At $t = 0$, the temperature of the rod is zero and the boundary conditions are fixed for all times at $T(0) = 100^\circ\text{C}$ and $T(10) = 50^\circ\text{C}$. The rod is of aluminium with $C = 0.2174$ cal/g. °C and $\rho = 2.7$ g/cm³. Therefore, $k = 0.49/(2.7 * 0.2174) = 0.835$ cm²/s and $\lambda = 0.835(0.1)/(2)^2 = 0.020875$. Do two iterations. [18]

$$T_i^{l+1} = T_i^l + \lambda (T_{i+1}^l - 2T_i^l + T_{i-1}^l) \text{ where } \lambda = k \frac{\Delta t}{\Delta x^2}$$

OR

Q6) a) Explain implicit method and its advantages and disadvantages in details. [12]
b) Explain classification of partial differential equations with examples. [6]

Q7) a) Use Newton's method to approximate the maximum of $f(x) = 2 \sin x - (x^2 / 10)$ with initial guess $x_0 = 1$. Do three iterations. [10]
b) What are the six steps of optimization? Enlist and explain. [7]

OR

Q8) Using Simplex method, Maximize $Z = 5x_1 + 3x_2$ [17]

Subject to: $x_1 + x_2 \leq 2$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12$$

$$x_1, x_2 \geq 0$$



Total No. of Questions : 8]

SEAT No. :

PA-1616

[Total No. of Pages : 2

[5926]-250

T.E. (Artificial Intelligence and Machine Learning)
MANAGEMENT AND ENTREPRENEURSHIP FOR IT
INDUSTRY
(2019 Pattern) (Semester - I) (318544)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be draw wherever necessary.*
- 3) *Figures to the right side indicate full Marks.*
- 4) *Assume the suitable data, if necessary.*

- Q1)** a) Define Entrepreneur. What are characteristic of an entrepreneur? [6]
b) Write about barriers to entrepreneurship. [6]
c) Explain about identification of business opportunity. [6]

OR

- Q2)** a) Discuss about entrepreneurship in India. [6]
b) Explain the types of Entrepreneur in detail. [6]
c) Explain : [6]
i) Market feasibility
ii) Technical feasibility
iii) Financial feasibility

- Q3)** a) What are the steps involved in formulation of project report. [6]
b) With a brief explanation, explain CPM and PERT. [6]
c) Explain the guidelines by planning commission for project report. [5]

OR

- Q4)** a) What is ERP? Explain importance of ERP. [6]
b) What is a project? Explain the required criteria in selecting a project. [6]
c) Explain steps involve in report writing. [5]

P.T.O.

- Q5)** a) Explain MSME-DI and NISIC. [6]
b) List the characteristics of small scale Industries. [6]
c) Explain trademark, copy rights and patents. [6]

OR

- Q6)** a) Explain characteristics of small and micro Industries. [6]
b) Explain steps involved in establishing micro and small enterprise. [6]
c) Write short note on : [6]
i) SIDBI
ii) DIC
iii) SSI

- Q7)** a) What intellectual property rights in detail. [6]
b) Explain Advantages and Disadvantages of IPR. [6]
c) Explain Criticisms and Politics of Intellectual Property Rights. [5]

OR

- Q8)** a) Explain Economic analysis of Intellectual Property Rights. [6]
b) Explain : [6]
i) WIPO
ii) WTO
c) Discuss Need for Private Rights versus Public Interests. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1617

[Total No. of Pages : 2

[5926]-251

T.E. (Artificial Intelligence and Machine Learning)

ROBOTICS

(2019 Pattern) (Semester-I) (Elective-I) (318545A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) What is homogeneous transformation in robot kinematics? [6]
b) What is a reference frame coordinate system? [6]
c) Explain Properties of Transformation Matrices. [6]

OR

- Q2)** a) Explain homogeneous transformations and Manipulator in detail. [6]
b) What is the Denavit-Hartenberg Matrix? [6]
c) Draw and explain Controller Architecture of Transformations and Kinematics. [6]

- Q3)** a) Explain Types of End effectors. [6]
b) Explain Hydraulic and Pneumatic systems. [6]
c) What are the end effectors tools? [5]

OR

- Q4)** a) Explain types of sensors in Robotics. [6]
b) Explain use of Miscellaneous Sensors in Sensor- Based Systems. [5]
c) Explain Proximity and range sensors. [6]

P.T.O.

- Q5)** a) What are Hardware Considerations for robotics? [6]
b) Explain Computational elements in Robotic Applications-Control.[6]
c) Explain Path planning for robotics. [6]

OR

- Q6)** a) Discuss use of Robot programming? [6]
b) What is the Robot Control Sequencing? [6]
c) Explain Artificial intelligence and Robot Programming. [6]

- Q7)** a) What are the applications of Material Transfer and machine loading/Unloading? [6]
b) What is Assembly and Inspection? [6]
c) What is difference between Robotics and labors? [5]

OR

- Q8)** a) Explain the task of future robot. [6]
b) Discuss Hazardous and Inaccessible Nonmanufacturing Environments in Robotics? [5]
c) Explain Processing Operations such as Welding and Coating. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1618

[Total No. of Pages : 2

[5926]-252

T.E. (Artificial Intelligence and Machine Learning)

PATTERN RECOGNITION

(2019 Pattern) (Semester-I) (Elective-I B) (318545B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain Nearest neighbor algorithm with example. [8]
b) Explain maximum likelihood parameter estimation. [6]
c) Explain Bayesian Interference. [4]

OR

- Q2)** a) Prove that the bayes classifier is equivalent to the minimum distance classifier, assuming that the feature vector is Gaussian. [8]
b) What is the difference between maximum likelihood and Bayes method. [6]
c) Explain Gaussian mixture models. [4]

- Q3)** a) Explain the perceptron learning algorithm in detail. [7]
b) Explain stochastic approximation of LMS algorithm. [6]
c) Explain sum of error estimate. [4]

OR

- Q4)** a) Explain any Linear discriminant based algorithm. [7]
b) Explain minimum squared error discriminant function. [6]
c) Explain decision hyperplane. [4]

P.T.O.

- Q5)** a) Explain K-means clustering algorithm with example. [8]
b) Define the criterion functions used in clustering. [6]
c) Define the terms weight, bias, activations with respect to neural network. [4]

OR

- Q6)** a) Define clustering and explain clustering algorithms. [8]
b) Describe the architecture of back propagation network. [6]
c) Draw the model of single artificial neuron. [4]

- Q7)** a) Explain following normal density function with formula [7]
i) Univariate normal density
ii) Multivariate normal density
b) What is the significance of Hidden Markov model in classifier design. [6]
c) Explain discriminant functions. [4]

OR

- Q8)** a) Explain principal component analysis for dimensionality reduction. [7]
b) Explain expectation maximization with the help of algorithm. [6]
c) Explain Bayesian parameter estimation. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1619

[Total No. of Pages : 2

[5926]-253

T.E. (Artificial Intelligence and Machine Learning)

INFORMATION SECURITY

(2019 Pattern) (Semester - I) (318545C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain in detail key management with suitable example. [6]
- b) Write a note on Diffie-Hellman key exchange. [6]
- c) Explain in detail Chinese reminder theorem. [6]

OR

- Q2)** a) Which are the different types of Cryptography. Explain Public Key Cryptography in detail. [6]
- b) Write a note on Elliptic Curve Cryptography. [6]
- c) Explain ElGamal algorithm in detail. [6]

- Q3)** a) Explain in Web Security issues. [6]
- b) Explain Hash Functions based on Cipher Block Chaining in detail. [6]
- c) Write a short note on IP Security: IPSec. [5]

OR

P.T.O.

- Q4)** a) Explain Secure Hash Algorithm (SHA) in detail. [6]
b) Write a note on Message Authentication functions. [6]
c) Explain MD4 in detail. [5]

- Q5)** a) Explain the concepts of trusted system & Trusted computing. [6]
b) What are types of Firewall, and also explain Intrusion prevention system: Network based in detail. [6]
c) What do you mean by Multilevel Security. [6]

OR

- Q6)** a) What do you mean by Flooding attacks. [6]
b) Write a note on Host based and network based Honeypot. [6]
c) Explain in detail Security for role based access control. [6]

- Q7)** a) Explain in detail Indian IT Act. [6]
b) Write a note on Proxy servers. [6]
c) State & explain Information Security related to cybercrime. [5]

OR

- Q8)** a) State the classification of Cybercrimes. Write a note on cybercrime. [6]
b) Write a note on The Indian IT Act-challenges. [6]
c) Explain Cyber stalking in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1620

[Total No. of Pages : 2

[5926]-254

T.E. (Artificial Intelligence and Machine Learning)
BUSINESS INTELLIGENCE
(2019 Pattern) (Semester - I) (Elective - I) (318545D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data necessary.*

- Q1)** a) Explain in detail Closed Loop BPM Cycle. [6]
b) Write a note on different types of Charts and Graphs related to Business Report. [6]
c) What is a Business Report and also explain the components of Business Reporting Systems in detail. [6]

OR

- Q2)** a) Explain in detail different BI tools. [6]
b) Write a note on Business Performance Management. [6]
c) Explain the 4 Perspectives of BSC in detail. [6]

- Q3)** a) Explain what is Descriptive and predictive analytics in detail. [6]
b) Explain Multiple Goals & Goal Seeking in detail. [6]
c) Write a note on decision tree related to decision analysis. [5]

OR

- Q4)** a) Explain Decision Modeling with Spreadsheets & Mathematical Programming Optimization in detail. [6]
b) Write a note on Decision Support Systems Modeling. [6]
c) Explain what is certainty & uncertainty related to Decision Making in detail. [5]

P.T.O.

- Q5)** a) Explain use of Business Intelligence in Banking in detail. [6]
b) State applications of Business Intelligence and explain use of Business Intelligence in Retail Industry in detail. [6]
c) Explain the concepts of Business Intelligence in Production. [6]

OR

- Q6)** a) Explain use of Business Intelligence in Fraud Detection in detail. [6]
b) Write a note on role of Visual and Business Analytics (BA) in BI. [6]
c) Explain the concepts of Business Intelligence in Telecommunications. [6]

- Q7)** a) Explain in detail BI Search & Text Analytics. [6]
b) Write a note on Impact of Analytics in Organizations. [6]
c) Explain Advanced Visualization in detail. [5]

OR

- Q8)** a) State the Emerging Technologies in Business Analytics. Write a note on Predicting the Future with the help of Data Analysis. [6]
b) Write a note on Location-Based Analytics for Organizations. [6]
c) Write a note on Issues of Legality related to Business Analytics. [5]

Total No. of Questions : 8]

SEAT No. :

PA-1621

[Total No. of Pages : 2

[5926]-255

T.E. (Honours in Artificial Intelligence and Machine Learning)

COMPUTATIONAL STATISTICS

(2019 Pattern) (Semester - I) (310301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is Sensitivity? Explain Types of Statistical Tests. [8]

b) Define the following terms. [4]

- i) Accuracy
- ii) Recall
- iii) Precision and
- iv) F-measure

c) Consider the confusion Matrix given below. Calculate Accuracy, Recall and Precision. [6]

Predicted class \ Actual class	CAT	Not CAT
CAT	150	10
Not CAT	20	100

OR

Q2) a) State and explain in depth the typical Analysis procedure used in statistical analysis. [8]

b) Differentiate the training error vs testing error. [4]

c) What is Hypothesis Testing? Comment on type-I and type-II error. [6]

Q3) a) Explain hyperparameter Tuning with GridSearchCV. [8]

b) State and Explain different Feature Scaling methods. [9]

OR

Q4) a) Explain Ridge Regression and Lasso Regression in details. [8]

b) Explain three different cross validation Techniques. [9]

P.T.O.

- Q5)** a) Explain chi-square Test for feature selection with example. [6]
b) Describe Recursive Feature Elimination with example. [8]
c) How does the Variance Thresholding is used for Robust Feature Selection. [4]

OR

- Q6)** a) What is Dimension Reduction? What are benefits of it? Explain different Dimension Reduction techniques. [10]
b) Explain with example under-sampling and over re-sampling. [8]
- Q7)** a) Explain Correlation coefficient and Rank Correlation in details. [8]
b) What is Multilinear Regression? Explain with Multilinear Regression model in details. [9]

OR

- Q8)** a) Write short notes on Residual Error and Mean Square Error. [8]
b) What is Bayes Theorem? Explain Bayes Theorem of conditional probability. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1622

[Total No. of Pages : 2

[5926]-256

T.E. (Computer)(Honors)

CYBER SECURITY

Information and Cyber Security

(2015 Pattern) (Semester - I) (310401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of scientific calculator is permitted.

Q1) a) What is cryptographic hash function? How is it useful in cryptography? List different cryptographic hash functions. Explain in detail any one cryptographic hash function. **[8]**

b) Find the key exchanged between Alok and Bobby considering following data $n = 11$, $g = 5$, $x = 2$, $y = 3$. Find the value of A,B & key K. **[9]**

OR

Q2) a) What are steps carried out in diffie hellman algorithm? List uses, advantages and disadvantages of diffie hellman algo. **[8]**

b) What do you mean by Asymmetric cryptography algorithm? Explain RSA algorithm in detail. **[9]**

Q3) a) Describe different categories of cybercrime with example. **[9]**

b) Explain the process of risk identification and risk assessment. **[9]**

OR

Q4) a) What are the difference between quantitative and qualitative risk analysis with providing examples. **[9]**

b) What is cyber stalking? How to identify and detect cyber stalking. **[9]**

Q5) a) What is SSL? How does SSL works? Why is SSL important. **[8]**

b) Describe IPSec protocol with its components and security services. **[9]**

OR

P.T.O.

- Q6)** a) What is the firewall? How does it work & explain different types of firewalls. [8]
- b) What is email security and why it is necessary? Explain any one algorithm used for email security. [9]

- Q7)** a) What is malware? Enlist different types of malware what precaution needs to protect from malware. [9]
- b) What is computer worm or virus? How does computer virus spread? How to protect against computer virus and worms. [9]

OR

- Q8)** a) Enlist different types of IDS. Describe any one type of IDS in detail. [9]
- b) Define phishing. Explain phishing with types and examples. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1623

[Total No. of Pages : 2

[5926]-257

T.E. (Computer Engineering) (Honors/Minors)

DATA SCIENCE

DATA SCIENCE AND VISUALIZATION

(2019 Pattern) (Semester - I) (310501)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is Linear regression? List the applications where linear regression can be applied? **[6]**

b) State and explain how Naïve Bays classifier can be used to solve the classification problems? **[6]**

c) Write a note on association rules. **[6]**

OR

Q2) a) What is clustering? Explain K-means clustering algorithm. **[6]**

b) Explain Apriori Algorithm used in machine learning with valid example. **[6]**

c) Illustrate how will you evaluate association rules. **[6]**

Q3) a) State and explain the different constituents of the decision tree. **[9]**

b) Write a note on the perceptron model. **[8]**

OR

Q4) a) When do you use Backpropagation in Neural Networks? Explain by taking a suitable example. **[9]**

b) What is entropy? How entropy is calculated explain with a suitable example. **[8]**

P.T.O.

- Q5)** a) Define the term Dashboard along with its evolution and steps to design the dashboard. [9]
- b) Write a note on: [9]
- i) Pie charts
 - ii) Bar graphs
 - iii) Scatterplots

OR

- Q6)** a) Explain the terms Network hierarchies and reports associated with data visualization. [6]
- b) Write a note on advanced visualization techniques and explain anyone of them. [6]
- c) Write a note on 'display media for Dashboard. [6]
- Q7)** a) What are different types of data model explain in brief. [6]
- b) List the advantages of multi-dimensional data model? [6]
- c) Discuss the challenges of clustering High-dimensional data. [5]

OR

- Q8)** a) Explain the need of data modelling. [6]
- b) Explain multidimensional data model with one example. [6]
- c) What do you mean by Principal Component Analysis? [5]



Total No. of Questions : 8]

SEAT No. :

PA-1624

[Total No. of Pages : 2

[5926]-258

T.E. (Computer Engineering) (Honors)

INTERNET OF THINGS

**Embedded Systems and Internet of Things
(2019 Pattern) (Semester - I) (310601)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of Non-Programmable scientific Calculators is allowed.

- Q1)** a) List and explain various features of the Arduino board in detail. [6]
b) Define sensor. Explain various types of sensors in detail. [6]
c) Write a short note on ESP8266. [5]

OR

- Q2)** a) What are the active and passive types of sensors? Discuss and provide suitable examples. [6]
b) Draw and describe the components of Raspberry Pi development board. [6]
c) What is the need of interfacing of sensors with development boards? How is it done? [5]

- Q3)** a) List the open source IDE for embedded system application development. Explain any one in detail. [5]
b) Explain Design, Components and Coding requirements of embedded systems application? [6]
c) What are the testing and deployment requirements of embedded systems applications? [6]

OR

- Q4)** a) What is the need of Integrated Development Platform for application development? Explain with suitable example. [6]
b) Describe any one open-source IDE for ES application development. [6]
c) Explain SDLC-Requirements of embedded systems application. [5]

P.T.O.

- Q5)** a) Draw and distinguish between physical design and logical design of IoT. [6]
b) Enlist and explain issues and challenges of IoT. [6]
c) Explain IoT functional blocks in detail. [6]

OR

- Q6)** a) Define Internet of Things (IoT). Enlist and explain its characteristics. [6]
b) With the help of neat diagram, Explain technical building blocks of IoT. [6]
c) Write a brief note on communication models of IoT and Communication APIs. [6]

- Q7)** a) What is CoAP? How it is suitable for IoT applications? Discuss in detail. [6]
b) Write a short note on AMQP protocol for IoT. [6]
c) Explain Zigbee architecture with suitable diagram. [6]

OR

- Q8)** a) Explain the MQTT protocol in detail. [6]
b) Define Radio-Frequency Identification. Explain the role of Radio-Frequency Identification in Internet of Things. [6]
c) Write a short notes. (Any Two). [6]
i) Bluetooth.
ii) AMQP.
iii) LiFi.
iv) Health Monitoring system.



Total No. of Questions : 8]

SEAT No. :

PA-1625

[Total No. of Pages : 2

[5926]-259

T.E. (Computer Engineering/Honor)

VIRTUAL REALITY

Augmented Reality

(2019 Pattern) (Semester - I) (310701)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain in detail how to change position and rotate objects using Geometric Models. [9]

b) Explain different types of eye movements. [8]

OR

Q2) a) Describe physiology of the human eye with a diagram. [9]

b) Describe axis angle representations of rotation in detail. [8]

Q3) a) Explain perception of color. [6]

b) Explain Monocular Depth Cues. [6]

c) How to improve latency? [6]

OR

Q4) a) How to improve frame rates in Visual Perception? [6]

b) What are Ray Tracing and Shading Models? Explain. [6]

c) What are the different strategies used to reduce the latency and to minimize the side effects of it? [6]

Q5) a) Explain the role of Physics Engine in Virtual World. [10]

b) Explain vestibular systems in detail. [7]

OR

P.T.O.

- Q6)** a) Explain Tracking in 2D Orientation. [10]
b) State and Explain different types ofvection. [7]

- Q7)** a) Explain the term locomotion. [9]
b) Describe Physiology of human hearing with diagrams. [9]

OR

- Q8)** a) Explain in short Auditory Perception and Auditory Rendering. [9]
b) Explain the interaction with motor programs and remapping of audio?[9]



[5926]-26

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - I) (309344)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) A liquid mixture of cyclohexane (1) /phenol (2) for which $x_1=0.6$ is in equilibrium with its vapour at 417 K. Determine the equilibrium pressure P and vapour composition y_1 from the following information. **[10]**

$$\ln \gamma_1 = A x_2^2, \ln \gamma_2 = A x_1^2, \text{ At } 417\text{K } P_1^{(\text{sat})} = 75.20 \text{ KPa}, P_2^{(\text{sat})} = 31.66 \text{ KPa.}$$

The system forms an azeotrope at 417K for which $x_1^{\text{az}} = y_1^{\text{az}} = 0.294$.

b) Explain the Gibbs - Duhem equation and its various forms. **[8]**

OR

Q2) Assuming the validity of Raoult's law do the following calculations for benzene (1)/toluene (2) system. **[18]**

- a) Given $x_1 = 0.33$ and $T = 100^\circ\text{C}$, find y_1 and P
- b) Given $y_1 = 0.33$ and $T = 100^\circ\text{C}$, find x_1 and P
- c) Given $x_1 = 0.33$ and $P = 120 \text{ KPa}$, find y_1 and T.

The Antoine equation and parameters are given below:

$$\ln P^{\text{sat}}/\text{KPa} = A - \frac{B}{T+C} \quad (T \text{ in } ^\circ\text{C})$$

Compound	A	B	C
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	219.79

P.T.O.

Q3) a) Explain following consistency tests for VLE data: [10]

- i) Slope of $\ln \gamma_1$ curves
- ii) Redlich Kister method.

b) Explain triple point and eutectic temperature with neat diagram. [7]

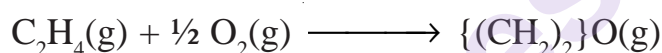
OR

Q4) a) Explain liquid - liquid equilibrium diagram on triangular co-ordinates for a system in which two pairs are partially soluble. [8]

b) Explain the following two methods of consistency tests for VLE data:[9]

- i) Using the coexistence equation.
- ii) Using the partial pressure data.

Q5) a) A system initially containing 2 mol C_2H_4 and 3 mol O_2 undergoes the reactions: [10]



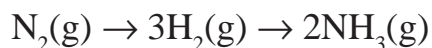
Develop expressions for the mole fractions of the reacting species as functions of the reaction co-ordinates for the two reactions.

b) Derive the following expression. [8]

$$-RT \ln K = \sum v_i G_i^0$$

OR

Q6) a) Estimate the standard free energy change and equilibrium constant at 700 K for the reaction [14]



Given that the standard heat of formation and standard free energy of formation of ammonia at 298 K to be -46100 J/mol and -16500 J/mol respectively. The specific heat data is given as,

$$C_p = 27.27 + 4.93 \times 10^{-3} T \text{ for } N_2$$

$$C_p = 27.01 + 3.51 \times 10^{-3} T \text{ for } H_2$$

$$C_p = 29.75 + 25.11 \times 10^{-3} T \text{ for } NH_3.$$

b) Write a note on feasibility of a chemical reaction. [4]

Q7) a) For the cracking reaction $\text{C}_3\text{H}_8 (\text{g}) \longrightarrow \text{C}_2\text{H}_4 (\text{g}) + \text{CH}_4 (\text{g})$ the equilibrium conversion is negligible at 300 K but becomes appreciable at temperatures above 500K. For a pressure of 1 bar, determine [12]

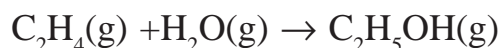
- i) Fractional conversion at 600K
- ii) The temperature at which the fractional conversion is 80%.

b) Explain phase rule for reacting systems. [5]

OR

Q8) a) 100 moles of gas mixture containing 60% H_2 , 20% N_2 and 20% inerts is catalytically reacted to get NH_3 at 50 bar and 400°C . Calculate percent conversion of H_2 and percent NH_3 in exit gases. Given K_p at $400^\circ\text{C} = 0.0125$. [8]

b) Calculate the equilibrium constant at 298 K for the reaction [9]



with the help of following data. Also comment about the feasibility of reaction.

	$S^\circ_{298}, \text{J/mol.K}$	$H^\circ_{298}, \text{J/mol.K}$
$\text{C}_2\text{H}_4 (\text{g})$	220.85	48,986
$\text{H}_2\text{O} (\text{g})$	189.12	-241997
$\text{C}_2\text{H}_5\text{OH} (\text{g})$	278.00	-238941

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Total No. of Questions : 8]

SEAT No. :

PA-1626

[Total No. of Pages : 2

[5926]-260

T.E. (Mechanical Engineering)

FOUNDATIONS OF SYSTEMS AND SYSTEMS ENGINEERING

(Honors in Systems Engineering)

(2019 Pattern) (Theory) (Semester-I) (302041MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Assume suitable data if necessary.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.

Q1) a) Explain Systems Science and illustrate the relationship between the systems science, system thinking and General system approach as applied to Engineered system. [9]

b) List and explain the life cycle stages of the system with a sketch. [9]

OR

Q2) a) Explain the concept of Systems with an example. [9]

b) Illustrates the relationship of the System of Interest (SOI), enabling systems, and the other systems in the operational environment. [9]

Q3) a) State and explain the types of System Architecture. [9]

b) What are the types of Architecture explain with any two types. [8]

OR

Q4) a) Explain the architecture definition process with an IPO diagram. [8]

b) Write a short notes on Architecture Trade-offs. [9]

Q5) a) Systematically explain the evolution of MBSE. [9]

b) Write a short notes on Modelling, simulation and trade-off analysis. [9]

OR

P.T.O.

- Q6)** a) With a neat sketch explain the basic structure of SysML. [9]
b) Explain the concept of modelling with MBSE. [9]

- Q7)** a) Explain the role of modelling in decision making. [8]
b) Write short notes on the basis of quantitative modelling. [9]

OR

- Q8)** a) Write a short notes on System dynamics modelling. [8]
b) Demonstrate the concept of Simulation modelling in the SE lifecycle.[9]



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Total No. of Questions : 8]

SEAT No. :

PA-1627

[Total No. of Pages : 2

[5926]-261

T.E. (Mechanical) (Honors)

ENERGY MANAGEMENT IN UTILITY SYSTEMS

Energy Management

(2019 Pattern) (Semester - I) (302021MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain salient features of Energy conservation act-2001. **[10]**

b) Explain briefly Net Zero Energy Building (NZEB). **[8]**

OR

Q2) a) Explain some of the long-term energy strategies available for the better energy secured nation? **[10]**

b) Explain PAT scheme in brief. **[8]**

Q3) a) Discuss ten steps of detailed energy audit. What are the areas that need to be focused during pre-audit phase? **[10]**

b) Explain the different instruments used for Energy Audit with application. **[7]**

OR

Q4) a) What is need of Energy Audit? Discuss different types of Energy Audit. **[10]**

b) Discuss energy audit report format. **[7]**

Q5) a) Explain Net Present value and how NPV is calculated. List advantages and disadvantages of it. **[10]**

b) Explain 'Return on Investment'. What are the advantages and limitations of it? **[8]**

OR

P.T.O.

- Q6)** a) Calculate net present value for an investment towards a Compact Fluorescent Lamp (CFL). The following table gives investment and cash flow. (Assume discount rate is 10% and life of the CFL is 2 years).[10]

Investment Rs. 400/-	
Saving in Year	Cash flow, Rs.
Year - 1	1000
Year - 2	1000

- b) Define the Internal Rate of Return (IRR) and write its equation. List its advantages and disadvantages.? [8]

- Q7)** a) Explain in detail about Ozone Layer depletion process and its various effects. [10]

- b) Explain environmental degradation due to greenhouse effect. [7]

OR

- Q8)** a) Explain acid rain and its adverse impact on environment. [10]

- b) Write short note on Carbon credits. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1628

[Total No. of Pages : 2

[5926]-262

T.E. (Mechanical/Automobile) (Honor)

ELECTRIC VEHICLES

e-Vehicle Technology

(2019 Pattern) (Semester - I) (302031MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Figures to the right of each question indicate full marks.
- 3) Draw the neat sketch wherever necessary.

- Q1)** a) Write a short note on different components of li-ion battery with neat sketch? [4]
- b) What are the different chemistries of li-ion batteries? Mention in short significance of each of them for electric vehicle. [8]
- c) Explain the advantages and disadvantages and applications of li-ion batteries. [8]

OR

- Q2)** a) Explain the following parameters of li-ion batteries in short (any two). [4]
- i) Cell voltage.
 - ii) Energy density.
 - iii) Power density.
- b) What is the type of charging li-ion battery? Explain the precautions needs to be taken while charging. [8]
- c) Write a short note on Availability of lithium ion batteries and government policies to fulfill the demands of lithium batteries for Indian e-vehicles. [8]
- Q3)** a) Explain battery management system with working mechanism and neat sketch? [8]
- b) Explain lead acid batteries with advantages, disadvantages and applications. [8]

OR

- Q4)** a) Write a short not on need of thermal management system in e-vehicles? Explain with mechanism. [8]
- b) Explain Li-ion supercapaciter with advantages, disadvantages and applications. [8]

P.T.O.

Q5) a) Write a short note on Mechanical and electrical connections of motors. [8]

b) List out the output characteristics of electric motor drives for EVs? [8]

OR

Q6) a) Write a short note on Output Characteristics of Motor Drives in Evs?[8]

b) Explain different types of drives used in electric vehicle with neat sketches. [8]

Q7) a) Explain the significance of implementation of IOT in electric vehicle on basis of wireless sensor network with neat sketch wherever required.[10]

b) What is battery swapping? Explain with Advantages and challenges of battery Swapping. [8]

OR

Q8) a) Explain the significance of IOT for modes of fast and efficient charging electric vehicles. [8]

b) Write a short note on Battery Standards in electric vehicles with any two types? [10]



Total No. of Questions : 8]

SEAT No. :

PA-1629

[Total No. of Pages : 2

[5926]-263

T.E. (Mechanical) (Honors)

3D PRINTING

**Additive Manufacturing Technology
(2019 Pattern) (Semester - I) (302011MJ)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculators is allowed.*
- 4) *Assume Suitable data, if necessary.*

Q1) a) Explain the process of Continuous Liquid Interface Production (CLIP).
Give advantages and applications of CLIP. **[10]**

b) What are the characteristics of SLA 3D printing? **[8]**

OR

Q2) a) Explain the process of Laser-Stereolithography (SL)? **[10]**

b) Explain Digital light processing with advantages and applications. **[8]**

Q3) a) Explain the Direct Metal Laser Sintering (DMLS) process with neat sketch
working principle. **[10]**

b) What is LENS 3D printing? What are the advantages of laser engineered
net shaping? **[7]**

OR

Q4) a) Write short note on (any two). **[10]**

i) Electron-Beam Melting (EBM).

ii) Laser Wire Deposition.

iii) Laser Blown Powder.

b) What is selective laser melting used for? What type of laser is used in
SLM? **[7]**

Q5) a) Explain basic Process and mechanism for Inkjet (droplet) - Based
Deposition and Fusion. Discuss any one type. **[10]**

b) Explain Nanoparticle Jetting with its neat sketch, advantages &
applications? **[7]**

OR

P.T.O.

- Q6)** a) Explain Multi-Jet Modeling (MJM) and Multi-Jet Fusion in short with its advantages and applications. [10]
b) Write in brief Plasma Deposition Techniques. [7]

- Q7)** a) Give brief discussion on 3D printing in prominent industries. [10]
b) Explain different Bio-medical Applications of 3D printing techniques.[8]

OR

- Q8)** a) Explain in detail 4D/5D printing, write application of 4D Printing. [10]
b) What is scaffolds and tissue and Organ Engineering. [8]



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Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PA-1630

[5926]-264

T.E. (Honors)

ROBOTICS

Principles of Robotics

(2019 Pattern) (Semester - I) (304181HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt all questions : Q.1 or Q.2, Q.3 or Q.4. Q.5 or Q.6 & Q.7 or Q.8.*
- 2) *Draw sketches where required.*

Q1) a) State the factors in selection and design of grippers. **[9]**

b) Explain with neat sketch Mechanical grippers. **[9]**

OR

Q2) a) State and explain various tools used as end effectors. **[9]**

b) Explain with neat sketch Tactile Sensor Gripper. **[9]**

Q3) a) Explain with neat sketch piezo electric sensors. **[8]**

b) Explain with neat sketch LVDT sensor. **[9]**

OR

Q4) a) Explain with neat sketch Force sensors. **[9]**

b) Explain with neat sketch range sensors. **[8]**

Q5) a) Enlist steps in forward kinematic analysis. **[9]**

b) Explain with neat sketch D-H parameter. **[9]**

OR

Q6) a) State properties of generalised composite Rotation matrix. **[9]**

b) A 2 DOF planar RR manipulator has $L_1=120\text{mm}$ & $L_2 = 75\text{mm}$. Determine joint angles using geometric approach, so that face end is located at (100, 70). **[9]**

P.T.O.

- Q7)** a) Explain various Image processing Techniques in Robotics . [9]
b) State and explain economic aspects in Robotics. [8]

OR

- Q8)** a) What is Robot safety. Explain 5 groups of Humans that are at risk of direct injury from Robot. [9]
b) Write notes on (any 2). [8]
i) Agriculture & farming.
ii) Home sector.
iii) Service sector.
iv) Research & exploration.



Total No. of Questions : 8]

SEAT No. :

PA-1631

[Total No. of Pages : 2

[5926]-265

T.E. (Electronics and Telecommunication) (Honors)

BLOCK CHAIN TECHNOLOGY

Introduction to Block Chain

(2019 Pattern) (Semester - I) (304181 HBCT)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4. Q.5 or Q.6 & Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.,
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What are the different core components in Blockchain? Explain. [9]
b) Compare permissionless and permissioned blockchain. [8]

OR

- Q2)** a) What are the different types of blockchain? Explain private blockchain in detail. [9]
b) What are the prominent applications of blockchain? Explain anyone in detail. [8]

- Q3)** a) What is a ledger in block chain? Name the common types of ledgers that can be considered by users in the blockchain. [6]
b) Explain bitcoin Mechanism. How does bitcoin uses blockchain. [6]
c) What is Hyperledger w.r.to blockchain technology? Explain. [5]

OR

- Q4)** a) What is bitcoin and explain advantages and disadvantages of bitcoin.[6]
b) What is Trust in blockchain ? Explain w.r.to Financial services. [6]
c) What is Hyperledger composer? Explain. [5]

- Q5)** a) Explain the cloud based blockchain in detail? [6]
b) What is Multichain? Explain how multichain works? [6]
c) What is stellar? How the stellar is used in blockchain. [6]

OR

P.T.O.

- Q6)** a) What makes multichain unique? Also, explain what is MULTI token? [6]
b) How the secure service is provided using cloud based blockchain? [6]
c) Explain the following w.r.to blockchain. [6]
i) R3 corda
ii) Ripple

- Q7)** a) How the blockchain is used in supply chain management ? Explain. [6]
b) What is the future of blockchain in health care system? Explain. [6]
c) Explain the voting system in the blockchain technology? [6]

OR

- Q8)** a) Explain the importance of blockchain in land records. [6]
b) Write a note on “Loyalty programs” w.r.to blockchain. [6]
c) How a blockchain is used to support sustainable business practices. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1632

[Total No. of Pages : 2

[5926]-266

T.E. (Civil) (Honors)

MERTO CONSTRUCTION

Surveying in Metro Construction

(2019 Pattern) (Semester - I) (301301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4. Q.5 or Q.6 & Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*
- 5) *Use of cell phone is prohibited in the examination hall.*
- 6) *Use of electronic pocket calculator is allowed.*

- Q1)** a) Define are Basic Requirements of an Ideal Alignment for metro? [5]
b) Explain Steps involved in Preliminary surveys. [6]
c) Enlist and elaborate the modern surveying techniques adopted for difficult terrain? [6]

OR

- Q2)** a) Explain GIS and remote sensing with diagram. Honors is Metro Construction. [5]
b) Define are the Criteria's for selection of good Alignment for Metro? [6]
c) Explain Photogrammetry in modern surveying with its advantages. [6]

- Q3)** a) Explain different types of gradient used in metro construction. [5]
b) Why maintenance of permanent way is important? [4]
c) What are the requirements of good track for metro? [4]
d) What kind of stresses acting on rails of metro? [5]

OR

- Q4)** a) On what factors do the mode of distribution of load on the track depends upon? Elaborate those factors. [8]
b) Brief the term Track Modulus and its types. [5]
c) What is photo-elastic Method? Explain in brief. [5]

P.T.O.

- Q5)** a) Explain the term Architectural design in Metro station. [5]
b) What are functions of Main Building Areas for different types of Metro stations? [7]
c) What are the objectives in station planning? [5]

OR

- Q6)** a) What kind of facilities should provide at metro station? [5]
b) What are construction types of Metro station? [5]
c) Explain the criteria are for selection of Site for a Metro Railway Station? [7]

- Q7)** a) Write short notes on (any 2). [12]
i) Lighting of tunnel Honors is Metro Construction.
ii) Tunnel approaches.
iii) Tunnel alignment and grade.
b) Explain various methods for 'Tunnel Ventilation'. [6]

OR

- Q8)** a) Enlist the various factors controlling the alignment of metro track. Explain any two in detail. [5]
b) Write short note on 'Safety Precautions in tunneling'. [4]
c) Enlist advantages and disadvantages of tunnels. [4]
d) Why drainage is necessary in tunnel? Discuss various drainage systems for Tunnel. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1633

[Total No. of Pages : 2

[5926]-267

T.E. (Civil Engineering) (Honors)
ARCHITECTURE AND TOWN PLANNING
Urban Housing and Infrastructure Planning
(2019 Pattern) (Semester - I) (301401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4. Q.5 or Q.6 & Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.,*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of non-programmable scientific calculator is allowed.*

- Q1)** a) Explain the roles of Central Government, State Government and Urban Local Body in “National Urban Rental Housing Policy 2016”. [6]
- b) Explain any five objectives of National Housing Bank (NHB). [5]
- c) Enlist different housing policies in India and Explain any one in detail.[6]

OR

- Q2)** a) Draw the flow chart of Housing Demand Model and explain the various steps involve in it. [6]
- b) Write a note on “Housing and Urban Development Corporation Limited (HUDCO)”. [6]
- c) Write down in detail any five objectives of “National Urban Housing and Habitat Policy 2007”. [5]

- Q3)** a) Write down the norms and area requirement for healthcare facilities as per URDPFI guidelines. [6]
- b) Write a note on “Financial aspect for water supply system”. [6]
- c) What is the need of urban infrastructure? Enlist the types. [5]

OR

P.T.O.

- Q4)** a) Explain the norms and area requirement for preprimary to secondary education as per URDPFI guidelines. [6]
- b) Which data is required for provision and planning of storm water drainage system? Explain in detail. [6]
- c) Explain the various steps for planning and implementing septage management. [5]
- Q5)** a) Explain the different components storm water drainage system. [6]
- b) Elaborate cost recovery means for urban services. [5]
- c) Explain in detail the seven step approach in Municipal Solid Waste Management Plan. [7]

OR

- Q6)** a) Explain the different components of water supply system. [6]
- b) Explain the basic design consideration of sewerage and sewage treatment system. [6]
- c) Explain any 3 techniques to treat the solid waste generated in urban area. [6]
- Q7)** a) Write a note on “National Water Policy-2012”. [6]
- b) Explain in detail the norms for street lighting. [6]
- c) Enlist different categories of green space and its norms as per URDPFI guidelines. [6]

OR

- Q8)** a) Write a note on “National Urban Sanitation Policy-2008”. [6]
- b) Explain the duties of various stakeholders in solid waste management as per Solid waste Management Rules 2016. [7]
- c) Write a note on “norms for fire protection as per URDPFI guidelines. [5]



Total No. of Questions : 8]

SEAT No. :

PA-3179

[Total No. of Pages : 2

[5926]-268

HONORS/MINORS : T.E. (Printing Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester-I) (308211)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain the characteristics of sensors and actuators. [9]
b) Explain the LDR interfacing using Arduino Board. [9]

OR

- Q2)** a) Explain working and characteristics of any two types of sensors used in printing industry. [9]
b) Explain the servo-motor interfacing using Arduino Board. [9]

- Q3)** a) Explain the Wi-Fi Communication system and explain the FHSS and DSSS technique used in WiFi. [8]
b) Explain the pinouts of ESP8266. [9]

OR

- Q4)** a) Explain any two protocols used in IOT applications. [8]
b) Explain the following instructions: [9]
1. pinMode(LED_BUILTIN, OUTPUT);
2. servo_7.attach(7, 500, 2500)
3. digitalWrite(LED_BUILTIN, HIGH);
4. noTone(0)
5. Serial.println("hello world")
6. digitalRead(11);
7. analogRead(A0)
8. #include <Servo.h>
9. pinMode(6, OUTPUT)

P.T.O.

Q5) Describe benefits of cloud platform and explain Infrastructure As A Service and Platform As A Service (PAAS). **[18]**

OR

Q6) Describe the issues and challenges in IOT. **[18]**

Q7) Describe in detail about application of IOT in healthcare sector and smart city. **[17]**

OR

Q8) Explain the role of IOT implementation in Printing industry. **[17]**



Total No. of Questions : 8]

SEAT No. :

PA-1634

[Total No. of Pages : 2

[5926]-269

T.E. (Computer Engineering)

Honors : Artificial Intelligence and Machine

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - II) (310303)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Write a note on probability reasoning. [8]

b) Explain Bayesian inference using a suitable example. [9]

OR

Q2) a) Explain Unification algorithm with suitable example. [8]

b) Represent the following sentences into formulas in predicate logic.[9]

- i) Jonh likes all kinds of food.
- ii) Apples are food.
- iii) Chicken are food.
- iv) Anything anyone eats and isn't killed by is food.
- v) Bill eats peanuts and is still alive.
- vi) Sue eats everything Bill eats.

Q3) a) Explain linear regression. Find linear regression equation for the following two sets of data: [6]

X	Y
2	3
4	7
6	5
8	10

b) Explain how Decision Trees are used in Learning. [6]

c) Explain how support vector machines are used for classification with suitable example. [6]

P.T.O.

OR

Q4) a) Explain: [6]

- i) Supervised learning.
- ii) Unsupervised Learning.

b) Explain the architecture of Artificial Neural Network. [6]

c) What is Artificial Neural Network? Give two applications of artificial neural networks in detail. [6]

Q5) a) Write a note on [8]

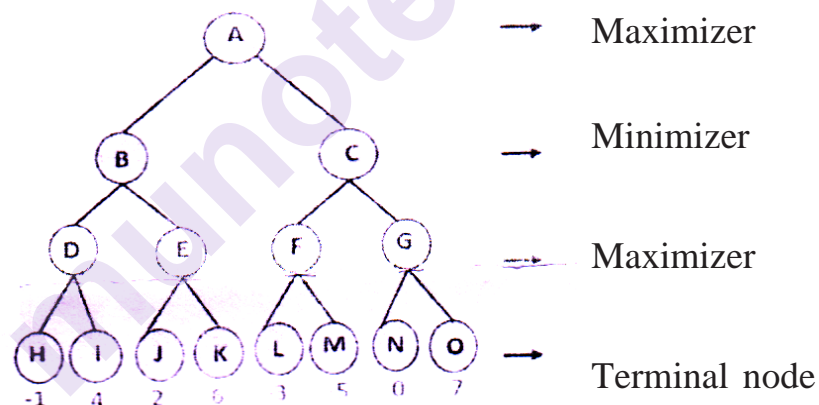
- i) State-of-the-art Game programs
- ii) Types of Games in AI.

b) Illustrate Mini-Max search for the tic-tac-toe game. [9]

OR

Q6) a) Explain Alpha-Beta Pruning with an example. [8]

b) Solve the given game tree using min max algorithm. [9]



Q7) a) Explain how sentiment analysis using Natural Language Processing techniques. [9]

b) What is NLP. Explain all five phases of NLP. [9]

OR

Q8) a) Explain general framework for computer vision applications. [9]

b) Explain forward chaining and backward chaining for a simple example. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1411

[Total No. of Pages : 2

[5926]-27

T.E. (Chemical Engg.)

CHEMICAL INDUSTRY MANAGEMENT

(2019 Pattern) (Semester - I) (Elective - I) (Theory) (309345 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain various functions of purchase manager. [8]
b) Explain the industrial purchasing process with quotation and comparative statement. [10]

OR

- Q2)** a) Explain in Inventory Control and importance of Economic Order Quantity (EOQ). [10]
b) Write a note on Principles of good lending. [8]

- Q3)** a) Describe why Market research is important. [8]
b) Explain in any two pricing strategies in detail with suitable example. [10]

OR

- Q4)** a) What is sales promotion? Explain sales promotion techniques. [10]
b) Explain the role of advertising in marketing along with it's advantages. [8]

P.T.O.

- Q5)** a) Write a explanatory note on International trade. [10]
b) Write a explanatory note on Patent and patent rights. [8]

OR

- Q6)** a) Explain the concept of Monopolies and Restrictive Trade Practices (MRTP) Act. [10]
b) Explain importance of Quality Management. [8]
- Q7)** a) Define and explain the objectives and procedure of work measurement. [8]
b) Explain the Classification of types of contracts. [8]

OR

- Q8)** a) Explain FERA in detail. [8]
b) Define work measurement. Explain the objectives and procedures of work measurement. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1635

[Total No. of Pages : 2

[5926]-270

T.E.

Cyber Security (Honor's /Minors)

ENTERPRISE ARCHITECTURE AND COMPONENTS

(2015 Pattern) (Semester - II) (310403)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Describe role of service registry and repository components in detail. [6]
- b) Describe key internal components of information delivery channels. [6]
- c) Define component & discuss various features of components. [6]

OR

- Q2)** a) Describe the component Mashup Hub. [6]
- b) Describe key external components of information delivery channels. [6]
- c) Describe multiple design points that need to be addressed by operational applications with examples. [6]

- Q3)** a) Describe operational model at logical level and physical level. [9]
- b) Discuss the context of operational model design techniques. [8]

OR

- Q4)** a) Describe the standards used for operational model relationship diagram in brief. [9]
- b) Describe encryption and data protection operational pattern. [8]

P.T.O.

- Q5) a)** What is metadata management? Describe metadata usage maturity levels. [9]
- b)** Elaborate with suitable diagram metadata management component model. [9]

OR

- Q6) a)** Discuss component interaction diagram with deployment scenario. [9]
- b)** Describe non-functional requirements and indicates their relevance in the metadata context. [9]

- Q7) a)** What is the goal of COBIT framework? List out it's principles. [9]
- b)** Explain the TOGAF lifecycle and how TOGAF framework can be used to create the projects [8]

OR

- Q8) a)** Write short note on SABSA, COBIT and TOGAF and their relationships. [9]
- b)** Describe SABSA framework layers. [8]



[5926]-271

T.E. (Computer Engineering) (Data Science)

(Honors/Minors)

STATISTICS AND MACHINE LEARNING

(2015 Pattern) (Semester-II) (310503)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

Q1) a) Explain eigen values and eigenvectors with example. [9]

b) Explain the concept of function and derivative with example. [9]

OR

Q2) a) Explain the chain rule with example. What is its significance. [9]

b) What is linear equation? How to represent the system of linear equation using matrices? [9]

Q3) a) Explore the use of machine learning in NetFlix and Youtube. [8]

b) Explain the role of machine learning in data science by using a suitable example. What is Reinforcement learning. [9]

OR

Q4) a) Explain with examples : [8]

i) Unsupervised learning

ii) Supervised learning.

b) How Reinforcement learning can be applicable in games. Explain with suitable example. [9]

P.T.O.

- Q5)** a) Define Regression and explain simple and multiple linear Regression in detail. [9]
- b) Explain the need of logistic Regression. Define Logit function and its relevance to sigmoid function. [9]

OR

- Q6)** a) Write short notes on [10]
- i) Polynomial Regression
- ii) Normalization in Linear Regression
- b) Consider the following example - [8]

<u>Bill</u>	<u>Tip</u>
34	5
108	17
64	11
88	8
99	14
51	5

construct line of equation (Note, Tip - dependent variable and Bill - Independent variable)

- Q7)** a) Briefly outline the major steps of decision free classification with terms entropy & Information gain. [9]
- b) Differentiate between classification and Regression trees. [4]
- c) What are advantages & disadvantages of Naive Bayes model. [4]

OR

- Q8)** a) State and explain naive Bayes theorem? [4]
- b) What are different types of Naive Bayes model? [4]
- c) What do you mean by entropy and information gain? Explain how to calculate with suitable steps. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1637

[Total No. of Pages : 2

[5926] - 272

T.E. (Computer Engineering) (Honors)
INTERNET OF THINGS ARCHITECTURES, PROTOCOLS AND
SYSTEMS PROGRAMMING
(2019 Pattern) (Semester - II) (310603)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Assume suitable data, if necessary.*
- 4) Use of Non-Programmable scientific calculators is allowed.*

- Q1)** a) Explain the working of DTLS. [6]
b) Explain in brief session layer protocols. [6]
c) Explain in detail CoAP. [5]

OR

- Q2)** a) Describe in brief transport layer protocols. [6]
b) Explain in detail DCCP. [6]
c) Describe in detail SCTP. [5]

- Q3)** a) Explain in detail vulnerabilities security requirements and threat analysis. [6]
b) What is IoT Security Tomography? Explain. [6]
c) Describe IoT layered attacker model in detail. [6]

OR

P.T.O.

- Q4)** a) Explain Identity Management and Establishment in detail. [6]
b) What are IoT Security Models? Explain in detail. [6]
c) Explain in brief IoT Security Protocols. [6]

- Q5)** a) Describe the components of Arduino. [6]
b) Describe the role of Web/Cloud Services for IoT development. [6]
c) Explain the use of APIs. [5]

OR

- Q6)** a) Describe the components of Raspberry Pi. [6]
b) Explain essential features of web APIs. [6]
c) Describe the components of Intel Galileo. [5]

- Q7)** a) Describe role of IoT for Smart Cities development. [6]
b) Describe the role of IoT for Industry. [6]
c) Describe the role of IoT for Health and Lifestyle. [6]

OR

- Q8)** a) Describe the role of IoT for Home Automation. [6]
b) Describe the role of IoT for Agriculture applications. [6]
c) Describe the role of IoT for Telecom/5G. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1638

[Total No. of Pages : 2

[5926]-273

Honors/Minors : T.E. (Computer Engineering)

AUGMENTED REALITY

(2019 Pattern) (Semester - II) (310703)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the different characteristics of tracking technology? [9]

b) What are multiple cameras infrared tracking in AR? [8]

OR

Q2) a) What are major software components for augmented reality systems?[9]

b) Explain outdoor tracking in details. [8]

Q3) a) Explain Marker detection procedure. [6]

b) Explain in detail types of Markers in Marker based tracking. [12]

OR

Q4) a) What do you mean by Model based tracking? [6]

b) Explain Feature based tracking method used in Augmented Reality. [12]

Q5) a) Explain optical see through and video see through devices. [8]

b) Explain different components of Augmented Reality. [10]

OR

Q6) a) Explain the term Virtual Retinal Systems. [8]

b) Explain Augmented Reality based on Projection systems. [10]

P.T.O.

- Q7)** a) How does Mixed Reality works? [10]
b) Explain different input and output in Mixed Reality. [7]

OR

- Q8)** a) Explain in detail working principle of SLAM. [10]
b) Explain any three applications of Mixed Reality in detail. [7]



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Total No. of Questions : 8]

SEAT No. :

PA-1639

[Total No. of Pages : 2

[5926]-274

T.E. (Mechanical Engineering)

(Honors/Minors)

MODEL BASED SYSTEMS ENGINEERING

(2019 Pattern) (Semester - II) (302043MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Assume suitable data, if necessary.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.

Q1) a) With neat sketch explain the structural features and Behavioral features of a block. [9]

b) Explain the concept of SysML diagrams. [9]

OR

Q2) a) Explain any two feature that is available in a block. [9]

b) Differentiate between Diagram and Model with example. [9]

Q3) a) With a neat sketch explain the basic structure of OOSEM. [9]

b) Demonstrate the purpose of XML and UXF. [8]

OR

Q4) a) List out the various steps in system engineering process. [9]

b) Explain the MBSE Methodology with a neat sketch. [8]

P.T.O.

- Q5)** a) Write down the difference between Modeling tool and diagramming tool. [9]
b) Explain the viewpoint relationship in brief. [9]

OR

- Q6)** a) Draw a V-model explain the various steps with an example. [9]
b) Describe Process properties and problems associated with Process. [9]
- Q7)** a) Explain the Requirement concept with a neat sketch of Simple taxonomy for types of requirement. [8]
b) What is the purpose of Requirement Validation? Elaborate on the different types of checks carried out on the requirements in the requirements document. [9]

OR

- Q8)** a) List and explain with a diagram the main views of Approach to Context - based Requirements Engineering (ACRE). [8]
b) Write short notes on the 'Requirement Description' concept along with the uses. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1640

[Total No. of Pages : 2

[5926]-275

T.E. (Mechanical)

(Honors/Minors)

ENERGY EFFICIENCY IN THERMAL UTILITIES

(2019 Pattern) (Semester - II) (302023MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data necessary.

Q1) a) List the types of steam trap and explain thermodynamic steam trap. [10]

b) Explain steam distribution system with neat sketch. [8]

OR

Q2) a) Explain energy saving opportunities in the steam distribution system. [10]

b) What is steam trap? Explain inverted bucket steam trap. [8]

Q3) a) Define efficiency of furnace and explain why efficiency of furnace is lower than boiler efficiency. State measures to improve the efficiency of furnace. [10]

b) A furnace output is 5000 kg/hour of billets. Thermal efficiency is claimed to be 25%. Specific heat of billet is 0.12 kcal/kg°C. Billets enter the furnace at 40°C and leave at 1200°C. Calculate the hourly oil consumption in liter if GCV of oil is 9200 kcal/liter. [7]

OR

Q4) a) What is refractory? Discuss properties of the refractory used in furnace. [10]

b) Explain the need of high emissivity coating in furnace. [7]

P.T.O.

- Q5)** a) Explain steam turbine and gas turbine cogeneration system with schematic diagram. [10]
b) List down all the Important Technical Parameters for Cogeneration plant. [8]

OR

- Q6)** a) Give classification of cogeneration system. Explain Topping cycle cogeneration system with schematic diagram. [10]
b) Explain Tri-generation with suitable schematic diagram. [8]

- Q7)** a) What are the different waste heat sources? Explain in brief. [7]
b) Classify waste heat recovery systems. Explain recuperators as a waste heat recovery device. [10]

OR

- Q8)** a) Explain the significance of LMTD in the performance analysis of heat exchangers. [7]
b) What is heat pipe? Explain the working of heat pipe with schematic diagram. [10]

Total No. of Questions : 8]

SEAT No. :

PA-1641

[Total No. of Pages : 2

[5926]-276

T.E. (Mechanical/Automobile)

(HONORS/MINORS)

ELECTRIC VEHICLE SYSTEM DESIGN

(2019 Pattern) (Semester - II) (302033MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw the neat sketch wherever necessary.*

- Q1)** a) What do you mean by breaks in automobiles? Explain with its functions and requirements? [4]
- b) Classify the breaks used in automobiles on basis of, [8]
- i) The Purpose
 - ii) The Construction
 - iii) Power Source
- c) List out different types of wheels and explain suitable type used in electric vehicle with its important features? [8]

OR

- Q2)** a) Differentiate between tube and tubeless tires along with neat sketch and its working and important features? [4]
- b) Define regenerative breaking with its Advantages and Disadvantages. [8]
- c) What is tire in automobiles? Explain with its features and basic types? [8]
- Q3)** a) What is importance of gear design in automobiles? Explain the Gear material technology with high bending fatigue strength and tooth surface fatigue strength? [8]
- b) What is the significance of transmission system in automobiles? Explain any one type of Electric Vehicle Transmission with neat sketch. [8]

P.T.O.

OR

Q4) a) What is the concept of differential system in electric vehicles? Explain any one type in detail? [8]

b) List out the parts of Transmission System? Explain any one of its design in detail? [8]

Q5) a) What do you mean by battery layout? Explain li-ion battery layout with neat sketch? [8]

b) Explain Vent Management System for electric vehicles with its important features. [8]

OR

Q6) a) Explain different modes of li-ion battery Pack Cooling System. [8]

b) List out any four battery performance parameters for electric vehicles? [8]

Q7) a) Explain Ergonomics based Roll-cage/Frame design with neat sketches? [10]

b) Explain Structural Design aspect of Roll-cage/Body-Frame? [8]

OR

Q8) a) Explain the importance and process involved in Impact/Crash Analysis. [8]

b) What do you mean by vehicle dynamics? Explain the components of vehicle dynamics with? [10]



Total No. of Questions : 8]

SEAT No. :

PA-1642

[Total No. of Pages : 2

[5926]-277

T.E. (Mechanical Engineering)
3D PRINTING (Honors/Minors)
Design For Additive Manufacturing
(2019 Pattern) (302013MJ) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8*
- 2) *Neat Diagrams must be drawn wherever necessary*
- 3) *Use of Non Programmable Scientific calculators is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Why anisotropy is an important problem for AM? Which plastic AM processes show anisotropic effects to what extend? **[9]**

b) What kind of defects generated in AM system? How to rectify them? Discuss in detail. **[8]**

OR

Q2) a) What are the limitations of AM system? Explain in detail. **[5]**

b) Discuss the various models for monitoring and control of defects in AM system. **[6]**

c) Enlist various AM technologies? Explain how to select AM technologies using decision methods. **[6]**

Q3) a) Write short note on : **[9]**

i) Sanding treatment

ii) Support Removal in AM

iii) Polishing Treatment.

b) Classify and Explain the types of slicing in AM. **[9]**

OR

Q4) a) Explain Hot Isostatic Pressing with neat sketch. **[6]**

b) What is slicing & why is it important in AM? **[6]**

c) Explain the importance of heal treatment in AM. **[6]**

P.T.O.

- Q5) a)** What is role of CAD in additive manufacturing? Discuss challenges faced during 3D model creation. [9]
- b)** What are ISO and ASTM standards? Explain ISO and ASTM standards for Additive Manufacturing. [8]

OR

- Q6) a)** Discuss various infill structure techniques in detail. [5]
- b)** Write short note on Continuum and Discrete Element Methods. [6]
- c)** What is topology optimization? Explain the benefits of topology optimization in additive manufacturing. [6]

- Q7) a)** What is 3D scanning process? Classify and Explain the types of 3D scanners. [9]
- b)** Explain the significance of Reverse engineering in Biomedical Engineering, Product Development and Manufacturing. [9]

OR

- Q8) a)** What is the relationship between Reverse Engineering and Rapid Prototyping for Layer-based Model generation. [6]
- b)** Classify and Explain the types of measuring devices used in reverse engineering. [6]
- c)** Explain data handling and reduction process in AM. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1643

[Total No. of Pages : 2

[5926]-278

T.E. (E & TC)

HONORS/MINORS

ROBOT PROGRAMMING & SIMULATION

(2019 Pattern) (Semester - II) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Using VAL language, discuss the basic commands used for motion control and program control for robot. [8]
- b) Briefly explain the production rate calculations used for robot in detail. [5]
- c) Explain different conditional statements used in VAL-II programming language. [5]

OR

- Q2)** a) Explain WAIT, SIGNAL and DELAY command for communication of robot. [8]
- b) Explain the basic commands used in VAL-II programming language. [5]
- c) With schematic diagram, explain the robotic applications in welding industry. [5]

- Q3)** a) With suitable example explain different constants and variables used in AML Language of robot. [8]
- b) Discuss the different motion instructions used in Robot. [5]
- c) Describe data processing in details. [5]

P.T.O.

OR

- Q4)** a) Describe the different Motion & Sensor commands of AML language of robot. [8]
b) With suitable example explain different program control statements are used in AML language of robot. [5]
c) Describe pick and place operation using industrial robot. [5]
- Q5)** a) Discuss the concept of soft robotics? Explain Robotic Process Automation in details. [8]
b) Explain the concept of Collision detection in details. [5]
c) Write short note on Virtual robotics. [4]

OR

- Q6)** a) Explain the following terms in details. [8]
i) Repeatability measurement of robot
ii) Robot economics.
b) Discuss Robot studio online software in details. [5]
c) Write short note on AR & VR in Robotics. [4]
- Q7)** a) What are the basics of simulation? Discuss different steps in simulation. [8]
b) Explain the classification of simulation software in details. [5]
c) Write short note on Analog and Hybrid simulation in details. [4]

OR

- Q8)** a) Discuss different techniques of simulation? Explain Monte Carlo method in details. [8]
b) Explain distributed lag models in details. [5]
c) Write Advantages and disadvantages of simulation. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1644

[Total No. of Pages : 2

[5926]-279

T.E. (E&TC)

DECENTRALIZE & BLOCKCHAIN TECHNOLOGIES

Honors : Block Chain Technology

(2019 Pattern) (Semester - II) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain the components of Blockchain Ecosystem? [6]
b) What are Merkle trees? How important are Merkle trees in Blockchains? [6]
c) What is meant by encryption? What is its role in Blockchain explain in detail. [6]

OR

- Q2)** a) Explain the RSA algorithm. How secure is this algorithm? [6]
b) State and Explain the difference between proof-of-work & proof-of-stake? [6]
c) Enlist some of the popular consensus algorithms? Why we need different consensus mechanisms? Explain any one in detail. [6]

- Q3)** a) What are the differences between Blockchain distributed ledger and traditional ledger? [6]
b) What is cryptography? What is its role Blockchain? [6]
c) What are the differences between blockchain and database? [6]

OR

P.T.O.

- Q4)** a) What are the key principles in Blockchain that are helpful in eliminating the security threats that needs to be followed? Explain any one in detail. [6]
- b) What is the difference between Ethereum and Bitcoin? [6]
- c) What is a ledger? Explain the common type of ledgers that can be considered by users in Blockchain? [6]

- Q5)** a) Explain the procedure to handle the risk management when it comes to securing the transactions records? [8]
- b) State and explain the difference between proof - of - work & proof-of-stake? [9]

OR

- Q6)** a) Explain in detail the steps that are involved in the Blockchain project implementation. [8]
- b) What advantages does blockchain have over other security tools? [9]

- Q7)** a) Explain a real life use case where Blockchain is being used? Also explain How Blockchain solves the problem. [8]
- b) List the limitations of block chain. What are the limitations of blockchain? Explain Consensus Mechanism. [9]

OR

- Q8)** a) What are other blockchain use cases? Explain any one in detail. [8]
- b) Explain the different types of Blockchain networks. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1412

[Total No. of Pages : 2

[5926]-28

T.E. (Chemical)

FOOD TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (309345 B) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of logarithmic tables, slide rule, Moillier charts, electronic pocket calculator and steam table is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Discuss about natural and ventilated low temperature storage methods of fruit and vegetable. [8]
- b) Write short notes on preservation of fruits and vegetables by [8]
- i) Chemicals
 - ii) Salt

OR

- Q2)** a) Explain glass containers seaming technology for canning of fruits and vegetables. [8]
- b) Write a Short note on Fruit and vegetable juices. [8]
- Q3)** a) Discuss about various unit operations involved in food engineering processing of food grains. [10]
- b) Explain applications and effect on food materials for freezing. [8]

OR

- Q4)** Write Short Notes on [18]
- a) Evaporation extrusion theory and equipment's.
 - b) Hot air dehydration theory and equipment's.
 - c) Baking theory and equipment's.

P.T.O.

Q5) Describe following techniques of foodstuff. [18]

- a) Packaging methods for prevention of food stuff.
- b) Shelf life of packaged foodstuff.

OR

Q6) a) Write short notes on: [10]

- i) Food packages in bags and crates.
- ii) Food packages in pouches and wrappers.
- b) Explain flexible packaging materials and their properties. [8]

Q7) a) Describe Objectives, importance and functions of quality control of food. [9]

- b) Explain quality assessment of food materials in fruits and vegetables. [9]

OR

Q8) a) Write short note on Food regulations, grades and standards. [9]

- b) Explain concept of USFDA/ISO 9000 in food quality assurance. [9]

Total No. of Questions : 8]

SEAT No. :

PA-1645

[Total No. of Pages : 2

[5926]-280

T.E. (Civil)

(Honors/Minors)

**PLANNING & QUANTITY ESTIMATION FOR METRO
CONSTRUCTION**

(2019 Pattern) (Semester-II) (301303)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*
- 5) *Use of cell phone is prohibited in the examination hall.*
- 6) *Use of electronic pocket calculator is allowed.*

- Q1)** a) Explain the main purpose of land acquisition under the Right to fair compensation Act 2013 (Explain in Brief)? [4]
- b) Explain the important features of the new Land Acquisition Act 2013? [5]
- c) Define how do you calculate compensation under Land Acquisition Act 2013? [4]
- d) Explain merits and demerits of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (New Act)? [5]

OR

- Q2)** a) Explain the rules for land acquisition? [5]
- b) Explain the benefits of land acquisition? [5]
- c) Explain 3G and 3H in land acquisition? [4]
- d) Explain the types of Land acquisition? [4]

- Q3)** a) Prepare detailed estimate of Elevated section (viaduct). [10]
- b) Explain the steps involved in construction of Underground section by Cut and Cover. [7]

OR

P.T.O.

- Q4)** a) Prepare detailed estimate of Underground station (Civil work). [10]
b) Explain steps involved in construction of Elevated station (E&M work including lift and escalator). [7]

- Q5)** a) Define which factors are influencing the investment decision? [6]
b) Enlist capital budgeting techniques and explain any 2 in brief. [6]
c) Explain cost of capital and its implications in budgeting decisions. [6]

OR

- Q6)** a) Define the concept of cost of capital. State how you would determine the weighted average cost of capital of firm. [6]
b) Explain Risk identification techniques? [6]
c) Distinguish between Internal Rate of Return and Net Present Value techniques. Which method would you recommend for evaluating investment? Explain. [6]

- Q7)** a) Explain Financial Support for PPPs in Infrastructure. [7]
b) Explain types of contract documents used for construction. [5]
c) Explain Construction Contract Specifications? [5]

OR

- Q8)** a) Describe types of Construction Contract Specifications. [7]
b) Write a short note on any two. [10]
i) BOT
2) BOOT
3) EPC contracts
4) Factors that influence procurement strategy selection



Total No. of Questions : 8]

SEAT No. :

PA-1646

[Total No. of Pages : 2

[5926] - 281

T.E. (Civil) (Honors/Minors)

SUSTAINABLE ARCHITECTURE AND LANDSCAPE DESIGN

Honors in Architecture & Town Planning

(2019 Pattern) (Semester - II) (301403)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if required.*

- Q1)** a) Write a note smart city. [6]
b) Write a note on green residential cluster. [6]
c) How existing water bodies are developed for benefitting adjoining area? [5]

OR

- Q2)** a) What is a green building? Enlist the concepts observed in green building. [6]
b) Explain the need of green belt and its outcome. [6]
c) What is the role of urban planner in sustainable planning? [5]

- Q3)** a) Enlist the principles of landscaping and elaborate any one with sketch. [6]
b) What is the need of landscape assessment and its use in planning? [6]
c) Write a note on : Environmental factors in landscaping. [5]

OR

P.T.O.

- Q4)** a) What is geomorphology and its significance in landscaping? [6]
b) What is the need of drainage in landscaping? [6]
c) Enlist types of landscaping and elaborate any one type of landscaping. [5]

- Q5)** a) What are different purposes and concerns of landscape? [6]
b) Enlist impacts of landscaping on environment and elaborate any one. [6]
c) Mention the components of landscape architecture and explain any one. [6]

OR

- Q6)** a) Enlist the factors affecting landscaping and elaborate any one. [6]
b) Elaborate, “How to plan landscape area”? [6]
c) What is meant by a green roof? How it is beneficial? [6]

- Q7)** a) In what way landscape is developed in rural area? [6]
b) Elaborate the concept of “industrialized areas as landscape” and treatment to be offered. [6]
c) Write a note on coastal area as a type of landscape. [6]

OR

- Q8)** a) In what way landscape is developed in urban area? [6]
b) Elaborate the means of improving landscape of existing road. [6]
c) Write a note on desert area as a type of landscape. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1647

[Total No. of Pages : 2

[5926]-282

T.E. (Instrumentation Engineering)
ANALYTICAL INSTRUMENTATION (Elective - II D)
(2019 Pattern) (Semester - II) (306271D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of calculator is allowed.*
- 5) Assume suitable data if necessary.*

- Q1)** a) List the detectors used in GC. Explain any one with neat diagram. [9]
- b) State the basic function of column in HPLC. List and explain types of columns in HPLC. [9]

OR

- Q2)** a) Explain gas chromatography with neat block diagram. Also draw the response of detector. [9]
- b) Explain construction and working of HPLC with neat diagram. [9]

- Q3)** a) List the instruments for pollution monitoring. Explain any one with suitable diagram. [9]
- b) Explain the instrumentation to analyze H₂S with neat diagram. [8]

OR

- Q4)** a) Explain instrumentation for measurement of turbidity level in water. [9]
- b) Explain oxygen analyzer with neat diagram. [8]

P.T.O.

- Q5)** a) State working principle of mass spectrometer. Explain quadrupole mass spectrometer with neat diagram. [10]
- b) List different membrane separation process. Explain any two of them. [8]

OR

- Q6)** a) Explain time of flight mass spectrometer with neat diagram. List the detectors used in mass spectrometry. [10]
- b) Explain microfiltration and ultrafiltration process with neat diagrams. [8]

- Q7)** a) Explain the block diagram of gamma spectrometry. [9]
- b) Explain Scintillation counter with neat diagram. [8]

OR

- Q8)** a) Explain GM counter tube with neat diagram. [9]
- b) State any 4 differences between GM counter and scintillation counter. State the applications of radiation measurement. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1413

[Total No. of Pages : 2

[5926]-29
T.E. (Chemical)
POLYMER ENGINEERING
(2019 Pattern) (Semester - I) (309345 C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the different methods of determination of Molecular weight. [6]
- b) Describe the physical properties of polymers and its significance. [6]
- c) Write a short note on the following terms: [6]
- i) Glass Transition Temperature
 - ii) Polymer Crystallinity
 - iii) Factors Affecting on the Glass Transition Temperature.

OR

- Q2)** a) Determine the molecular weight of a polystyrene sample which has an a value of 0.60, a K value of 1.6×10^{-4} dL/g, and a limiting viscosity number or intrinsic viscosity of 0.04 dL/g. [6]
- b) What is molecular weight? Describe the effect of molecular weight on engineering properties of polymers? [6]
- c) Define the following terms and their significance in molecular weight of polymers. [6]
- i) M_n
 - ii) M_w
 - iii) M_v

P.T.O.

- Q3)** a) Explain kinetic of step growth polymerization with example and its influence on polymers. [6]
b) Write a short note on copolymerization and its applications. [5]
c) Describe the copolymers & its kinetics coordination polymerization. [6]

OR

- Q4)** a) What is polymerization? Explain the kinetics of step growth polymerization. [10]
b) Write the differences between thermoplastics and thermosetting polymers. [7]
- Q5)** a) Write a short on the following terms: [10]
i) Fillers
ii) Plasticizers
iii) Lubricants
iv) Colourants
v) UV stabilizers
b) Write the difference between the fire retardants and antioxidants. [8]

OR

- Q6)** a) Describe the Fillers, Plasticizers, Lubricants, and UV stabilizers. [8]
b) Describe the different moulding methods of polymers with neat sketch. [10]
- Q7)** a) Explain the classification of thermosetting polymers. Write the comparisons between thermosetting polymers and thermoplastics. [7]
b) Describe the properties and application of natural rubber, SBR, Vinyl esters, Butyl Silicons, Thiokol. [10]

OR

- Q8)** a) Write short note on Epoxy resins and its applications. [4]
b) What are the differences between natural and synthetic polymers? [3]
c) Explain the pressure-less processing techniques for polymer synthesis. [10]



Total No. of Questions : 8]

SEAT No. :

PA-1414

[Total No. of Pages : 2

[5926]-30

T.E. (Chemical)

DOWNSTREAM PROCESSING

(2019 Pattern) (Semester - I) (309345D) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is Cryogenic distillation for refinery? Explain in details with suitable examples. [10]

b) Give advantages and disadvantages of Cryogenic distillation. [8]

OR

Q2) a) Explain in details with suitable examples azeotropic distillation. [10]

b) Give advantages and disadvantages of extractive distillation. [8]

Q3) a) Explain in details about pressure swing distillation. [10]

b) Explain in details with suitable examples homogeneous azeotropic distillation. [7]

OR

Q4) a) Explain in details hydrogel process with suitable application. [10]

b) Give the properties of catalyst and advantages of catalyst. [7]

Q5) a) What is adsorption? Explain in details with suitable sketches about break through curves. [10]

b) Give the name of natural adsorbents and its application in separation processes. [8]

OR

P.T.O.

Q6) a) Explain in details about any one process of energy conservation separation. [10]

b) What is role of catalyst in chemical reaction, Gives the uses of catalyst. [8]

Q7) a) Explain in details about Separations process synthesis for nonazeotropic mixtures. [10]

b) Define Capacity, selectivity and regeneration. [7]

OR

Q8) a) Explain in details with neat sketches separation synthesis algorithm. [10]

b) Explain in details about hydrogel process with suitable examples. [7]

Total No. of Questions : 8]

SEAT No. :

PA-1415

[Total No. of Pages : 2

[5926]-31

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING

(2019 Pattern) (Semester-II) (309348)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Derive performance equation for mixed flow reactor. [12]

- b) In an isothermal batch reactor, the conversion of liquid reactant A achieved in 13 min 70% .Find space time to effect this conversion in PER considering first order kinetics. [6]

OR

Q2) a) Derive performance equation for plug flow reactor and represent the graphs of plug flow reactor for general case and constant density system. [12]

- b) Explain the terms space time and space velocity and state their units. [6]

Q3) a) Explain various types of multiple reactions with suitable examples. [12]

- b) Derive the relationship for C_{Rf} in terms of ψ for plug flow reactor in case of parallel reaction. [5]

OR

Q4) a) Explain the terms used to characterize parallel reactions. [12]

- b) Reactant A in liquid phase reacts to produce R and S by the parallel reaction. Both reactions are of first order. A feed with $C_{A0}=1$, $C_{R0}=0$ and $C_{S0}=0$ enters in two mixed flow reactors in series ($\tau_1=2$ min and $\tau_2=5$ min). The composition within the first reactor is $C_{A1}=0.4$, $C_{R1}=0.4$ and $C_{S1}=0.2$. Find the composition of the exit stream from the second reactor. [5]

P.T.O.

- Q5)** a) Explain effect of temperature on heat of reaction. [12]
b) Explain the concept of chemical equilibrium with characteristics. [6]

OR

- Q6)** a) Explain heat of reaction from thermodynamics. [12]
b) Discuss the Van't Hoff isotherm equation. [6]

- Q7)** A reactor with dividing baffles is to be used to carry the reaction $A \rightarrow R$ $-r_A = 0.05 C_A \text{ mol/(L min)}$, Pulse test results are? [17]

T,min	0	10	20	30	40	50	60	70
C	35	38	40	40	39	37	36	35

Calculate the conversion

- i) Assuming plug flow.
ii) Assuming the tanks-in-series

OR

- Q8)** a) Explain relationship between E, F and C curves. [9]
b) Explain the concept of RTD in detail. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1416

[Total No. of Pages : 3

[5926]-32

T.E. (Chemical)

MASS TRANSFER - II

(2019 Pattern) (Semester - II) (309349)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Write a material balance for single stage solvent Extraction with immiscible solvents with graphical representation of equilibrium characteristics. **[8]**

- b) A solution containing 5% acetaldehyde and 95% Toluene is to be extracted with water in five stage crosscurrent extraction to extract Acetaldehyde. Toluene and water are essentially immiscible. 25 kg of water is used per 100 kg of feed each time. Calculate the amount of Acetaldehyde extracted and the final concentration of the exit solution. **[10]**

The equilibrium is $Y = 2.20 X$

Where $Y = \text{kg of Acetaldehyde/kg of water}$

$X = \text{kg of nicotine/kg of Toluene}$

OR

Q2) a) Explain Binodal Solubility Curve with triangular diagram in solvent Extraction. **[8]**

- b) Nicotine (C) in a water (A) solution containing 1 % nicotine is to be extracted with kerosene (B) at 293 K (20°C). Water and kerosene are essentially insoluble. 100 kg of a feed solution is to be treated with kerosene in three-stage cross current extraction system using equal quantity of solvent each time. If nicotine removed is 66.3 % of that in feed determine the quantity of solvent used for each stage. **[10]**

P.T.O.

Equilibrium data are as follows:

X = kg Nocotine/kg water	0	0.00101	0.00246	0.00502	0.00751	0.00998	0.0204
X = kg Nocotine/kg kerosene	0	0.00807	0.00196	0.00456	0.00686	0.00913	0.0187

Q3) a) Crushed oil seeds containing 55 % oil by weight are to be extracted at a rate of 4000 kg/h using 6000 kg/h of Hexane containing 5% by weight as a solvent in a countercurrent two stage Extraction system. The oil seeds retain 1 kg of solution per kg of oil- free cake. Calculate the percentage of oil recovery based on the original feed obtained under the above conditions. **[10]**

b) Explain applications of leaching and the factors affecting the rate of leaching. **[7]**

OR

Q4) a) Write the material balance for the single stage leaching operation assuming variable underflow and no insoluble in the overflow with graphical representation. **[7]**

b) Explain the construction and mechanism of Boliman (Basket) Extractor for leaching operation with neat diagram. **[10]**

Q5) a) Explain the characteristics of adsorbents and mention different types of adsorbents with their specific applications. **[8]**

b) Discuss on the principle, equilibria and rate of ion Exchange process in details. **[10]**

OR

Q6) a) Describe the adsorption Isotherms in adsorption operation. Explain the Breakthrough Curve in detail giving its significance and mention the factors affecting the shape. **[10]**

b) Explain Pressure Swing Adsorption and Temperature Swing Adsorption with their applications. **[8]**

Q7) a) Give classification of membrane processes. What are different membrane modules? [7]

b) Crystallizer is charged with 7500 kg of an aqueous solution at 377K. Anhydrous sodium sulphate is 29.6% by weight in the feed. The solution is cooled in the cooling stage, and 5% of water is lost by evaporation. As a result, crystals of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystallize out. Calculate the yield of the crystals and the quantity of mother liquor is found to contain 18.3% by weight anhydrous Na_2SO_4 . Data: Molecular weight of $\text{Na}_2\text{SO}_4 = 142$. [10]

OR

Q8) a) Elaborate the Factors affecting the rate of crystallization and the Classification of Crystallizers based on applications. [10]

b) Explain the construction and working of Swenson Walker Crystallizer with diagram. [7]

x x x

Total No. of Questions : 8]

SEAT No. :

PA-1417

[Total No. of Pages : 2

[5926]-33

T.E. (Chemical)

TRANSPORT PHENOMENA

(2019 Pattern) (Semester - II) (309350)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Derive the expression of molar flux, concentration profile and average concentration for diffusion with homogeneous chemical reaction. [12]
- b) Diffusivity of gas-pair oxygen-carbon tetrachloride is determined by observing steady state evaporation of carbon tetrachloride. The distance between CCl_4 liquid level and top of tube is 17.1 cm. The total pressure on the system is 755 mm Hg and temperature is 0°C . Vapor pressure of CCl_4 at this temperature is 33 mm Hg. Cross-sectional area of tube is 0.82 cm^2 . If it is found that 0.0208 cm^3 of CCl_4 evaporate in 10-hour period, what is diffusivity of gas-pair $\text{CCl}_4\text{--O}_2$? (Density of $\text{CCl}_4 = 1.59\text{ g/cm}^3$) [6]

OR

- Q2)** a) Consider a natural gas mixture contained in a pyrex tube with radius as R_1 and R_2 . Obtain an expression for the rate at which helium will leak through the tube. [12]
- b) Explain stepwise procedure to solve mass transfer problems. [6]
- Q3)** a) Use Navier Stoke's equation of motion to derive Hagen Poiseuille equation. [12]
- b) What do you mean by partial time derivative, total time derivative and substantial time derivative? [5]

OR

P.T.O.

- Q4) a)** Derive Newton's second law of motion. [12]
b) What do you mean by equation of change for isothermal system? [5]

- Q5) a)** Derive Blake Kozeny equation for laminar flow of fluid through packed bed. [12]
b) Derive expression for friction factor and Reynold number for laminar flow through fluid through pipe. [6]

OR

- Q6) a)** Derive Burke Plummer equation for turbulent flow of fluid through packed bed. [12]
b) Explain macroscopic mass balance equation. [6]

- Q7) a)** Explain Martinnelli's analogy. [9]
b) Explain Reynold analogy. [8]

OR

- Q8) a)** Explain Chilton and Colburn analogy. [9]
b) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate instantaneous rate of evaporation from the drop if drop surface is at 21°C and air at 60° C. Vapor pressure of water at 21°C is 0.0247atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3} \text{ mol s}^{-1} \text{ cm}^{-2}$. [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PA-1418

[5926]- 34

[Total No. of Pages : 2

T.E. (Chemical)

ENERGY CONSERVATION IN CHEMICAL PROCESS INDUSTRIES
(2019 Pattern) (Elective- II A)(Semester - II) (309351 A)

Time :2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) Discuss the importance of nuclear option for power generation in India?[18]

OR

Q2) Explain in detail methodology for forecasting industrial energy supply and demand. [18]

- Q3)** a) Write in details elements of energy management program. [9]
b) Enlist activities for promoting energy conservation in present status. [8]

OR

Q4) Explain in detail about plant level organization, division level organization, corporate level organization. [17]

- Q5)** a) Draw the sketch of Evaporators and explain its principle and working.[9]
b) Explain Waste-Minimization and Resource Conservation. [9]

OR

P.T.O.

- Q6)** a) Draw the sketch of heat pump and explain its principle and working. [9]
b) Enlist the checklist for energy conservation in lighting system. [9]

Q7) Enlist the energy consuming units in Sugar Industry and discuss how energy can be conserved? [17]

OR

Q8) Explain waste minimization and its classification, housekeeping, process change, recycling, product modification, waste minimization methodology steps, benefits of waste minimization in petroleum industry. [17]



Total No. of Questions : 8]

SEAT No. :

PA-1419

[Total No. of Pages : 2

[5926]-35

T.E. (Chemical)

PROCESS INSTRUMENTATION & CONTROL
(2019 Pattern) (Semester - II) (Elective-II) (309351 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain with diagram, construction, working and calibration of pressure sensor using dead weight tester. [8]

b) What are transducers? Explain types of transducers. [8]

OR

Q2) a) What are different types of manometers? With neat sketch explain well manometer. [8]

b) Explain classification of Pressure measuring instruments. [8]

Q3) a) Explain with diagram, construction and working of ultrasonic level measurement method. [9]

b) Explain with diagram, construction, working sight or gauge glass method.[9]

OR

Q4) a) Explain with diagram, construction and working of Orifice meter with its industrial application. [10]

b) Explain classification of flow measuring instruments. [8]

Q5) a) Describe with neat diagram the following techniques of composition analysis. [18]

- i) Ultraviolet Absorption Spectroscopy
- ii) IR absorption spectroscopy

OR

P.T.O.

- Q6) a)** Write short notes on : [10]
i) pH meter
ii) Refractometry
b) Explain principle with diagram, construction, working of HPLC. [8]

- Q7) a)** Derive the transfer function of mercury in glass thermometer and find the dynamic behavior for step change in input. [9]
b) Give classification of process variable with respect to process control.[9]

OR

- Q8) a)** Explain with equation, different control actions. [9]
b) What are servo and regulatory operation? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1420

[Total No. of Pages : 2

[5926]-36

T.E. (Chemical Engg.)

CORROSION ENGINEERING (Elective-II)

(2019 Pattern) (Semester - II) (309351C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail about dezincification. [2]
b) Explain in detail about pitting corrosion and method to prevent pitting corrosion. [8]
c) Discuss Remedial measure for dezincification and intergranular corrosion. [8]

OR

- Q2)** a) What is uniform attack, explain in detail? [5]
b) Explain in detail about pitting corrosion and dezincification. [8]
c) What is stress corrosion cracking? Explain in detail. [5]

- Q3)** a) Explain the concept in detail about explains Pilling-Bedworth Ratio. [5]
b) Explain in detail about Mechanisms of Oxidation. [6]
c) Explain in detail about Corrosion of iron and steel. [6]

OR

- Q4)** a) Explain the concept in detail about High temperature oxidation. [6]
b) Write a short note on : [8]
i) Mechanisms of Oxidation
ii) Corrosion of iron and steel
c) What is Corrosion? [3]

- Q5)** a) Explain Different types of Corrosion and Preventive method for it. [10]
b) What is Coating? Explain with Example. [8]

OR

P.T.O.

Q6) Write short note on :

[18]

- a) Heat treatment
- b) Anodic protection
- c) Passivity

Q7) a) Explain the Method to Prevent Galvanic Corrosion.

[7]

- b) Explain in detail about Modification technique for material, also suggest required heat treatment to avoid corrosion. Justify your answer with proper example.

[10]

OR

Q8) a) Explain the Modification required in Material to prevent Corrosion.

[10]

- b) Explain in Detail about reaction occurred in corrosion, with example.

[7]



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Total No. of Questions : 8]

SEAT No. :

PA-1421

[Total No. of Pages : 1

[5926]-37

T.E. (Chemical)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (Elective-II)
(2019 Pattern) (Semester - II) (309351D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) Discuss adaptive and learning process in detail **[18]**

OR

Q2) Explain in detail Fuzzy logic and genetic algorithms. **[18]**

Q3) Define expert system and explain in detail characteristics, limitations, advantages, disadvantages and application of expert system. **[17]**

OR

Q4) Explain in detail tools and techniques of expert system. **[17]**

Q5) a) Discuss the difference between first order and second order logic with examples. **[9]**

b) Explain deductive retrieval and backward chaining in detail. **[9]**

OR

Q6) a) Discuss the role of reasoning in knowledge-based systems. **[9]**

b) Explain logic and inference in detail. **[9]**

Q7) a) Explain the concept of problem decomposition with help goal trees. **[9]**

b) Discuss rule based expert systems with example. **[8]**

OR

Q8) Explain in detail forward and backward state space planning with neat diagram. **[17]**



Total No. of Questions : 8]

SEAT No. :

PA-1422

[Total No. of Pages : 2

[5926]-38

T.E. (Civil Engg.)

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2019 Pattern) (Semester-I) (301001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers Q.No1 or Q.No 2, Q.No3 or Q.No 4, Q.No 5 or Q.No 6, Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain hydrological design parameters to be considered for design of culverts and bridges. **[10]**

- b) An urban catchment has area of 85ha. The slope of catchment is 0.006 and the maximum length of water travel is 950 m. The maximum depth of rainfall with return period of is as below

Duration (min)	5	10	20	30	40	60
Depth of rainfall (mm)	17	26	40	50	57	62

If a culvert for drainage at the outlet of this area is to be designed for a return period of 25 years estimate the required peak flow rate, by assuming runoff coefficient as 0.3 **[8]**

OR

Q2) a) State and explain step by step procedure to delineate watershed on a topo sheet with neat sketches. **[10]**

- b) Explain step by step software procedure to generate contour map of a catchment area where dam is to be constructed. **[8]**

Q3) a) State and explain importance of various investigations to be carried out before constructed of multipurpose dam project. **[10]**

- b) What are reservoir losses and suggest method to control leakages from reservoir. **[7]**

OR

Q4) a) Explain how you will fix the capacity of reservoir using elevation capacity curve and dependable yield. Explain neat sketch. **[10]**

- b) State measures to control reservoir sedimentation. **[7]**

P.T.O.

- Q5) a)** Derive the formula to calculate discharge of a well in a confined aquifer and unconfined aquifer. **[10]**
- b)** What is water logging? Explain tile drain method and also state formula for spacing of tile drains. **[8]**

OR

- Q6) a)** Explain participatory irrigation management and also explain water distribution societies in detail. **[10]**
- b)** State various types of tube wells and explain construction of slotted type. **[8]**

- Q7) a)** Explain Piped Distribution Network (PDN) and state its advantages. **[10]**
- b)** What is micro irrigation and what are its advantages compared other methods of irrigation. **[7]**

OR

- Q8) a)** State various methods of canal revenue collection and explain any two in detail. **[10]**
- b)** Differentiate between surface irrigation and subsurface irrigation and explain sprinkler irrigation in detail. **[7]**



Total No. of Questions : 8]

SEAT No. :

PA-1423

[Total No. of Pages : 2

[5926]-39

T.E. (Civil)

WATER SUPPLY ENGINEERING
(2019 Pattern) (Semester-I) (301002)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and clearly state the same.
- 5) Use of an electronic pocket calculator is allowed.

- Q1)** a) What do you understand by loss of the head and negative head in a rapid sand gravity filter? What are the permissible values? What will happen if the negative head is excessive? [10]
- b) Calculate the dimensions of rapid sand gravity filter for one lakh population with 200 l/c/d water supply. Assume rate of filtration as 100 l/m²/min & mean size of sand 1.5mm. The terminal head loss is 2M. calculate depth of filter sand required if break through index B=0.002. [8]

OR

- Q2)** a) On what factors the dose of Coagulants depends? How the optimum coagulant dose is determined? [3+3=6]
- b) Enlist minimum 4 coagulants used. Explain any 01 in detail. [2+4=6]
- c) Explain with a neat sketch: Working principle of tube settler. [2+4=6]
- Q3)** a) The water works of a town of population 25,000 has to meet its water demand at the rate of 135 l/c/d. If the disinfection is to be done by bleaching powder having 45% available chlorine, determine the quantity of bleaching powder required per year. The required dose of chlorine at the water work is 0.3 ppm for disinfection. [5]
- b) Explain in detail: use of Nano technology in water treatment. [5]
- c) Explain with suitable chemical reactions: use of chlorine as disinfectant and importance of pH in chlorination. [7]

OR

P.T.O.

- Q4)** a) State the various methods used for softening of water. State their advantages & disadvantages. [8]
 b) What do you understand by desalination? Why it is necessary? Explain the electrodiaylsis method of desalination. [9]

- Q5)** a) What is meant by balancing capacity of reservoir? How it is determined?[6]
 b) Designed demand of the town is 5 MLD. It is pumped into an elevated service reservoir at a uniform rate from 5am to 9 am & 5pm, to 9pm. The variation in consumption of water is given below. [6]

Period	5am to 9am	9am to 5pm	5 pm to 9pm	9pm to 12 am	12 am to 5 am
06 Consumption	40%	15%	30%	10%	05%

Determine the balancing capacity of the reservoir.

- c) Illustrate use of GIS and drone technology in water management with two examples. [3+3=6]

OR

- Q6)** a) Explain in detail: leak detection techniques as an important tool in water supply engineering. [6]
 b) Explain with a neat sketch : Roof top rain water harvesting. [2+4=6]
 c) Explain in detail: components of RWH system. [6]

- Q7)** a) Explain with example : Jal Jeevan Mission and its impact in rural India before and after its implementation. [9]
 b) Draw a flowchart of package water treatment plant and explain in brief its unit operation and process. [8]

OR

- Q8)** a) Write and explain various kinds of fixtures and fittings used for water saving. [9]
 b) write detailed notes on : [4+2=8]
 i) SMART city mission
 ii) AMRUT



Total No. of Questions : 8]

SEAT No. :

PA-1424

[Total No. of Pages : 2

[5926]-40

T.E. (Civil)

DESIGN OF STEEL STRUCTURES
(2019 Pattern) (Semester - I) (301003)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 Q.8.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Take $f_y = 250$ and $f_c = 410$ grade of steel.*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400$ N/mm².*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator, IS : 800-2007 and steel table are allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) State and explain in brief type of column bases. [3]
b) Check the adequacy of ISHB 450 @ 85.4 kg/m to carry a factored axial load of 750 kN at an eccentricity of 270 mm about major axis. The effective length of column is 3 m. Consider only section strength. [14]

OR

- Q2)** a) Find buckling class of section ISHB 400 @ 77.4 kg/m used as a column.[3]
b) A column consist of section ISHB 350 @ 67.4 kg/m carries an axial compression factored load of 1700 kN. Design a suitable bolted gusseted base. The base is rest on M20 grade of concrete pedestal. Use 20 mm diameter bolts for the connection. [14]

- Q3)** a) Explain in brief how lateral support is provided to the compression flange of beams with suitable sketches. [4]
b) A simply supported beam carries a uniformly distributed load of magnitude W kN/m on entire span of 6 m. The compression flange is *laterally unsupported* throughout the span. Find the intensity of uniformly distributed load the section ISMB 500 @ 89.6 kg/m can carry for the beam safely. Both ends of beam are fully restrained against torsion.[14]

OR

- Q4)** a) Classify the section ISLB 500 @ 75.0 kg/m and ISA 100 × 75 × 8 mm @ 10.5 kg/m used as a beam. [4]
b) Design a suitable I-section for a simply supported beam of span 6 m carrying a dead load 20 kN/m and live load 40 kN/m. The beam is *laterally supported* throughout the span. [14]

P.T.O.

- Q5)** Determine panel point dead load, imposed load and wind load for a truss as shown in Figure 1. Assume design wind pressure as 1100 N/m^2 , use G.I. Sheet and the centre to centre spacing of truss as 4 m. Assume self-weight of purlin 120 N/m . [17]

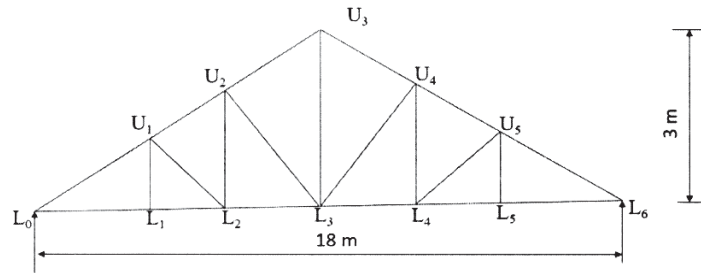


Figure 1

OR

- Q6)** Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data: [17]

- Crane capacity 200 kN
- Self-weight of the crane girder excluding trolley 200 kN
- Self-weight of the trolley, electric motor, hook, etc. 40 kN
- Minimum approach of the crane hook to the gantry girder 1.20 m
- Wheel base 3.5 m
- Span of crane girder 16 m
- Span of gantry girder = 8 m
- Self-weight of rail section 300 N/m

- Q7)** a) Explain in brief IS provisions for length and spacing of intermittent weld. [4]
 b) A Simply supported welded plate girder of span 30 m is subjected to uniformly distributed load 30 kN/m on whole span excluding self weight of plate girder. Design cross section of plate girder. Assume compression flange is laterally supported throughout the span. [14]

OR

- Q8)** a) Explain in brief flange curtailment of plate girder. [4]
 b) A simply supported welded plate girder is designed for the span of 24 m. It is subjected to a shear force of 2300 kN and bending moment of 20700 kNm. A section used for plate girder to carry above load is as given below - [14]
 Flanges - 780 mm wide and 50 mm thick
 Web - 16 mm thick and 2600 mm deep
 Design intermittent welded connection between flange and web. Also design end bearing stiffener.



Total No. of Questions : 8]

SEAT No. :

PA-1425

[Total No. of Pages : 4

[5926]-41

T.E. (Civil Engg.)

ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

(2019 Pattern) (Semester - I) (301004)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non programmable scientific calculator is allowed.

- Q1)** a) What is Financial Management? Explain “Why construction financial management is different”? [6]
- b) What are the roles and responsibilities of construction finance manager?[6]
- c) Write down the definition of contract and explain: [5]
- i) Percentage rate contract
 - ii) Item rate contract

OR

- Q2)** a) The following were the expenses on a contract which commenced on 1st January, 2020. [8]
- i) Materials purchased = Rs. 2,00,000
 - ii) Material at the end = Rs. 2,250
 - iii) Direct wages = Rs. 20,000
 - iv) Plant issued = Rs. 8,000
 - v) Direct expenses = Rs. 9,000

The contract price was 2,40,000. It was duly received when the contract was completed on 31st March, 2020. Change indirect expenses at 15% on wages and provide Rs. 1,500 for depreciation on plant. Prepare the contract account.

- b) Explain how recording of site account is performed at project site. [4]
- c) What is a contract account? Draw the typical format of contract account.[5]

P.T.O.

Q3) a) Explain in brief the essential elements of budget. [4]

b) What is 'Rule of 72'? Write down its formula. [5]

If Mr. 'A' has invested Rs. 20,00,000 at a 8% rate of interest, in how many number of years the invested amount gets doubled?

c) Calculate the Internal Rate of Return (IRR) on the investment in the following cash flow: [8]

Year	0	1	2	3	4	5
Cash inflow	-1,00,000	+20,000	+30,000	+20,000	+40,000	+40,000

Consider 10% discount rate for first calculation.

OR

Q4) a) Cash flow projections for a proposal are shown in the table given below. Calculate Net Present Value (NPV) of the cash flow at discount rate of 15% throughout. Suggest whether the project is worth executing or not.[6]

Year	Cash Flow (Rs.)
0	-2,00,000
1	+35,000
2	+35,000
3	+35,000
4	+35,000
5	+35,000
6	+35,000
7	+35,000
8	+37,000

b) Write down a detailed note on "Financial Budget". [5]

c) A concrete mixer was purchased at Rs. 9,00,000. Assuming Scrap Value to be Rs. 6,50,000 after 10 years. Calculate the depreciation at the end of 5 years by [6]

i) Straight Line Method

ii) Constant Percentage Method

Q5) a) Write down the significance of working capital in construction company. Enlist any 6 factors considered for determination of working capital. [6]

b) Considering 10% contingencies, calculate the working capital from the following data; [6]

Particulars	Amount (Rs.)	Particulars	Amount (Rs.)
Bank Balance	2,55,000	Account Payable	2,80,000
Term loan from Bank	2,95,000	Stock of finished goods	1,20,000
Payable unclaimed dividend	55,000	Account receivable	3,00,000
Commission receivable	62,000	Staff PF	80,000

c) What is classification problem in inventory management? How to solve this problem? Explain any one method. [6]

OR

Q6) a) Write a note on following: [6]

- Types of working capital
- Components of working capital

b) The yearly requirement of cement by a construction firm is 250 bags. The cost of one bag of cement is Rs.540 and ordering cost per order is Rs.100. Assume annual carrying cost for inventory of 20% of average inventory management. Calculate Economic order Quantity and number of orders in one year. If the lead time is 5 days calculate order point. [6]

c) Explain in detail “Operating Cycle” with figure. [6]

Q7) a) What is direct tax? Explain any two types of direct tax in India. [6]

b) Calculate the property tax for the apartment which used only for residential purpose, from following location data: [6]

- No of floors - 14 (Floor factor - 1.10)
- Base value - Rs. 370/Sqft
- User category factor - 0.5
- Nature and type of structure - RCC (factor-1)

- v) Age of building - 18 years (Age factor-0.85)
 - vi) Carpet area -550 Sqft
 - vi) Location - Thane
 - viii) Tax rate -0.775%
- c) Explain any 6 functions of Reserve Bank of India (RBI). [6]

OR

- Q8)** a) Calculate the payable property tax to be paid on property located in Chennai from following data; [6]

Plinth area = 400sq. ft.

Monthly rent notified = Rs. 6per sq.ft.

Tax rate = 30%.

Library cess = 15%.

Consider 10% rebate on age of building.

- b) Explain “Unit Area System” for the calculation of property tax. [6]
- c) What are objectives the of Tax planning? Explain in brief Corporate tax planning. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1426

[Total No. of Pages : 3

[5926]-42

T.E. (Civil)

**ADVANCED FLUID MECHANICS AND HYDRAULIC
MACHINES**

(2019 Pattern) (Semester - I) (Elective - I) (301005 a)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) What is surge tank? Explain its function. Also explain different types of surge tank. [9]

b) Calculate the time required to empty a cylinder tank which is half full initially. The inside diameter and the length of the tank are 2.5 m and 5 m respectively. Orifice at the bottom of the tank is 7.5 cm in diameter with $C_d = 0.6$: [9]

- i) when the tank is vertical
- ii) When the tank is horizontal

OR

Q2) a) A pipe line 3 km long carries water at a velocity of 1 m/s. The valve at the downstream end of the pipe is closed in 3 sec. Calculate: [10]

- i) the peak water hammer pressure caused due to the closure.
- ii) the length of the pipeline subjected to the above peak pressure.

b) Explain one complete cycle of water hammer phenomenon. [8]

Q3) a) Derive an expression for force exerted by jet on flat moving plate held inclined to the jet. [7]

P.T.O.

- b) A jet of water from a nozzle is deflected through 65° from its original direction by a curved plate, which it enters tangentially without shock, with a velocity of 25 m/s and leaves with a velocity of 20 m/s. If the discharge through the nozzle is 8 N/s, calculate the magnitude and direction of resultant force on the vane if the vane is stationary. [10]

OR

- Q4)** a) In case of a jet striking symmetric moving curved vane at the centre, show that maximum efficiency is obtained at $V = 2u$, where V is velocity of jet and u is velocity of vane. [8]
- b) A jet of water 6 cm in diameter having velocity of 20 m/s, strikes normally on a flat plate. Determine the force on the plate: [9]
- i) If the plate is stationary
 - ii) If the plate is moving with a velocity of 5 m/s in the direction of jet.
 - iii) Also find the work done/sec on the plate and the efficiency of the jet when plate is moving.
- Q5)** a) Calculate the diameter of the jet and mean diameter of a Pelton wheel working under following conditions: [10]
- i) power = 14,000 kW
 - ii) net head available = 900 m
 - iii) speed = 600 rpm
 - iv) C_v for jet = 0.98
 - v) Speed ratio = 0.46
 - vi) Overall efficiency = 90%
- b) What is draft tube? Describe various types of draft tube. [8]

OR

- Q6)** a) What is cavitation in turbine? What are its effects? What are the measures to reduce its effect? [8]
- b) A model of Francis turbine is prepared to a scale of 1:6 and tested under a head of 6 m. The model generates 0.215 kW power when running at 1232 rpm. What will be the speed and power generated by the prototype when working under head of 80 m? [10]

Q7) a) Explain cavitation in centrifugal pump and its effect and remedies to reduce these effects. [9]

b) During a test on a centrifugal pump, following observations were made:[8]

- i) vacuum gauge reading on suction side = 295 mm of mercury.
 - ii) pressure gauge reading on delivery side = 18 m of water.
 - iii) distance between the gauges = 0.5 m
 - iv) power required by the pump = 70 kW
 - v) discharge of pump = 200 lps
 - vi) diameter of suction pipe = 30 cm
 - vii) diameter of delivery pipe = 25 cm
- calculate manometric head and overall efficiency.

OR

Q8) a) Draw a neat sketch of centrifugal pump and explain function of each component. [8]

b) A centrifugal pump delivers water against a net head of 14.5 m and at a design speed of 1000 rpm. The vanes are curved back at an angle of 30° with the periphery. The impeller diameter is 300 mm and the outlet width is 50 mm. Determine the discharge of the pump if the manometric efficiency is 95%. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1427

[Total No. of Pages : 2

[5926]-43

T.E. (Civil Engineering)

RESEARCH METHODOLOGY AND IPR

(2019 Pattern) (Semester - I) (Elective - I) (Theory) (301005b)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and clearly state.

- Q1)** a) What are the advantages of primary and secondary data? [9]
b) Indicate the need for data collection and describe the nature of data. [9]

OR

- Q2)** a) Define the term 'Data', How it is different from 'facts' and scores'? [9]
b) What are the various types of interview? Explain the various advantages and limitations of interview. [9]

- Q3)** a) Describe the qualitative and quantitative data interpretation methods. [8]
b) Describe, in brief, the layout of a research report, covering all relevant points. [9]

OR

- Q4)** a) Write a brief note on the 'task of interpretation' in the context of research methodology. [8]
b) Write short notes on Bibliography and its importance in context of research report. [9]

- Q5)** a) Outline the main differences between utility models and patents. Does India have legislation on Utility models? [8]
b) How does WIPO promote the protection of intellectual property? [9]

OR

P.T.O.

- Q6)** a) What are the legislations covering IPRs in India? [8]
b) List out the subject matter protected by intellectual property rights under the World Intellectual Property Organization (WIPO). [9]

- Q7)** a) Write a short notes of following:- [9]
i) Trade mark
ii) Term of copyright
iii) Geographical Indication
b) Comment on the Patent Act 1970 and its amendment. Explain in brief the Patent filling procedure. What are the differences between product Patents and Process Patents? [9]

OR

- Q8)** a) Define Patentability? Explain the utility of patents. [9]
b) Describe Copyright and the works protected under copyright act. Briefly explain the process of obtaining copyright. [9]

Total No. of Questions : 8]

SEAT No. :

PA-1428

[Total No. of Pages : 2

[5926]-44
T.E. (Civil Engg.)
CONSTRUCTION MANAGEMENT
(2019 Pattern) (Semester - I) (Elective - I) (301005 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Write short note on project cash flow. [6]
b) Explain the importance of Workmen's compensation act 1923. [6]
c) Explain the importance of labor laws in construction sector. [6]

OR

- Q2)** a) Explain interstate migrant workers act. [6]
b) Explain importance of capital investments. [6]
c) Write note on profit loss statement. [6]

- Q3)** a) Write short note on identification of risk in construction project. [6]
b) Write short note on energy cost escalation. [6]
c) Explain simulation analysis. [5]

OR

- Q4)** a) Explain break even analysis. [6]
b) What are the types of value and explain value engineering. [6]
c) Explain the importance of insurance in risk management. [5]

- Q5)** a) What is the role of material manager. [6]
b) Explain the various phases of material flow. [6]
c) Explain the concepts of logistics. [6]

OR

P.T.O.

- Q6)** a) Explain EOQ model in detail. [6]
b) What is codification and classification of material in material management? [6]
c) What are the function of material management? [6]
- Q7)** a) Write short note on genetic algorithm. [6]
b) Write short note on recruitment and selection process. [6]
c) Write short note on training and development. [5]

OR

- Q8)** a) Explain the term with suitable example. [6]
i) Carrier planning
ii) Compansation and benefits
b) What is the application of ANN in Civil Engineering? [6]
c) Explain in detail. staffing pattern and policy. [5]

Total No. of Questions : 8]

SEAT No. :

PA-1429

[Total No. of Pages : 2

[5926]-45

T.E. (Civil)

**ADVANCED CONCRETE TECHNOLOGY
(2019 Pattern) (Semester - I) (Elective - I) (301005 D)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What are chemical admixtures? Explain how water reducing admixture's function. [9]
b) Explain the mechanism of air entraining admixtures. [9]

OR

- Q2)** a) What are shrinkage reducing admixtures? How it affects the properties of concrete? [9]
b) Explain the classification of chemical admixtures. Explain the working of any one admixture in detail. [9]

- Q3)** a) What is the role of fibers in concrete? How it affects the properties of concrete? [8]
b) Explain the classification of glass fibers. [9]

OR

- Q4)** a) Explain the differences between SFRC and SIFCON. [8]
b) What are synthetic fibers? Explain the role of any one fiber on the properties of concrete. [9]

- Q5)** a) Explain autogenous shrinkage. What factors affect autogenous shrinkage. [9]
b) What factors affect the plastic shrinkage of concrete? [9]

OR

P.T.O.

- Q6)** a) What is permeability of concrete? How is it measured? [9]
b) What is chloride ion penetration in concrete? How can it be mitigated?[9]

- Q7)** a) Explain half-cell potential? Explain with a neat diagram. [8]
b) Explain electric resistivity method. [9]

OR

- Q8)** a) Explain the difference between permeability and absorption in concrete.[8]
b) How are concrete cores extracted? Explain the procedure. [9]

[5926]-46

T.E. (Civil Engineering)

MATRIX METHODS OF STRUCTURAL ANALYSIS
(2019 Pattern) (Semester - I) (Elective - I) (301005 e)

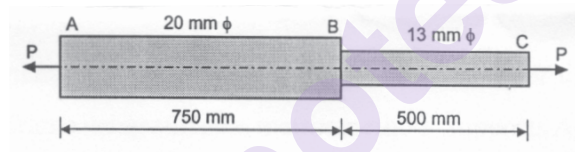
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.

- Q1) a)** A member ABCD is loaded as shown in figure. Determine total deformation of rod using member approach of stiffness method. Assume $E = 70 \text{ GPa}$. [9]

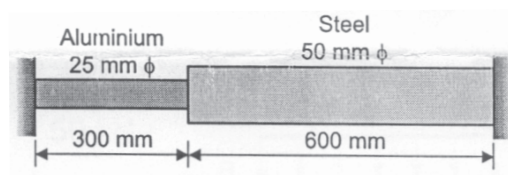


- b) For a truss member, develop the member stiffness matrix showing unit displacement diagrams. [8]

OR

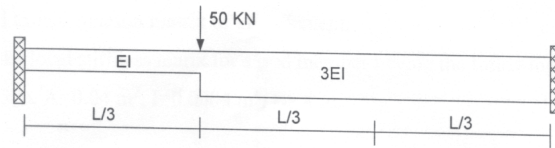
- Q2) a)** A three member pin jointed frame forms an equilateral triangle having 5m length of each member. AB member is horizontal and is attached to hinges at A & B. Joint C is subjected to vertical force of 20 kN and horizontal force of 100 kN. Analyze the truss using stiffness method. [9]

- b) A composite member loaded as shown in figure. Determine deformation of aluminium and steel rod using member approach of stiffness method. [9]
 Take E for steel = 200 GPa and E for Aluminium = 70 GPa.

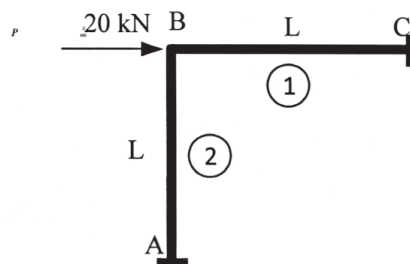


P.T.O.

- Q3) a)** Using member stiffness approach of matrix methods, find the deflection and rotation under the load 50 kN for the beam of length 6 m shown in figure. [8]



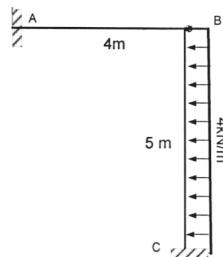
- b)** Explain the significance of transformation matrix. For the frame shown in the figure, determine the transformation matrix $[R]$ of element 2 of the frame shown in figure. Take $E = 200 \text{ GPa}$, $A = 0.04 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 3.5 \text{ m}$. [9]



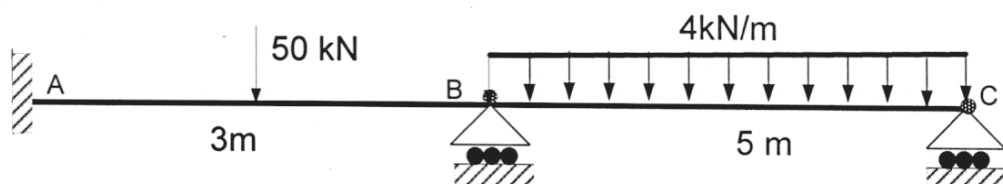
OR

- Q4) a)** Determine the member stiffness matrix for structure axes for the member 'AB' of the given portal frame using stiffness matrix method. Supports A and C are clamped. Properties of both the members: [8]

$$E = 1.5 \times 10^7 \text{ kN/m}^2; A = 0.05 \text{ m}^2; I = 0.00045 \text{ m}^4$$



- b)** Using member stiffness method, find the rotations at B and C for the two span continuous beam. Point load is centrally places. [9]



- Q5) a)** Explain the significance of transformation matrix for grid element. Derive the standard transformation matrix of grid element. [9]
- b) Derive the local stiffness matrix for a grid member having the following details. Take $G = 78 \text{ GPa}$, $A = 0.04 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 4 \text{ m}$. [9]

OR

- Q6) a)** For the grid member, derive the standard stiffness matrix for local axis. [9]
- b) Derive the transformation matrix for a grid member having its local axis inclined at an angle of 60 degree with the global x axis and having the following details. [9]
- Take $G = 70 \text{ GPa}$, $A = 0.05 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 4 \text{ m}$ and $E = 200 \text{ GPa}$.
- Q7) a)** Write the computer algorithm and flowcharts for generating the global/structure stiffness matrices for truss element. [8]
- b) For a space frame member, develop the member stiffness matrix with proper sketches. [9]

OR

- Q8) a)** Derive the transformation matrix for space frame member. [8]
- b) Write the flowchart showing the generation of the global stiffness matrix for a Grid member. [9]



[5926]-47

T.E. (Civil)

ADVANCED MECHANICS OF STRUCTURES
(2019 Pattern) (Semester - I) (Elective - I) (301005 F)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of electronic pocket calculator is allowed.

- Q1) a)** A simply Supported beam is loaded and supported as shown in fig 1. Determine support reaction at A, Shear force & Bending Moment at C by drawing influence line diagram. [8]



Fig. 1

- b)** A simply supported beam is loaded & supported as shown in fig. 2. Determine Support Reactions, Shear & Moment at C by drawing influence line diagram. [9]

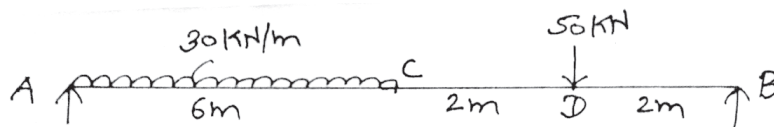


Fig. 2

OR

P.T.O.

- Q2) a)** Draw the influence line diagram for the member $U_2 U_3$, $L_2 L_3$, and $U_2 L_2$ of a truss as shown in fig. 3. [8]

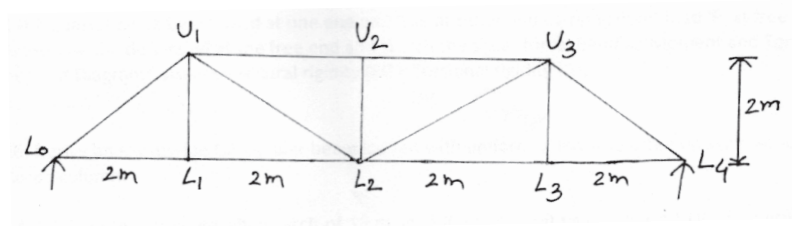


Fig. 3

- b)** Draw the influence line diagram for the member $U_1 U_2$, $L_1 L_2$, and $U_1 L_1$ of a truss as shown in fig. 4 [9]

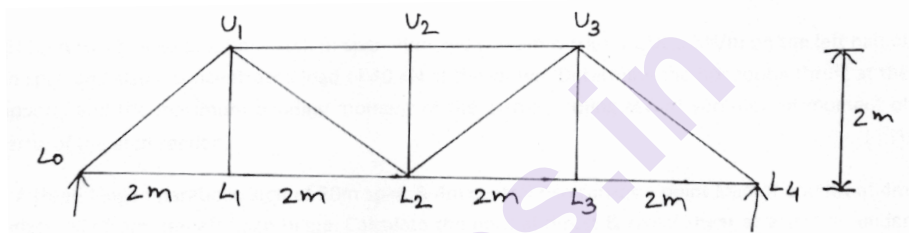


Fig. 4

- Q3) a)** A simply supported beam of 20 m span is carrying a rolling UDL of intensity 40 kN/m with length larger than the span. Determine [12]
- Maximum Reactions
 - Maximum negative & positive shear force & Maximum Bending Moment at a section 8m from left support.
 - Absolute Maximum Bending Moment anywhere in the span.
- b)** Two wheel loads 80 kN & 200 kN spaced 2m apart move on a girder of span 16m. Find the maximum positive and negative shear force at a section 4m from left end. Any wheel load can lead the other. [6]

OR

- Q4) a)** A simply supported beam of 10 m span is carrying a rolling UDL of 4m length with intensity of 20 kN/m moving from left to right. Determine [12]
- Maximum Reactions
 - Maximum negative & positive shear force & Maximum Bending Moment at a section 4m from left support.
 - Absolute maximum Bending moment anywhere in the span.

- b) A uniformly distributed live load of 60 kN per meter run of length 5m moves on a girder of span 16m. Find the maximum positive and negative shear force at a section 6m from the left end. [6]

Q5) A quarter circle beam fixed at one end and free at other end carrying Point load 'P' at free end. Determine the deflection at the free end and sketch the shear force, Bending Moment and Torsional moment Diagrams. Assume flexural rigidity $[EI] = \text{Torsional rigidity } (GJ)$. [17]

OR

Q6) Derive an expression for circular beam loaded with uniformly and supported on symmetrically placed column. [17]

Q7) a) A three hinged parabolic arch of 16 m span & 3 m central rise carries a UDL of length 8m of intensity 25 kN/m on the left half of the span. Find reactions at support, Horizontal thrust, Bending Moment, Normal Thrust, Radial Shear at 4m from left support. [13]

b) A two hinged parabolic arch of span 30m and central rise 4m is subjected to a point load of 30 kN at the centre of arch. Find the horizontal thrust and moment at 8m from left hand support. [5]

OR

Q8) a) A two hinged parabolic arch of span 40m and rise 5m carries a UDL 5 kN/m on the left half of the span and also a concentrated load of 40 kN at the crown. Determine the horizontal thrust at the supports and the maximum bending moment of the arch assuming secant variation of moment of inertia of the arch section. [13]

b) A three hinged parabolic arch of 20m span & 4m central rise carries a point load of 150 kN at 4m horizontally from the left hand hinge. Calculate the normal thrust & radial shear at a section under the point load. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1432

[Total No. of Pages : 3

[5926]-48

T.E. (Civil)

**WASTE WATER ENGINEERING
(2019 Pattern) (Semester-II) (301012)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary and clearly state.
- 5) Use of electronic calculator is allowed.

Q1) a) Explain the principle and working of activated sludge process with suitable flow chart. **[2+3]**

b) What is sludge bulking. Explain the control measure for the sludge bulking. **[2+3]**

c) An average operating data for the design of conventional activated sludge treatment plant is as follows: **[8]**

Wastewater flow=35000m³/d

Volume of aeration tank=10000 m³

Influent BOD=250 mg/l

Effluent BOD=20 mg/l

mixed liquor suspended solids=2500mg/l

Effluent suspended solids =30 mg/l

Waste sludge suspended solids=9700 mg/l

Quantity of waste sludge=220m³/d

Based on the information, above determine,

- i) Aeration period
- ii) Food to microorganism ratio (F/M ratio)
- iii) Percentage efficiency of BOD removal
- iv) Sludge age (days)

OR

P.T.O.

Q2) a) State modifications in ASP and hence differentiate between completely mixed ASP and extended aeration ASP. [3+3]

b) Explain the term with respect to activated sludge process. [4]

- i) Hydraulic Retention Time (HRT)
- ii) Solid Retention Time (SRT),
- iii) Mixed Liquor Suspended Solids (MLSS),
- iv) Food to Microorganism ratio (F/M ratio)

c) An average operating data for conventional activated sludge treatment plant is as follows: [8]

- i) Sewage flow = 30000 m³/day
- ii) Volume of aeration tank = 10000 m³
- iii) Influent BOD = 250 mg/lit
- iv) Effluent BOD = 20 mg/lit
- v) Mixed liquor suspended solids = 2500 mg/lit
- vi) Effluent suspended solids = 30 mg/lit
- vii) Waste sludge suspended solids = 9700 mg/lit
- viii) Quantity of waste sludge = 220 m³/d

Determine:

- a) aeration period
- b) Food to microorganism's ratio
- c) percentage of efficiency of BOD removal
- d) Sludge age

Q3) a) Discuss the phytoremediation technology for wastewater treatment. Also discuss the advantages and limitations of this process. [8]

b) Determine the size of a high-rate trickling filter for the following data; [9]

- i) Sewage flow = 8 MLD
- ii) Recirculation ratio = 1.5
- iii) BOD of sewage = 230 mg/l
- iv) BOD removed in primary sedimentation tank = 30%
- v) Final effluent BOD = 20 mg/l
- vi) Depth of filter = 2 m

OR

- Q4)** a) Discuss the root zone technology for wastewater treatment. Also discuss the advantages and limitations of this process. [8]
- b) Determine the size of a high-rate trickling filter for the following data; [9]
- i) Sewage flow = 5 MLD
 - ii) Recirculation ratio = 1.5
 - iii) BOD of sewage = 230 mg/l
 - iv) BOD removed in primary sedimentation tank = 30%
 - v) Final effluent BOD = 20 mg/l
 - vi) Depth of filter = 2m

- Q5)** a) Draw a neat sketch of up flow anaerobic sludge blanket (UASB) reactor. explain the working of UASB reactor and comment on its suitability for treatment of industrial waste water. [3+3+3]
- b) Explain working principle and application of MBR and MBBR. [9]

OR

- Q6)** a) Design a septic tank for 300 users. Water allowance is 120 liters per head per day also design a suitable soil absorption system if the percolation rate is 3 min/cm and depth of ground water table below GL is 1.5m. [9]
- b) Explain working principle and application of SBR and FMBR. [9]

- Q7)** a) Explain the anaerobic sludge digestion process. [5]
- b) Explain various methods of sludge treatment. [7]
- c) What are the process carried out to recycle and reuse of treated wastewater [5]

OR

- Q8)** a) Write a short note on sludge drying bed. [5]
- b) Explain any two methods of sludge disposal with advantages, disadvantages and applications. [7]
- c) Write a short note on: sludge thickener. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1433

[Total No. of Pages : 7

[5926]-49

T.E. (Civil)

DESIGN OF RC STRUCTURES
(2019 Pattern) (Semester - II) (301013)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
- 2) Figures to the right indicate full marks.
- 3) IS 456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary, assume suitable data and indicate clearly.

Q1) a) Design any intermediate flight of a dog legged staircase of a residential building as shown in Figure 1 with the following data: **[13]**

- i) Floor to floor height = 3.15m
- ii) Rise = 175mm; Tread = 250mm; Width of flight = 1.0m
- iii) Width of supporting beams = 230mm
- iv) Live load = 3.0 kN/m², Floor finish = 0.75 kN/m²
- v) Material = M30, Fe 500
- vi) Draw details of reinforcement. Use LSM approach.

b) What do you meant by doubly reinforced section? Under which circumstances doubly reinforced sections are needed. Explain check for deflection for doubly reinforced section. **[5]**

OR

P.T.O.

Q2) Design a simply supported reinforced concrete floor beam B12 as shown in Figure 1 with following data: [18]

- i) Center to center Span of beam = 3.73 m
- ii) Width of supporting columns = 300mm
- iii) Beam width = 230 mm
- iv) The beam supports two way slab of thickness 120mm on both sides of beam
- v) Live load = 3 kN/m^2 ; Floor finish = 1.5 kN/m^2
- vi) The wall on this beam is 150 mm thick and 2.7 m high.
- vii) Material - M25, Fe 415
- viii) Show details of reinforcement. Use LSM

Q3) Design a continuous floor beam B8-B9-B10 as shown in Figure 1 using IS code coefficients (or moment distribution). Thickness of the all floor slab is 120 mm, live load and floor finish load on all slabs are 2.5 kN/m^2 and 1.5 kN/m^2 , respectively. The wall on this beam is 230 mm thick and 2.7 m high. Use M 25 and Fe 500 steel. Design longitudinal reinforcement for all the spans and support for flexure. Design shear reinforcement only for beam B19. Draw neat sketch showing details of main and shear reinforcement. Use LSM.[17]

OR

Q4) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span AB = 4.0m, BC = 6.0m and CD = 5.0m. The beam carries working dead load of 24 kN/m (including its self-weight) and working live load of 20 kN/m . The beam supports 120mm slab on one side. Calculate design moment for span BC and support C after 20 % redistribution of moments by considering proper load case. Design span BC and support C for flexure only. Draw the reinforcement details.

Material- Concrete of grade M30, Fe 500 reinforcement. [17]

Q5) Design an axially loaded short column C10 as shown in Figure 1 from terrace to footing level (floor wise four parts of column) for a G + 2 building with following details: **[18]**

- i) Floor to Floor height = 3.6 m, consider both ends fixed.
- ii) Height of column below plinth = 2.5 m
- iii) Live load on all slabs = 4 kN/m²
- iv) Floor Finish Load = 1.5 kN/m²
- v) Water Proofing Load on roof slab = 1.5 kN/m²
- vi) Wall thickness = 150 mm (Internal)
- vii) Slab thickness = 130 mm
- viii) Size of beams = 230 × 450 mm

Material M 25 and Fe 500 used. Show detailed floorwise load & design calculations. Draw section of column showing reinforcement details for each floor.

OR

Q6) Design a bi-axial short column by limit state method with material M25 and Fe 500 to carry Ultimate load of 1400 kN. Factored moment of 90 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. **[18]**

Q7) Design an isolated pad footing for a working axial load of 800 kN. The effective length of column is 3.2 m. Use M30 grade of concrete and Fe 500 grade of steel. SBC of soil is 200 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. **[17]**

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 800 kN and 900 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is 400 × 400mm. Safe bearing capacity of soil is 150kN/m². Use M30 concrete and Fe 500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. **[17]**

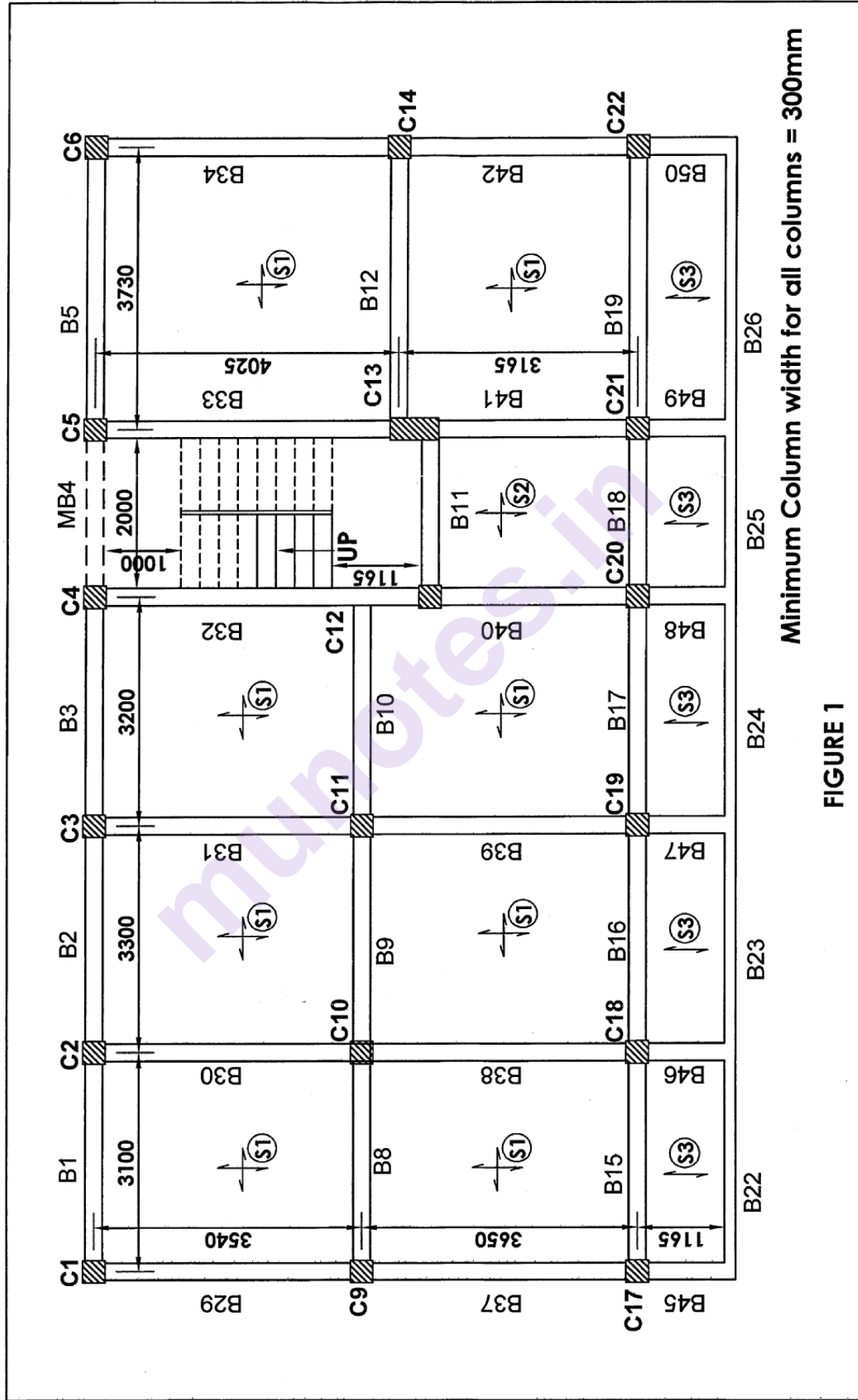


FIGURE 1

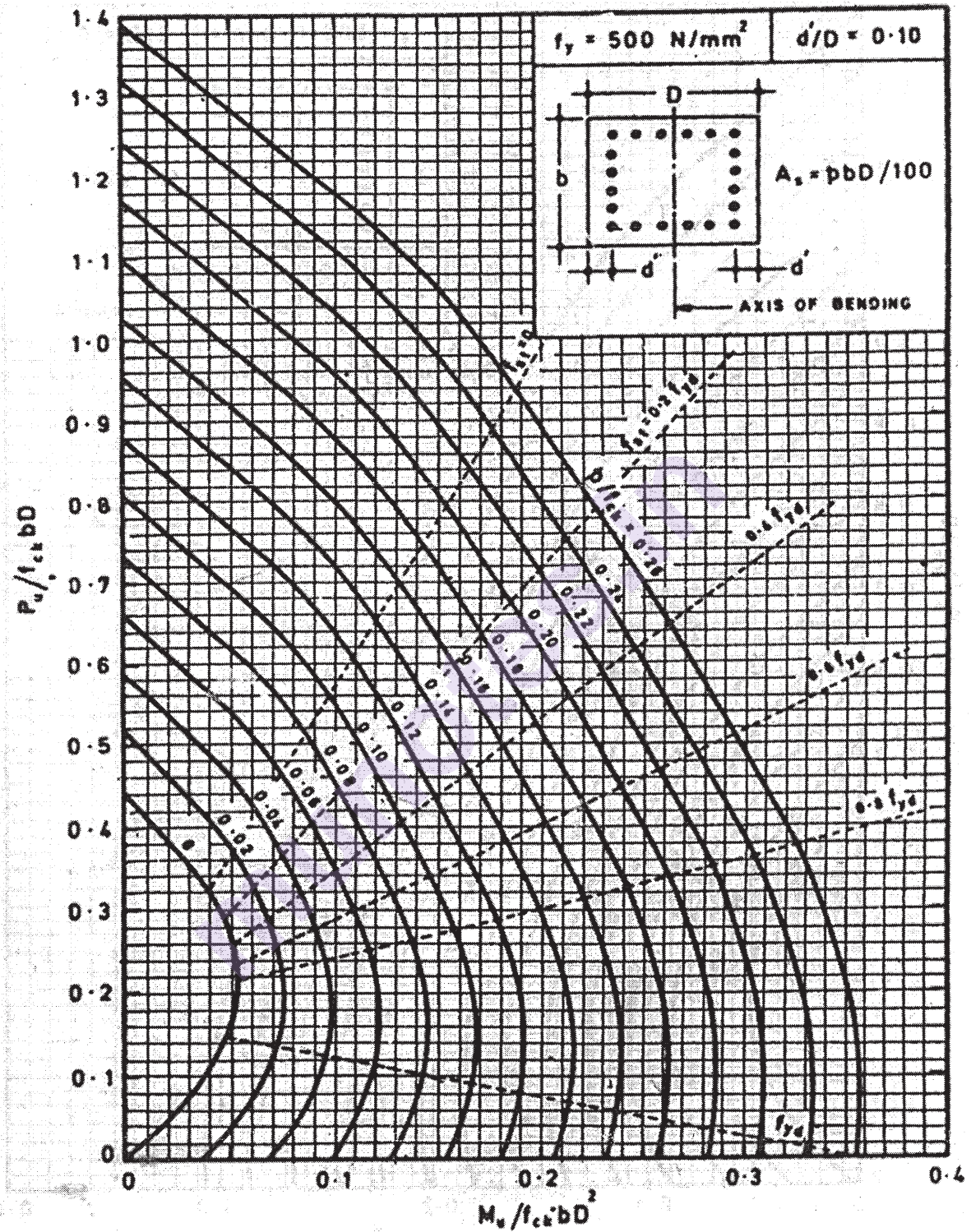
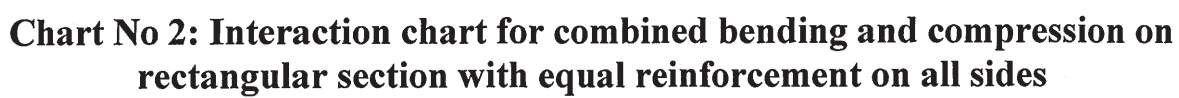


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



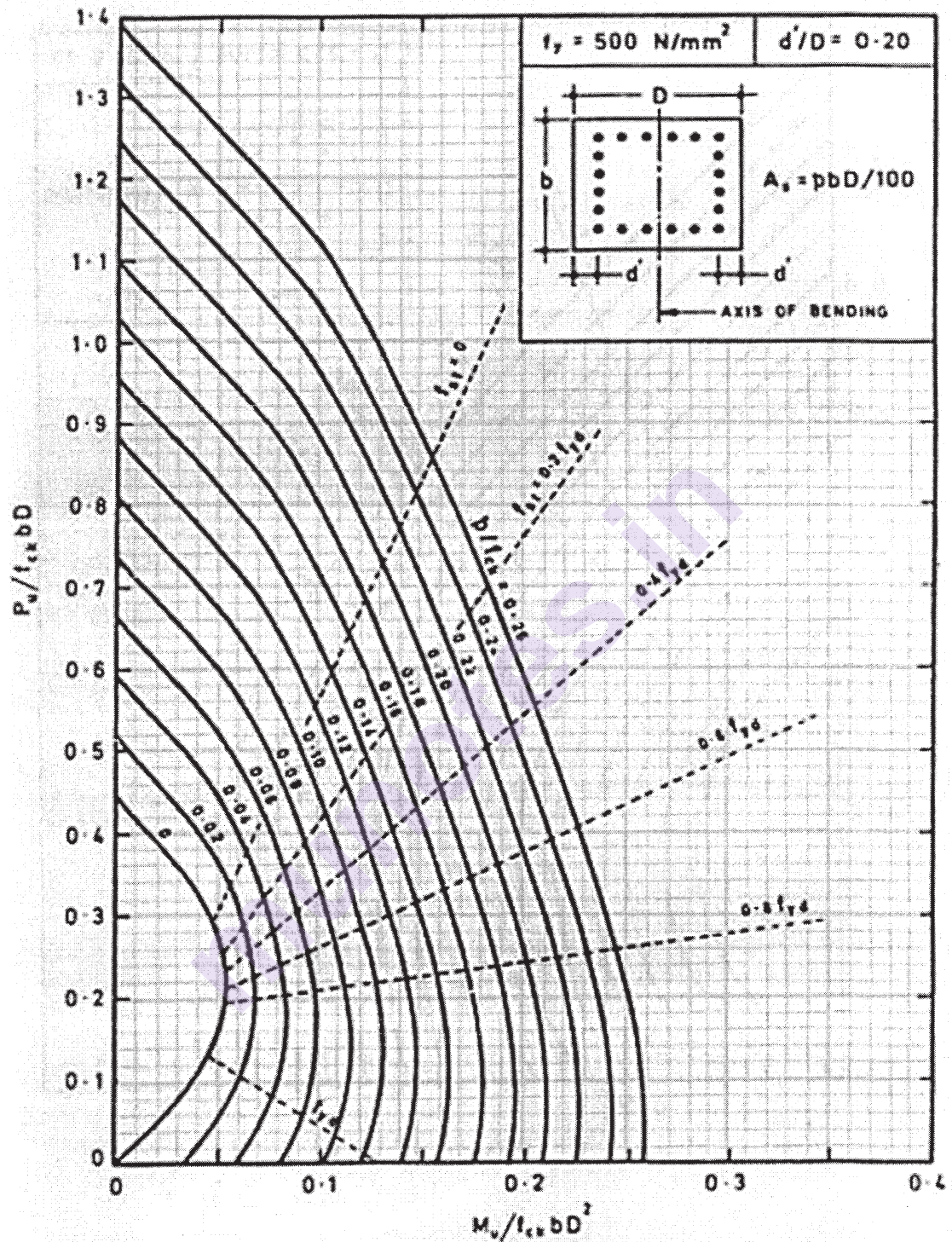


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

x x x

Total No. of Questions : 8]

SEAT No. :

PA-1434

[Total No. of Pages : 2

[5926]-50

T.E. (Civil)

**REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM
(2019 Pattern) (Semester - II) (301014)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume Suitable data, if necessary.
- 4) Use of electronic pocket calculator is allowed in the examination.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Describe Global Navigation Satellite system in detail. [6]
b) Define IRNSS and illustrate its structure. [6]
c) Write Advantages of GPS. [6]

OR

- Q2)** a) Compare different GNSS system throughout the World. [6]
b) Define DGPS. Write sources of errors of DGPS. [6]
c) Explain the type of Remote Sensing platforms. [6]

- Q3)** a) List the image interpretation keys and explains any two in detail with the help of necessary diagram. [6]
b) Merits and Demerits of Visual and Digital Image Interpretation. [6]
c) State the application of Digital Elevation Model (DEM) [5]

OR

- Q4)** a) Define Triangular Irregular Network Model (TIN) and state its application. [6]
b) What is Digital Image Processing? What are the most common image processing functions. [6]
c) State the application of Digital Terrain Model (DTM). [5]

P.T.O.

- Q5)** a) Enlist the application of GIS and explain any one detailed application in Civil Engineering. [6]
- b) Write in detail about various components of GIS. [6]
- c) Illustrate Cloud Computing with types and applications. [6]

OR

- Q6)** a) Define Geographical Information System and state Spatial Data types. [6]
- b) Write a note on fundamentals of Cartography and map creation in GIS. [6]
- c) State and explain essential elements of GIS. [6]

- Q7)** a) Define Raster and Vector Data types. Explain with neat diagram. [6]
- b) What is Georeferencing of GIS data? And explain its importance in the field of GIS? [6]
- c) Define DBMS. State its function. [5]

OR

- Q8)** a) Explain the application of GIS in Hydrology. [6]
- b) What are the various methods of Georeferencing of GIS data? Explain in brief. [6]
- c) Write GIS data types and its representation. [5]

x x x

Total No. of Questions : 10]

SEAT No. :

PA-484

[Total No. of Pages : 4

[5926]-501

T.E. (Automobile Engineering)
DESIGN OF MACHINE ELEMENTS
(2015 Course) (Semester - I) (316481)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

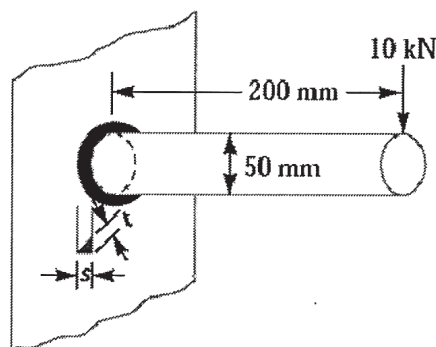
Q1) a) Explain terms Design Synthesis. [4]

b) Prove that Efficiency of self locking square threads is less than 50%?[6]

OR

Q2) a) Explain the equivalent torsional moment. [4]

b) A 50 mm diameter solid shaft is welded to a flat plate as shown in Fig. If the size of the weld is 15 mm, find the maximum normal and shear stress in the weld. [6]



Q3) a) Define Factor of Safety and service factor. [4]

b) Define the function of key and Classify the keys. [6]

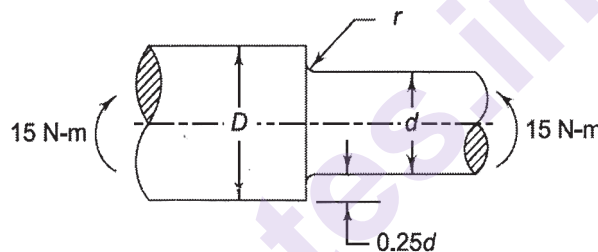
OR

P.T.O.

- Q4)** a) Explain self locking and overhauling of power screw? [6]
 b) Explain briefly the various phases involved in the process of design of machine elements? [4]

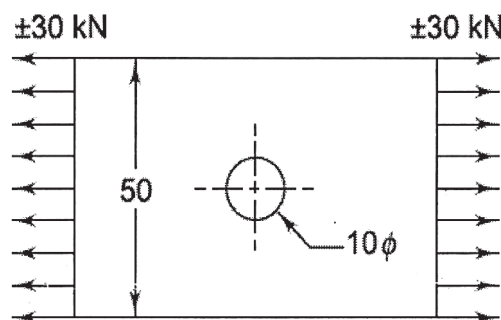
- Q5)** a) Write a short note on Stress concentration. [4]
 b) Define and explain Endurance limit. [6]
 c) A round shaft made of a brittle material and subjected to a bending moment of 15 N-m is shown in Fig. The stress concentration factor at the fillet is 1.5 and the ultimate tensile strength of the shaft material is 200 N/mm². Determine the diameter d , the magnitude of stress at the fillet and the factor of safety. [6]

If $r = 2$ mm and $\frac{r}{d} = 0.155$



OR

- Q6)** a) Draw the Goodman diagram and write its equation. [4]
 b) A plate made of steel 20C8 ($S_{ut} = 440$ N/mm²) in hot rolled and normalized condition is shown in Figure. It is subjected to a completely reversed axial load of 30 kN. The notch sensitivity factor q can be taken as 0.8, surface finish factor 0.89, Theoretical stress concentration factor 2.51 and the expected reliability is 90%. The size factor is 0.85. The factor of safety is 2. Determine the plate thickness for infinite life. [6]



- c) Draw neat labeled sketches for stress time relationship for mathematical models of : [6]

- i) Alternating stresses
- ii) Repeated stresses and
- iii) Reversed stresses.

Explain the notations used.

- Q7)** a) Explain the term Hunting of tooth. [4]

- b) State and explain the different type of gear tooth failure, their gear tooth failure, their causes and remedies. [6]

- c) The following data is given for a pair of spur gear with 20° full depth involute teeth $Z_p = 18$, $Z_g = 36$, $m = 5$ mm, $b = 50$ mm. Pinion having steel material with $S_{ut} = 600 \text{ N/mm}^2$, BHN = 330 and gear having steel material with $S_{ut} = 510 \text{ N/mm}^2$ and BHN = 280. Take FOS = 2 $n_p = 1440$ rpm Find

beam strength and Wear strength if $= 0484 - \frac{2.87}{z}$ and $C_v = \frac{5.6}{5.6 + \sqrt{v}}$. [8]

OR

- Q8)** a) What is virtual number/formative number of teeth in helical gears? [4]

- b) Explain the term crowing of gear tooth. [6]

- c) A pair of helical gear consist of $z_p = 20$, $z_g = 100$, $N_p = 720$ rpm, $\alpha_n = 20^\circ$, $\phi = 25^\circ$, $m_n = 4$ mm, $b = 40$ mm. Both gear are made by same material with $S_{ut} = 600 \text{ N/mm}^2$, BHN = 300, $C_s = 1.5$, FOS = 2. Assume velocity factor is in account. Find power transmitting capacity. Take $Y = 0.3475$. [8]

- Q9)** a) A pair of worm gear drive is designated as 2/60/10/6. The worm transmits 5 kW at 1440 rpm. Take $\mu = 0.05$, $\alpha = 20^\circ$. Calculate forces acting on worm and wheel. [8]

- b) A pair of straight bevel gears is mounted on shafts, which are intersecting at right angles. The number of teeth on the pinion and gear are 20 and 60 respectively. The pressure angle is 20° . The pinion shaft is connected to an electric motor developing 5 kW rated power at 1440 rpm. The service factor can be taken as 1.5 and load distribution factor 1.2. The pinion and the gear are made of steel ($S_{ut} = 700 \text{ N/mm}^2$) and heat-treated to a surface hardness of 350 BHN. The module and face width are 5 mm and 45 mm respectively. Determine the factor of safety for bending as well as for pitting. Take $C = 11400 \text{ N/mm}^2$ and $e = 50$ microns. Take

$$P_d = \frac{21v \times (Ceb + P_{t\max})}{21v + \sqrt{(Ceb + P_{t\max})}} \quad [8]$$

OR

- Q10)a)** Obtain the expression for ratio factor used in wear strength equation of bevel gear. [8]
- b) A pair of bevel gears, with 20° pressure angle, consists of a 30 teeth pinion meshing with a 45 teeth gear. The module is 6mm, while the face width is 50 mm. The material for the pinion and gear is steel 50C4 ($S_{ut} = 570 \text{ N/mm}^2$) and the surface hardness is 350 BHN. The pinion rotates at 500 rpm and receives 16.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine the factor of safety against bending failure and against pitting failure. Take $e = 20$ microns. [8]

x x x

[5926]-502

T.E. (Automobile/Mechanical/Mechanical-S/W)

HEAT TRANSFER

(2015 Pattern) (Semester - I) (302042)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8., Q.9 Or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right of each question indicate full marks.*
- 4) *Assume suitable data wherever necessary and mention the same clearly.*
- 5) *Use of steam tables, Mollier chart and calculator is allowed.*

Q1) a) What do you mean by Initial conditions? Elaborate heat flux and convection boundary condition with example. **[5]**

b) A very long 25 mm diameter copper ($k = 380 \text{ W/m.K}$) rod extends from a surface at 120°C . The temperature of surrounding air is 25°C and the heat transfer coefficient over the rod is $10 \text{ W/m}^2\text{.K}$. Evaluate : **[5]**

- i) Heat loss from the rod,
- ii) How long the rod should be in order to be considered infinite?

OR

Q2) a) Define and Explain significance of following Fin Efficiency and Fin Effectiveness. **[5]**

b) A metal plate of 4mm thickness ($k = 95.5 \text{ W/m}^\circ\text{C}$) is exposed to vapour at 100°C on one side and cooling water at 25°C on opposite side. The heat transfer coefficients on vapour and water side are $14500 \text{ W/m}^2 \text{ K}$ and $2250 \text{ W/m}^2\text{K}$ respectively. **[5]**

Determine

- i) The rate of Heat transfer
- ii) The overall heat transfer coefficient

Q3) a) Define and Explain significance of following Biot Number and Fourier Number. **[5]**

b) A hollow sphere of inside radius 30 mm and outside radius 50 mm is electrically heated at its inner surface at a constant rate of 105 W/m^2 . The outer surface is exposed to a fluid at 30°C , with heat transfer coefficient of $170 \text{ W/m}^2\text{K}$. The thermal conductivity of the material is 20 W/m.K . Calculate inner and outer surface temperatures. **[5]**

P.T.O.

OR

Q4) a) Derive expression for temperature distribution for constant cross sectional area infinitely long fins. [5]

b) Explain the concept of Time constant and response of thermocouple. [5]

Q5) a) Define and explain significance of following : [8]

i) Nusselt Number

ii) Grashoff Number

iii) Stanton Number

iv) Prandtl Number

b) A flat plate 1 m wide and 1.5 m long is maintained at 90°C in air with free stream temperature of 10°C flowing along 1.5 m side of the plate. Determine the velocity of the air required to have a rate of energy dissipation as 3.75 kW. [8]

Use correlations

$$Nu_L = 0.664 Re^{1/2} Pr^{1/3} \quad \text{for laminar flow;}$$

$$Nu_L = [0.036 Re^{0.8} - 836] Pr^{1/3} \quad \text{for turbulent flow.}$$

Take properties of air :

$$\rho = 1.0877 \text{ kg/m}^3,$$

$$\mu = 2.029 \times 10^{-5} \text{ kg/ms},$$

$$k_f = 0.028 \text{ W/m K},$$

$$Pr = 0.703,$$

$$C_p = 1.007 \text{ kJ/kg K}.$$

OR

Q6) a) Write note on following : [8]

i) Velocity Boundary layer

ii) Thermal Boundary layer

b) Evaluate the heat transfer rate from a 100 W incandescent bulb at 140°C to an ambient at 24°C. Approximate the bulb as 60 cm diameter sphere. Calculate the percentage of power lost by natural convection. [8]

Use following correlation and air properties ;

$$Nu = 0.60 (GrPr)^{1/4}$$

The properties of air at 82°C are

$$\nu = 21.46 \times 10^{-6} \text{ m}^2/\text{s},$$

$$k_f = 30.38 \times 10^{-3} \text{ W/m, K},$$

$$Pr = 0.699.$$

Q7) a) Explain following in brief [8]

i) Wien's Law

ii) Kirchhoff's Law

iii) Lambert's Cosine Law

iv) Stefan Boltzmann Law

- b) Determine the following quantities for an industrial furnace (black body) emitting radiation at 2650°C . [8]
- Spectral emissive power at $\lambda = 1.2 \mu\text{m}$,
 - Wavelength at which the emissive power is maximum,
 - Maximum spectral emissive power,
 - Total emissive power,
 - Total emissive power of the furnace, if it is treated as gray and diffuse body with an emissivity of 0.9.

OR

- Q8)** a) Explain following in brief [8]
- Emissive power
 - Emissivity
 - Intensity of radiation
 - Solid Angle
- b) Two parallel, infinite gray surfaces are maintained at temperature of 127°C and 227°C respectively. If the temperature of the hot surface is increased to 327°C . By what factor is the net radiation exchange per unit area increased? Assume the emissivities of colder and hotter surfaces to be 0.9 and 0.7, respectively. [8]

- Q9)** a) Draw Temperature profiles in case of following heat exchanger flow arrangements [8]
- Parallel Flow
 - Counter flow
 - Condenser
 - Evaporator
- b) A chemical having specific heat of 3.3 kJ/kg.K at a rate of $20,000 \text{ kg/h}$ enters a parallel flow heat exchanger at 120°C . The flow rate of cooling water is $50,000 \text{ kg/h}$ with an inlet temperature of 20°C . The heat transfer area is 10 m^2 and overall heat transfer coefficient is $1050 \text{ W/m}^2.\text{K}$. Determine
- The effectiveness of the heat exchanger,
 - Outlet temperature of water and chemical.
- Take C_p of water as 4.186 kJ/kg.K . [10]

OR

- Q10)** a) Explain different regimes of pool boiling with neat sketch. What are different factors which affect nucleate boiling? [8]
- b) Define and explain significance of [10]
- LMTD
 - NTU
 - Effectiveness
 - Correction factor
 - Capacity ratio



Total No. of Questions : 10]

SEAT No. :

PA-486

[Total No. of Pages : 4

[5926]-503

T.E. (Mechanical/ Automobile)

THEORY OF MACHINES - II

(2015 Pattern) (Semester - I) (302043)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Define the following terms related to helical gear: [4]

- i) Helix angle
- ii) Transverse circular pitch
- iii) Normal circular pitch
- iv) Axial pitch

b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 10 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and contact ratio. [6]

OR

Q2) a) Explain the phenomenon of interference in involute gears. [4]

b) A three start worm has a pitch diameter of 80 mm and a pitch of 20 mm. It rotates at 600 rpm and drives a 40 teeth worm gear. If coefficient of friction is 0.05, find: [6]

- i) The helix angle of the worm
- ii) The speed of the gear
- iii) The centre distance
- iv) The efficiency and maximum efficiency

Q3) a) Draw a sketch to represent the pitch cone angles of bevel gears. [2]

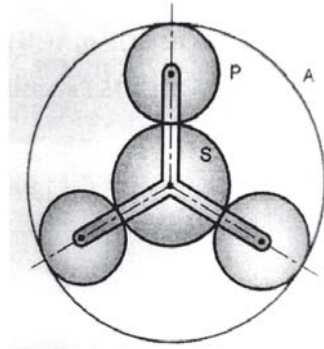
b) An epicyclic gear train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B, which drives wheel D through an idle wheel, C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 rpm about the axis of A and D. If the wheels B and D have 25 and 40 teeth respectively. find [8]

- i) The number of teeth on C
- ii) Speed and sense of rotation of C

OR

P.T.O.

- Q4) a)** What is contact ratio? State its significance. [2]
- b)** The annulus A in an epicyclic gear train rotates at 300 rpm about the axis of fixed sun gear which has 80 teeth. A three armed spider is driven at 180 rpm. Determine the number of teeth required on planet P. Refer the following figure. [8]



- Q5)** The following data relate to a cam profile which operates a roller follower rising with SHM and lowering with uniform acceleration and retardation:

Minimum radius of cam 30 mm,

Radius of roller 10 mm,

Lift of follower 45 mm,

Offset of follower axis 12 mm towards left,

Angle of ascent 70° ,

Angle of descent 120° ,

Angle of dwell in highest position of follower 45° ,

Speed of cam 200 rpm.

Draw the profile of the cam and determine the maximum velocity and acceleration during the lift and return of follower. [16]

OR

- Q6) a)** What is a cam jump phenomenon? How cam jump can be minimized? [6]
- b)** Draw a cam profile operating with knife edge follower in the following desired way.
- Follower to move out through a distance of 20 mm during 120° .
 - Follower to dwell for next 60° .
 - Follower to return to its initial position during 90° .
 - Follower to dwell for remaining cam rotation.

The cam rotates at 500 rpm. The minimum radius of cam is 40 mm and line of follower is offset 15 mm from the axis of the cam. The displacement to take place with uniform acceleration and retardation for both inward and outward stroke. [10]

- Q7) a)** Explain with the help of neat sketch precision position and structural error. [6]
- b) Determine the chebychev spacing for function $y = 2x^3 - x$ for the range $0 \leq x \leq 4$, where four precision points are required. For three precision points, determine $\theta_2, \theta_3, \theta_4$ and ϕ_2, ϕ_3, ϕ_4 if $\Delta\theta = 45^\circ$ and $\Delta\phi = 90^\circ$. [10]

OR

- Q8) a)** Explain the following terms: [6]
- Function generation
 - Body guidance
 - Dimensional synthesis
- b) Synthesize a 4 bar mechanism with input link 'a', coupler link 'b', output link 'c' and grounded link 'd'. Angles θ and ϕ for the successive positions are given in the table below:

	1	2	3
θ	20°	35°	50°
ϕ	35°	45°	60°

If the grounded link is 40 mm, using Freudenstein's equation find out other link lengths to satisfy the given positional conditions. [10]

- Q9) a)** Discuss in brief continuously variable transmission. [6]
- b) A rotor of the turbine of a ship has a mass of 2500 kg and rotates at a speed of 3200 rpm counter-clockwise as seen from stern. The rotor has a radius of gyration of 0.4 m. Determine the gyroscopic couple and its effect when
- Ship steers to the left in a curve of 80 m radius at a speed of 7.75 m/s.

- ii) Ship pitches 5 degrees about and below the mean position and the bow is descending with its maximum velocity. The pitching motion is SHM with a periodic time of 40 seconds.
- iii) Ship rolls and at instant, its angular velocity is 0.4 rad/s clockwise when viewed from stern.

[12]

OR

Q10)a) Write a short note on spheroidal and cone variators. [6]

- b) An aeroplane flying at 250 km/hr turns towards the right and completes a quarter circle of radius 75 m. The mass moment of inertia of the rotary engine and propeller is 80 kg-m^2 . The engine speed is 2400 rpm clockwise when viewed from the rear end. Find the gyroscopic couple on the aircraft and state its effect on it. Also explain the effect if the aeroplane performs a loop in the vertical plane. [12]



Total No. of Questions : 10]

SEAT No. :

PA-487

[Total No. of Pages : 2

[5926]-504

T.E. (Automobile Engineering)

AUTOMOTIVE ELECTRICAL AND ELECTRONICS

(2015 Pattern) (Semester-I) (316482)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Question Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What do you mean by Wiring Harness? Explain with neat sketch. [5]
b) List and explain the different battery rating in vehicle. [5]

OR

- Q2)** a) List and explain various factors affecting on battery life. [5]
b) Explain with neat sketch hydrometer test of battery. [5]

- Q3)** a) Draw and explain typical layout of starting system in vehicle? [5]
b) List and explain the function of various components in electronic ignition system. [5]

OR

- Q4)** a) Describe the various features of LED headlight used in vehicle. [5]
b) Explain with neat sketch Bimetallic Fuel Gauge in vehicle. [5]

- Q5)** a) Classify the MAF sensor and explain construction and working of hot wire air flow sensor with its advantages. [8]
b) Explain the construction and working principles of knock sensor with neat sketch. [8]

OR

- Q6)** a) Classify the position sensor and explain the working principle of throttle position sensor in detail. [8]
b) Discuss the construction and working principle of solenoid actuator with its applications. [8]

P.T.O.

- Q7)** a) Explain in briefly components and sensors used in electronic fuel injection system. [8]
b) Discuss in detail requirement of engine at warming and full load enrichment. [8]

OR

- Q8)** a) Explain with neat layout construction and working of CRDI system with its advantages and disadvantages. [8]
b) Explain with neat layout construction and working of antilock braking system with its advantages and disadvantages. [8]
- Q9)** a) List and explain various factors affecting on spark timing of engine. [6]
b) What is an ECU? List the types of ECU used in advance automotive vehicle. [6]
c) Classify electronic suspension and explain the working of adaptive electronic suspension system. [6]

OR

- Q10)** a) Draw and explain the closed loop control system for engine management. [6]
b) List and explain the function of various components in tyre monitoring system. [6]
c) Explain the working features of Adaptive cruise control system in vehicle. [6]



Total No. of Questions : 9]

SEAT No. :

PA-488

[Total No. of Pages : 2

[5926]-505

T.E. (Mechanical/Automobile)

METROLOGY AND QUALITY CONTROL

(2015 Pattern) (Semester - I) (302045)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8 & Q.No.9.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programmable calculator is allowed.

- Q1)** a) Explain hole and shaft basis system with neat sketch. [5]
b) Design GO and NOGO limit plug gauge for checking a hole having size 50 (+0.06, -0.00). Assume gauge maker's tolerance equal to 10% of work tolerance and wear allowance equal to 10% of gauge maker's tolerance. [5]

OR

- Q2)** Differentiate between (any two) [10]
a) Accuracy & Precision
b) Line and End Standards
c) Systematic and Random Error

- Q3)** a) Calculate chord length and its distance below the tooth tip for a gear of module 4 mm and pressure angle 20 degree. [4]
b) Classify comparators, explain mechanical comparator. [6]

OR

- Q4)** a) Define surface finish and explain various surface characteristics. [5]
b) Explain automatic inspection system. [5]

- Q5)** a) Explain 7QC Tools. [7]
b) Explain Juran's trilogy approach with diagram. [9]

OR

P.T.O.

- Q6)** a) Explain the concept of cost of quality & value of quality. [8]
 b) Define quality circle and list the objectives of quality circle. [8]

- Q7)** a) Calculate AOQ for single sampling plan $N=10,000$, $c = 1$, $p = 0.004$, $P_a = 0.558$. Assume total no. of defectives in sample (n_p) = 1.5 [8]
 b) Discuss six sigma with suitable normal distribution curve. [8]

OR

- Q8)** a) A batch of 100 test specimens made of grey cast iron are tested on UTM, to determine the ultimate tensile strength of material. The results are tabulated as follows: [8]

Ultimate tensile strength of material	Frequency
270	4
290	32
310	50
330	12
350	2

Calculate :

- i) Mean
 ii) Variance
 iii) Std. deviation
 b) What are the various elements of quality audit? [8]

- Q9)** Write note on (Any 3) [18]

- a) TPM Pillars
 b) DMAIC
 c) QFD
 d) TQM
 e) 5S
 f) JIT



Total No. of Questions : 10]

SEAT No. :

PA-489

[5926]- 506

[Total No. of Pages : 2

T.E. (Automobile Engineering)

**AUTOMOTIVE AERODYNAMICS AND BODY ENGINEERING
(2015 Pattern) (Semester - II) (316486)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Write a short note on History of vehicle aerodynamics. [4]
b) Explain Strategies for body shape development. [6]

OR

- Q2)** a) Explain Resistance to vehicle motion. [4]
b) Write a short note on Aerodynamics performance improvement using front and rear end modification. [6]

- Q3)** a) With help of neat sketch explain flow around circular Cylinder and Aerofoil. [4]
b) Explain dirt accumulation on the vehicle. [6]

OR

- Q4)** a) With help of neat sketch explain flow around car. [6]
b) Explain Pressure Distribution on the vehicle. [4]

- Q5)** a) What is meant by Lift and pitching? [8]
b) Write a short on Importance of Bumper in automobile. [8]

OR

P.T.O.

- Q6)** a) Explain Types of seat used in automobiles. [8]
b) Explain Types of safety belts. [8]

- Q7)** a) Explain symmetric & asymmetric vertical loads in cars. [8]
b) Explain longitudinal load and load distribution on vehicle structure. [8]

OR

- Q8)** a) Explain types of Light construction vehicle body. [8]
b) Explain driver cabin design. [8]
- Q9)** a) Explain the design of chassis frame. [10]
b) Explain Ergonomics and aesthetics. [8]

OR

- Q10)** a) What is importance of Downward Visibility? [8]
b) What is the Commercial type construction of bus body? [10]



[5926]-507

T.E. (Mechanical/Mechanical Sandwich/Automobile)
NUMERICAL METHODS AND OPTIMIZATION
(2015 Course) (Semester - II) (302047)

*Time : 2½ Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of programmable calculator is not permitted.*
- 5) *Assume suitable data, if necessary.*

Q1) Use Bisection method to obtain the root of $x.e^x - 5 \cos x$ Start with initial guess – 1.5 and – 2. Do 5 iterations. **[6]**

OR

Q2) Solve equation $e^x \cos x - 1.4 \sin x = 0.8$ using Newton-Raphson method, taking $x = 1$ and doing three iterations. **[6]**

Q3) Evaluate the following equations by using Gauss Elimination Method. Do partial Pivoting. **[6]**

$$\begin{aligned}y + 2z &= 5 \\ -x + 2y + 4z &= 11 \\ -3x + y - 5z &= -12\end{aligned}$$

OR

Q4) Solve the following equation by Thomas algorithm. **[6]**

$$\begin{aligned}3x_1 - x_2 &= 5 \\ 2x_1 - 3x_2 + 2x_3 &= 5 \\ x_2 + 2x_3 + 5x_4 &= 10 \\ x_3 - x_4 &= 1\end{aligned}$$

P.T.O.

Q5) Solve following linear programming problem using Simplex method. [8]

Maximize $z = 100x_1 + 120x_2$ Subjected to condition

$$2x_1 + 3x_2 \leq 1500$$

$$3x_1 + 2x_2 \leq 1500$$

$$x_1 + x_2 \leq 700$$

$$x_1, x_2 \geq 0$$

OR

Q6) Explain the following terms used in linear programming problem [8]

- a) Decision Variable
- b) Optimal solution
- c) Objective function
- d) Feasible solution

Q7) a) Use RK method of fourth order to obtain the numerical solution of

$$\frac{dy}{dx} = \sqrt{x^2 + y} \text{ find } y \text{ at } x = 0.4 \text{ given } y(0) = 1 \text{ take } h = 0.2. \quad [8]$$

b) Draw the flowchart for Parabolic Equation. [10]

OR

Q8) a) Solve for $\frac{\delta u}{\delta t} = \frac{\partial^2 u}{\partial x^2}$ the following explicit finite scheme given by [6]

- i) $u = \sin(\pi x)$ for $t = 0$ where $0 < x < 1$
 - ii) $u(0, t) = u(1, t) = 0$ and
 - iii) Increment in t is $k = 0.02$ and in x is $h = 0.2$
- Calculate value of u for $t = 0$ to 0.06 at $x = 0$ to 1

b) Draw the flowchart for RK second order simultaneous method. [12]

Q9) a) Draw the flowchart for fitting exponential curve $Y = ae^{bx}$ using Least Square Technique. [8]

b) State the degree of polynomial which might be suitable for following function. Calculate $f(3.5)$ using forward difference interpolation formula. [8]

x	2	3	4	5	6	7	8	9
y = f(x)	19	48	99	178	291	444	643	894

OR

Q10)a) Use least square regression to fit a straight line to the data given bellow. **[8]**

X	1	2	3	4	5	6	7
Y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

b) Draw the flowchart for Lagrange's Interpolation. **[8]**

Q11)a) Find double integration of $f(x, y) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Use trapezoidal rule. **[8]**

b) Draw the flowchart for Simpson's 1/3 rule. **[8]**

OR

Q12)a) Compute the integral $\int_0^1 4 + 2 \cos x \, dx$ using gauss Legendre two-point formula. **[8]**

b) Draw the flowchart for trapezoidal rule. **[8]**



Total No. of Questions : 10]

SEAT No. :

PA-491

[Total No. of Pages : 2

[5926]-508

T.E. (Mechanical/Automobile)

MANUFACTURING PROCESS-II

(2015 Pattern) (Semester-II) (302051)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Draw neat sketch of single point cutting tool geometry. [4]
b) Explain with neat sketch construction of radial drilling machine. [6]

OR

- Q2)** a) Draw a neat sketch of twist drill and explain various terminologies of twist drill. [4]
b) Calculate the index crank movement for 51 divisions by compound indexing methods. [6]
Hole circles are,
Plate no 1 : 15,16,17,18,19,20
Plate no 2 : 21,23,27,29,31,33
Plate no 3 : 37,39,41,43,47,49

- Q3)** a) What are different types of broaching machines? Explain schematic of any one machine. [4]
b) Explain with diagram various types of chips formed during metal cutting operation. [6]

OR

- Q4)** a) Enlist advantages and limitations of Column and knee type-milling machine. [4]
b) Explain Centre-less grinding operation with neat sketch. [6]

- Q5)** a) Explain working principle of USM. State its advantages and disadvantages. [8]
b) Draw schematics of Abrasive Jet Machining and explain its process parameters. [8]

OR

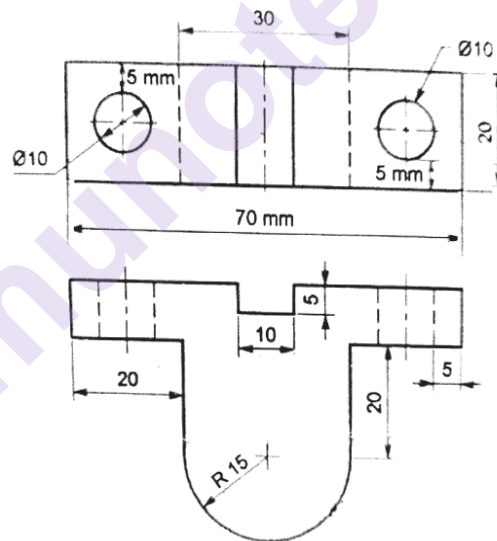
P.T.O.

- Q6)** a) Compare the principle of ECM and EDM along-with various process parameters. [8]
 b) What are the factors that influence material removal rate in USM. [8]

- Q7)** a) Explain following codes [8]
 M00, M01, M02, M03, M04
 G00, G01, G02, G03, G04
 b) Differentiate absolute and incremental positioning system in CNC. [8]

OR

- Q8)** a) Explain CNC machine with neat sketch. [4]
 b) Write a part program for a 30 mm diameter bar having 80 mm length needs to be reduced to 15 mm diameter and 50 mm length. (Assume and mention suitable data if needed) [8]
 c) Differentiate between open and close loop system. [4]
- Q9)** a) What are different types of jigs? Explain any one with suitable sketch. [6]
 b) Design and draw drilling jig for drilling two 10 mm diameter holes in the component shown in the figure below. [12]



OR

- Q10)** a) Draw and explain diamond pin locator. [4]
 b) Explain in detail significance of milling fixtures with diagram. [6]
 c) Write short note on [8]
 i) 3-2-1 principal of location
 ii) Poka-yoke concept in jigs and fixture



Total No. of Questions : 10]

SEAT No. :

PA-492

[Total No. of Pages : 4

[5926]-509
T.E. (Automobile)
DESIGN OF ENGINE COMPONENTS
(2015 Pattern) (Semester - II) (316484)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) What is Buckling of connecting rod? **[4]**

b) Enlist any three IC engine components with its material? **[6]**

OR

Q2) a) Draw neat sketch of crankshaft and explain forces acting on it? **[4]**

b) Following data is given for the piston of four stroke diesel engine: **[6]**

Cylinder bore=250 mm, maximum gas pressure = 4MPa, bearing pressure at small end of connecting rod: 15MPa, Length of piston pin in bush of small end is 45% of bore diameter, ratio of inner to outer diameter of piston pin = 0.6, mean diameter of piston boss = 1.4 times the outer diameter of piston pin, allowable bending stress for piston pin = 84 N/mm²

Calculate:

- i) Inner and outer diameter of piston pin
- ii) Mean diameter of piston boss
- iii) Check the design for bending stresses.

Q3) a) Write materials and manufacturing methods used for connecting rod? **[2]**

b) Design an exhaust valve for a horizontal diesel engine using following data. **[8]**

P.T.O.

Cylinder bore 150 mm, length of stroke 275mm, engine speed 500rpm, maximum gas pressure 3.5MPa, seat angle 45° . Assume mean velocity of exhaust gas 50 m/s. Take k value for steel 0.42. Calculate:

- i) diameter of valve port
- ii) diameter of valve head
- iii) thickness of valve head
- iv) diameter of valve stem and
- v) maximum lift of valve

OR

- Q4)** a) Write down the function of Connecting rod and crankshaft? [2]
 b) What is need of Lubrication system in automobile? Differentiate Air and water cooling systems? [8]

- Q5)** a) The Torque developed by an engine is given by following equation: [8]
 $T = 14250 + 2200\sin 2\Theta - 1800 \cos 2\Theta$

Where T is the torque in N-m and Θ is the crank angle from the inner dead center position. The resisting torque of machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150rpm. A solid circular steel disc is used as flywheel. The mass density of the steel is 7800kg/m^3 . Calculate the radius of the flywheel.

- b) The following data is given for a rimmed flywheel made of grey cast iron FG 200, [8]
 Mean radius of rim = 1.5m,
 Thickness of rim 200mm,
 Width of rim = 300mm,
 Number of spokes = 6,
 Cross sectional area of each spoke = 10000 mm^2 .
 Speed of rotation = 720 rpm.
 Calculate:
 i) The tensile stress in rim at $\Phi = 30^\circ$ and $\Phi = 0^\circ$ and
 ii) The axial stress in each spoke.
 The mass density of the cast iron FG200 is 7100kg/m^3

OR

- Q6)** a) How will you calculate the principal stresses in rotating disc. [4]
 b) A rimmed flywheel made of grey cast iron FG200 ($\rho=7100\text{Kg/m}^3$) is required to keep down fluctuations in speed from 200 to 220 rpm. The cyclic fluctuations in energy are 30000 N-m, while the maximum torque during the cycle is 75000 N-m. The outside diameter of flywheel should not exceed 2m. It can be assumed that there are 6 spokes and the rim contributes 90% of the required inertia. The cross section of the rim is rectangular and the ratio of width to thickness is 2. Determine the diameter of the rim. Assuming suitable cross section for spokes, calculate the stresses in the rim and the spokes using Timoshenko's Expression. [12]
- Q7)** a) Differentiate between sliding contact bearing and rolling contact bearings. [8]
 b) A single row deep groove ball bearing is subjected to radial force of 8kN and a thrust force of 3 kN. The shaft rotates at 1200rpm the expected life L_{10h} of the bearing is 20000h. The minimum acceptable diameter of the shaft is 75mm. Select the suitable bearing for this application. Assume value of X and Y factor as 0.56 and 1.5 respectively. [8]
- OR
- Q8)** a) Explain various applications of sliding contact bearings and rolling contact bearings in vehicles? [8]
 b) The following data is given for a hydrostatic thrust bearing: [8]
 Thrust load = 500 N,
 Shaft speed = 720 rpm,
 Shaft diameter 500mm,
 Recess diameter = 300mm,
 Film thickness 0.15mm,
 Viscosity of lubricant = 160 SUS,
 Specific gravity = 0.86
 Calculate:
 i) supply pressure
 ii) flow requirement in litres/min.
 iii) power loss in pumping
 iv) frictional power loss.

Q9) Write short note on :

[18]

- Cylinder power balance
- Selection of engine type on the basis of Stroke and Bore
- Exhaust gas CO and HC analyzer

OR

Q10) Write short note on :

[18]

- Mechanical fuel pump testing
- Selection of number of cylinders and Cylinder arrangement
- Oscilloscope engine analyzers

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \leq e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Table 1-X and Y factors of single row deep groove ball bearings

Principal dimensions (mm)			Basic load ratings (N)		Designation
d	D	B	C	C ₀	
70	90	10	12100	9150	61814
	110	13	28100	19000	16014
	110	20	37700	24500	6014
	125	24	61800	37500	6214
	150	35	104000	63000	6314
75	180	42	143000	104000	6414
	95	10	12500	9800	61815
	115	13	28600	20000	10615
	115	20	39700	26000	6015
	130	25	66300	40500	6215
	160	37	112000	72000	6315
	190	45	153000	114000	6415

Table 2 - Dimensions and static and dynamic load capacity of single row deep groove ball bearings.



Total No. of Questions : 8]

SEAT No. :

PA-1435

[Total No. of Pages : 2

[5926]-51

T.E. (Civil Engg.)

ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

(2019 Pattern) (Semester-II) (Elective-II) (301015A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Describe influence of geological factors upon urban development and planning. [6]
b) Write a note on amygdaloidal basalt as construction material. [6]
c) What is landslide? Explain the causes and control measures of landslide. [6]

OR

- Q2)** a) What are favorable conditions/characteristics of the rock for the purpose of construction material? [6]
b) Will dam building activity cause a major/minor earthquake? Explain. [6]
c) Write in detail on treatments given to fracture/fracture zone. [6]
- Q3)** a) Explain various mechanical properties of rocks. [6]
b) Calculate RQD recovery and Core recovery from following table. [6]

Run in m	Piece No.	Length in cm	Nature of fracture
3-6m	1	12	J
	2	10	J
	3	70	M
	4	55	M
	5	50	M
	6	13	J
	7	50	J
	8	6	J
	9	8	J
6-9 m	10	70	M
	11	80	M
	12	90	M
	13	10	M

P.T.O.

- c) Calculate apparent resistivity values at different depth zones. [6]

Sr.No	R	a	apparent resistivity
1	1.50	1	?
2	1.40	2	?
3	1.47	3	?
4	1.32	4	?
5	1.19	5	?
6	1.09	10	?

OR

- Q4)** a) Explain in detail Bieniawski's Geomechanical classification. [6]
 b) What is Electrical Resistivity method of Geophysical Exploration? Explain Wenner method. [6]
 c) What is Rock Quality Designation (RQD)? Explain How to calculate Core recovery and RQD? [6]

- Q5)** a) How economy has been achieved by proper geological interpretation? Discuss any one case study. [6]
 b) What are the reasons of tail channel erosion in Deccan Trap area? [6]
 c) Discuss various suitable and unsuitable conditions for dam construction on dipping strata. [5]

OR

- Q6)** a) Discuss reasons of success and/or failure of percolation tanks on various basalts. [6]
 b) Explain treatment to be given to a dyke crossing dam alignment. [6]
 c) Discuss the strength and water tightness characters of DTB from foundation point of view. [5]

- Q7)** a) Explain in detail engineering geological investigations for tunneling. [6]
 b) Is the columnar basalt suitable/unsuitable for tunnel excavation? Give reasons. [6]
 c) Explain in brief safe bearing capacity during bridge construction. [5]

OR

- Q8)** a) Can we locate a pier of bridge partly on weathered rock and on dyke? [6]
 b) Explain standup time of rock during tunneling. [6]
 c) Discuss with suitable examples suitability of compact basalts and amygdaloidal basalt from tunneling point of view. [5]



Total No. of Questions : 10]

SEAT No. :

PA-493

[Total No. of Pages : 2

[5926]-510

T.E. (Automobile Engg.)

**AUTOMOTIVE TRANSMISSION
(2015 Pattern) (Semester - II) (316485)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1)** a) Describe the design features and applications of front engine front wheel drive with neat sketch. [5]
- b) Draw and explain neat layout of bus chassis with its characteristics. [5]

OR

- Q2)** a) Explain the construction and working of hydraulic operation of clutch. [5]
- b) Explain the construction and working of synchronizing unit with neat sketch. [5]

- Q3)** a) What are the Clutch lining materials? List down the desirable properties of clutch lining materials. [5]
- b) Draw and explain the performance characteristics of gear box. [5]

OR

- Q4)** a) Describe the effect of torque reaction and driving thrust on drive line of vehicle. [5]
- b) What is mean by whirling speed of propeller shaft? Elaborate in detail. [5]

- Q5)** a) Explain the necessity and working of locking type of differential with its applications. [8]
- b) Describe the construction and working of semi floating axle with its neat sketch and write its applications. [8]

OR

P.T.O.

- Q6)** a) Write the necessity of lubrication in final drive and explain which factors affecting on selection final drive lubrication. [8]
b) What are the functions of axle? Explain various loads acting on rear axle. [8]

- Q7)** a) Explain the construction and working principle of fluid flywheel with neat sketch. [8]
b) Draw and explain the performance characteristics of torque convertor. [8]

OR

- Q8)** a) Draw and explain the layout of hydraulic control system in automatic transmission. [8]
b) Draw and explain the construction and working of Wilson type of gear box. [8]

- Q9)** a) Describe the necessity of final drive and drive ratios in transmission system. [6]
b) Differentiate between semi floating and three quarter floating type of axle. [6]
c) Explain the construction and working principle of Simple epicyclic gear train. [6]

OR

- Q10)** a) What is mean by Hydromatic transmission? Explain it in brief. [6]
b) Explain the principle of semiautomatic and automatic type of transmission with its applications. [6]
c) Describe the merits and demerits of Continuous Variable Transmission (CVT). [6]



Total No. of Questions : 10]

SEAT No. :

PA-494

[Total No. of Pages : 2

[5926]-511

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2015 Pattern) (Semester - I) (309341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any Five Questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) What is round off error? What problems can be created by round off errors?[10]

OR

Q2) Find the bounds for the propagation error in adding two numbers. For example if one is calculating $X + Y$ where [10]

$$X = 1.5 \pm 0.05,$$

$$Y = 3.4 \pm 0.04$$

Q3) What is the Newton Raphson Method?

[10]

OR

Q4) Estimate the common logarithm of 10 using linear Newton's interpolation.[10]

- a) Interpolate between $\log 8 = 0.9030900$ and $\log 12 = 1.0791812$.
- b) Interpolate between $\log 9 = 0.9542425$ and $\log 11 = 1.0413927$.

Q5) The following table gives the value of density of saturated water for various temperatures of saturated steam. Using Newton divided difference interpolating find the densities when the temperatures are 130°C and 275°C respectively.[16]

Temp° C (= T) :	100	150	200	250	300
Density kg/m ³ (= d) :	958	917	865	799	712

OR

P.T.O.

Q6) Find the approximate value of $I = \int_0^1 \frac{dx}{1+x}$ using the trapezium rule with 2, 4 and 8 equal subintervals. Using the exact solution, find the absolute errors. [16]

Q7) Given $y' = x^3 + y$, $y(0) = 2$, compute $y(0.2)$, $y(0.4)$ and $y(0.6)$ using the Runge-Kutta method of fourth order. [16]

OR

Q8) Using Eulers method, solve $\frac{dy}{dx} + 2y = 0$, $y(0) = 1$. Take $h = 2$ Obtain (0.1), (0.2) and (0.3). [16]

Q9) Explain Golden search method and its application. [18]

OR

Q10) What is process Optimization? State different methods of Optimization. [18]

x x x

Total No. of Questions : 10]

SEAT No. :

PA-495

[Total No. of Pages : 3

[5926]-512

T.E. (Chemical)

MASS TRANSFER - I

(2015 Pattern) (Semester - I) (309342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figurers to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What are the general principle of mass transfer? Explain importance of mass transfer operations. [4]

- b) A volatile organic compound Benzene costing Rs. 45 per Kg is stored in tank 10 m diameter & open at top. A stagnant air film 10 mm thick is covering the surface of the compound beyond the compound is absent. If the atmospheric temp. is 25 0C, vapour pressure of compound is 150 mmHg & its molar diffusivity is 0.02 m²/hr. Calculate the molar flux of Benzene. [6]

OR

Q2) a) Give the Importance of mass heat & momentum analogies. [2]

- b) Explain the two resistance concept, derive the equation for overall resistance to Mass Transfer. [8]

Q3) a) Define absorption factor & stripping factor. [2]

b) What is gas phase controlled mass transfer. [2]

c) Discuss about minimum L/G ratio. [6]

OR

P.T.O.

- Q4) a)** 5000 kg/hr of SO₂ air mixture contain 5 % by volume SO₂ is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit concentration of SO₂ is reduced to 0.15 %. The tower operates at 1 atm. The equilibrium relation is given by $Y = 30 X$ [6]

Where $Y = \text{Moles SO}_2 / \text{Moles water}$

$X = \text{Moles SO}_2 / \text{Moles water}$

If the packed height of tower is 420 cm. Estimate the height of transfer unit (H. T. U.)

- b) Explain choice of solvent for absorption. [4]

- Q5) a)** A mixture of nitrogen-acetone vapor at 800mm Hg and 25°C has % saturation of 80 %. Calculate

- i) Absolute humidity
- ii) Partial pressure of acetone
- iii) Absolute molal humidity
- iv) Volume% of Acetone

The vapor pressure of acetone at 25°C is 190mm Hg [8]

- b) Define wet bulb temperature and derive an expression relating wet bulb temperature with absolute humidity and psychometric ratio. [8]

OR

- Q6) a)** Define [8]

- i) Absolute humidity
- ii) Saturation humidity
- iii) Percent Humidity
- iv) Relative humidity

- b) Derive equation for height of cooling tower [8]

- Q7) a)** Give the Difference between Packed Column and Plate Column. [4]

- b) Explain various Types of packing used in Packed Column. [4]
- c) Explain venture scrubber and wetted wall for column gas-liquid contact [8]

OR

- Q8)** a) Write a short note on: [8]
- i) Spray Tower
- ii) Bubble Column
- b) Explain sparged vessel & mechanically agitated vessels with neat diagram. [8]

- Q9)** a) Give the Construction and working of Fluidized bed Dryer. [8]
- b) A batch of solid for which following table of data applies is to be dried from 25% to 6% moisture under conditions identical to those for which data are tabulated the initial weight of wet solid is 300kg and drying surface is 1m²/8 kg of dry Vapour. Determine the time required for drying. [10]

x	0.35	0.25	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
n	0.3	0.3	0.3	0.266	0.239	0.208	0.180	0.150	0.097	0.07	0.025

OR

- Q10)** a) What is drying? Give classification of dryers & purpose of drying operations. [6]
- b) Derive the equation for Total Time required For drying. [6]
- c) A Certain Material was dried under constant drying condition and it was found that 2 hours are required to reduce the free moisture content from 20% to 10%. How much longer would be required to reduce Free moisture content to 4%. Assume that no constant rate period is encountered. [6]



Total No. of Questions : 10]

SEAT No. :

PA-1888

[Total No. of Pages : 2

[5926]-513

T.E. (Chemical)

INDUSTRIAL ORGANISATION AND MANAGEMENT
(2015 Pattern) (Semester - I) (309343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figurers to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Discuss in detail Manpower planning. **[6]**

b) Write a note on Partnership. **[4]**

OR

Q2) Discuss in detail Joint Stock Company along with characteristics and advantages. **[10]**

Q3) a) Write an explanatory note on Industrial Fatigue. **[6]**

b) Write a note on merit rating. **[4]**

OR

Q4) Discuss various functions of Purchase manager. **[10]**

Q5) a) What is sales promotion? Explain sales promotion technique **[8]**

b) What do you mean by sales forecasting? Explain in detail. **[8]**

OR

Q6) a) With a neat sketch explain the term Marketing Mix used in industry. **[8]**

b) What is Advertising? Explain its importance in product selling. **[8]**

P.T.O.

- Q7) a) Write Notes on :** [8]
- i) VAT and ModVAT
 - ii) Custom and Excise duty
- b) Elaborate the detail procedure for explain in detail the procedure to import equipment from foreign source. [8]

OR

- Q8) a) Explain the Quality Circle in chemical process industry.** [8]
- b) Explain in detail various factors affecting international trade. [8]

- Q9) Write short notes on** [18]

- a) ISO
- b) Patent and patent rights
- c) Flow Chart and Flow Diagram

OR

- Q10)a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. [12]**
- b) Write note on MRTP. [6]



Total No. of Questions : 10]

SEAT No. :

PA-496

[Total No. of Pages : 2

[5926]-514

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY
(2015 Pattern) (Semester - I) (309344)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) Explain the production of Soda Ash by Solvay process with major engineering problems. **[10]**

OR

Q2) Describe the process for chlorine and caustic soda production with help of reactions. **[10]**

Q3) Describe production of single super phosphate. **[10]**

OR

Q4) Explain contact process for sulfuric acid manufacturing in details. **[10]**

Q5) a) What is hydrogenation of oil? Describe process in detail. **[8]**

b) Explain extraction of oils from oilseeds. **[8]**

OR

Q6) a) Explain manufacturing of penicillin with major engineering problems. **[8]**

b) Describe the continuous hydrolysis and saponification process for Soap mfg. **[8]**

P.T.O.

Q7) a) Explain Polymerization in details. [10]

b) Explain the production of producer gas. [6]

OR

Q8) a) Explain cracking operation in details. [10]

b) Explain the production of water gas. [6]

Q9) a) Explain manufacturing of styrene. [10]

b) Discuss production of vinyl chloride. [8]

OR

Q10) a) Explain manufacturing of phenol by cumene process. [10]

b) Explain manufacturing of formaldehyde. [8]



Total No. of Questions : 8]

SEAT No. :

PA-497

[Total No. of Pages : 3

[5926]-515

T.E. (Chemical Engineering)

CHEMICAL ENGINEERING THERMODYNAMICS - II

(2015 Pattern) (Semester - I) (309345)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Prove that the partial molar property is given by:

$$\bar{M}_1 = M + x_2 \frac{dM}{dx_1} \quad [6]$$

- b) Derive variation of Chemical Potential with respect to temperature. [6]
- c) The need arises in a laboratory for 2000 cm³ of an antifreeze solution consisting of 30 mol-% methanol in water. What volumes of pure methanol and of pure water at 25°C must be mixed to form the 2000 cm³ of antifreeze at 25°C? The partial molar volumes are given as follows:

$$\underline{V}_1 = 37 \text{ cm}^3/\text{mol}$$

$$\underline{V}_2 = 18 \text{ cm}^3/\text{mol}$$

Also find n, n₁, n₂ and total volume V. [8]

OR

Q2) a) Give the applications of Phase Equilibria. What is the condition for two phases in equilibrium? [6]

b) Define fugacity and fugacity co-efficient. Derive an expression for the effect of temperature on fugacity coefficient. [6]

c) Binary system acetonitrile [8]

i) /nitromethane

ii) conforms closely to Raoult's law.

P.T.O.

Vapor pressures for the pure species are given by the following Antoine equations:

$$\ln P_1^{\text{sat}} / \text{kPa} = 14.2724 - \frac{2945.47}{t/^{\circ}\text{C} + 224.00}$$

$$\ln P_2^{\text{sat}} / \text{kPa} = 14.2043 - \frac{2972.64}{t/^{\circ}\text{C} + 209.00}$$

Prepare a graph showing P vs. x_1 and P vs. y_1 for a temperature of 75°C.

- Q3)** a) Assuming the carbonated water contains only CO_2 (species 1) and H_2O (species 2), determine the compositions of the vapor and liquid phases in a sealed can of “soda” and the pressure exerted on the can at 10°C. Henry’s constant for CO_2 in water at 10°C is about 990 bar. [8]
- b) Draw and explain a block diagram for BUBBLE point calculation. [8]

OR

- Q4)** a) Give different models for the activity coefficient. Explain any two of them. [8]
- b) Derive the following expression for the excess Gibbs free energy:

$$\overline{G}_i^E = RT \ln \gamma_i \quad [8]$$

- Q5)** a) Derive the expression for the Lewis Randall Rule. [8]
- b) Binary system acetonitrile (1) /nitromethane (2) conforms closely to Raoult’s law. Vapor pressures for the pure species are given by the following Antoine equations: [8]

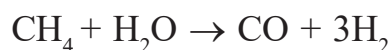
$$\ln P_1^{\text{sat}} / \text{kPa} = 14.2724 - 2945.47/(T - 49.15)$$

$$\ln P_2^{\text{sat}} / \text{kPa} = 14.2043 - 2972.64/(T - 64.15)$$

Prepare a graph showing P vs x_1 and P vs y_1 for a temperature of 348.15 K.

OR

Q6) a) For a system in which the following reaction occurs,



assume there are present initially 2 mol CH_4 , 1 mol H_2O , 1 mol CO and 4 mol H_2 . Determine expressions for the mole fractions y_i as functions of ϵ . [8]

b) Show that the Reaction equilibrium constant decreases as the temperature increases, if the reaction is exothermic. Derive suitable expression. [8]

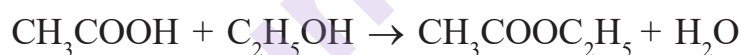
Q7) a) Derive following expression for the Chemical Reaction Equilibrium:

$$\ln K = \frac{-\Delta G^\circ}{RT} \quad [10]$$

b) Explain Chemical Reaction Equilibrium. Deduce the Gibb's phase rule for the chemical reaction equilibria. [8]

OR

Q8) a) Acetic acid is esterified in the liquid phase with ethanol at 100 °C and atmospheric pressure to produce ethyl acetate and water according to the reaction: [10]



If initially there is 1 mol of each of acetic acid and ethanol, estimate the mole fraction of ethyl acetate in the reacting mixture at equilibrium. For the reaction at standard state (298 K):

$$\Delta H_{298}^\circ = -3640J$$

$$\Delta G_{298}^\circ = -4650J$$

b) What are Fuel Cells? Explain it with detailed diagram and working of each component. [8]



Total No. of Questions : 10]

SEAT No. :

PA-498

[Total No. of Pages : 3

[5926]-516

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING - I

(2015 Pattern) (Semester - II) (309348)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a) Explain four different ways of representing a reaction rate. [4]
b) Using a integral method of analysis, obtain a relationship for determining 'k' for second order irreversible reaction. [6]

OR

- Q2) Aqueous A reacts to form R ($A \rightarrow R$) and in the first minute in a batch reactor its concentration drops from $C_{A0} = 2.03$ mol/lit to $C_{Af} = 1.97$ mol/lit. Find rate equation for the kinetics are second order with respect to A. [10]

- Q3) An aqueous feed containing A (1 mol/lit) enters a 2-liter plug flow reactor and reacts away ($2A \rightarrow R$, $-r_A = 0.5 C_A^2$ mol/lit.s.) Find the outlet concentration of A for feed rate of 0.5 liter/min. [10]

OR

- Q4) a) At certain temperature, half-life period and initial concentration for a reaction are [6]

$$t_{1/2} = 420 \text{ sec}, C_{A0} = 0.405 \text{ mol/lit}$$

$$t_{1/2} = 275 \text{ sec}, C_{A0} = 0.64 \text{ mol/lit}$$

find the rate constant of reaction

- b) At certain temperature, half-life period and initial concentration for a reaction are [4]

$$t_{1/2} = 420 \text{ sec}, C_{A0} = 0.405 \text{ mol/lit}$$

$$t_{1/2} = 275 \text{ sec}, C_{A0} = 0.64 \text{ mol/lit}$$

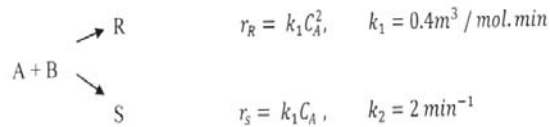
find the rate constant of reaction

- Q5) a) Derive performance equation for Batch Reactor. [8]
b) Derive performance equation for Mixed Flow Reactor. [8]

OR

P.T.O.

Q6) a) Liquid reactant A decomposes as follows. **[12]**



Feed of aqueous A ($C_{A0} = 40 \text{ mol/m}^3$) enters the reactor, decomposes a mixture of A, R and S leaves, Find C_R , C_S and τ for $X_A = 0.9$ in:

- i) Mixed flow reactor
 - ii) Plug flow reactor
- b) Discuss the qualitative discussion about product distribution for parallel reactions. **[4]**

Q7) a) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. **[8]**

- b) Define optimum temperature progression (OTP) needed for optimum reactor performance. **[8]**

OR

Q8) Calculate the heat of reaction at 600°C.



Heat capacities of reacting species may be expressed as

$$C_p = \alpha + \beta T + \gamma T^2 + \delta T^3$$

Component	α	$\beta \times 10^2$	$\gamma \times 10^5$	$\delta \times 10^9$
A	-0.24	8.65	-5.12	12.05
B	-1.30	8.40	-5.55	14.25
C	6.45	0.104	-0.008	0

The heat of reaction at the standard state (25°C) of the reaction is 27.23 k cal/g mol. **[16]**

Q9) A sample tracer was injected into the vessel and effluent concentration was measured as function of time. Construct C and E and Determine the fraction of material leaving the vessel that has spent 33 and 6 min and fraction of material that has spent 7.75 and 8.2 min in the vessel. **[18]**

T (min)	0	1	2	3	4	5	6	7	8	9	10	12	14	16
C (g/cm ³)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.5	0	0

OR

Q10)a) Write a note on (any three) **[10]**

- i) Tank in series model.
- ii) C and E curve.
- iii) Micro and macro mixing of fluids
- iv) Dispersion Model.

b) Explain E, F and C curve and find relationship between them. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-499

[Total No. of Pages : 2

[5926]-517

T.E. (Chemical)

TRANSPORT PHENOMENA

(2015 Pattern) (Semester - II) (309349)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figurers to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain Bingham model of Non-Newtonian fluid. [6]
b) Explain Fourier's law of heat conduction with suitable example. [8]
c) State the boundary conditions to solve mass transfer problems. [6]

OR

- Q2)** a) Derive expression of Hagen Poiseuille Equation for flow of a Newtonian fluid through the tube. [6]
b) Explain procedure to setup and solve heat transfer problems. [6]
c) Derive the expression of molar flux and concentration profile for diffusion with heterogeneous chemical reaction. [8]

- Q3)** Derive equation of motion in a Cartesian co-ordinate system for a flow of fluid through a control volume of size $\Delta x.\Delta y.\Delta z$. [16]

OR

- Q4)** a) Explain macroscopic energy balance equation. [8]
b) Derive Navier-Stokes equation of motion. [8]

P.T.O.

Q5) Drive Ergun equation for flow through packed bed. [17]

OR

Q6) Derive expression of fanning friction factor. [17]

Q7) Derive the correlation of binary mass transfer coefficient in one phase at low mass transfer rates. [17]

OR

Q8) Explain Martinnelli's analogy, Chilton-Colburn analogy, Reynold's analogy. [17]



Total No. of Questions: 10]

SEAT No. :

PA-500

[5926]-518

[Total No. of Pages : 4

T.E. (Chemical)

CHEMICAL ENGINEERING DESIGN-I

(2015 Pattern) (Semester-II) (309350)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) A storage vessel is required to store 45000 kg of oil. The density of oil to be stored is 910 kg/m^3 . The diameter of can be taken as 2.5 m. An empty space of 10% of oil volume is to be provided over the oil surface. If the plates in the size of 1.2 X 2.5 m in different thicknesses are available for fabrication, estimate the total no. of plates required for fabrication of storage tank. Also determine minimum thickness required for storage tank. Welded joint efficiency = 85%. Permissible stress of material = 1020 kg/cm^2 . **[10]**

OR

Q2) Design a saddle support for a horizontal vessel using following data. **[10]**

Material - Low carbon steel, vessel diameter = 1230 mm, Length of shell = 8000 mm, shell thickness = 10 mm, Working pressure = 0.5 N/mm^2 , Head thickness = 10mm, Torispherical head - Crown radius = 1230mm, Knuckle radius - 75 mm, Total head depth = 257 mm, Corrosion allowance = 1.5mm, Permissible stress = 95 N/mm^2 , Weight of the vessel and contents = 119430 N, Distance of saddle centre line from shell end = 320 mm, Included angle = 120° .

Q3) 1.2 Kg/sec of organic liquid to be cooled from 45°C to 20°C . The organic liquid is cooled by chilled water supplied from refrigeration unit at a temperature of 5°C and can be heated up to 10°C . Properties of organic liquid and water are: **[10]**

P.T.O.

Properties	Organic liquid	Water
Specific heat (J/Kg.K)	2150	4180
Viscosity (N.S/m ²)	0.25×10^{-3}	0.8×10^{-3}
Thermal conductivity (W/m.K)	0.133	0.61

Steel tubes are available with 12mm ID and 2mm thick, Length of tube = 1.6 m, Thermal conductivity of steel tubes = 45 W/mK, Fouling resistance can be neglected. Design a suitable heat exchanger.

OR

- Q4)** Skirt support is to be designed for tall vertical vessel having dia. 2.5 m and height 37m. Skirt dia. is equal to diameter of vessel while skirt is 3.5m high. The weight of vessel with all its attachments is 2, 22,000 Kg. The minimum weight of vessel is 1,70,000 Kg. The wind pressure acting on the vessel is 130 Kg/cm². Seismic coefficient = 0.08, K for cylinder = 0.7, Permissible tensile stress of material = 1400 Kg/cm², Yield stress of material 2000 Kg/cm², Permissible stress of concrete = 45 Kg/cm², BCD is 32 cm greater than skirt diameter. No of bolts to be used 24. Estimate the thickness of skirt support. [10]

- Q5) a)** A single effect evaporator is to concentrate 9070 kg/h of a 20% solution of sodium hydroxide to 50% solids. The guage pressure of the steam is 1.37 atm, the absolute pressure in the vapour space is to be 10 mm Hg. The overall heat transfer coefficient is estimated to be 1400 w/m² °C. The feed temperature is 37.8 °C. Calculate the amount of steam consumed, the economy and the heating surface required. [12]

- b) Explain boiling point rise. [5]

OR

Q6) a) Explain the feeding methods for multiple effect evaporators. [6]

- b) 3 kg/sec of aqueous solution containing 12% solute is to be concentrated to 40% by weight. The feed solution at 21 °C enters the first effect of a forward feed arrangement of triple effect evaporator. Steam is available at 4 kg/cm² with temperature 143°C. Vacuum in the last effect is 0.2 kg/cm² corresponding to a boiling temperature 60 °C. [11]

Overall heat transfer coefficient for three effects:

$$U_1 = 1800 \text{ W/m}^2 \text{ K}, U_2 = 1000 \text{ W/m}^2 \text{ K}, U_3 = 600 \text{ W/m}^2 \text{ K}.$$

C_p for liquor = 3700 J/kg K- assumed to be constant

$$\lambda \text{ of steam} = 2441 \text{ kJ/kg}, \lambda \text{ of vapour} = 2357 \text{ kJ/kg}$$

Find:

- i) Minimum area required for each effect.
- ii) Steam Economy

Q7) a) A reaction vessel is fitted with a plain jacket and stiffening rings for the reaction vessel with the help of following data:

vessel shell internal diameter = 2130 mm,

Jacket internal diameter = 2260 mm, Jacket length = 2500 mm,

Pressure inside the reactor = 0.55 N/mm², Jacket internal pressure = 0.35 N/mm²,

Temperature = 150 °C,

Material of construction - open hearth steel with allowable stress = 98 N/mm²,

Modulus of elasticity = 190kN/mm², Poisson's ratio = 0.30 [10]

- b) With neat sketches describe vortex and swirling and methods to avoid it. [7]

OR

Q8) a) A jacketed agitated reactor consists of a vertical cylinder 1.2 m in diameter with a hemispherical base & flanged flat top. Jacket is fitted to the cylindrical section only and extends to a height of 0.9 m. Spacing between the jacket & vessel wall is 75 mm. The jacket is fitted with a spiral baffle. The pitch between the spirals is 200 mm. The jacket is used to cool the reactor contents with chilled water at 10°C @ 32,500 kg/h. Exit temperature of water is 20°C. Estimate the heat transfer coefficient at the outside wall of the reactor and pressure drop in the jacket. Density of water = 998 kg/m³, viscosity of water = 1.136 mNs/m², $N_{pr} = 7.9$, $k_f = 0.59$ W/m.k, $j_f = 3.2 \times 10^{-3}$. [10]

b) Comment on selection of a jacket or a coil for a reaction vessel. [7]

Q9) a) Design a separator for the separation of a mixture of steam and water.
 Steam : Flow rate = 2100 kg/h, Density = 2.2 kg/m³
 Water : Flow rate = 1000 kg/h, Density = 930 kg/m³
 Operating pressure = 4 bar [10]
 b) Explain knockout drum and reflux drum. [6]

OR

Q10) a) Design a decanter to separate light oil from water. The oil is the dispersed phase. Oil - Flow rate = 1,000 kg/h, Density = 900 kg/m³, Viscosity = 3 mNs/m², Water - Flow rate = 5,000 kg/h, Density = 1,000 kg/m³, Viscosity = 1 mNs/m², Droplet diameter = 150 μ m. [10]
 b) Explain material hazards and process hazards? [6]



[5926]-519

T.E (Chemical Engg.)

MASS TRANSFER - II

(2015 Pattern) (Semester - II) (309351)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Derive the Rayleigh equation and Give its significance. [5]

- b) A feed of 50% hexane and 50% octane mixture by mole is flash distilled. The vapour and liquid leaving the separator are assumed to be in equilibrium. If the fraction of feed converted to vapour is 0.5. Find the composition of distillate and residue. The equilibrium data : [5]

Mole Fr. of Hexane in liquid (x)	1	0.69	0.4	0.192	0.045	0
Mole Fr. of Hexane in vapour (y)	1	0.932	0.78	0.538	0.18	0

OR

- Q2) a) A mixture of 35 mole % of A and 65 mole % of B is to be separated in a distillation column. The concentration of distillate is 92 mole % and 96 mole % of component A is recovered in the distillate. The feed is all vapour. The Reflux Ratio is 4 and relative volatility is 2.4. How many equilibrium stages are required in each section of the column? [8]

Equilibrium Data:

(x)	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
(y)	0	0.21	0.375	0.507	0.615	0.706	0.783	0.848	0.906	0.956	1.0

- b) What is minimum Reflux Ratio? [2]

P.T.O.

- Q3) a)** A solution of Nicotine in water containing 1 % nicotine is to be extracted with kerosene at 293K. Water and kerosene are practically immiscible (Essentially insoluble). [6]

Assume the equilibrium relationship to be $Y = 0.9 X$

Where $Y = \text{kg of nicotine / kg of kerosene (kg C / kg B)}$

$X = \text{kg of nicotine /kg of water (kg C / kg A)}$

Determine % extraction of nicotine if 100 kg of the feed solution is extracted with 150 kg of solvent (kerosene).

- b) Differentiate between azeotropic distillation and Extractive distillation.[4]

OR

- Q4) a)** Explain Binodal Solubility Curve and the effect of temperature on Binodal Solubility Curve in solvent Extraction. [6]

- b) Describe the different feed conditions in distillation. [4]

- Q5) a)** Write material balance for single stage leaching. [6]

- b) Oil is be extracted from meal by means of benzene using continuous counter- current leaching unit. The unit treats 1000 kg of meal (on completely exhausted solids basis) per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids contain 55 kg of oil and 451 kg of benzene. Find the number of stages required. The entrainment data is : [10]

Kg of oil/kg of solution	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Kg of solution/kg of solid	0.5	0.505	0.515	0.53	0.55	0.517	0.595	0.62

OR

- Q6) a)** Explain the method for finding number of stages in continuous counter-current leaching. [6]

- b) Describe the construction, mechanism and application of Pachuka Tank for leaching operation with neat sketch. [8]

- c) Give any four applications of leaching operation. [2]

Q7) a) Which parameters should affect the shape of Breakthrough curve in adsorption? [6]

b) A solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.96. Calculate the necessary dosage of the fresh carbon per 2000 kg solution for a single stage process. The data for an equilibrium isotherm is as follows : [10]

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium colour	9.6	8.6	6.3	4.3	1.7	0.7

OR

Q8) a) The equilibrium relation for the decolourisation operation is $Y = 0.5 X^{0.5}$ where Y= gm color removed / gm of adsorbent, X = gm color in oil / 1000gm of color free oil. 100 Kg oil containing one part of color to three part of oil is agitated with 25 Kg of adsorbent. Calculate the percentage colour removed, if all 25 Kg of adsorbent is used in one stage. [10]

b) What are the desirable characteristics of an adsorbent. [6]

Q9) a) State methods of super saturation and explain Miers Theory of super saturation in crystallization. [6]

b) A Solution contains 500 Kg Na_2CO_3 and water has a concentration of 25% by wt. of salt. It is cooled from 335K to 285K in an agitated mild steel vessel. Weight of the vessel is 750 Kg. 2.0% water is lost by evaporation. Crystals of $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$ are formed. Calculate the yield of crystals and the heat to be removed? [8]

Data: Solubility At 285K: 8.9 Kg/100 Kg water.

Heat capacity of solution: 3.6 KJ/Kg K.

Heat Capacity of M.S: 0.5 KJ/KgK.

Heat of Solution; 78.5 MJ/KMol.

Latent heat of Vaporization: 2395 KJ/Kg.

- c) Define the terms in membrane processes; 1. Rejection 2. Permeability 3. Membrane fouling 4. Cake Resistance [4]

OR

- Q10)**a) A batch of 500 kg of KCl is dissolved in water to make a saturated solution at 350 K when the solubility is 30% by weight of KCl in water. The solution is cooled to 293 K when the solubility is 25.4% by weight. Determine the quantity of crystals obtained if 3.5% of the original water is lost by evaporation. Also determine the capacity of the vessel if the density of feed is 1200 kg/m^3 and the volume of the vessel is 1.2 times the volume of the solution. [10]
- b) Classify the membrane processes and explain the principle of Reverse Osmosis. [5]
- c) What is importance of seeding in the crystallizer. [3]



Total No. of Questions : 8]

SEAT No. :

PA-1436

[Total No. of Pages : 3

[5926]-52

T.E. (Civil)

SOFT COMPUTING TECHNIQUES

(2019 Pattern) (Semester-II) (Elective-II) (301015b)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Your answers will be valued as a whole.
- 4) Assume suitable data, if necessary

Q1) a) Discuss Overfitting of ANN and their effects. What is normalization and denormalization of data. [9]

- b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6,6,8], First layer weights (input to hidden) : [0.4 -0.5 0.6; -0.3 0.8 -0.7], First layer bias: [3; -3, 7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2], Use sigmoidal transfer function between the first layer and hidden layer and Linear function between the hidden layer and output layer. [9]

OR

Q2) a) For feed forward back propagation neural network, how to fix number of Input neurons, Output neurons, Hidden layers, hidden neurons? Discuss data preprocessing. [9]

- b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6, 6, 8.], First layer weights (input to hidden): [0.4 -0.5 0.6; -0.3 0.8 -0.7], First layer bias: [3; -3, 7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2], Use sigmoidal transfer function between the first layer and hidden layer and Linear function between the hidden layer and output layer. [9]

Q3) a) Distinguish between Recurrent networks and Radial basis function networks with suitable example for each. [8]

- b) Discuss working of self-organized feature maps with a suitable example. [9]

OR

P.T.O.

Q4) a) Distinguish between Radial basis function networks and Generalized regression neural networks. [8]

b) The power developed by a water turbine (P) depends upon the rotational speed N, Operating head (H), Gravitational acceleration (g), diameter (D) and breadth (B) of the runner, density (ρ) and viscosity (μ) of water. Design a 3 layered neural network using the above parameters and give the following details: [9]

- i) Input and output parameters
- ii) Architecture with figure
- iii) Size of weight and Bias matrix
- iv) Activation function/s between the layers.
- v) Performance function/s

Q5) a) Discuss the Genetic operators in Genetic Algorithm in detail. [9]

b) Explain the basic working of support vector Machine. What are hard margin and soft margin SVMs? [9]

OR

Q6) a) Discuss in detail an application of Genetic Algorithm in Civil Engineering. [9]

b) What is a kernel in SVM? Why do we use kernels in SVM? Discuss any one kernel in detail. [9]

Q7) a) Discuss the working of Model Tree and Random Forest Regression. [8]

b) 28-day Compressive strength of concrete (in MPa) depends on the quantity (in Kg/m³) of Cement, Fine aggregate, coarse aggregate and water. Design a model using Random Forest, using the above parameters and give the following details: [9]

- i) Input and output parameters
- ii) No. of trees
- iii) Data Division
- iv) Out of bag estimates
- v) Performance function/s

OR

Q8) a) Discuss the need of Out of Bag estimates in Random Forest. Explain Bagging in Random Forest. [8]

b) The power developed by a water turbine (P) depends upon the rotational speed N, operating head (H), Gravitational acceleration(g), diameter(D) and breath(B) of the runner. density(ρ) and viscosity(μ) of water. Design a Model using Model Tree using the above parameters and give the following details: [9]

- i) Input and output parameters
- ii) No. of rules
- iii) Splitting criteria
- iv) Standardization of data
- v) Performance function/s



Total No. of Questions : 10]

SEAT No. :

PA-502

[Total No. of Pages : 2

[5926]-520

T.E. (Chemical)

**PROCESS INSTRUMENTATION AND CONTROL
(2015 Pattern) (Semester - II) (309352)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain classification of temperature measuring instruments. [5]
b) Differentiate between Analog and Digital instrument. [5]

OR

- Q2)** a) Explain filled system thermometers with neat diagram. [5]
b) Explain Thermister with neat diagram. [5]

- Q3)** a) Explain classification of Pressure measuring instruments. [5]
b) What are transducers? Explain types of transducers. [5]

OR

- Q4)** a) Explain well manometer with neat sketch. [5]
b) Explain C type Bourdon pressure sensors with neat diagram. [5]

- Q5)** a) Explain with diagram, construction and working of Orifice meter with its industrial application. [8]
b) Explain with diagram, construction and working of Sight glass level measurement method. [8]

OR

P.T.O.

- Q6)** a) Explain with diagram, construction and working of Ultrasonic level measurement method. [8]
b) How level can be measured using radiation method? Draw neat sketch and explain in detail. [8]

- Q7)** Explain principle with diagram, construction and working of: [16]
i) HPLC
ii) pH meter

OR

- Q8)** Describe with neat diagram the following techniques of composition analysis. [16]

- i) Mass spectroscopy
ii) IR Absorption Spectroscopy

- Q9)** a) With the help of block diagram explain working of feedback control system. [9]
b) Derive the dynamic response equation of first order system for step change. [9]

OR

- Q10)** a) Explain with equation and diagram, different control actions. [9]
b) State difference between first order and second order system. [9]



Total No. of Questions : 10]

SEAT No. :

PA-503

[Total No. of Pages : 2

[5926]-521

T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING
(2015 Pattern) (Semester - I) (301001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8 and Q.No.9 or Q.No.10.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

Q1) a) Explain in brief various types of rain gauge stations, Explain any one with sketch. **[5]**

b) Write a note on drip irrigation with neat sketch state advantages and disadvantages of drip irrigation. **[5]**

OR

Q2) a) Explain Area Velocity method of discharge measurement. **[5]**

b) What is duty? State factors affecting & explain methods of improving duty. **[5]**

Q3) a) Derive the formula to calculate discharge of a well in a confined aquifer. **[5]**

b) Explain Darcy's Law, with its application. **[5]**

OR

Q4) a) List various methods of assessing canal revenue. Explain volumetric basis method with merits & demerit. **[6]**

b) Explain the following **[4]**

- i) Aquifer
- ii) Aquiclude
- iii) Specific Yield of an Aquifer
- iv) Porosity of soil

P.T.O.

- Q5) a)** What is hydrograph? Explain all the parts/components of the typical hydrograph. Explain fern shaped catchment. [8]
- b)** Explain various climatic factors affecting runoff. [8]

OR

- Q6) a)** What is “S” curve hydrograph? Explain its component and construction with a sketch. [8]
- b)** Explain extreme value distribution (Gumble’s) [8]

- Q7) a)** What is reservoir sedimentation? What is the significance of trap efficiency? Explain with sketch. [8]
- b)** What are various reservoir losses. What are various measures to control these losses. [8]

OR

- Q8) a)** Explain fixation of reservoir capacity using elevation capacity curve and dependable yield. [8]
- b)** Explain the mass curve and explain the step by step procedure to determine the reservoir capacity and surplus water. [8]

- Q9) a)** Compare Warabandi with cooperative water distribution system. [9]
- b)** Write a short note on ancient system of water distribution which still exist in North Maharashtra. [9]

OR

- Q10)a)** What is water logging? Explain tile drain formula and also state formula for spacing of tile drain. [9]
- b)** Draw a neat section for lift irrigation scheme and state various components of lift irrigation scheme. Explain various design steps in lift irrigation system. [9]

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Total No. of Questions : 12]

SEAT No. :

PA-1889

[Total No. of Pages : 3

[5926]-522

T.E. (Civil)

**INFRASTRUCTURE ENGINEERING AND
CONSTRUCTION TECHNIQUES
(2015 Pattern) (Semester - I) (301002)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) Explain the salient features of B.R.T.S. [6]

OR

Q2) Write a note on Smart City. [6]

Q3) a) Explain the Advantages and Disadvantages of concrete sleepers. [4]

b) Explain with sketch, points & crossings. [4]

OR

Q4) a) What is track Maintenance? Explain concept of Directed Track Maintenance (DTM) [4]

b) Draw a diagram for components parts of Permanent Way. [4]

Q5) a) What are different methods of dewatering system? Explain Well Point system with suitable sketch. [4]

b) Write note with sketch. Diaphragm walls. [4]

OR

P.T.O.

- Q6)** a) Define - Grouting. Explain any one method of grouting. [4]
b) List various Dredging systems? Explain any one with sketch? [4]

- Q7)** a) Explain with neat sketch, Trenchless tunneling. [6]
b) What is mucking? State the various methods of mucking? Explain any one in detail. [6]
c) Explain with neat sketch. Needle Beam Method. [4]

OR

- Q8)** a) Write note on- Tunnel Boring Machine. [6]
b) State methods of Tunnel Ventilation. Explain any one in detail. [6]
c) With labeled sketch, define following terms: [4]
i) Shaft ii) Addit
iii) Pilot Tunnel iv) Portal

- Q9)** a) Define-Breakwater. Explain the necessity of breakwater. [6]
b) List out the various components of Port? Explain any two in detail? [6]
c) With labeled sketch, define following terms : [4]
i) Fenders ii) Bulkhead
iii) Jetty iv) Wharf

OR

- Q10)** a) What are points to be considered for selection of site for Harbour? [6]
b) Differentiate between Wet Dock and Dry Dock. [6]
c) With labeled sketch, define following terms : [4]
i) Tetra pod ii) Tri bar
iii) Hexapod iv) Quay wall

- Q11)**a) Explain in detail, Economic life of equipment. [6]
- b) Write note on- [6]
- i) Scrapers
- ii) Dumpers
- c) Explain the preventive maintenance of equipment. [4]

OR

- Q12)**a) Explain the selection criteria for cranes. [6]
- b) Discuss various factors affecting selection of equipment for project. [6]
- c) Explain - Operating cost of Equipment. [4]



Total No. of Questions : 10]

SEAT No. :

PA-504

[Total No. of Pages : 3

[5926]-523

T.E. (Civil)

STRUCTURAL DESIGN - I

(2015 Pattern) (Semester - I) (301003)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat sketches must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Take Fe 410 grade of steel.
- 5) Take ultimate stress in bolt, $f = 400 \text{ N/mm}^2$.
- 6) Assume suitable data, if necessary.
- 7) Use of electronic pocket calculator, IS : 800-2007 and Steel Table is allowed.
- 8) Use of cell phone is prohibited in the examination hall.

Q1) a) Explain modes of failure in compression member with the help of sketch. [3]

b) Design a single angle section to carry tensile load of 100 kN. Assume 4 bolts of 20mm diameter at suitable pitch and end distance for connection. [7]

OR

Q2) a) Differentiate working stress method and limit state method of design. [3]

b) Design double angle section to carry factored compressive load of 120 kN. Length of the member is 2.1m. [7]

Q3) a) Define a beam-column member with suitable examples and the sketches. [4]

b) A column of 5 m length has to support factored load of 600 kN. The column is effectively held in position at both ends and restrained against rotation at one end. Design column section using I-section. [6]

OR

Q4) Design a slab base for a column consisting of ISHB 400 @ 77.4 kg/m carrying axial factored load of 1100 kN. Use M20 grade of concrete. [10]

P.T.O.

Q5) A simply supported beam of effective span 5 m carries factored udl 50 kN/m. The section is laterally supported throughout the span. Design the beam using I-section and apply usual checks. [16]

OR

Q6) A simply supported beam of effective span 4.5 m carries factored udl 60 kN/m. The section is laterally unsupported throughout the span. Design the beam using I-section and apply usual checks. [16]

- Q7)** a) Explain seated connection with the help of neat sketches. [5]
- b) Design a bolted framed connection for the factored beam end reaction 100 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of the column section ISHB 200 @ 37.3kg/m. [12]

OR

Q8) A simply supported welded plate girder of an effective span of 21 m subjected to working udl of 70 kN/m throughout the span. Assuming compression flange laterally supported throughout the span, design economical cross section for the plate girder along with welded connections. [17]

Q9) Design a gantry girder for following conditions- [17]

Span for gantry girder = 6.5 m

Span for crane girder = 16 m

Crane capacity = 250 kN

Weight of crane girder = 280 kN

Weight of trolley = 50 kN

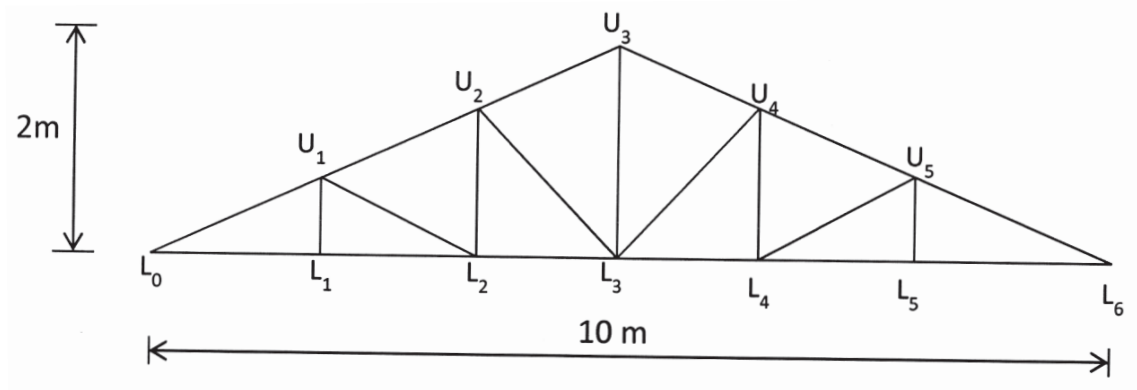
Approach distance = 1 m

Wheel spacing = 3.5 m

Weight of rails can be assume as 0.3 kN/m

OR

Q10) Design members L_0-L_1 and L_0-U_1 for the truss as shown in figure which is to be used for an industrial building situated at Mumbai and is covered with GI sheets. Assume design wind pressure, $P_z = 950 \text{ kN/m}^2$. [17]



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[5926]-524

T.E. (Civil Engineering)

STRUCTURAL ANALYSIS - II

(2015 Pattern) (Semester - I) (301004)

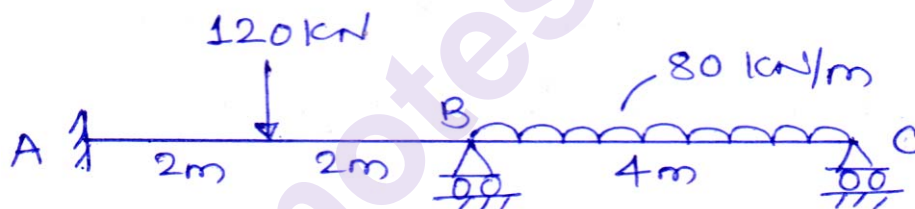
Time : 2½ Hours]

[Max. Marks : 70

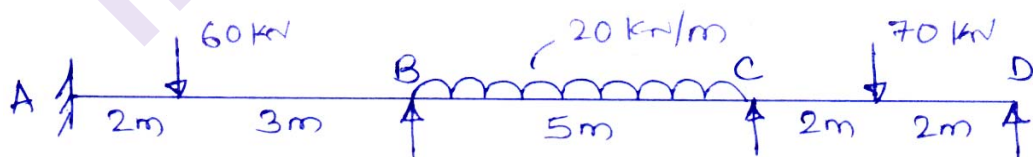
Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Use of non programmable calculator is allowed.

Q1) a) Analyse the continuous beam by slope deflection method. Draw BMD. [10]

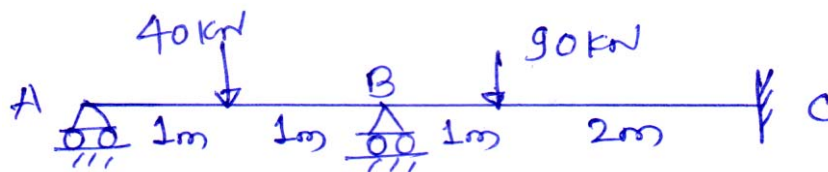


b) Analyse the continuous beam by using Moment Distribution Method. Draw BMD. [10]



OR

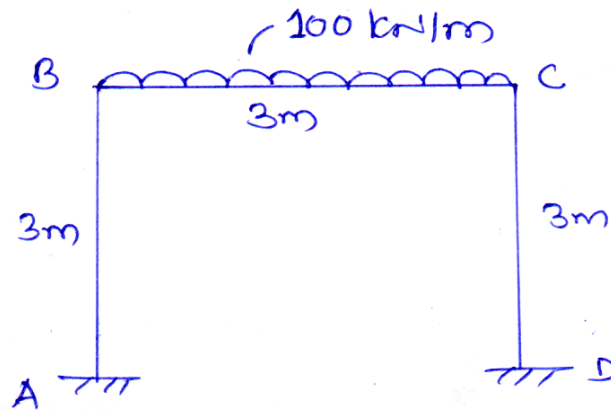
Q2) a) Analyse the continuous beam by flexibility Matrix method. [10]



P.T.O.

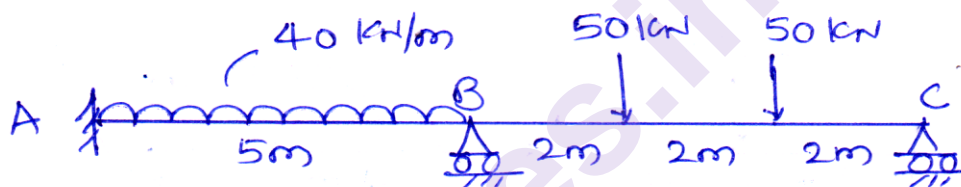
b) Analyse the portal frame by slope deflection method. Draw BMD.

[10]



Q3) Analyse the continuous beam by stiffness matrix method. Draw SFD & BMD.

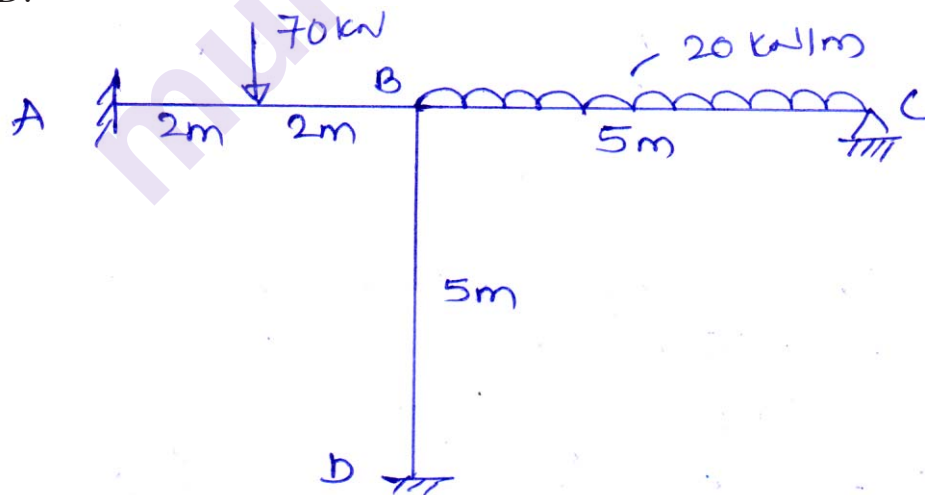
[16]



OR

Q4) Analyze the frame by stiffness matrix method. Take EI as constant. Draw BMD.

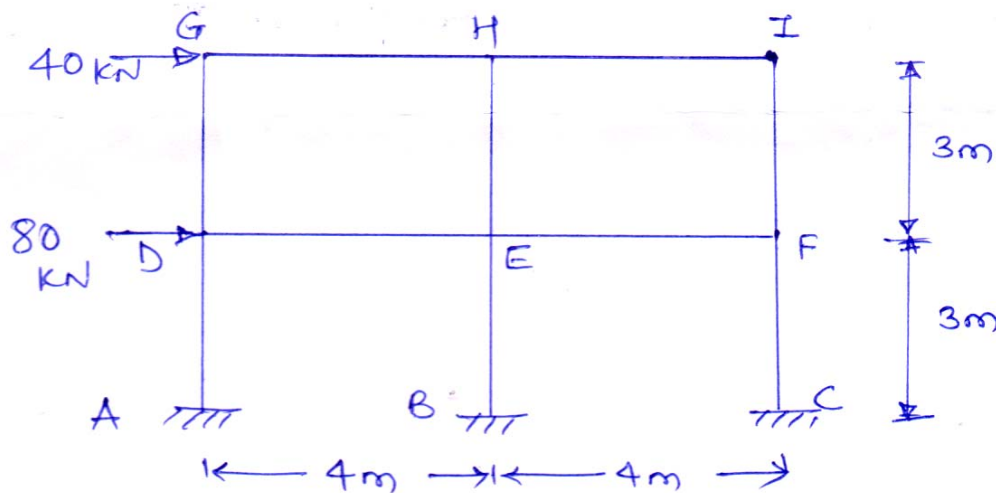
[16]



Q5) a) A cantilever beam of span 'L' carries uniformly distributed load of intensity w kN/m. determine the deflection at free end by using 5 nodes.

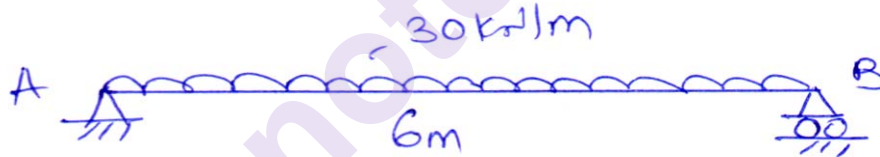
[6]

- b) Analyze the frame by portal method. Draw BMD. & SFD. [12]



OR

- Q6) a) Analyze the frame by shown in figure for (Q5b) by cantilever method. Draw SFD & BMD. [12]
 b) Find maximum deflection for the beam shown, by using finite difference method. Take 3 nodes. [6]



- Q7) a) Derive expression for shape function for a two noded bar element taking natural co-ordinate system. [8]
 b) Explain plain stress and plain strain problem. [8]

OR

- Q8) a) Explain following terms : [8]
 i) Nodes ii) LST
 iii) Co-ordinate systems iv) Shape function
 b) Determine shape function for a CST element in terms of natural co-ordinate system. [8]



Total No. of Questions : 8]

SEAT No. :

PA-506

[Total No. of Pages : 3

[5926]-525

T.E. (Civil)

FLUID MECHANICS - II

(2015 Pattern) (Semester - I) (301005)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) A thin flat plate 80 cm long and 40 cm wide was held in wind tunnel with velocity of air 108 km/hr in such way that drag and lift coefficients were 0.2 and 0.6, respectively. **[6]**

Determine

- i) Drag force
 - ii) Lift force
 - iii) Resultant force
 - iv) Power exerted if weight of air is 11.5 N/m^3
- b) Derive continuity equation as applicable of open channel flow. **[6]**
- c) Design an economical trapezoidal channel with side slope 1V : 2H, bed slope 1:3000 carrying discharge of $5 \text{ m}^3/\text{s}$. (Assume Manning's coefficient, $n = 0.03$). **[6]**

OR

- Q2) a)** Explain polar diagram. **[6]**
- b) Explain specific energy diagram. **[6]**
- c) A hydraulic jump of energy dissipater is designed to have energy loss of 8.5 m when Froude Number before jump is 7.2. Determine sequent depths. **[6]**

Q3) a) A 150 mm diameter jet moving at 30 m/s impinges on a series of a vanes moving at 15 m/s in the direction of the jet. The jet leaves the vanes at 60° with the direction of motion of the vanes. **[9]**

P.T.O.

Calculate:

- i) The force exerted by the jet in the direction of motion of the vanes.
 - ii) Work done by the jet per second. Construct inlet and outlet velocity triangles.
- b) i) Explain working of centrifugal pump.
- ii) Draw neat sketch of centrifugal pump showing all heads.

[8]

OR

- Q4) a)** A 100 mm diameter jet discharging $0.45 \text{ m}^3/\text{s}$ impinges on a series of curved vanes moving at 20 m/s . The direction of the jet and the direction of motion of the vane are the same at inlet. Each vane is so shaped that if stationary it would deflect the jet by 165° . [9]

Calculate:

- i) The force exerted in the direction of motion of the vane,
 - ii) The power developed and
 - iii) The hydraulic efficiency.
- b) A pump with a shaft input of 8 kW and an efficiency of 75% is connected in pipe line conveying $0.1 \text{ m}^3/\text{s}$ of water. The suction and delivery line of the pump are 150 mm and 120 mm in diameter. The suction line enters the pump 0.75 m below the discharge end of the pump. If the suction pressure is 75 kPa find the pressure at the discharge end of the pump and the rise in the hydraulic gradient across the pump. [8]

- Q5) a)** Sketch a layout of typical hydroelectric power generation plant and explain in brief function of each element. [8]

- b) A Pelton wheel has to be designed for the following data. Power to be developed = 5500 kW . Net head available = 260 m , speed = 470 rpm , ratio of jet diameter to wheel diameter = 0.1 , and overall efficiency = 85% . Find number of jets, diameter of the wheel, and quantity of water required, number of buckets [10]

OR

- Q6)** a) A hydraulic turbine is to operate at 180 rpm under a head of 35m. The discharge is $26 \text{ m}^3/\text{s}$ and the overall efficiency is 85%. Determine the speed, discharge, and output power when head is reduced to 15 m. [9]
- b) Derive expressions for unit quantities. Also explain the importance of these quantities. [9]

- Q7)** a) Derive differential equation for GVF. State the assumptions made. [8]
- b) A wide rectangular channel carries a discharge of $4 \text{ m}^3/\text{s}/\text{m}$. The bed slope of the channel is 1:2400 and Manning's $n = 0.09$. At a certain section along this channel depth of flow is 2.5 m. How far upstream or downstream of this section the depth of flow will be within 10% of the normal depth? Use direct step method. Use two steps only. [9]

OR

- Q8)** a) Explain M1, M2 and M3 GVF profiles. [8]
- b) A rectangular channel 12 m wide carries a discharge of $45 \text{ m}^3/\text{s}$. If at a section in this channel the depth is 1.6 m, how far (upstream or downstream) from this section will the depth be 2.0 m. Take $S_o = 0.0009$ and $n = 0.017$. [9]



Total No. of Questions : 10]

SEAT No. :

PA-507

[Total No. of Pages : 3

[5926]-526

T.E. (Civil)

ADVANCED SURVEYING

(2015 Pattern) (Semester - II) (301007)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8, Q.No.9 or Q.No.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain how to determine the intervisibility of triangulation stations. [6]
b) Explain the principle of echo sounding. [4]

OR

- Q2)** a) Explain the factors governing accuracy in SBPS positioning. [6]
b) What are tides? Explain the weight gauge. [4]

- Q3)** a) Define Remote Sensing. List out the applications of remote sensing & describe any one in detail. [6]
b) What do you mean by sounding? Explain how soundings are reduced and plotted. [4]

OR

- Q4)** a) What is GIS? Explain the raster and vector data structure. [6]
b) State different tide gauges used in hydrographic surveying. Explain any one in detail. [4]

- Q5)** a) State the conditions of adjustments of a triangle with central station. [5]
b) Define: [8]
i) spherical excess,
ii) accidental errors and systematic errors,
iii) independent and conditioned quantity, and
iv) weight

P.T.O.

- c) The angles of a spherical triangle PQR were observed as follows: [5]
 $P = 87^{\circ}14'39''$ weight = 4
 $Q = 39^{\circ}40'48''$ weight = 3
 $R = 53^{\circ}4'55''$ weight = 2
 Find the values of the adjusted spherical angles, if the spherical excess is known to be $9''$.

OR

- Q6)** a) Explain the following in relation with triangulation survey: [5]
 i) Weight of an observation
 ii) Station adjustment
 b) A surveyor carried out levelling operations of a closed traverse ABCDA starting from A and found that, [8]
 B was 6.71 m above A
 C was 5.59 m above B
 D was 3.48 m above C
 D was 13.72 m above A
 The accuracy of all the four levelling operations is assumed to be equal. Determine the probable heights of B, C and D by the method of correlates.
 c) Explain the principle of least squares method. [5]
- Q7)** a) Define relief displacement. Derive an expression for the same. [5]
 b) Define: [5]
 i) Isocentre,
 ii) Exposure Station,
 iii) Flying height and
 iv) Tilt and tip
 c) The scale of an aerial photograph is 1 cm=160 m & the size of the photograph is 20 cm x 20 cm. If the longitudinal overlap is 65% and side overlap is 35%, determine the number of photographs required to cover an area of 232 sq. Km. [6]

OR

- Q8)** a) What are the applications of photogrammetry? Explain any one of them in detail. [5]
 b) Explain the procedure of determining the minimum number of aerial photographs required to cover a given areas. [5]

- c) Determine the minimum number of aerial photographs required to cover an area of $40 \text{ km} \times 30 \text{ km}$, with the following details: [6]

Size of an aerial photograph = $23 \text{ cm} \times 23 \text{ cm}$

Scale of aerial photograph : $1 \text{ cm} = 150 \text{ m}$

Longitudinal overlap = 60%

Side overlap = 30%.

- Q9)** a) Calculate the difference in level between two points M & N and the elevation of the point M from the following observation: [8]

- i) Horizontal distance MN = 4100 m
- ii) Angle of depression from M to N = $2^\circ 10' 10''$
- iii) Height of instrument at M = 1.48 m
- iv) Height of signal at N = 4.30 m
- v) Coefficient of refraction = 0.07
- vi) Radius of the earth = 6371 Km
- vii) RL of N = 612.50 m

- b) Explain the procedure of marking the alignment of the tunnel on the surface of the ground and transferring the alignment underground. [8]

OR

- Q10)** a) It is required to determine the elevation of a station O. Observations were made to three stations A, B and C already fixed and of known elevations. The following data was recorded. [8]

Inst.Stn	Stn obs.	Ht. of inst.	Distance (m)	Ht. of signal	Vertical angle
O	A	1.50	3600	5.6	$1^\circ 1' 20''$
	B		4700	4.1	$-53' 00''$
	C		5000	4.9	$-34' 10''$

- b) Describe the procedure for determining centre line length of bridge and procedure for location of bridge piers while setting out a bridge. [8]



Total No. of Questions : 10]

SEAT No. :

PA-508

[Total No. of Pages : 3

[5926] - 527

T.E. (Civil)

**PROJECT MANAGEMENT AND ENGINEERING ECONOMICS
(2015 Pattern) (Semester - II) (301008)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain project --- Life Cycle Concept. [5]

b) Explain Certified Project Management Professionals (PMP). [5]

OR

Q2) a) Explain in detail the features of PMBOOK in point of view of construction industry. [5]

b) Prepare the Work Breakdown Structure (WBS) for Bunglow. [5]

Q3) a) Write down the Implementation of Safety Programs on construction site. [5]

b) Draw the network diagram and make out critical path, [5]

Activity	Duration
1-2	3
1-3	2
1-4	6
2-4	5
2-5	7
3-4	2
4-5	4

P.T.O.

OR

Q4) a) What do you mean by Inventory Control? How it can be achieve?
[2 + 3]

b) Explain Critical path and type of Floats in detail. [5]

Q5) a) Frame the CPM network for the data given in the table below and Also find : [10]

i) Critical Path and Normal Duration of the project.

ii) Calculate the normal cost and optimum cost. Assume the total cost of the project Rs. 11,000/- and initial cost Rs. 300/- per day.

Calculate the optimum duration.

Activity	Events		Duration (Days)		Slope of Cost curve in Rs.Day
	Preceding	Succeeding	Normal	Crash	
A	10	30	7	3	100
B	10	20	9	7	60
C	30	50	4	1	150
D	20	50	5	3	250
E	20	40	3	1	20
F	50	60	6	4	332
G	40	60	2	1	1000

b) Enlist the Project Management Software use in Construction Industry. Explain any one software & its use. [8]

OR

- Q6)** a) What do you know about earned value analysis? How economic health of any project analyzed by using it? [6]
- b) Explain Resource Allocation, write steps in resource smoothening and leveling. [6]
- c) What do you mean by Resource optimization? Explain in detail. [6]

- Q7)** a) Define Project Economics and Write down its importance in Construction Industry. [6]
- b) Explain Equity Shares and Debenture Capital concept in detail. [6]
- c) Elaborate Law of Diminishing Marginal Utility. [4]

OR

- Q8)** a) Explain the Simple and Compound Interest with example. [6]
- b) What are the factors affecting on Price Determination? [6]
- c) Explain the Law of Demand and Elasticity of Demand. [4]

- Q9)** a) Role of Project Management Consultants in Pre-tender and Post-tender process. [8]
- b) What are the types of Project Appraisals? Explain with example. [8]

OR

- Q10)** a) Write a short note on **any two** : [8]
- i) Break even analysis.
- ii) IRR and ARR method.
- iii) Role of project management consultant.
- b) Explain in detail the importance of Study of Project Feasibility report before starting any project. [8]



Total No. of Questions : 12]

SEAT No. :

PA-509

[5926]-528

[Total No. of Pages : 3

T.E. Civil

**FOUNDATION ENGINEERING
(2015 Pattern) (Semester-II) (301009)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and mention it clearly.
- 5) Non programmable calculator is allowed.

SECTION-I

Q1) Discuss Seismic refraction method of soil exploration in accordance with: [7]

- a) Principle
- b) Procedure and sketch
- c) Limitation

OR

Q2) a) Differentiate between SPT and DCPT. [3]

b) Discuss factors affecting sample disturbance. [4]

Q3) a) Explain the modifications suggested by Mayerhoff in the Terzaghi's bearing capacity equation. [3]

b) Discuss how to determine bearing capacity of the layered soil. [3]

OR

Q4) A strip footing 1 m wide, with the base located at the depth of 1 m below ground surface. Soil properties are $\gamma = 18.5 \text{ kN/m}^3$, $c = 3.0 \text{ kN/m}^2$ and $\phi = 20^\circ$. Determine safe bearing capacity using F.S.=3. For $\phi = 20^\circ$, $N_c = 11.8$, $N_q = 3.9$ and $N_\gamma = 1.7$. Use Terzaghi's analysis. [6]

P.T.O.

Q5) Explain the terms. [7]

- a) Compression index
- b) Over consolidation ratio
- c) Allowable soil pressure
- d) Consolidation settlement

OR

Q6) The consolidation test is conducted on the soil with following properties, compression index 0.25, void ratio at the stress of 10 kN/m^2 is 2.02. Determine

- a) Change in void ratio if stress is increased by 9 kN/m^2 .
- b) Settlement if soil is 4m thick. [7]

SECTION-II

Q7) a) Enlist the methods of determining pile capacity. Explain any two methods. [6]

b) Sketch a sectional elevation of well foundation. Explain the function of each part. [6]

c) Explain in detail negative skin friction on piles. [4]

OR

Q8) a) Find out group capacity of piles by following methods.

- i) Individual action
- ii) Block Failure

Pile group consists of 15 piles arranged in 3 rows, diameter of pile is 300 mm, depth of pile 8m, $c = 25 \text{ kN/m}^2$, Spacing of pile = 0.8 m c/c. $\alpha = 1.0$, Unit weight of soil = 10 kN/m^3 . Neglect bearing resistance. [6]

b) Explain with figures the following difficulties and their rectification [6]

- i) Tilt
- ii) Hanging up
- iii) Sand blow.

c) What is caisson disease? Mention what precautions should be taken to avoid caisson disease. [4]

- Q9) a)** Explain the terms with sketches. [6]
i) Free earth support
ii) Fixed earth support in connection with anchored sheet piles for their bending moment.
b) Explain merits and demerits of Circular type, Diaphragm type cellular cofferdams. [6]
c) What are the various ground improvement techniques? Explain any one of them. [4]

OR

- Q10)a)** Enlist types of cofferdams and explain any two types of cofferdams. [6]
b) What is swelling potential of soil and what are the methods for determination of swelling potential of black cotton soil. [6]
c) Explain the engineering problems associated with black cotton soil. [4]
- Q11)a)** What is liquefaction? Explain the liquefaction susceptibility criteria. [6]
b) Explain the use of geosynthetics in
i) Retaining wall
ii) Deep foundation
iii) Embankments on soft soils. [6]
c) What is reinforced earth wall? Explain with neat sketch. [6]

OR

- Q12)a)** Define the following terminologies correlated with earthquake. [6]
i) Epicenter
ii) Focus
iii) Focal depth
iv) Epicentral distance
v) Foreshocks and aftershocks
vi) Body waves
b) Enlist the advantages of geosynthetics materials over conventional materials. [6]
c) Enlist and explain different types of seismic waves. [6]



Total No. of Questions : 12]

SEAT No. :

PA-510

[Total No. of Pages : 7

[5926] - 529

T.E. (Civil)

STRUCTURAL DESIGN - II

(2015 Pattern) (Semester - II) (301010)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10. and Q.11 or Q.12.
- 2) Figures to the right indicate full marks.
- 3) IS 456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary assume suitable data and indicate clearly.

Q1) State and explain modes of failure (Balanced, Under reinforced and Over reinforced section) with diagrams. [5]

OR

Q2) Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in tension by LSM approach. [5]

- a) for M25 concrete and Fe 500 steel.
- b) for M20 concrete and Fe 250 steel.

Q3) Design a reinforced concrete beam subjected to a bending moment of 20 kNm. Use M20 concrete and Fe 415 reinforcement. Keep the width of the beam equal to half the effective depth, use WSM. [7]

OR

P.T.O.

Q4) Calculate the moment of resistance by LSM for flanged beam section detailed as below [7]

- a) Width of rib = 230 mm.
- b) Effective flange width = 1250 mm.
- c) Thickness of flange = 120 mm.
- d) Total depth = 600 mm with clear cover 25 mm.
- e) Tension steel = 6 No. of 20 mm diameter bars.
- f) Use M25 grade of concrete and Fe 415 grade of steel.

Q5) Design one way slab of clear size $2.9 \text{ m} \times 6.2 \text{ m}$ only for flexure by LSM. The slab is supported by beams of width 230 mm along all the edges. Draw neat sketches showing details of reinforcement. Take live load = 4 kN/m^2 ; Floor finish = 1.5 kN/m^2 ; Materials : M25 grade of concrete; Fe 500 grade of reinforcement. Neglect check for shear. [8]

OR

Q6) Design first flight from plinth level to midlanding level (**only for flexure**) of a dog-legged staircase for the following data : [8]

- a) No of treads in flight = 8 Nos;
- b) Rise = 175 mm, Tread = 250 mm;
- c) Width of landing at midlanding level = 1.2 m;
- d) Width of stair = 1.2 m;
- e) Live load = 3 kN/m^2 ; Floor finish = 1.0 kN/m^2 ;
- g) The staircase is supported by two beams of width 230 mm; first beam is below the first riser and second beam is at the end of midlanding.
- h) Materials : M20 Concrete; Fe 500 Steel.

Show details of reinforcement. Use LSM.

Q7) Design a simply supported reinforced concrete floor beam with following data : **[16]**

- a) Clear Span of beam = 6.0 m.
- b) Width of supporting columns = 450 mm.
- c) Beam width = 300 mm.
- d) Ultimate UDL on beam = 50 kN/m, inclusive of self weight.
- e) The beam supports a slab of thickness 120 mm on one side of beam.
- f) Material - M25, Fe 500.
- g) Show details of reinforcement. Use LSM.

OR

Q8) Design a continuous beam ABCDE for **flexure** only using IS Code coefficients. AB = 4.7m; BC = 5.0m; CD = 4.8m. The beam supports 140 mm slab on both sides. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 12 kN/m. Consider material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[16]**

Q9) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB = 5.5 m, BC = 4.0 M and CD = 6.5 m. The beam carries dead load of 28 kN/m (including its self weight) and live load of 15 kN/m. The beam supports 120 mm slab on both sides. Apply 18% redistribution of moments. Calculate design moment for span CD and support B. Design span CD and support B only for flexure. Draw the reinforcement details.

Material-Concrete of grade M25, Fe 500 reinforcement. **[16]**

OR

Q10) Design a bi-axial short column by limit state method with material M25 and Fe 415 to carry working axial load of 1000 kN. Working moment of 60 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.0 m. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. **[16]**

- Q11)** a) Explain different parameters of interaction curves for the design of column. [4]
- b) Design a short axially loaded column and its isolated footing for carrying a Ultimate axial load of 1300 kN. The effective length of column is 2.6 m. Use M30 grade of concrete and Fe 500 grade of steel. SBC of soil is 300 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. [14]

OR

- Q12)** Design an uni-axial short column by limit state method with material M25 and Fe 415 to carry a working load of 700 kN and working moment of 80 kN-m about major axis bisecting the depth of column. The unsupported length of column is 408 m. The column is hinged at both ends. Also design the footing for this column considering axial load and moment for **flexure** and **punching shear**. Take SBC = 300 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. [18]

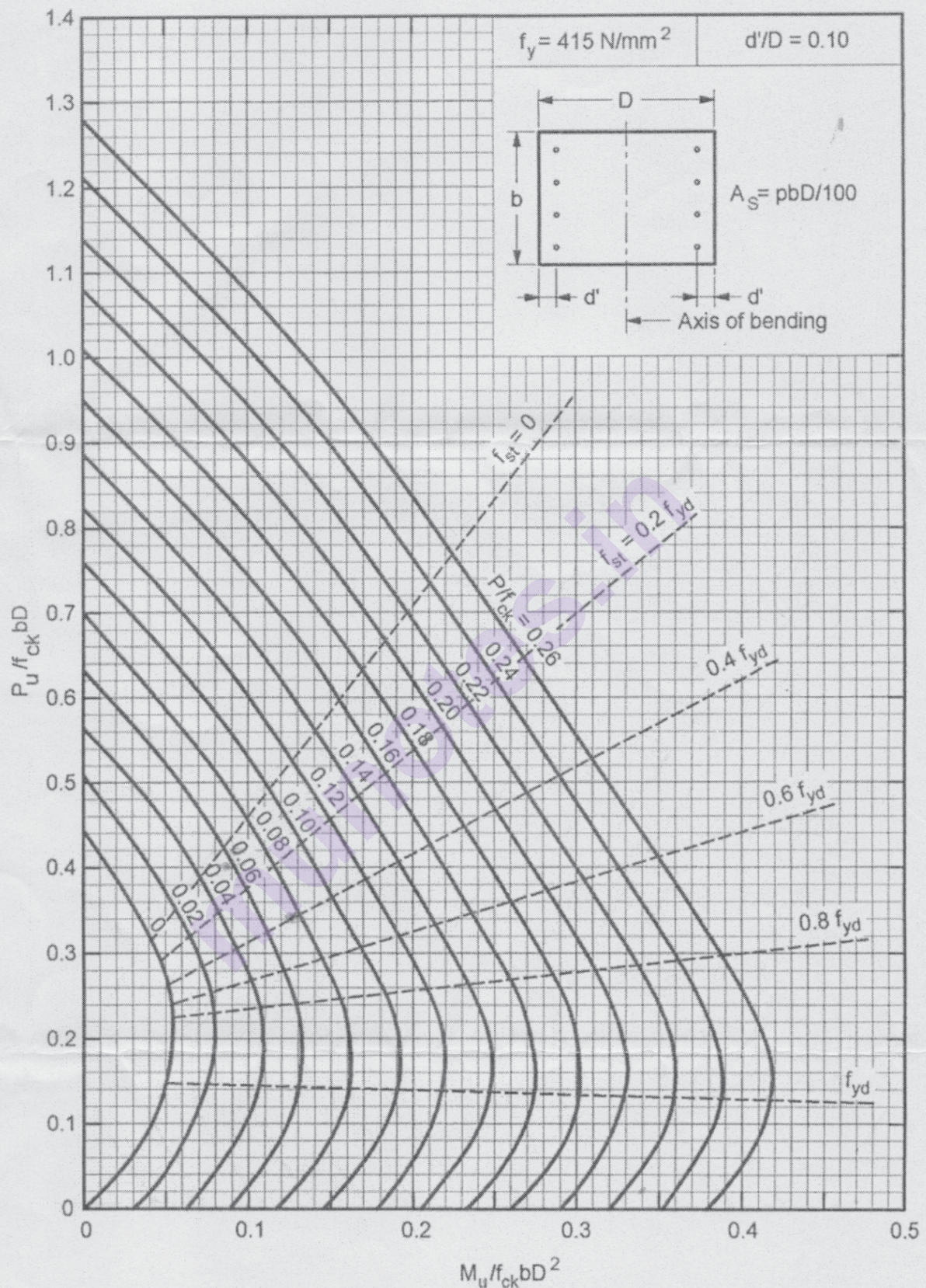


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides

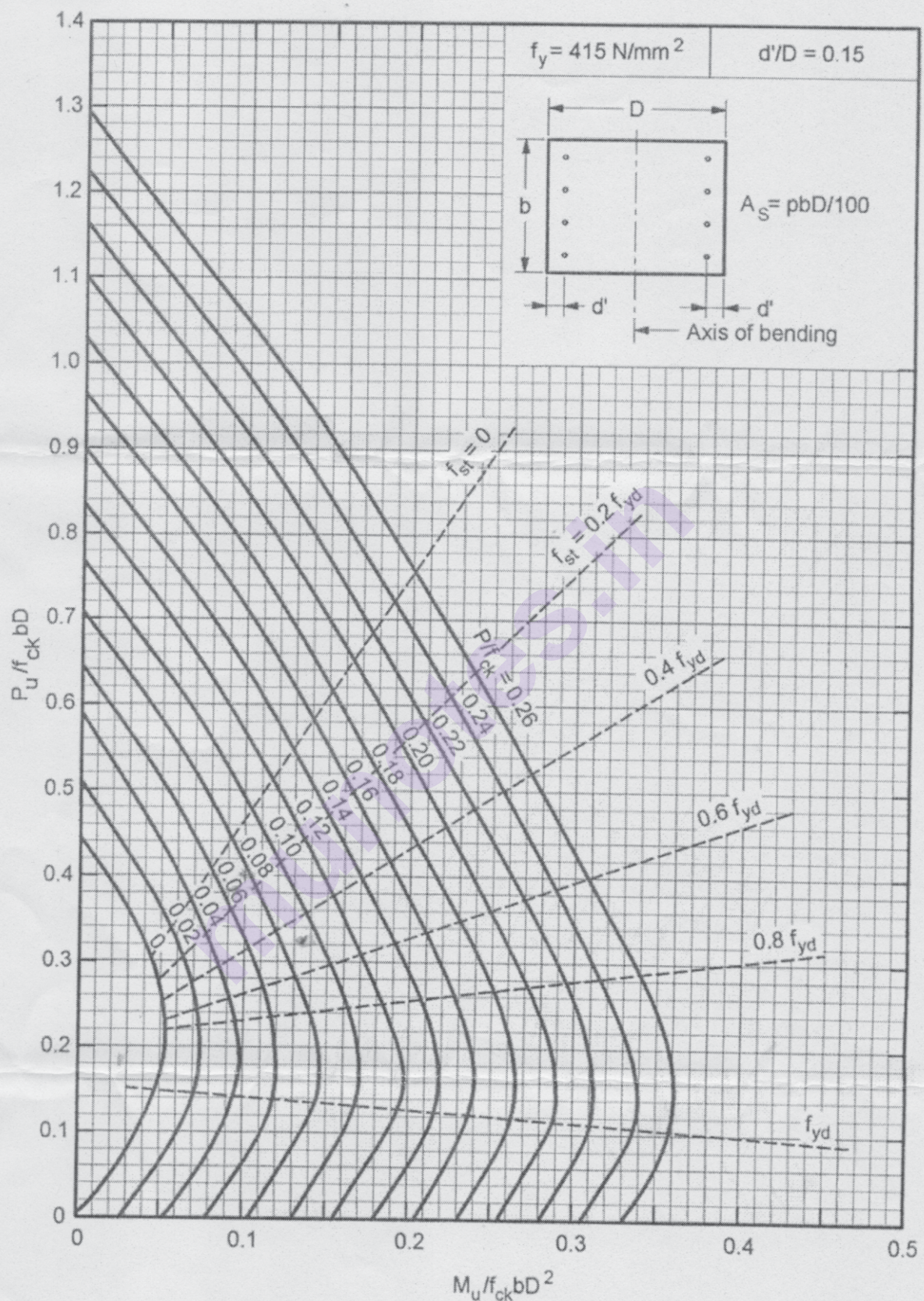


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides

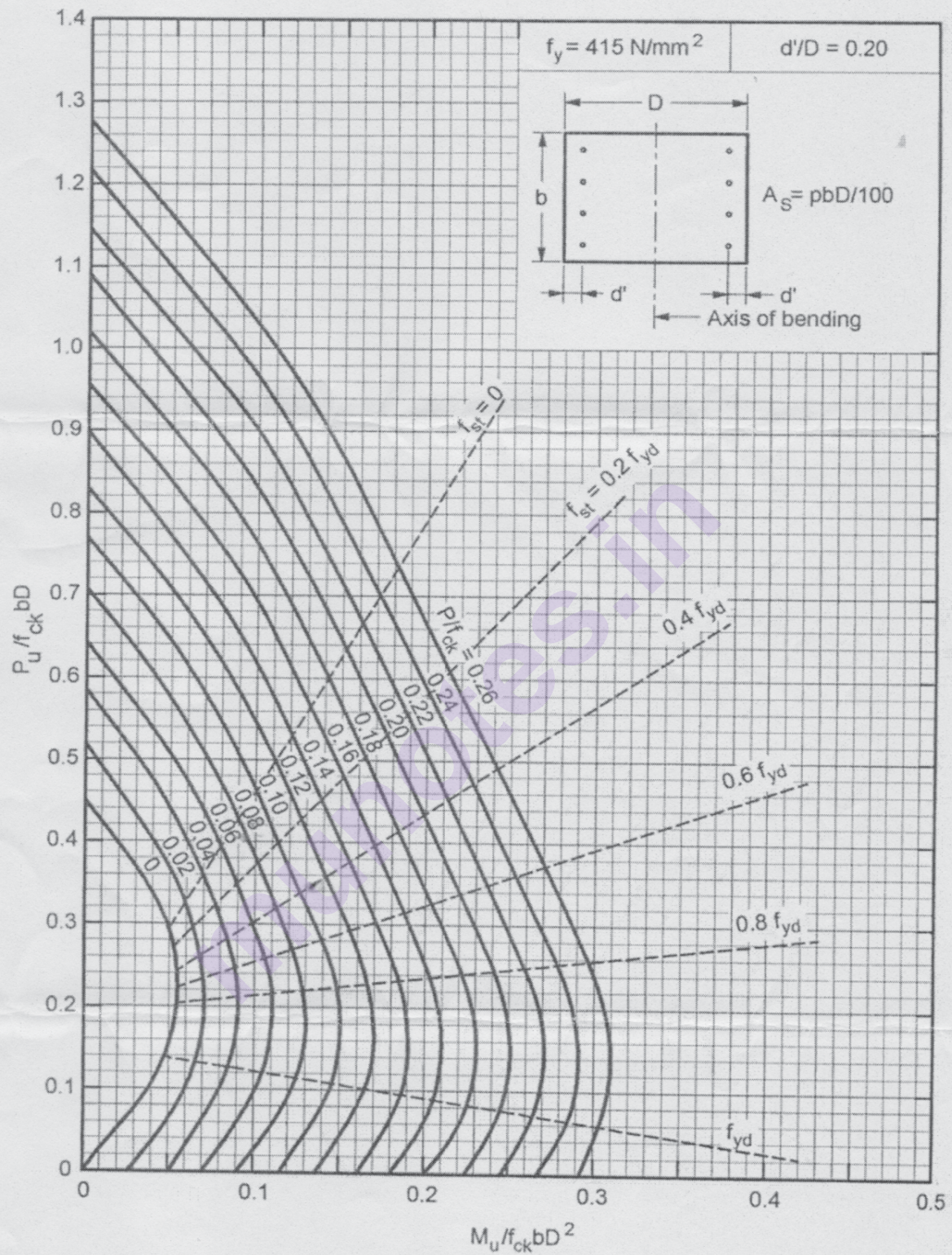


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite



Total No. of Questions : 8]

SEAT No. :

PA-1437

[Total No. of Pages : 2

[5926]-53

T.E. (Civil)

ADVANCED SURVEYING

(2019 Pattern) (Semester-II) (Elective-II) (301015c)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Determine the azimuth and altitude of a star from the following data:
Declination of star = $20^{\circ}30'N$ hour angle of star = $42^{\circ}6'$ Latitude of observer = $50^{\circ}N$. [6]
- b) Explain the shore line survey. [4]
- c) Explain the analytical method of determining the position of boat in hydrographic surveying. [8]

OR

- Q2)** a) Mention the properties of spherical triangle. [6]
- b) Define mean sea level.Explain the importance of mean sea level in surveying. [4]
- c) Explain the process to establish horizontal and vertical control in hydrographic surveying. [8]

- Q3)** a) A line AB, 2000 m lying at an elevation of 500 m measures 8.65 cm on a vertical photograph for which focal length is 20 cm. Determine the scale of the photograph in an area the average elevation of which is about 800 m. [6]
- b) Define vertical photograph, tilted photograph and oblique photograph.[5]
- c) The scale of an aerial photograph is 1 cm=200 m & the size of the photograph is 23 cm × 23 cm. If the longitudinal overlap is 60% and side overlap is 30%, determine the number of photographs required to cover an area of 200 sq. Km. [6]

OR

P.T.O.

- Q4)** a) What is meant by photogrammetry? Explain the following terms: plumb point, principal point, isocentre and scale of photograph. [6]
b) Define perspective projection, nadir point and tilt. [5]
c) A camera of $f=25$ mm is used to take a vertical photograph when $h=1800$ m. What is the flying height of aircraft in order to get the scale of 1:10000. [6]
- Q5)** a) Explain the components of ideal remote sensing system. [5]
b) Describe the working principle of Electronic total station. [8]
c) Write a note on raster and vector model in GIS. [5]

OR

- Q6)** a) Explain the components of GIS. [5]
b) Explain the salient features of Electronic total station. [8]
c) Explain the interaction of electromagnetic energy with the earth's surface. [5]
- Q7)** a) Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS. [9]
b) Write a note on segments of GPS. [8]

OR

- Q8)** a) Explain the basic principle of GPS and its applications in Civil Engineering. [9]
b) Explain digital terrain modelling. [8]



Total No. of Questions : 10]

SEAT No. :

PA-511

[Total No. of Pages : 3

[5926]-530
T.E. (Civil Engg.)
ENVIRONMENTAL ENGINEERING - I
(2015 Pattern) (Semester - II) (301011)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2 and Q.3 or Q.4 and Q.5 or Q.6 and Q.7 or Q.8 and Q.9 or Q.10.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

- Q1) a)** Determine effective stack height of stack for following data. **[6]**
- i) Physical stack is 203m tall with 1.07 m inside diameter.
 - ii) Wind velocity 3.56 m/s, air temperature 13°C.
 - iii) Barometric pressure is 1000 millibars.
 - iv) Stack gas velocity is 9.14 m/s, stack gas temperature 149°C.
- b) Write the ambient quality standards for Air pollution. **[4]**

OR

- Q2) a)** Define water supply scheme. Mention various factors affecting the design period. **[6]**
- b) State the factors which affect the generation rate of solid waste. **[4]**
- Q3) a)** Explain in detail domestic and public consumption of water. Give typical values in tabular form. **[6]**
- b) Enlist name of heavy metal found in water and their effects. **[4]**

OR

- Q4) a)** Enlist various types of aerators. Draw plan and cross section for circular type cascade aerator. Also mention typical dimensions on it. **[6]**

P.T.O.

- b) Find the dimensions of a circular sedimentation tank from the following [4]
- Detention period = 4Hrs
 - Quantity of water to be treated = 2.5 million liters per day and
 - Depth of water=3m.

- Q5) a)** Determine the surface area for settling tank for $0.5 \text{ m}^3/\text{sec}$. Flow using design overflow rate as $32.5 \text{ m}^3/\text{m}^2/\text{day}$. Also find the depth of tank if detention time is 95 min. Assume $L/B = 2:1$ to $L/B = 5:1$ and length of tank should not exceeds 100m. [10]
- b) What is coagulation. Explain different types of coagulant. [6]

OR

- Q6) a)** What are different types of filters? Explain filter troubles. [10]
- b) A city has a population of 1,00,000 with an avg. Rate of demand of 160 lit.per head per day. Find the area of rapid sand filter. (bed size-9m×5m)[6]
- Q7) a)** Enlist and explain various methods of disinfection. Mention factors affecting the efficiency of disinfection. Also explain the concept of chlorine demand. [10]
- b) Flocculation chamber is 30 m long 12m wide 4.5 m deep is to treat 75 mld of water. I is equipped with the 12m long and 0.3 m wide paddles supported parallel to each other and moved by four horizontal shaft which rotate at a speed of 2.5 rpm the center line of paddle is 1.8 m from the shaft which is situated at mid depth of tank. Two paddles are mounted on each shaft opposite to each other. If mean velocity of water is $\frac{1}{4}$ rth of paddle find [6]
- Power consumption
 - Time of flocculation
 - Value of G if kinematic viscosity of water is $1.31 \times 10^{-6} \text{ m}^2/\text{sec}$

OR

Q8) a) Explain with necessary chemical reactions the lime soda process for softening of water. Also compare the lime soda process with zeolite process. [10]

b) Explain the any two processes for removal of odour and colour. [6]

Q9) a) What is service reservoir? Give the importance of distribution system. Draw sketch of ESR and show on it all of its component parts and appurtenances. [9]

b) The population of 5 decades from 1930 to 1970 are given below in table. Find out the population after one, two and three decades beyond the last known decade, by using arithmetic increase method. [9]

Year	1930	1940	1950	1960	1970
Population	25000	28000	34000	42000	47000

OR

Q10) Write note on: [18]

- Methods of distribution
- Packed WTP in township
- Wastage and leakage of water - its detection and prevention.

Total No. of Questions : 8]

SEAT No. :

PA-512

[Total No. of Pages : 2

[5926]-531

T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2015 Pattern) (Semester - I) (310241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What are limitations of finite automata? Explain use of regular expression and finite automata in lexical analysis. **[6]**

b) Convert the following grammar to Chomsky Normal Form (CNF) **[6]**

$G = (\{S\}, \{a, b\}, P, S)$

$P = \{S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb\}$

c) Identify the language denoted by following regular expressions : **[8]**

a) $(11 + 0)^* (00 + 1)^*$

b) $(1 + 01 + 001)^* (\epsilon + 0 + 00)$

OR

Q2) a) Construct NFA for regular expression $(a+b)^+aab$. **[6]**

b) Write regular expression to accept following languages over **[6]**

$\Sigma = \{a, b\}$:

- i) Strings having at least one occurrence of 'aaa'
- ii) Strings starting and ending with same symbol
- iii) Strings having alternate occurrences of 'a' and 'b'

c) Write short notes on : **[8]**

- i) Chomsky Hierarchy
- ii) Ambiguous grammar

P.T.O.

- Q3)** a) Differentiate between FA and TM. [4]
 b) Construct a Turing Machine for $R = aba^*ba$ [6]
 c) Design a TM that multiplies two unary numbers over $\Sigma = \{1\}$. Write simulation for the string $11*111$. [8]

OR

- Q4)** a) Construct a Turing Machine for $R = ba^*b$ [4]
 b) Design TM to accept the set L of all strings formed with 0 and 1 and having substring '000'. [6]
 c) Write short note on [8]
 i) Universal Turing Machine
 ii) Multi-tape Turing Machine

- Q5)** a) Construct PDA that accepts a string of balanced parentheses. [6]
 b) Define PDA. What are different types of PDA? [6]
 c) Explain the working of top-down parser with an example. [4]

OR

- Q6)** a) Construct PDA that accepts following language $L = \{a^n b^n | n \geq 0\}$. Write simulation for string 'aaabbb'. [6]
 b) Prove that CFLs are closed under union and concatenation. [6]
 c) Explain the working of bottom-up parser with example. [4]

- Q7)** a) Explain post correspondence problem. [6]
 b) Prove that the satisfiability problem is NP-complete. [6]
 c) Explain tractable and intractable problems. [4]

OR

- Q8)** a) What is polynomial time reduction? Explain with suitable example. [6]
 b) Justify that Travelling salesman problem is NP-complete. [6]
 c) Differentiate between P and NP classes. [4]

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Total No. of Questions : 10]

SEAT No. :

PA-513

[Total No. of Pages : 3

[5926]-532

T.E. (Computer Engineering)
DATABASE MANAGEMENT SYSTEM
(2015 Pattern) (Semester - I) (310242)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Design an E-R diagram for keeping track of the exploits of your favorite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes. [5]
- b) Create a before trigger that checks for a relation r, if the values in a phone number field of the inserted tuple is blank, it replaces the value by the null value. [5]

OR

- Q2)** a) What are integrity constraints. Explain with example domain constraints and Referential integrity constraints. [5]
- b) Consider a relation loan (loan-number, branch-name, amount) construct a view named loan branch for the above relation to see all loan data in the loan relation except amount. [5]
- Q3)** a) Consider the following database schema person (driver-id, name, address) Car (License, model, year) accident (report - number, date, location) owns (driver-id, license) Participated (driver-id, licence, report - number, damage-amount) [5]
- i) Find all the name of person whose name contains 'a'.
 - ii) Update the damage amount for the car with license number "AABB2000" in the accident with report number "AR2197" to \$3000.

P.T.O.

- b) What are anomaly in relational model? Explain how normalization can be used to reduce the anomalies. [5]

OR

- Q4)** a) Draw and explain structure of Database system. [5]
 b) While converting ER diagram into tables when do we do combination of schemas. Give example. [5]

- Q5)** a) Consider the transaction T_3 , T_4 and T_6 are working on data item Q. Schedule is given below decide whether the following schedule is view serializable or not? Justify your answer. [8]

T_3	T_4	T_6
ReadQ		
	WriteQ	
WriteQ		WriteQ

- b) Explain the two Phase lock protocol for concurrency control. Also explain its two version. Strict two-phase lock protocol and rigorous two-phase lock protocol. [9]

OR

- Q6)** a) What is R - time stamp(Q) and W- time stamp(Q)? Explain the necessary condition used by time stamp ordering protocol to execute for a read/Write operation. [8]
 b) Explain transactional properties in relational databases. [9]

- Q7)** a) Explain 2 phase commit Protocol. [9]
 b) What are the different approaches for storing a relation is distributed databases. State its advantages and disadvantages. [8]

OR

- Q8)** a) Explain in detail speed up and scale up in parallel databases. When is the parallel system is said to demonstrate linear speed up and linear scale up and also explain which factors work against can diminish both speed up and scale up. [9]
 b) Explain distributed database architecture and also explain homogeneous and heterogeneous distributed databases. [8]

- Q9)** a) Compare SQL and NOSQL databases. [4]
b) Explain BASE properties of NOSQL Database. [4]
c) Explain Document based and key value data model of NOSQL Database. [8]

OR

- Q10)** a) What is Hadoop? Explain HDFS and MAPREDUCE. [8]
b) State and explain CAP Theorem. [4]
c) What is NOSQL database state its advantages over RDBMS. [4]



Total No. of Questions : 10]

SEAT No. :

PA-514

[Total No. of Pages : 2

[5926]-533

T.E. (Computer Engineering)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2015 Pattern) (Semester - I) (310243)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Explain and classify life cycle paradigm for software engineering and problems encountered when it is applied. **[5]**

b) Differentiate between waterfall and evolutionary model. **[5]**

OR

Q2) a) Apply XP process model to build a product. **[5]**

b) List SRS representation types. Explain any ONE in detail. **[5]**

Q3) a) Discuss some of the problems that occur when requirements must be elicited from 3-4 different customers. **[5]**

b) Explain layered architecture style with neat diagram. **[5]**

OR

Q4) a) Draw and explain a context -level model for the system as “Information Kios”. **[5]**

b) Develop a set of screen layouts with a definition of major and minor menu items for the “safe home system”. **[5]**

Q5) a) Discuss 4Ps of project management concepts with an example. **[8]**

b) Use an estimation technique to estimate cost, effort and schedule for an “Information System” project. Consider any 3 system components. **[8]**

OR

P.T.O.

Q6) a) Assume that you have been contracted by a university to develop an on-line course registration system (OLCRS). First, act as the customer as student, specify the characteristics of a good system. Your instructor will provide you with a set of preliminary requirements for the system. Using the estimation methods discussed, develop an effort and duration estimate for OLCRS. Suggest how you would: [8]

- i) Define parallel work activities during the project.
- ii) Distribute effort throughout the project.

b) Examine the two project scheduling tools as PERT and CPM. [8]

Q7) a) Examine the reasons for software project failure. Suggest measures to overcome from failures. [6]

b) Justify that Version control is very important in SCM. [6]

c) Compare SCM for conventional software and SCM for WebApp with an example. [6]

OR

Q8) a) What is software SCM repository? Explain the 3 repositories used in SCM. [8]

b) Support with example 'Known Risks' and Predictable Risks'. [8]

c) Define the Software Reengineering. [2]

Q9) a) What is the need of stubs and drivers in software testing? Discuss the acceptance testing. [8]

b) Describe the GUI testing process in detail with an example. [8]

OR

Q10) a) Discuss the differences between verification and validation, and explain why validation is a particularly difficult process. [8]

b) Discuss various testing mechanisms to test non-functionality parameters using an example. [8]



Total No. of Questions : 10]

SEAT No. :

PA-515

[Total No. of Pages : 2

[5926]-534

T.E. (Computer Engineering)
INFORMATION SYSTEMS AND ENGINEERING
ECONOMICS
(2015 Pattern) (Semester - I) (310244)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of scientific calculator is permitted.*

- Q1)** a) What are the different information systems used by Indian Railways? [5]
- b) Describe the difference between the centralized versus decentralized management of IT. [5]

OR

- Q2)** a) What are the different information systems used by Indian Railways? Explain them in brief. [5]
- b) Analyze the bargaining power of the courier firms vs. Flipkart. Who has an edge? [5]

- Q3)** a) Explain the different challenges of data management. [5]
- b) What is meant by e-Governance? Explain. [5]

OR

- Q4)** a) What is meant by business process? Explain. [5]
- b) What is the meaning of outsourcing and how is it different from off-shoring? [5]

P.T.O.

Q5) a) State and explain four fundamental principles that are followed in any engineering decision. [8]

b) Explain Economic Equivalence. [8]

OR

Q6) a) What is the value of money? How is it calculated? [8]

b) What is rational decision making? Explain steps involved in it. [8]

Q7) a) Explain with suitable example Producer price index. [8]

b) What is annual-equivalence analysis? State its benefits. [8]

OR

Q8) a) Explain the following terms : [8]

i) Profitability Index

ii) MARR

b) Explain with suitable example discounted cash flow method. [8]

Q9) a) What is Break Even Analysis? Explain in detail. [10]

b) Explain the various financial statements with their needs. [8]

OR

Q10)a) Enumerate the elements of project cost. Explain them in brief. [10]

b) Write short note on : Cost Benefit Analysis [8]



Total No. of Questions : 8]

SEAT No. :

PA-516

[Total No. of Pages : 2

[5926]-535

T.E. (Computer Engineering)

DESIGN AND ANALYSIS OF ALGORITHMS

(2015 Pattern) (Semester - II) (310250)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Make suitable assumptions whenever necessary.*

- Q1)** a) Explain the concept of Principle of Mathematical Induction and prove the correctness of an algorithm to find factorial of a number. [6]
- b) State and explain stepwise refinement with a suitable example. [6]
- c) Draw and explain architecture of Artificial Neural Network. Explain the importance of weight, bias and target output. [8]

OR

- Q2)** a) What are algorithms? Explain algorithm as technology. [6]
- b) Explain the importance of Tail recursion with a suitable example. [6]
- c) Write short notes on (Any Two): [8]
- i) Evolutionary Computing
 - ii) Stimulated Annealing
 - iii) Tabu Search

- Q3)** a) Differentiate between Deterministic and non-deterministic algorithm. Write non-deterministic polynomial time algorithm for Knapsack problem. [8]
- b) Hamiltonian cycle is NP Hard or not? Justify your answer. [8]

OR

- Q4)** a) Explain Asymptotic notations with example. [8]
- b) What is SAT AND 3-SAT problem? Prove that 3-SAT problem is NP complete. [8]

P.T.O.

- Q5) a)** What is Embedded System? Explain embedded sorting algorithm. [8]
b) State and explain Fibonacci Heaps in detail. Enlist its applications. [8]

OR

- Q6) a)** Explain Tractable and non-tractable problems with example. [8]
b) Explain amortized analysis. Find the amortized cost with respect to stack operations. [8]

- Q7) a)** What is Distributed algorithm? Explain distributed Breadth First Search algorithm with example. [9]
b) Compare and contrast String matching algorithms. Explain any one algorithm with example. [9]

OR

- Q8) a)** Write and Explain Multithreaded Merge Sort Algorithm. [9]
b) Define performance measure of multithreaded algorithms. Write a multithreaded algorithm for Fibonacci Series and explain performance measure of Fibonacci (6) execution with suitable diagram. [9]



Total No. of Questions : 10]

SEAT No. :

PA-517

[Total No. of Pages : 2

[5926]-536

T.E. (Computer Engineering)

SYSTEMS PROGRAMMING AND OPERATING SYSTEM

(2015 Pattern) (Semester - II) (310251)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 Or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Which data structures are used by two pass assembler? Explain with example. [6]

b) What is a macro? Compare macro with function. [4]

OR

Q2) a) What is the need of DLL? Explain with example. [4]

b) What is LEX? Explain its working. [6]

Q3) a) Which data structures are used by two pass macro preprocessor? Explain with example. [5]

b) Show two variants of specifying an intermediate code in assembler. Compare them. [5]

OR

Q4) a) Explain compile and Go loader scheme with example. [5]

b) What is a compiler? Explain any two phases of compiler with suitable diagram. [5]

Q5) a) Draw and explain process state transition diagram. [6]

b) Differentiate between process and thread. [6]

c) Explain Bankers Algorithm with an example. [6]

P.T.O.

OR

- Q6)** a) What is process control block? Draw its structure and explain. [6]
b) Explain the concept of context switching with the help of neat diagram. [6]
c) What is a deadlock? State and explain the conditions for deadlock to occur. [6]

- Q7)** a) Explain segmentation with suitable example in brief. [6]
b) Explain contiguous memory allocation with suitable example. [6]
c) What is thrashing? Explain in brief. [4]

OR

- Q8)** a) Differentiate between internal and external fragmentation. [6]
b) Explain demand paging with suitable diagram. [6]
c) Write a short note on swapping. [4]

- Q9)** a) What is file system? Explain file system implementation in brief. [6]
b) What is two level directory structure? Explain with suitable diagram. [6]
c) Describe any one disk scheduling policy with an example. [4]

OR

- Q10)** a) What are the file access methods? Explain them in detail. [6]
b) What is tree structured directory? Explain with suitable diagram. [6]
c) Write a note on free space management. [4]



Total No. of Questions 10]

SEAT No. :

PA-518

[5926]-537

[Total No. of Pages : 2

T.E. (Computer Engineering)

EMBEDDED SYSTEMS & INTERNET OF THINGS (ES AND IOT)

(2015 Pattern) (Semester-II) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any five questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Draw neat & labelled diagram wherever necessary.

- Q1)** a) Explain the steps involved in the IoT system design methodology. [5]
b) What is Embedded system? Draw and explain the block diagram of IoT. [5]

OR

- Q2)** a) Explain the network layer protocol for IoT systems. [5]
b) Explain Earliest Deadline First scheduling algorithm. [5]

- Q3)** a) Explain the WebSocket-based communication API with diagram. [5]
b) Explain the IoT Level-3 with suitable diagram [5]

OR

- Q4)** a) Explain the IoT Level-5 with suitable diagram. [3]
b) Discuss about the Four pillars of IoT with diagram. [4]
c) What is Raspberry Pi? List the various ports available. [3]

- Q5)** a) Explain the BACNet Protocol. [6]
b) Explain the Zigbee architecture with suitable diagram. [6]
c) Write a short note on 5A and 3I characteristics of IoT. [4]

OR

- Q6)** a) Discuss why the Sensor Standards for Interoperability are important. [6]
b) What are the different key elements of M2M architecture? [4]
c) What are the different topology of 802.15.4? Explain with suitable diagram. [6]

P.T.O.

- Q7)** a) Explain the key elements of the ETSI M2M architecture. [6]
b) Explain SCADA Middleware Standards in brief. [6]
c) Explain mobile cloud computing. [5]

OR

- Q8)** a) Explain unified multitier WOT Architecture in details. [6]
b) Draw and explain RFID architecture. [6]
c) What is OSGi: The Universal Middleware? [5]

- Q9)** a) Design Smart Parking System, what are the different components required? Draw deployment design for this system. [6]
b) Write short note on. [6]
i) Amazon Autos scaling
ii) Amazon SQS
c) Write the AutoBahn installation and setup steps. [5]

OR

- Q10)** a) Describe the use of Amazon EC2 for IoT. [5]
b) Explain in brief Model, Template and View in Django architecture. [6]
c) Design Smart Irrigation System (SIS) based on followings. [6]
i) Define process specification for SIS IoT System.
ii) Domain model of SIS IoT system.
iii) Information model of SIS IoT system.
iv) Controller service of SIS IoT system.



Total No. of Questions : 10]

SEAT No. :

PA-519

[Total No. of Pages : 2

[5926]-538

T.E. (Computer Engineering)

SOFTWARE MODELING AND DESIGN

(2015 Pattern) (Semester - II) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8., Q.9 Or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

Q1) a) Explain SDLC with Rational Unified Process (RUP). [5]

b) Explain include and extend relationship in use case model with example.[5]

OR

Q2) a) Explain 4+1 View Architecture of UML. [5]

b) Draw Use Case diagram for ATM system by considering cash withdrawal scenario. [5]

Q3) a) Draw a sequence diagram for Online Shoppe System. [5]

b) Explain the elements of a class diagram with example. [5]

OR

Q4) a) Why is a class diagram important in static modeling? How is it different from an object diagram? [5]

b) Define interface. Explain required and provided interface with example.[5]

Q5) a) Explain Client Server architecture in detail. [8]

b) Explain the broker pattern for service oriented architecture. [8]

OR

Q6) a) Explain object oriented architecture with a suitable example. [8]

b) Explain the real time software architecture. [8]

P.T.O.

- Q7)** a) What is the use of design pattern in modern software development? Explain categories of design pattern. [8]
b) What is singleton pattern? Explain with suitable example. [8]

OR

- Q8)** a) Explain factory method with its intent, motivation and implementation with suitable example. [8]
b) Explain iterator design pattern with suitable example. [8]

- Q9)** a) What is integration testing? Explain its type in detail. [6]
b) What is performance testing? List few tools of performance testing. [6]
c) Explain difference between verification & validation. [6]

OR

- Q10)** a) What is Cyclomatic Complexity? Explain with example. [6]
b) Define test case? What is the importance test case? Give example. [6]
c) Explain acceptance testing in detail. [6]



Total No. of Questions : 10]

SEAT No. :

PA-520

[Total No. of Pages : 2

[5926]-539

T.E. (Computer Engineering)

WEB TECHNOLOGY

(2015 Pattern) (Semester - II) (310254)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2 and Q.3 or Q.4 and Q.5 or Q.6 and Q.7 or Q.8 and Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What do you mean by HTML? List and discuss the differences between HTML elements and tags? [5]
b) Explain how to call JavaScript function from HTML page. [5]

OR

- Q2)** a) What are the strengths of XML technology? Also list the limitations of using XML. [5]
b) List and explain different Data Types available in JavaScript with example? [5]

- Q3)** a) What is use of is ThreadSafe in JSP? Also explain single thread modle in JSP. [5]
b) Explain HttpServletRequest and HttpServletResponse with suitable examples. [5]

OR

- Q4)** a) How to create array and read elements in java script? [5]
b) Write the differences between include action and include directive in JSP. [5]

- Q5)** a) What is Multi-dimensional arrays in PHP? Explain it with simple PHP code. [8]
b) Draw and explain how AJAX works with the help of suitable example. Also list different values of readystate and status property of the XMLHttpRequestObject. [8]

OR

P.T.O.

- Q6)** a) What is form handling in PHP. Explain server side include in PHP with sample code. [8]
b) What are the technologies used in traditional web programming? Also identify location of each technology used in this model. [8]

- Q7)** a) What is use of controller in Angular JS? Explain significance of \$scope while using controller. [8]
b) Create Simple AngularJS application to display “Hello, Input Name” using proper directive. [8]

OR

- Q8)** a) Write and explain various steps for creating angularJS application with the help of tags. [8]
b) Identify and explain data tags from struts2 which are used to manipulate data displayed on any web application page. [8]

- Q9)** a) Draw and explain the role of EJB container in Enterprise applications. Also list the different benefits of using EJB? [9]
b) What are the different types of EJB? Identify and explain situations about when to use session beans. [9]

OR

- Q10)** a) Draw and explain scenario of client accessing remote EJB. List and discuss some of the EJB clients. [9]
b) How does a web service work? Illustrate working of web service with the help diagram as well as simple example. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1438

[Total No. of Pages : 3

[5926]-54

T.E. (Civil)

ADVANCED GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester-II) (Elective-II) (301015d)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail measurement of undraind strength of clay. [6]
b) State and explain the factors affecting angle of shearing resistance. [6]
c) Write a short note on pore pressure parameters and its determination.[6]

OR

- Q2)** a) What are the three standard triaxial shear tests with respect to drainage conditions? Explain with reasons the situations for which each test is to be preferred. [6]
b) Explain the following : [6]
i) Differentiate between a box shear test and a triaxial shear test for soils.
ii) Differentiate between shear strength parameters obtained from total and effective stress considerations.
c) Explain procedure for determination of pore presssure parameters. [6]

- Q3)** a) Drained triaxial compression test results are given below. Plot the stress path in p–q, q'. [6]

σ_1 (kpa)	σ_3 (kpa)	τ (kpa)
300	300	100
400		
500		
565		
590		

P.T.O.

- b) Draw and explain the stress path ($t-s, s'$) for gradual built up of overburden pressure due to sedimentation and its removal. [6]
- c) What is stress path? State the factors influencing the stress path. [5]

OR

- Q4)** a) Undrained triaxial compression test results are given below, plot the stress path in $p-q, q'$. [6]

σ_1 (kpa)	σ_3 (kpa)	Δ (kpa)
300	300	100
350		165
380		200
396		224
398		232

- b) Draw and explain the stress path ($t-s, s'$) for stress changes near retaining wall. [6]
- c) State and explain the variants of cambridge plot. [5]

- Q5)** a) What are the various soil stabilization techniques? Write their suitability with respect to the soil type. [6]
- b) How effective is lime stabilization in stabilizing the clay soils? Discuss the chemical reactions that takes place in lime treated soil. [6]
 - c) Why soils are to be stabilized. Discuss the principles of soil-flyash stabilization and associated benefits. [6]

OR

- Q6)** a) Differentiate between lime stabilization and cement stabilization techniques. [6]
- b) Explain how the engineering properties of soil are changed by the process of bituminous stabilization. [6]
 - c) Discuss the applicability of industrial wastes in soil stabilization. [6]

- Q7)** a) Explain the terms grouting and freezing soil. [6]
b) Describe the procedure of vibro-flotation technique for ground improvement. [6]
c) Explain in detail technique of deep mixing. [5]

OR

- Q8)** a) Explain the terms bored compaction piles and deep mixing. [6]
b) State the purpose of sand drain and explain functions of vertical sand drain. [6]
c) Explain in detail compaction pile. [5]



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Total No. of Questions : 10]

SEAT No. :

PA-521

[Total No. of Pages : 2

[5926]-540

T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2015 Pattern) (Semester - I) (311121)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) What is elasticity of supply and demand? [5]
b) What is demand forecasting? Explain the methods for demand forecasting. [5]

OR

- Q2)** a) Write a short note on ethics in technology management. [5]
b) Explain Public Sector Undertaking (PSU). [5]

- Q3)** a) Explain six sigma in detail. [5]
b) Define technology and its relation with society. [5]

OR

- Q4)** a) Write a short note on Ishikawa - diagram for Pareto Analysis. [5]
b) Explain environmental management system standard. [5]

- Q5)** a) Write a short note on methods of costing. [6]
b) Give the characteristics of monopolistic competition and oligopoly. [4]
c) What do you mean by market research? [6]

OR

P.T.O.

- Q6)** a) Explain online marketing in detail. [4]
b) Write a short note on [6]
i) Fixed cost
ii) Variable cost
iii) Average cost
iv) Marginal cost
c) Write a short note on new product development. [6]
- Q7)** a) Describe the stages of group formation. [6]
b) Explain the qualities of good Leadership. [4]
c) Explain Maslow theory of need hierarchy. [6]
- OR
- Q8)** a) Write a short note on Leadership - Laissez - Faire. [6]
b) Write a short note on HR-Planning. [4]
c) Explain Herzberg's two factor theory. [6]
- Q9)** a) What is IPR? Explain different forms of IPR. [6]
b) Explain Importance and limitations of rational decision making. [6]
c) What are the criteria for security patents? [6]
- OR
- Q10)** a) Write any one case study on small scale industries in India. [6]
b) Explain decision making under certainty. [6]
c) Write patent format and structure in detail. [6]

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Total No. of Questions : 10]

SEAT No. :

PA-522

[Total No. of Pages : 2

[5926]-541

T.E. (Electrical)

ADVANCED MICROCONTROLLER AND ITS APPLICATIONS
(2015 Pattern) (Semester - I) (303141)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8 and Q.9 OR Q.10.*
- 2) *Figures to the right side indicate full marks.*

- Q1)** a) Explain any two Addressing modes in detail. [6]
b) Explain following instruction with suitable example [4]
i) IORWF f,d,a
ii) INCF f,d,a

OR

- Q2)** a) Discuss stack memory and stack pointer in detail. [6]
b) Blink LED connected to RB3 using assembly language instructions.[4]

- Q3)** a) Explain TRISA and PORTA in detail. [6]
b) Write a C program to generate delay of 5 milisecs. Using Timer0. Assume crystal frequency of 10 MHz. [4]

OR

- Q4)** a) Explain the role of Header and pre-processor directives in detail. [6]
b) Write Assemble language program to perform addition of BCD numbers 20H and 45H and store it to location 45H. [4]

- Q5)** a) Explain CCP1CON register in detail and also give its value to have capture mode for every rising edge. [8]
b) Explain PWM mode with the help of block diagram. [8]

OR

P.T.O.

Q6) a) Write a C program to generate 1Khz PWM frequency at 50% duty cycle on CCP1 pin. [8]

b) Discuss working of compare mode in detail with help of block diagram. [8]

Q7) a) Explain TXSTA and RCSTA registers in detail. [8]

b) Draw and explain 8 bit mode of LCD interfacing with pic 18f458.[9]

OR

Q8) a) Explain the steps of interrupt programming. [8]

b) Write C program to transmit character “K” continuously at a baud rate of 9600 and crystal frequency of 10MHz. [9]

Q9) a) Explain ADCON0 ADCON1 register in details. [8]

b) Draw the interfacing diagram of opto-isolator and also explain its interfacing procedure. [9]

OR

Q10)a) Explain temperature measurement using LM35 and give the algorithm to transfer the result to PORT C and PORT D, lower byte to PORTC and higher byte to PORTD. [8]

b) Write C program to generate triangular wave using DAC. [9]



Total No. of Questions : 8]

SEAT No. :

PA-523

[Total No. of Pages : 2

[5926]-542

T.E. (Electrical Engineering)

ELECTRICAL MACHINES - II

(2015 Pattern) (Semester - I) (303142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable additional data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Obtain the formula for [6]
- i) coil pitch factor &
 - ii) distribution factor of armature winding.
- b) Plot OCC & SCC of alternator. Write the procedure to obtain voltage regulation of 3-ph alternator. Draw the necessary phasor diagram at lagging & leading power factor. [7]
- c) Explain why synchronous motor is called synchronous condenser. Draw the necessary phasor diagram. [7]

OR

- Q2)** a) Compare salient pole type construction with non-salient pole type for three phase alternator [6]
- b) Plot OCC & zero power factor load curve of alternator. Write the procedure to obtain voltage regulation of 3-ph alternator. [7]
- c) Compare three phase synchronous motor with three phase induction motor. [7]

- Q3)** a) What is synchronous induction motor? Explain the working using schematic diagram. [8]
- b) Explain construction and working of permanent magnet AC motor. Also state its merits and demerits. [8]

OR

P.T.O.

- Q4) a)** Draw the construction diagram and explain the working of reluctance stepper motor. Also state its merits and demerits. [8]
- b) Draw the schematic diagram & explain the working of BLDC motor. State its applications. [8]

- Q5) a)** State the problems associated with dc series motor on ac supply. Explain remedies for ac operation. [8]
- b) What is universal motor? How will you reverse the direction of rotation? State its applications. [8]

OR

- Q6) a)** Draw the schematic diagram & compare the conductively compensated and inductively compensated series motor. [8]
- b) Plot a circle diagram of ac series motor & write down its procedure. [8]
- Q7) a)** Draw the construction diagram and explain the working of shaded pole induction motor. Also state its applications. [8]
- b) Draw the equivalent circuit of single phase induction motor explain the all terminology used. [10]

OR

- Q8) a)** Draw the connection diagram and explain working of capacitor start induction motor. Also sketch its torque characteristics & state its 3 applications. [8]
- b) Draw the connection diagram and explain working of split phase induction motor. Also plot its torque characteristics & state any 3 applications. [10]



Total No. of Questions : 10]

SEAT No. :

PA-524

[Total No. of Pages : 2

[5926]-543

T.E. (Electrical)

POWER ELECTRONICS

(2015 Pattern) (Semester - I) (303143)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 Or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain the triggering of SCR using UJT. [4]
b) What is the duty cycle of chopper and explain PWM and FM techniques of voltage control. [6]

OR

- Q2)** a) Explain the triggering of SCR using RC gate triggering. [4]
b) A step up chopper has input voltage of 220 V and output voltage of 660 V. if the conducting time of thyristor chopper is 100 µsec, compute the pulse width of output voltage. Draw circuit diagram and waveforms. [6]

- Q3)** a) With neat constructional diagram explain working of GTO. Also explain its characteristics. [4]
b) A single phase full converter with large inductance, find average output voltage and reduction in output voltage due to overlap of $\alpha=30^\circ$ and $\mu=2^\circ$, supply voltage is 230 V. [6]

OR

- Q4)** a) Explain class - D commutation of SCR. [4]
b) A single phase full converter connected to 230 V, 50 Hz source is feeding a load $R=10\Omega$ in series with a large inductance that make the load current ripple free. For firing angle of 45° , calculate rectification efficiency, FF, RF. [6]

P.T.O.

Q5) a) Draw neat circuit diagram to explain working of a 3 phase fully controlled converter feeding resistive load. Derive output voltage expression and explain the range of control for continuous and discontinuous conduction. [8]

b) Explain with neat circuit diagram triggering of TRIAC using DIAC. [8]

OR

Q6) a) Draw and explain 3 ϕ full converter with freewheeling diode for RL load. Draw output voltage and current waveforms for $\alpha = 30^\circ$ and $\alpha = 0^\circ$. [8]

b) Explain single phase AC voltage regulator feeding inductive load. Draw output voltage waveform and derive equation for rms output voltage. [8]

Q7) a) Explain with neat circuit diagram working of single phase full bridge voltage source inverter connected to RL load and draw output voltage and current waveforms. [8]

b) Compare multiple pulse modulation with Sinusoidal pulse width modulation. [8]

OR

Q8) a) Explain working of Current source inverter with ideal switches. [8]

b) Explain multiple pulse modulation used in inverters. Draw necessary waveforms to obtain four pulses per half cycle of output voltage waveform. Why multiple pulse modulation is better than single pulse modulation? [8]

Q9) a) Draw and explain 3 phase, voltage source inverter feeding star connected resistive load, in 120° mode of conduction. State clearly sequence of conduction. Draw control signals and waveforms for phase and line voltage across the load. [10]

b) List different harmonic elimination techniques used in inverter. Explain any two methods in detail. [8]

OR

Q10) a) Draw and explain 3 phase, voltage source inverter feeding star connected resistive load, in 180° mode of conduction. State clearly sequence of conduction. Draw control signals and waveforms for phase and line voltage across the load. [10]

b) Draw a neat diagram and explain cascaded multilevel converter. [8]



Total No. of Questions : 8]

SEAT No. :

PA-525

[Total No. of Pages : 2

[5926]-544

T.E. (Electrical)

ELECTRICAL INSTALLATION MAINTENANCE & TESTING
(2015 Pattern) (Semester -I) (303144)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Compare 3-phase, 4-wire A.C. underground system with dc 2 wire system on the basis of volume required for the conductor material. [8]
- b) Draw and explain-main and transfer bus bar system. [6]
- c) Classify different maintenace strategies and explain preventive maintenance for a distribution transformer. [6]

OR

- Q2)** a) A single phase distributor has loop Resistance of 0.3Ω and a reactance of 0.4Ω . the far end of the distributor has a load current of 80A and p.f 0.8 lagging at 220V. The midpoint M of the distributor has a load current of 50A at p.f 0.707 lagging with reference to voltage M. Calculate the sending end Voltage and p.f. [8]
- b) List the different methods of earthing. With suitable diagram explain plate earthing as per IS. [6]
- c) Discuss various insulation stressing factors in transformers, clearly stating the impact of each. [6]
- Q3)** a) List and explain the failure modes in a transformer and explain how to avoid such failures? [10]
- b) Explain the various abnormal condition and causes of failure of induction motor. [8]

OR

P.T.O.

Q4) a) How degree of polymerization and partial discharge measurement is used for condition monitoring of transformer? [10]

b) What is signature analysis? How it is used for condition monitoring of induction motor? [8]

Q5) a) Explain general rules for commercial and residential wiring work. [8]

b) While estimating, how price catalogue, labour rates and schedule of rates are correlated? [8]

OR

Q6) a) What are the essentials of estimating and costing? How cable sizing is to be decided for particular application. [8]

b) State the general factors that should be considered in estimation of HT and LT lines. [8]

OR

Q7) a) List out various objectives of Electrical safety. [8]

b) Explain IE Act and Statutory Regulations with respect to electrical safety. [8]

OR

Q8) a) Write a short note on: [8]

i) Different hazardous area and its effects on human body.

ii) Danger arising due to failure of Insulation of the equipment.

b) Explain different causes of accidents and describe how electric accidents can be prevented? [8]



Total No. of Questions : 10]

SEAT No. :

PA-526

[Total No. of Pages : 2

[5926]-545
T.E. (Electrical)
POWER SYSTEM - II
(2015 Pattern) (Semester - II) (303146)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Derive the equation for sending end complex power. [7]
b) What do you mean by “Right of Way” in transmission system? Compare this term in EHVAC and HVDC transmission system. [3]

OR

- Q2)** a) Show that per unit impedance of transformer on both sides are same. [7]
b) What is surge impedance loading? Explain its significance. [3]

- Q3)** a) What are the advantages of EHVAC system? [7]
b) State the advantages of per unit system in power system analysis. [3]

OR

- Q4)** a) Explain Y_{bus} using bus incidence matrix. [7]
b) When HV transmission line is loaded, the voltage regulation is positive. State statements are true or false with justification. [3]

- Q5)** a) Two 11kV, three phase 3MVA generators having sub-transient reactance of 15% operates in parallel. The generator is connected to transmission line through a transformer of 6MVA 11/22kV with leakage reactance of 5%. Choose the base MVA = 6 MVA and base kV = 11kV on generator, convert circuit into per unit diagram. Determine fault MVA and fault current in kA, if the three phase fault is on [9]

- i) HT side
 - ii) LT side of transformer
- b) When and unloaded alternator is shorted at its terminal, draw oscillograph waveform of fault current and discuss about transient, sub transient and steady state period. [8]

OR

P.T.O.

Q6) a) A 10 MVA, 6.6 kV, 3-phase star-connected alternator having a reactance of 20% is connected through a 5 MVA, 6.6 kV/33 kV transformer of 10% reactance to a transmission line having a resistance and reactance per conductor per kilometre of 0.2 Ω and 1 Ω respectively. Fifty kilometres along the line, a short-circuit occurs between the three conductors. Find the current fed to the fault by the alternator. Choose generator ratings are as base values. [9]

b) State whether following statements are true or false with justification [8]

- i) In case of three phase fault at the terminal of an unloaded alternator, the sub transient state current is greater than transient & steady state current.
- ii) In case of three phase fault at the terminal of an unloaded alternator, the sub transient time constant is greater than transient and steady state time constant.

Q7) a) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjected to a line to ground fault. The sequence reactance are $x_1 = j0.3pu$, $x_2 = j0.1pu$ and $x_0 = j0.05pu$. If the generator neutral is grounded through a reactance of $x_n = j0.05pu$, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. [9]

b) Derive the equation of fault current in LL fault. [8]

OR

Q8) a) Derive the equation of three phase power using symmetrical component. [9]

b) In case of LLG fault, show that fault current. [8]

$$I_f = \frac{-3E_{a1}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

Q9) a) Compare HVDC and EHVAC transmission system. [8]

b) Write short note on “Constant current control in HVDC lines”. [8]

OR

Q10)a) Write short note on: [8]

- i) Monopolar HVDC link
- ii) Back to back HVDC link

b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. [8]



[5926]-546**T.E. (Electrical) (Semester - II)****CONTROL SYSTEM - I****(2015 Pattern) (303147)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Draw neat diagram wherever necessary.
- 4) Assume suitable data, if necessary.

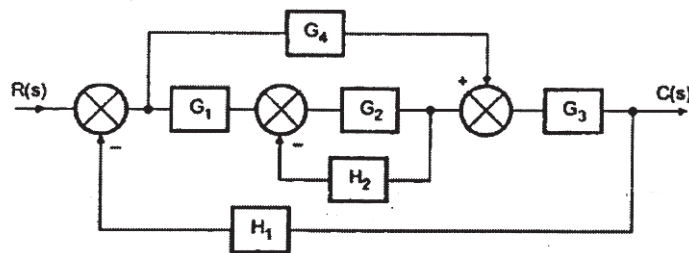
Q1) a) Define open loop and closed loop system with suitable examples? [6]**b) The transfer function of a system is given by, [7]**

$$T(s) = \frac{K(s+6)}{s(s+2)(s+5)(s^2+7s+12)}$$

Determine

- i) Poles
- ii) Zeros
- iii) Characteristic equation and iv) Pole-zero plot in s-plane
- c) A characteristic equation of a feedback control system is given by $s^5 + s^4 + 4s^3 + 4s^2 + 2s + 1 = 0$ comment on stability. [7]

OR

Q2) a) Obtain the closed loop transfer function $C(s)/R(s)$. [7]

- b) For the second order system $C(s)/R(s) = 25/s^2 + 6s + 25$. Find rise time, peak time, peak overshoot and settling time. [7]
- c) Sketch the root locus for a system with open loop transfer function. [6]

$$G(s) = \frac{K(s+1)}{(s+2)(s+3)(s+4)}$$

P.T.O.

- Q3) a)** Define and write formula [8]
 i) Resonant frequency
 ii) Resonant Peak
 iii) Band width
 Plot M , M versus ω for a second order system.
- b)** The open loop transfer function of the unity feedback system is given by
- $$G(s)H(s) = \frac{5}{s(s+1)(s+2)}$$
- Draw the Polar plot of the above open loop transfer function. [8]
- OR
- Q4) a)** Briefly state the Nyquist criterion. [6]
b) Construct Nyquist plot for a feedback control system whose OLTF is given by, $G(s)H(s) = \frac{2}{s(1-2s)}$. [10]
- Q5) a)** Define Gain margin, phase margin, phase crossover frequency, gain crossover frequency. [6]
b) The open loop transfer function of an unity feedback system is given by,
- $$G(s)H(s) = \frac{K}{s(1+0.02s)(1+0.04s)}$$
- OR
- Q6) a)** Sketch bode diagram showing gain margin and phase margin for [6]
 i) Stable system ii) Unstable system
b) The open loop transfer function of an unity feedback system is given by,
- $$G(s)H(s) = \frac{10(s+20)}{(s+1)(s+2)(s+10)}$$
- Also comment on stability. [12]
- Q7) a)** Write the short note on [8]
 i) Lag compensator
 ii) DC Tachometer
b) Write short notes on synchros. [8]
- OR
- Q8) a)** Explain the various controllers used in control system. [8]
b) Using the step by step procedure, explain Ziegler Nichols method to design PID controller. [8]



Total No. of Questions : 08]

SEAT No. :

PA-1155

[Total No. of Pages : 3

[5926]-547
T.E. (Electrical)
UTILIZATION OF ELECTRICAL ENERGY
(2015 Pattern) (Semester - II) (303148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of logarithmic talbes, slide rule, Mollier charts, electronics pocket calculator is and steamtable is allowed.*
- 5) *Figures to the right indicate full marks.*

- Q1)** a) Explain with neat diagram Ajax Watt Furnace. [6]
b) Write a short note on street lighting with principle. [6]
c) Calculate the time taken to melt 2.75 ton of steel in 3ph arc furnace having following data Current:- 4500A, Resistance:- 0.027Ω, Arc voltage:- 55 V, Reactance:- 0.0045Ω, Latent heat:- 8.91 kcal/kg, Specific heat:- 0.118, Initial temp:- 17 deg C, Melting Point:- 1365 deg C, If the overall efficiency is 62 %, find power factor and Efficiency of the furnace. [8]

OR

- Q2)** a) A filament lamp of 500W is suspended at a height of 5 meter above working plane and gives uniform illumination over an area of 8 mtr diameter. Assume reflector efficiency as 60%.
Determine the illumination on the working plane. Lamp efficiency is 0.9 watt per candle power. [6]
b) Draw electric circuit diagram used in Air Conditioner and explain in brief. [6]
c) Define- [8]
illumination
Luminous Intensity
Solid Angle
Coefficient of Utilization

P.T.O.

- Q3)** a) Sketch the various arrangements of current collecting devices used in electric Locomotive. [8]
b) Explain composite system of track electrification. [8]

OR

- Q4)** a) Write a short note on flood lighting scheme [8]
b) Explain following systems of track electrification [8]
i) Single phase low frequency AC system
ii) Kando system

- Q5)** a) Define [8]
i) Average Speed
ii) Schedule speed
iii) Coefficient of adhesion
iv) Tractive effort
b) A train weighing 225 tons is accelerated up a 1.5 % gradient with an acceleration of 1.4 km/hr/sec. Determine the minimum adhesive weight of locomotive for this purpose if the coefficient of adhesion is 0.22. Assume train resistance as 55 Nw/Ton and rotational inertia of 10%. [8]

OR

- Q6)** a) A train is required to run between two stations 1.6 km apart with an average speed of 40kmph. The run is to be made a simplified quadrilateral speed time curve. If the maximum speed is 64kmph, acceleration is 2 kmphps, coasting is 0.16 kmphps, breaking retardation is 3.3 kmphps. Determine the acceleration time, coasting time and breaking time. [8]
b) Sketch a simplified Trapezoidal speed time curve and derive the expression for Maximum speed. [8]

- Q7)** a) Obtain efficiency for Series parallel starting of two motors. [4]
b) Explain the train Anti-collision protection system. [6]
c) An electric train uniformly accelerated at 6km/hr/sec for 21 sec on a level track, braked at 6km/hr/sec. the free running period for the train is 10 min and stop time of 5 min. Draw speed time curve and calculate distance between stations, average speed and schedule speed. [8]

OR

- Q8)** a) Explain suitability of D.C. series motor for traction purpose. [4]
b) Write a short note regenerative braking in traction. [6]
c) A 2400 tonne train including loco proceeds down a gradient of 1 in 75 for 6 minutes during which its speed gets reduced from 65 kmph to 40 kmph by application of regenerative braking. Find the energy returned to the lines if the tractive resistance is 5.2 kg / tonne, rotational inertia 10% and overall efficiency of the motor during regeneration is 75 %.[8]



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Total No. of Questions : 8]

SEAT No. :

PA-528

[Total No. of Pages : 2

[5926] - 548

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES
(2015 Pattern) (Semester - II) (303149)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Derive the output equation for a single phase core type transformer. [6]

- b) Explain the transformer auxiliaries [6]
- i) breather and conservator.
 - ii) pressure release valve.
- c) Explain mechanical forces develop under short circuit condition in a transformer and the measures to counteract them. [8]

OR

Q2) a) Explain the specifications of three phase transformers as per IS 2026 (Part I). [6]

- b) Explain the procedure to calculate the no load current of a three phase transformer. [6]
- c) Explain the procedure for the design of tank with tubes and derive the relation for the number of tubes. [8]

Q3) a) Define specific magnetic loading. Explain the factors to be considered for the choice of specific magnetic loading. [8]

- b) Derive the Output equation for three phase induction motor with usual notations. [8]

OR

P.T.O.

- Q4) a)** Explain any two types of AC windings used for three phase induction motor. [8]
b) Explain the various factors in detail which play a major role while deciding the number of stator slots. [8]

- Q5) a)** Explain the various factors that are to be considered while deciding the length of air gap. [8]
b) What are the suitable combinations of stator and rotor slots taken into consideration while designing induction motor? Explain in detail. [8]

OR

- Q6) a)** What is Unbalanced Magnetic Pull (UMP) and what are the practical aspects of it? [8]
b) A 11.2 KW, 415 v, 3 phase, 6 pole, star connected squirrel cage induction motor has the following data : number of stator slots = 54, number of rotor slots = 63, number of conductors per slot = 16, efficiency = 0.87, power factor = 0.82, current density = 6A/mm^2 . Find bar current, end ring current, area of bar, area of end ring. Assume Rotor mmf as 85% of Stator mmf. [8]

- Q7) a)** Explain the different types of leakage flux in an induction motor. (any three) [6]
b) Explain the MMF Calculation for air gap, stator teeth, stator core, rotor teeth and rotor core. [6]
c) A 25 KW, 1440 rpm, three phase, 50 Hz, 4 pole, 415 V, delta connected Induction motor has flux equal to 20mwb and area is 500 cm^2 . The length of air gap is 0.6 mm. The gap contraction factor is 1.533 and mmf for iron parts is 25% of mmf for air gap. The average flux density is 0.4 wb/m^2 . Find the magnetizing current. Assume the stator winding factor as 0.955. [6]

OR

- Q8) a)** Define and explain the continuous rating of electrical machine. [6]
b) Explain the effects of ducts on calculation of magnetizing current. [6]
c) A 75 KW, 3300 V, 50 Hz, 8 pole, three phase, star connected Induction motor has magnetizing current equal to 35% of full load current. Find the stator turns per phase if the mmf required for flux density at 60° from the interpolar axis is 500 A. Assume that stator winding factor as 0.95. Efficiency = 0.94, power factor = 0.86. [6]



Total No. of Questions : 12]

SEAT No. :

PA-529

[Total No. of Pages : 3

[5926]-549
T.E. (Electrical)
ENERGY AUDIT AND MANAGEMENT
(2015 Pattern) (Semester - II) (303150)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) Assume suitable data, if necessary.*

Q1) Give salient features of Electricity Act 2003. **[6]**

OR

Q2) Explain short term and long term energy policies. **[6]**

Q3) Explain principles of energy management. **[7]**

OR

Q4) What is energy policy of an industry? Give suitable example. **[7]**

Q5) Explain different supply side management measures for energy management. **[7]**

OR

Q6) Explain demand management by using demand management tools. **[7]**

Q7) a) With suitable diagrams explain process flow diagram and energy flow diagram. What is the relevance of such diagrams? **[8]**

P.T.O.

- b) By using least square method find linear fit for following data points of production and energy consumption. [8]
(10, 225); (15, 275); (17, 290); (20, 325) and (25, 375).

OR

- Q8)** a) What is preliminary energy audit? [4]
Also explain format of energy audit report. [4]

- b) Use Cusum technique to calculate energy savings from following data. The specific energy consumption in a process plant is 1100kcal/T and fixed energy consumption of plant being 3500 kcal. The data for six months is given below. [8]

Month	Production (T)	Annual energy consumption kcal
1	1250	780000
2	1100	750000
3	1400	820000
4	1300	810000
5	950	740000
6	1050	750000

- Q9)** Solve the following: [18]

- Explain in detail Energy Efficient motors.
- Discuss energy saving options in air conditioning systems.
- Explain energy conservation measures in sugar industry.

OR

- Q10)a)** What is cogeneration? Explain types of cogeneration systems with suitable examples. State the advantages of cogeneration systems. [10]

- b) Explain different measures for reducing T & D losses. [8]

- Q11)a)** Explain payback period used for financial appraisal. State advantages of the same. Is there any discrimination between lending and borrowing. **[8]**
- b) Calculate net present value for following investment with discounting rate of 11%. The cash inflows from end of first year are 25000, 30000, 35000, 40000, 40000 and 40000 with initial investment of 60000. **[8]**

OR

- Q12)a)** What is Internal Rate of Return? How it is calculated? How to judge economic feasibility from it? **[8]**
- b) In a process plant 1000W, 20 numbers halogen lamps are used for illumination. Lamps are 'ON' for 14 hrs a day and 365 days. These lamps are replaced with 400W, 20 numbers sodium vapour lamps. The cost of new lamp is Rs. 5,500/unit. The current electricity rate is Rs. 9.5/kWh. Calculate energy saved and payback period. **[8]**

Total No. of Questions : 8]

SEAT No. :

PA-1439

[Total No. of Pages : 2

[5926]-55

T.E. (Civil)

ARCHITECTURE AND TOWN PLANNING
(2019 Pattern) (Semester-II) (Elective-II) (301015e)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Explain in detail how TPS and NHP controlling haphazard growth of town. [9]

b) Enlist and explain objectives of town planning and state benefits of town planning. [9]

OR

Q2) a) What is meant by new town? Which parameters are involved in design of new town? [9]

b) Elaborate Mechanism of preparation of DP according to MRTP Act 1966. [9]

Q3) a) What is the importance of Civic Surveys for D.P.? How these are carried out for housing and land use structure for new town? [9]

b) Explain the objectives and functions of CIDCO and its role of developing New Mumbai. [8]

OR

Q4) a) Elaborate hierarchy of roads and Traffic Management system. [9]

b) Elaborate objectives, functions of any planning agency and the organizational details. [8]

Q5) a) Explain in detail features of Land Acquisition, Rehabilitation and Resettlement Act 2013. [9]

b) Explain in detail concept of "MAHA-RERA". [9]

OR

P.T.O.

- Q6)** a) Write a note on URDPFI guidelines and its contents for infrastructure.[9]
b) How AMRUT guidelines helpful to overall development of city? [9]

- Q7)** a) Explain in detail planning strategy for special township project. [8]
b) Write a note on SEZ and CRZ. [9]

OR

- Q8)** a) What is the contributions of rural planning in overall development of town planning. [8]
b) Explain in detail application of GIS, GPS remote sensing in Town planning. [9]



Total No. of Questions : 8]

SEAT No. :

PA-530

[Total No. of Pages : 2

[5926]-550

T.E. (Electronics Engg.)

POWER ELECTRONICS AND APPLICATIONS

(2015 Pattern) (Semester - I) (304201)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) What are the advantages & disadvantages of water cooling and oil cooling? [7]

b) Draw and explain switching characteristics of MOSFET. [7]

c) Explain Safe operating area of IGBT. [6]

OR

Q2) a) Draw two transistor analogy of SCR. Derive its anode current equation.[7]

b) Draw and explain single phase Full converter for RL Load. [7]

c) Explain Construction, Operation of TRIAC with its VI characteristics.[6]

Q3) a) Explain three phase PWM inverters. [8]

b) Draw and explain three phase inverter with the help of waveform for 120° conduction mode for R load. [8]

OR

Q4) a) Explain Variable frequency control of three phase inverters. [8]

b) Draw and explain single phase full bridge voltage source inverter for R load. Derive the expression for RMS output voltage. [8]

P.T.O.

- Q5) a)** A step up chopper has input voltage of 220V and output voltage of 660V. If the non conducting time of thyristor chopper is $100\ \mu\text{s}$, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage. [8]
- b)** Explain flyback converter (SMPS) with circuit diagram, waveforms and operational analysis. [10]

OR

- Q6) a)** Explain in details the operation of step down chopper. Derive the expression for average output voltage. [10]
- b)** What is a chopper? Explain with circuit diagram and waveforms, working of 2 quadrant and 4 quadrant chopper. [8]
- Q7) a)** Explain the operation of electronic ballast with the help of block diagram. Also state its advantages. [8]
- b)** Draw and explain bipolar HVDC transmission system. Also state its advantages. [8]

OR

- Q8) a)** Explain application of power electronics in induction heating. [8]
- b)** Draw and explain online UPS with neat diagram. [8]

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Total No. of Questions : 10]

SEAT No. :

PA-531

[Total No. of Pages : 3

[5926]-551

T.E. (Electronics)

INSTRUMENTATION SYSTEMS

(2015 Pattern) (Semester - I) (304202)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10 from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) Draw a neat sketch of typical time response curve and explain the following dynamic characteristics of measuring instrument. [5]

- | | |
|------------------|-------------------|
| i) Response time | ii) Time constant |
| iii) Rise time | iv) Settling time |

b) Explain with suitable diagram the concept of output impedance with respect to interfacing of sensor to signal conditioning circuit. [5]

OR

Q2) a) State applications of electronics nose. Enlist different types of sensors used for detecting smell/odour in an electronic nose. [5]

b) Define the term reliability. Explain bath tub curve with respect to reliability. [5]

Q3) a) State the equation for thermistor resistance as a function of temperature. Draw a neat sketch for a typical thermistor characteristic curve. Explain how voltage divider circuit is used for thermistor signal conditioning. [5]

b) Explain working principle of : [5]

- i) Nuclear level gauge and
- ii) Ultrasonic level sensor

OR

P.T.O.

- Q4)** a) Describe with neat sketch electromagnetic flow meter. [5]
b) Draw a neat sketch of rotameter. Can a rotameter be used in a horizontal pipe line? If not, explain why? [5]

- Q5)** a) Explain with neat sketch working principle of thermal accelerometer. State applications of accelerometers. [8]
b) Explain working principle of Geiger Muller counter used for detection of nuclear radiation. [8]

OR

- Q6)** a) Explain the process of charge transfer in CMOS image sensors. [8]
b) Explain with neat sketch working principle of incremental optical encoder. What is the use of index pulse in incremental encoder? Explain how an incremental encoder is used to sense direction of rotation of shaft. [8]

- Q7)** a) Explain working principle of PZT actuators. State its applications. [8]
b) Explain magneto-transistor and magneto-resistive elements (MRE). [8]

OR

- Q8)** a) Write a short note on surface micromachining for MEMS devices. [8]
b) Explain with neat block diagram the concept of SMART sensor system. [8]

- Q9)** a) Draw and explain the symbols of following pneumatic valves. [6]
i) 5×2 valve
ii) 4×2 valve
iii) 3×2 valve
b) Explain how a solenoid is used as an actuator. [6]
c) Draw control valve characteristics and explain the terms : [6]
i) Quick Opening
ii) Linear and
iii) Equal Percentage

OR

- Q10)** a) A 5V control signal is to be used to turn ON and OFF a pump operating on 230 VAC. Explain a relay driver circuit which can be used for this application. [6]
- b) Explain control of single acting cylinder using an appropriate directional control valve. [6]
- c) Explain how actuators are classified. Explain any one type of actuators. [6]



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Total No. of Questions : 10]

SEAT No. :

PA-532

[Total No. of Pages : 3

[5926]-552

T.E. (Electronics)

ELECTROMAGNETICS AND WAVE PROPAGATION

(2015 Pattern) (Semester - I) (304203)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic - pocket calculator is allowed.

Q1) a) Derive expression for electric field intensity due to sheet charge using Gauss's law. [5]

b) The point charges $-1nC$, $4nC$, and $3nC$ are located at $(0,0,0)$, $(0,0,1)$ and $(1,0,0)$ respectively find the energy in the system. [5]

OR

Q2) a) Derive expression for the capacitance of spherical plate capacitor. [6]

b) Two point charges $-4\mu C$ and $5\mu C$ are located at $(2, -1, 3)$ and $(0, 4, -2)$ respectively. Find the potential at $(1, 0, 1)$, assuming zero potential at infinity. [4]

Q3) a) State and explain Biot - Savart law. [4]

b) Derive boundary condition for electric field at an interface between conductor and dielectric. [6]

OR

Q4) a) Derive the boundary condition at an interface between two magnetic medium. [6]

b) Give $\vec{D} = \rho \cos^2 \phi \vec{a}_z \text{ C/m}^2$, calculate the charge density at $(1, \pi/4, 3)$ and the total charge enclosed by the cylinder of radius 1m with $-2 \leq z \leq 2m$. [4]

P.T.O.

Q5) a) Define displacement current and displacement current density and hence show that, $\nabla \times \bar{H} = \bar{J}_c + \bar{J}_d$

where \bar{J}_c = conduction current density.

\bar{J}_d = Displacement current density. [8]

b) Give $\bar{E} = E_m \sin(\omega t - \beta z) \bar{a}_y$ in free space, find \bar{D} , \bar{B} and \bar{H} . Sketch \bar{E} and \bar{H} at $t = 0$. [8]

OR

Q6) a) Write Maxwell's equation for static and Time varying field in both point and integral form. [8]

b) State and explain Faraday law. [4]

c) Find the frequency at which conduction current density and displacement current density are equal in a medium with

$\sigma = 2 \times 10^{-4} \text{ S/m}$ and $\epsilon_r = 81$. [4]

Q7) a) Derive expression for wave equation in perfect conducting medium. [8]

b) An electric field in free space is given by, [8]

$$\bar{E} = 50 \cos(10^8 t + \beta x) \bar{a}_y \text{ V/m.}$$

i) Find the direction of wave propagation.

ii) Calculate β and the time it takes to travel a distance of $\lambda/2$.

iii) Sketch the wave at $t = 0$, $T/4$, and $T/2$.

OR

Q8) a) State and prove Poynting theorem, interpret each term. [8]

b) Define the term polarization and explain the following, [8]

i) Linear polarization

ii) Circular polarization

iii) Elliptical polarization

Q9) a) Explain in detail following modes of propagation: **[10]**

- i) Ground wave propagation
- ii) Sky wave propagation
- iii) Space wave propagation

b) Explain **[8]**

- i) Virtual Height
- ii) MUF
- iii) Skip distance
- iv) Multi-hop propagation

OR

Q10)a) Explain the fundamental equation for the free space. **[10]**

b) Explain characteristics of wireless channel: **[8]**

- i) Fading
- ii) Multipath delay spread
- iii) Coherence Bandwidth
- iv) Coherence Time



Total No. of Questions : 8]

SEAT No. :

PA-533

[Total No. of Pages : 2

[5926]-553

T.E. (Electronics Engineering)

MICROCONTROLLERS AND APPLICATIONS

(2015 Pattern) (Semester - I) (304204)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Explain the functions of following registers of 8051 microcontroller [4]
- i) Accumulator
 - ii) Program Counter
 - iii) DPTR
 - iv) Stack Pointer
- b) Interface LED 0 to LED 7 to port 1 of 8051 microcontroller. Write an assembly language program to turn ON LEDs from LED 0 to LED 7 sequentially with some delay and to turn OFF LEDs from LED 7 to LED 0 sequentially with some delay. [8]
- c) Draw interfacing diagram to interface an 8 bit DAC with 8051 microcontroller. Write an assembly language program to generate Ramp, Triangular and Sine waveform. [8]

OR

- Q2)** a) Draw and explain frequency counter using 8051 microcontroller. [4]
- b) Explain different modes of operation of timer of 8051 microcontroller. [8]
- c) Explain the following development tools [8]
- i) Assembler
 - ii) Compiler
 - iii) IDE
 - iv) Emulators

P.T.O.

- Q3)** a) Explain the following with respect to PIC 18FXXX microcontroller [8]
i) Watch dog timer
ii) Power down mode
b) List the features of PIC 18FXXX microcontroller. Explain the different registers of PIC 18FXXX microcontroller. [8]

OR

- Q4)** a) Explain the function of Program counter in PIC 18FXXX microcontroller. What is the width of Program counter in PIC 18FXXX microcontroller? How much program memory can be interfaced with PIC 18FXXX microcontroller? Explain Program memory organization in PIC 18FXXX microcontroller. [8]
b) Explain the following instructions of PIC 18FXXX microcontroller [8]
i) ANDLW 0x11
ii) MULW 0x22
iii) ADDLW 0x01
iv) RETFIE
- Q5)** a) Interface 16×2 LCD in 4 bit mode with PIC 18FXXX. Write an embedded C program to display message “INDIA” on LCD. [8]
b) Explain Timer 0 of PIC18FXXX microcontroller in 4 bit and 8 bit mode. [8]

OR

- Q6)** a) With the help of neat diagram explain how speed of dc motor can be controlled by using CCP of PIC 18FXXX microcontroller. [8]
b) Explain in brief I/O ports of 18FXXX microcontroller. Explain the function of TRISx and LATx registers of I/O port of PIC 18FXXX microcontroller. [8]
- Q7)** a) Explain MSSP structure with SPI mode in PIC 18FXXX microcontroller. [8]
b) List the features of ADC of 18FXXX microcontroller. Write an embedded C program to convert analog into digital. Draw the flow chart. [10]

OR

- Q8)** a) Explain designing of home protection system. Draw and explain home protection system. [8]
b) Write short note on : [10]
i) I2C
ii) SPI



Total No. of Questions : 10]

SEAT No. :

PA-534

[Total No. of Pages : 2

[5926]-554

T.E. (Electronics)

DATA COMMUNICATION

(2015 Pattern) (Semester -I) (304205)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Apply Shannon Fano encoding scheme for given message ensemble, find coding Efficiency. [6]

$[X]=[x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8]$

$[P] = [1/4 1/8 1/16 1/16 1/4 1/16 1/8 1/16]$

b) What is ARQ? Explain Go back N and selective repeat ARQ protocols.[4]

OR

Q2) a) Generate a systematic (7,4) cyclic code for the messages 1010 and 1000.[6]

b) Explain different analog and digital data transmission modes. [4]

Q3) a) Apply Huffman coding to following message ensemble. Find efficiency.
 $x = [x_1 x_2 x_3 x_4 x_5 x_6 x_7] = \text{probabilities } [0.3, 0.2, 0.2, 0.15, 0.1, 0.05]$ [6]

b) Write a note on Bandwidth SNR trade-off and use of orthogonal signal to achieve Shannon's limit. [4]

OR

Q4) a) What are different types of guided and unguided transmission media? Explain any one guided media in detail with neat diagram. [6]

b) State and explain properties of cyclic codes. [4]

Q5) a) Explain in detail principle of Delta modulator with block diagram and supporting waveforms. Derive the expression for slope overload error.[8]

b) Draw the block diagram of PCM generation and regeneration and explain the functional block details. [8]

OR

P.T.O.

- Q6)** a) With neat block diagram explain the Adaptive delta modulator and demodulator. State the advantages of ADM over DM. [8]
- b) State the properties of line codes & draw the waveforms for the bit sequence 11100101 for [8]
- i) RZ unipolar
 - ii) NRZ polar
 - iii) AMI
 - iv) Split Phase Manchester

- Q7)** a) Explain PSK transmitter and receiver with neat block diagram with signal space and spectrum. [8]
- b) Explain ASK in detail with the help of transmitter and receiver block diagram. [8]

OR

- Q8)** a) Explain M-ary PSK in detail with the help of transmitter and receiver block diagram with signal space and spectrum. [8]
- b) Explain QAM transmitter and receiver block diagram with its waveforms. [8]
- Q9)** a) Consider a Fast hop - SS system with binary FSK, 2 hops/symbol and a PN sequence with binary message 010010010000. The message is transmitted using following PN sequence {010, 110, 101, 100, 000, 101, 011, 001, 001, 111, 011.....} plot the output frequency for input message. [10]
- b) Draw and explain the block schematic of DS-SS PSK Transmitter and receiver. [8]

OR

- Q10)** a) Write a note on [10]
- i) Properties of PN-Sequence.
 - ii) Compare FDMA, TDMA & CDMA.
- b) With neat block schematic explain the FHSS transmitter and receiver. [8]



Total No. of Questions : 10]

SEAT No. :

PA-535

[Total No. of Pages : 3

[5926]-555

T.E. (Electronics Engineering)

DSP & APPLICATIONS

(2015 Pattern) (Semester - II) (304206)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Describe in brief advantages of DSP over analog signal processing. [6]
b) Evaluate IDFT of the following sequence $X(k) = [6, 2j-2, -2, -2j-2]$. [4]

OR

- Q2)** a) State & prove convolution property of z transform. [6]
b) Evaluate circular convolution of the following sequences.
 $x_1(n) = [4 \ 2 \ 6 \ 7]$ $x_2(n) = [3 \ 4 \ 5 \ 2]$ [4]

- Q3)** a) The transfer function of the system is defined by $H(z) = \frac{z^2 - 5z + 6}{z^2 - \frac{5}{6}z + \frac{1}{6}}$ [6]
i) Comment on stability of the system.
ii) Find difference equation of the system.
b) Draw Radix 2 DIT FFT signal flow graph to evaluate 8 point DFT. [4]

OR

- Q4)** a) Describe in brief overlap & add method of linear filtering of long data sequences. [4]
b) Describe in brief sampling theorem & aliasing effect. [6]

P.T.O.

- Q5) a)** Explain in detail frequency sampling method of designing FIR filter. [6]
b) The desired frequency response of a low pass filter is given by

$$H_d(\omega) = \begin{cases} e^{-j2\omega} & |\omega| < \frac{\pi}{4} \\ 0 & \frac{\pi}{4} < |\omega| \leq \pi \end{cases}$$

Determine the filter coefficient $h(n)$, if $h(n) = h_d(n) \times w(n)$ using Hamming window. Determine the length and order of filter. [10]

OR

- Q6) a)** Realize the following system function using minimum number of multipliers [10]

i) $H(z) = 1 + \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2} + \frac{1}{3}z^{-3} + \frac{1}{2}z^{-4} + z^{-5}$

ii) $H(z) = (1 + z^{-1}) \left(1 + \frac{1}{4}z^{-1} + \frac{1}{4}z^{-2} + z^{-3} \right)$

- b)** Describe in brief finite word length effect in FIR filter design. [6]

- Q7) a)** For a Bilinear Transformation method, discuss the warping effect. Explain the design steps of IIR filter by BLT method. [8]

- b)** Using Bilinear Transformation, design a butterworth filter which satisfies the following conditions. Consider $T_s = 1$ sec. [10]

$$0.8 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2 \quad 0.6\pi \leq \omega \leq \pi$$

OR

- Q8) a)** Compare between

i) IIR & FIR filters

ii) Impulse Invariance & BLT method. [8]

- b)** Obtain the direct form I & direct form II structures for following system
 $y(n) = -0.2 y(n-1) + 0.6 y(n-2) + 0.62 x(n) + 0.1 x(n-2)$. [6]

- c)** Explain design steps of IIR filter by Impulse Invariance method. [4]

- Q9)** a) With neat block diagram explain in brief architecture of DSP. [8]
b) Describe in brief triggering circuit for converter using DSP. [8]

OR

- Q10)** a) Explain in brief use of DSP for interference cancellation in ECG. [8]
b) Discuss in brief following issues involved in DSP processor design. [8]
i) Speed
ii) Pipelining
iii) Quantization error
iv) Accuracy



Total No. of Questions : 10]

SEAT No. :

PA-536

[Total No. of Pages : 2

[5926]-556

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS

(2015 Pattern) (Semester - II) (304207)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Assume suitable data if necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) List the features of MSP430 Microcontroller. **[4]**

b) Explain in brief system clocks of MSP430 Microcontroller. **[6]**

OR

Q2) a) Explain PWM generation in MSP430. **[6]**

b) Draw and explain CPU register structure and their uses in MSP 430 Microcontroller. **[4]**

Q3) a) State features of ARM7 and explain pipeline used in ARM7. **[6]**

b) Compare SPI and I2C communication protocol. **[4]**

OR

Q4) a) Explain difference between ARM7, ARM9 and ARM11. **[6]**

b) Explain addressing modes of DMA controller in MSP430. **[4]**

Q5) a) Explain the PLL and VPB divider of LPC2148. Explain the calculation of 'M' multiplier and 'P' divider in PLL write the steps of PLL programming. **[8]**

b) Interface LED's to PO.0 to PO.7 port pins of LPC2148. Write an embedded C program to blink these LED's. **[8]**

P.T.O.

OR

- Q6)** a) Explain function of any four GPIO registers of LPC2148. [8]
b) Interface LCD to LPC2148 and write a program to display string 'INDIA'. [8]

- Q7)** a) State the features of DAC of LPC2148 and write a program to generate square wave using DAC. [8]
b) Draw and explain interfacing of EEPROM using I2C communication to LPC2148. Draw flow chart to read and write data in EEPROM. [8]

OR

- Q8)** a) Draw and explain interfacing of SD card with LPC2148 using SPI protocol. [8]
b) List the features of on chip ADC of LPC2148. Write an embedded C program to convert analog input into digital. [8]

- Q9)** a) Draw and explain block diagram of CORTEX M3 processor. [10]
b) Compare ARM7 with CORTEX M series. [8]

OR

- Q10)** a) Draw and explain CMSIS structure of cortex series. [10]
b) Compare CORTEX A, CORTEX M, CORTEX R processor series. [8]



Total No. of Questions 8]

SEAT No. :

PA-537

[5926]-557

[Total No. of Pages : 2

T.E. (Electronics Engineering)
BUSINESS MANAGEMENT AND ORGANISATION
(2015 Pattern) (Semester-II) (304208)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain various factors to be considered while setting up an enterprise. [8]
b) Explain the positive and negative effects of globalization. [6]
c) Write a short note on private sector. [6]

OR

- Q2)** a) List various government policies and explain the SEZ policy. [8]
b) List features, relative merits and demerits of Joint stock companies. [6]
c) Differentiate between Traditional commerce and E-commerce. [6]

- Q3)** a) Write a short note on Business Ethics? Explain the advantages of Business Ethics. [8]
b) Explain the importance of professionalization in business. [8]

OR

- Q4)** a) Explain the need of Social responsibility and Social Audit in Business. [8]
b) Explain Technological Development and Social Change in Business. [8]

- Q5)** a) Define management and explain the functions of management. [8]
b) Compare the theories of F.W. Taylor and Henri Fayol. [8]

OR

P.T.O.

- Q6)** a) Explain management as Art, Science and Profession. [8]
b) Distinguish between Administration and Organization. [8]

- Q7)** a) What is Strategic Management? Explain the benefits of Strategic Management. [10]
b) Write a short note on Total Quality Management. [8]

OR

- Q8)** a) With an example explain the social responsibility of management. [10]
b) Write a short note on: [8]
i) Stress Management
ii) Management of Crisis



Total No. of Questions : 8]

SEAT No. :

PA-538

[Total No. of Pages : 2

[5926]-558

T.E. (Electronics)

FUNDAMENTALS OF HDL

(2015 Pattern) (Semester - II) (304209) (Backlog)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) List the different types of operators in VHDL. [4]
- b) Write a VHDL Code for a 8:1 Mux. Also draw its truth table and logic block with symbol. [8]
- c) With an example write the structure of entity and architecture including library. [8]

OR

- Q2)** a) List down the features of CPLD and also its limitations. [8]
- b) Draw structure block of FPGA. [4]
- c) What are the different programming techniques used in FPGA. [8]

- Q3)** a) List down the advantages of Verilog HDL? [6]
- b) Write a Verilog HDL code for a 4bit-full subtractor. [6]
- c) What are arithmetic operators in verilog? Explain with an example. [4]

OR

P.T.O.

- Q4)** a) How a signal declaration and assignment statements are done in Verilog?
Write its syntax and explain with an example. [8]
- b) Distinguish between function and procedure. [8]

- Q5)** a) State how to use task and procedure in designing full adder in Verilog. [8]
- b) Explain shift, equality and bitwise operators in Verilog. [6]
- c) By using Case statement in behavior modeling, write a Verilog HDL code for 8-bit ALU. [4]

OR

- Q6)** a) Compare blocking and non blocking types in Verilog. [8]
- b) What is gate level modeling? Explain all types of gates. [10]
- Q7)** a) What are predifened and user defined primitives? [8]
- b) Write a Verilog HDL code for a 4bit Binary Counter. [8]

OR

- Q8)** a) Explain with an example Compiler Directives with System Task. [8]
- b) Find the value of Following Expressions If the two unsigned variables are A = 4' B 1110 and B=4'B1011. [8]
- i) {A & & B}
- ii) (A || B)
- iii) {4{A}, 2{B}}
- iv) B < < 2



Total No. of Questions : 8]

SEAT No. :

PA-539

[Total No. of Pages : 2

[5926]-559

T.E. (Electronics Engineering)

PLC & APPLICATIONS

(2015 Pattern) (Semester - II) (304210)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) A motor control circuit with two start and two stop switches. When a start button is depressed, the motor runs. By sealing, it continues to run, when start button is released. Either stop button stops the motor when depressed. Draw (i) Gate Symbol (ii) Relay logic ladder diagram, and (iii) PLC logic ladder diagram. [6]
- b) Explain the basic operating principle of an electromagnetic control relay? [6]
- c) Enlist the types of analog PLC systems? Explain in detail about the PLC Analog signal processing. [8]

OR

- Q2)** a) Explain in detail about the discrete type I/O module. [8]
- b) Explain in detail about relay type instruction. [6]
- c) Draw the ladder diagram of control of traffic lights in one direction. [6]
- Q3)** a) Explain in detail about the Electric Noise and suitable example of noise suppression. [9]
- b) Explain PLC Maintenance in detail. [8]

OR

- Q4)** a) What are the steps to be followed when commissioning a PLC system? Explain in detail. [9]
- b) Explain in detail about the circuit protections & wiring. [8]

P.T.O.

- Q5)** a) Explain any one type of process used in process control Industries. Explain about the structure of control systems. [8]
b) Explain in detail about Remote terminal unit (RTU). [8]

OR

- Q6)** a) Draw and explain the block diagram of SCADA system in detail. [8]
b) Explain in detail about Master terminal unit (MTU). Enlist any three applications of HMI in industry. [8]
- Q7)** a) What are the advantages of standard industrial network? Explain the serial communication interface in detail. [9]
b) Write short notes on Ethernet/IP and Modbus. [8]

OR

- Q8)** a) Explain in detail with suitable diagram about the operation of two-axis robot control with PLC. [9]
b) Explain types of communication interface and types of networking channels in PLC. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1440

[Total No. of Pages : 2

[5926]-56

T.E. (Civil Engg.)

SOLID WASTE MANAGEMENT

(2019 Pattern) (Semester-II) (Elective-II) (301015f)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume necessary data.
- 5) Use of scientific calculator is allowed.

- Q1)** a) State the factors considered during evaluation of on-site processing equipments of solid waste. [6]
b) Explain thermal volume reduction method of processing technique. [6]
c) State the terms related to solid waste management [6]
i) Segregation
ii) Recovery
iii) Recycling
iv) Reuse

OR

- Q2)** a) List the factors affecting composing process of solid waste. [6]
b) Specify the role of transfer station in municipal solid waste management.[6]
c) Explain Integrated Solid Waste Management by citing out the political, environmental and economic aspects along with its advantages. [6]

- Q3)** a) How does incineration help in the management of solid waste? [6]
b) Describe the incineration technologies and air emissions and its control in detail. Explain the following : [6]
i) Pyrolysis
ii) Refuse derived fuel
iii) Bio gasification
c) How to estimate of low and high heating value of any material. [5]

OR

- Q4)** a) Write environmental impacts of waste to energy system. [6]
b) What are the different types of incinerators? Explain any one. [6]
c) Write working principle, advantages and disadvantages of anaerobic digestion process. [5]

P.T.O.

- Q5)** a) Draw a neat labeled sketch of single liner system of leachate control.[6]
b) State any two advantages and disadvantages of Landfill method of solid waste disposal. [6]
c) Describe the factors which affect production of leachate and landfill gas in the landfill? [6]

OR

- Q6)** a) What is Leachate? How it is formed? How its movement is controlled?[6]
b) Enlist methods of Biomining and explain any one method of it. [6]
c) What is bioreactor landfill? What are the different types of bioreactor landfill? [6]

- Q7)** a) Explain Domestic waste and Hazardous solid waste. [6]
b) Explain the control measures for minimizing the industrial solid waste.[6]
c) Suggest various management technologies for biomedical waste. [5]

OR

- Q8)** a) Discuss the present scenario of recycling of E- waste in India. [6]
b) Explain EPA - identification of hazardous and toxic waste. Write down the characteristics of hazardous waste. [6]
c) Write objectives and major provision in plastic waste management rules - 2016. [5]



Total No. of Questions : 8]

SEAT No. :

PA-540

[Total No. of Pages : 2

[5926]-560
T.E. (E & TC)
POWER ELECTRONICS
(2015 Pattern) (Semester - II) (304186)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of Calculator is allowed.

- Q1)** a) Explain Gate & switching characteristics of SCR of using suitable waveform. [7]
- b) What is need of Series & Parallel combination of SCR, explain equalizing circuit. [7]
- c) Compare 120 and 180 degree mode of 3 phase inverter for balanced star R load. [6]

OR

- Q2)** a) For an SCR, gate cathode characteristics is given by $V(q) = 1 + 10 I(q)$, gate source voltage is rectangular pulse of 15V with 20 μ sec duration for an average power dissipation of 0.3 W and a peak gate drive power of 5W compute: The resistance to be connected in series with the SCR gate, the triggering frequency, the duty cycle of triggering pulse. [7]
- b) Draw and explain about the construction and VI characteristics of POWER MOSFET. [6]
- c) Draw & explain about Single phase full converter with RL load with waveform. [7]

- Q3)** a) Explain operation of four quadrant chopper with circuit diagram. [8]
- b) A dc chopper is fed from 100 V dc. Its load voltage consists of rectangular pulses of duration 1m sec in an overall cycle time of 3 msec. Calculate the average output voltage and ripple factor. [8]

OR

P.T.O.

- Q4) a)** Explain working of SMPS, what are its advantages over linear power supply. [8]
- b) A single-phase half-wave ac voltage controller using one SCR in antiparallel with a diode, feeds 1 kW, 230 V heater. For a firing angle of 90° , calculate the load power and input power factor. [8]

- Q5) a)** What are the resonance converters? State its advantages over rectifier converters. [6]
- b) Explain working of Online UPS & Offline UPS. [6]
- c) The half-bridge series resonant converter is operated at an output frequency of 7 kHz. If $C_1=C_2=C=3\text{ mF}$, $L_1=L_2=L=50\text{ mH}$, $R=2\text{ W}$ and $E_{dc}=220\text{ V}$, calculate the peak supply current. [6]

OR

- Q6) a)** Explain Voltage & frequency control methods for 3 Phase induction motor drive. [6]
- b) A series R-L-C circuit when excited by a 10 V sinusoidal voltage source of variable frequency, exhibits resonance at 100 Hz and has a 3-dB bandwidth of 5 Hz. Calculate voltage across the Inductor L at resonance. [6]
- c) Explain the advantages of Electronic ballast over conventional ballast, state its operation. [6]
- Q7) a)** What are speed control techniques of DC Motor? Explain single phase separately excited DC motor power circuit. [8]
- b) Explain the fan regulator operation using TRIAC with wave form. [8]

OR

- Q8) a)** How over voltage protection will be done in power electronics circuits, explain through one circuit. [8]
- b) Explain the working of Led lamp driver circuit used for household application explain through block diagram. [8]



Total No. of Questions : 08]

SEAT No. :

PA-541

[Total No. of Pages : 3

[5926]-561

T.E. (E & TC)

**INFORMATION THEORY, CODING & COMMUNICATION
NETWORKS**

(2015 Pattern) (Semester - II) (304187)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of non-programmable calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Comment whether following code is perfect code or not, with necessary justification. **[10]**

i) (7, 4) LBC

ii) (6, 3) LBC

b) A discrete source emits messages x_1 & x_2 with probabilities $3/4$ & $1/4$ with BSC (Binary Symmetric Channel). Find $H(X)$, $H(Y)$, $H(XY)$. Also find mutual information. For prob $P = 1/3$ (Error probability). Draw channel diagram. **[10]**

OR

Q2) a) Apply Huffman coding for the symbols [A E H N G S] generated by a DMS with probabilities [0.19 0.15 0.2 0.16 0.4 0.08]. Also calculate coding efficiency. **[5]**

b) State information capacity theorem. A channel has B.W. of 5kHz and signal to Noise power ratio of 63. Determine the BW needed if SNR is reduced to 31. **[5]**

c) Obtain Generator & Parity check matrix for (7, 4) systematic cyclic code, using Generator polynomial $G(x) = x^3 + x + 1$. **[10]**

P.T.O.

Q3) a) For a 1/3 rate convolution encoder using three generators. [10]

$$g1 = [1 \ 0 \ 0]$$

$$g2 = [1 \ 0 \ 1]$$

$$g3 = [1 \ 1 \ 1]$$

- i) Sketch the encoder configuration.
 - ii) Draw state and Trellis diagram.
 - iii) Find the output code sequence for the input sequence 10110.
- b) Consider (15, 7) double error correcting BCH code with $g(x) = x^8 + x^7 + x^6 + x^4 + 1$ and received code word $C = [0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1]$. Find the corrected codeword. Use primitive polynomial $x^4 + x + 1$ [8]

OR

Q4) a) For systematic rate 1/2 convolutional encoder with constraint length 2. Parity bit is generated by mod-2 sum $p = x + 1$. [8]

- i) Draw the encoder
 - ii) Draw state diagram, trellis diagram
 - iii) Find out the output for message (1 0 1).
- b) Consider (15, 7) double error correcting BCH code with $g(x) = x_8 + x_7 + x_6 + x_4 + 1$ and received code word $C = [0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 | 1 \ 1 \ 1 \ 0 \ 1 \ 1]$. Find the corrected codeword. Use primitive polynomial $x_4 + x + 1$. [10]

Q5) a) Explain network design issues. [8]

b) Compare coaxial cable, twisted pair cable and fiber optic cable. [8]

OR

Q6) a) Compare OSI and TCP/IP models. [8]

b) Define network. Explain different network topologies. [8]

Q7) a) What is ARQ? Explain three types of ARQ. [8]

b) Explain different data transfer modes of HDLC. [8]

OR

Q8) a) Explain HDLC frame fields with neat diagram. [8]

b) What is framing? Explain different types of framing methods. [8]



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Total No. of Questions: 8]

SEAT No. :

PA-542

[5926]-562

[Total No. of Pages : 2

T.E. (Electronics & Telecommunication)

BUSINESS MANAGEMENT

(2015 Pattern) (Semester-II) (304188)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Discuss Fayol's 14 principles of management. [6]
b) What is Kaizen? State its advantages and limitations. [6]
c) Explain cost benefit analysis. [8]

OR

- Q2)** a) Explain advantages and disadvantages of line organization. [6]
b) Explain any two quality management assistance tools in detail. [6]
c) State and explain different project resources. [8]

- Q3)** a) Define human resource management and explain different steps of HR planning. [8]
b) Comment on career planning and management. [8]

OR

- Q4)** a) State the methods of executive development. [8]
b) What are the key parameters for talent acquisition. [8]

- Q5)** a) State the 5C's of identifying a good business opportunity. [8]
b) State the role of entrepreneur in economic development. [8]

OR

P.T.O.

- Q6)** a) State the causes of industrial disputes. [8]
b) What are industrial relations? State the causes of healthy industrial relations. [8]
- Q7)** a) Discuss how different disabilities affect web accessibility. [10]
b) Explain the role of online publication in digital marketing. [8]

OR

- Q8)** a) State the benefits of branding. Explain any two types of branding. [10]
b) Define supply chain management and state its benefits. [8]



Total No. of Questions : 8]

SEAT No. :

PA-543

[Total No. of Pages : 2

[5926]-563

T.E. (E & TC)

ADVANCED PROCESSORS

(2015 Pattern) (Semester - II) (306189)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Draw & explain the data flow model of ARM 7. [6]

b) Explain with neat diagram relation between CCLK & PCLK with the help of VPB/APB divider. Find the configuration of VPB divider to achieve PCLK = 30MHz for FOSC = 12MHz. [7]

c) Interface 16×2 LCD with LPC 2148 to display message "WELCOME" on LCD. Draw interfacing LCD diagram. [7]

OR

Q2) a) Draw & explain the structure of CPSR. [6]

b) Draw on interfacing diagram for GLCD with LPC 2148. Write an algorithm to interface GLCD. [7]

c) Explain interrupt structure of LPC 2148. [7]

Q3) a) Explain GPS interfacing with LPC 2148. Draw GPS interfacing diagram. [8]

b) Explain EEPROM interfacing using I2C. Draw EEPROM interfacing diagram with LPC 2148. [8]

OR

Q4) a) Draw onchip DAC interfacing with LPC2148. Write an embedded C program for generation of wave form. [8]

b) Explain SD card interfacing with LPC2148. Draw interfacing diagram & explain interfacing with the help of an algorithm. [8]

P.T.O.

- Q5) a)** Explain the general purpose DSP processors. - FIR & IIR. [8]
- b) Explain the use of hardware FFT processor with a neat schematic. [8]

OR

- Q6) a)** Explain in detail selection criteria of DSP. Compare versions of fixed point digital signal processors. [8]
- b) State features of TMS320C67X processor. Draw & explain architecture of TMS320C67X processor. [8]

- Q7) a)** Explain on-chip peripherals of TMS320C67X processor & explain any two in detail. [10]
- b) Explain the operation of basic fetch packet format in detail. [8]

OR

- Q8) a)** Explain the concept of pipeline operation in TMS320C67X processor for improving performance with different phases. [10]
- b) Draw & explain the internal memory architecture of TMS320C67X processor. [8]



Total No. of Questions : 8]

SEAT No. :

PA-544

[Total No. of Pages : 2

[5926]-564

**T.E. (Electronics & Telecommunication Engineering)
SYSTEM PROGRAMMING AND OPERATING SYSTEMS
(2015 Pattern) (Semester - II) (304190)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Differentiate between Macro & Function with one example. [6]
b) What is need for code optimization? Explain code optimization with suitable examples. [7]
c) List the Job scheduling algorithms. Explain shortest Job First Algorithm. [7]

OR

- Q2)** a) Explain the different phases of language processing. [6]
b) What is loader? List basic features and functions of loader. [7]
c) What is an operating system? Explain the function of an operating system. [7]

- Q3)** a) What is mutual exclusion? Explain concept of deadlock. [9]
b) Explain dining philosophers problem and producer consumer problem. [9]

OR

- Q4)** a) What is Banker's algorithm? Explain it with suitable example. [9]
b) Explain Inter process communication with their problems & solutions. [9]

P.T.O.

- Q5)** a) Explain virtual memory with segmentation. [8]
b) Explain design issues in paging. What is demand paging? Explain with example. [8]

OR

- Q6)** a) List the page replacement algorithm and explain any one. [8]
b) Explain the concept of physical address, logical address, pages and page frames. Explain the process of deriving physical address from logical address. [8]

Q7) Write a short note on [8]

- a) i) Directory structure in OS
ii) File Management system in OS
- b) Give classification of I/O devices. Hence explain any four properties used for classification of I/O devices. [8]

OR

- Q8)** a) Explain any two file organization techniques. [8]
b) Explain Linux file system. [8]

Total No. of Questions : 10]

SEAT No. :

PA-545

[Total No. of Pages : 2

[5926]-565

T.E. (IT)

THEORY OF COMPUTATION
(2015 Pattern) (Semester - I) (314441)

Time : 2½ Hours]

[Max. Marks : 70

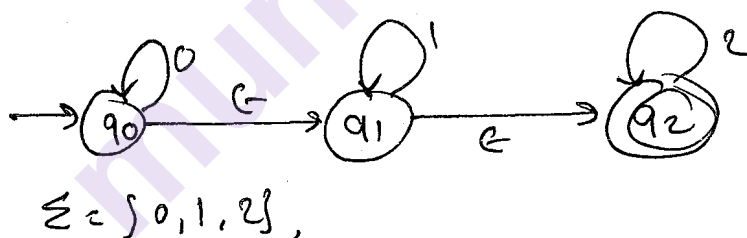
Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Design a Moore m/c which will increment the given binary number by 1. [6]
b) Give the difference between DFA and NFA. [4]

OR

- Q2)** a) Describe English language for following RE : [4]
i) $(a^*ab^*ab^*) + b^*$
ii) $a+b^*c$
b) Find NFA from given NFA-€ [6]



- Q3)** a) Show that $P = Q$, where $P = (1+011)^*$, $Q = \epsilon + 1^*(011)^*(1^*(011)^*)^*$ [4]
b) For the following CFG, find regular expression and FA that define the same language : $S \rightarrow aD \mid bA$, $A \rightarrow aD \mid a$, $D \rightarrow bA \mid b$ [6]

OR

- Q4)** a) Give RE and FA for [5]
 $L = L1 \cap L2$ $\Sigma = \{0, 1\}$ where $L1 =$ All the string of odd length
 $L2 =$ All the starting with 'a'
b) Show that the context free languages are closed under union, concatenation and kleen star. [5]

P.T.O.

- Q5)** a) Design a PDA accepting by empty store / stack of the following language :
 $\{a^n b^n c^m \mid m, n \geq 1\}$ [9]
- b) Let $L = \{a^m b^n \mid n < m\}$. Construct [8]
- a CFG grammar accepting L ,
 - a PDA accepting L by empty state.

OR

- Q6)** a) Construct a PDA equivalent to the following CFG : [9]
 $S \rightarrow 0AA, A \rightarrow 0S \mid 1S \mid 0.$
- b) Design a PDA accepting by empty store / stack of the following language:
 $\{a^m b^n \mid m > n \geq 1\}.$ [8]

- Q7)** a) Design a TM to recognize the language equal no. 0's and 1's [9]
- b) Give the short note on following : [8]
- Type of TM
 - Halting problem of TM

OR

- Q8)** a) Construct a TM that can accept language $\Sigma = \{0, 1\}$, [9]
 $L = W W^R \mid (W \text{ is in } (0 + 1)^*)$
- b) Give the short note on following : [8]
- Church's Turing hypothesis
 - UTM

- Q9)** a) Explain with an Example of Turing Reducibility? [8]
- b) If L is Recursive language over Σ , show that [8]
 L (L is defined as $\Sigma - L$ is also recursive.

OR

- Q10)** a) Explain the complexity class P, NP and differential between NP Complete and NP Hard. [8]
- b) Show that PCP over $|\Sigma| \geq 2$ is unsolved. [8]

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Total No. of Questions : 10]

SEAT No. :

PA-546

[Total No. of Pages : 3

[5926]-566

T.E. (Information Technology)
DATABASE MANAGEMENT SYSTEMS
(2015 Pattern) (Semester - I) (314442)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain various components of DBMS system with the help of diagram. **[5]**

- b) Explain the following terms : **[5]**
- i) Weak Entity
 - ii) Generalization
 - iii) Specialization
 - iv) Mapping Cardinality
 - v) Super Key

OR

Q2) a) Explain the problems that may arrive if the DBA doesn't deliver the responsibilities properly. **[5]**

- b) Consider the following database **[5]**

Student(RollNo, Name, Address, Date_of_Birth)

Subject(Subject_Code, Subject_Name)

Marks(RollNo, Subject_Code, Score)

Write following query in SQL using two possible ways (Possible ways are Join, Nested queries, Views)

Find average marks of each student, along with the name of student.

P.T.O.

- Q3)** a) Construct an ER diagram for a car insurance company that has a set of customers each of whom owns one or more cars. Each car has associated with zero to any number of recorded accidents. [5]
- b) Explain Boyce-Codd normal form (BCNF) with suitable example and explain why 4NF is more desirable than BCNF. [5]

OR

- Q4)** a) Differentiate between (ANY 2) : [5]
- i) Implicit and Explicit cursor
 - ii) Trigger and Stored procedure
 - iii) Embedded SQL and Dynamic SQL
- b) What are the steps involved in query processing? Explain each in brief with diagram. [5]

- Q5)** a) What is the basis of immediate updates recovery technique? What does the deferred updates recovery technique involve? [8]
- b) What is shadow paging? Explain how shadow paging works in detail with suitable example. [8]

OR

- Q6)** a) Explain time stamped based and lock-based protocol with suitable example. [8]
- b) If you are designing web-based system to make railway reservation which DBMS architecture, would you choose? Why? Why would be the other architectures are not a good choice? [8]

- Q7)** a) Define JSON. What is the rule for writing JSON? Differentiate between JSON and XML. [8]
- b) Explain in brief the advantages of MongoDB over RDBMS. [8]

OR

- Q8)** a) How data validation done in XML? Explain with suitable example. [8]
- b) Draw and explain HDFS architecture? [8]

- Q9)** a) Compare and contrast OLTP and OLAP. [6]
b) Explain classification in detail with suitable example. [6]
c) Explain KDD in detail. [6]

OR

- Q10)** a) Define Data Warehouse? Why is it needed? Draw and explain architecture of Data Warehouse. [9]
b) Write a short note on : [9]
i) Machine learning for Big data
ii) Business Intelligence

□□□

Total No. of Questions : 10]

SEAT No. :

PA-547

[Total No. of Pages : 2

[5926]-567

T.E. (Information Technology)

SOFTWARE ENGINEERING & PROJECT MANAGEMENT

(2015 Pattern) (Semester - I) (314443)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Contrast between spiral models & RAD Model. **[5]**

b) Discuss the significance of Clean Room Software Engineering. **[5]**

OR

Q2) a) Discuss in brief basic waterfall Process Models. **[5]**

b) Illustrate the significance of Verification and Validation with an example. **[5]**

Q3) a) Discuss Kano diagram of prioritizing requirements. **[5]**

b) Discuss the PERT chart and CPM in the context of software project management. **[5]**

OR

Q4) a) Illustrate with an example how Cost Estimation Tools and Techniques are used in IT industry. **[5]**

b) Demonstrate how swimlane and class diagram are contributing to analyse the requirements. **[5]**

Q5) a) Discuss in brief agile process model of software development. **[6]**

b) How Extreme programming contributes to agile process model. **[10]**

OR

P.T.O.

- Q6)** a) Illustrate with example significance of XP and Scrum in agile development. [8]
b) Discuss role refactoring & pair programming in agile development. [8]

- Q7)** a) Explain use of Microsoft project management tool for software project management. [8]
b) Discuss the various attributes of Performing Quality Assurance. [8]

OR

- Q8)** a) Enlist the Tools and Techniques for Quality Control and explain them in brief. [8]
b) Demonstrate with example various common Sources of Risk in IT projects. [8]

- Q9)** a) Discuss the role of SCM repository, SCM process, & SCM tools in software Engineering. [9]
b) Contrast between collaborative development, & test-driven development with help an example. [9]

OR

- Q10)** a) Discuss in detail Project Management trends in software development. [9]
b) Enlist components of CASE and discuss in short. [9]



Total No. of Questions : 10]

SEAT No. :

PA-548

[Total No. of Pages : 2

[5926]-568
T.E. (Information Technology)
OPERATING SYSTEM
(2015 Pattern) (Semester-I) (314444)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain operating system functions. [5]
b) Differentiate between user level and kernel level threads. [5]

OR

- Q2)** a) Write a shell program for string operations. [5]
b) Explain the concept of virtual machine with benefits. [5]

- Q3)** a) Explain the 5-state diagram. [5]
b) Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here. [5]

I	0	1	2	3	4
T(pi)	80	20	10	20	50

Using FCFS Scheduling, create a Gantt chart and find turnaround time for p3.

OR

- Q4)** a) Explain the concept of general and binary semaphores. [5]
b) Write a short note on Process Control Block. [5]

- Q5)** a) Explain with a diagram the concept of translation look aside buffer. [6]
b) For the following reference string. [12]

6,5,1,2,5,3,5,4,2,3,6,3,2,1,2

Count the number of page faults that occur with 3 frames using FIFO, Optimal and LRU page replacement methods. Discuss the result.

OR

P.T.O.

- Q6)** a) State and explain diff approaches of I/O buffering. [6]
b) Write a short note on: [6]
i) Compaction
ii) Thrashing
c) Explain the concept of demand paging with neat diagram. [6]

- Q7)** a) For the given sequence of disk request. determine the total distance travelled by disk head in satisfying the entire request for FCFS, C-SCAN and C-LOOK algorithms. Initial head position is 120 and total number of cylinders in the disk is 200. [12]
27,129,110,186, 147,41,10.64. 120
b) Define following terms [4]
i) Seek time
ii) Rotational latency

OR

- Q8)** a) Explain free space management technique. [8]
b) Write short notes on: [8]
i) Directory Structure
ii) File Sharing
- Q9)** a) Describe the steps for adding new system call in the Linux Kernel. [8]
b) Write short note on following: [8]
i) Process scheduling in Linux
ii) Linux file system

OR

- Q10)** a) Explain in detail Linux Booting process. [8]
b) List and explain different inter-process communication mechanisms in Linux operating system. [8]



Total No. of Questions : 10]

SEAT No. :

PA-549

[Total No. of Pages : 2

[5926]-569

T.E. (Information Technology)
HUMAN - COMPUTER INTERACTION
(2015 Pattern) (Semester -I) (314445)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Write a short note on “The psychology of everyday things”. **[5]**

b) List human Input-Output channels & discuss briefly about it. **[5]**

OR

Q2) a) Explain short term memory and long-term memory with example. **[5]**

b) What is ergonomics? Explain in detail. **[5]**

Q3) a) Explain disciplines contributing to HCI. **[5]**

b) What is User experience? Explain the term “design for user experience”. **[5]**

OR

Q4) a) What is reasoning? Explain different types of reasoning with examples. **[5]**

b) Explain models of interaction with an example. **[5]**

Q5) a) What is interaction design? Explain software design process. **[8]**

b) What is Wire-Framing? Explain various techniques for prototyping. **[8]**

OR

Q6) a) Explain various forms of navigation design. **[8]**

b) What Model - View - Controller (MVC) Framework? Explain in detail. **[8]**

Q7) a) Explain Scheiderman’s eight golden rules of interface design. **[8]**

b) Explain evaluation techniques in detail. **[8]**

OR

P.T.O.

- Q8)** a) Explain User interface management system (UIMS) in detail. [8]
b) Explain principles that support usability. [8]

- Q9)** a) Discuss computer mediated communication. Explain any one in detail.[9]
b) Draw and explain HTA for making a cup tea. [9]

OR

- Q10)**a) Explain evaluation through user participation along with its advantages and disadvantages. [9]
b) Explain GOMS. Create GOMS description of task of photocopying an article from a journal. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1441

[Total No. of Pages : 2

[5926]-57

T.E. (Computer / A.I.D.S. Engg)
DATABASE MANAGEMENT SYSTEMS
(2019 Pattern) (Semester - I) (310241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Justify the impact of normalization on database? Explain 2nd normal form, 3rd normal form and BCNF with example. [8]
b) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. [9]

OR

- Q2)** a) What is the impact of insert, update and delete anomaly on overall design of database? How is normalization used to remove these anomalies? [9]
b) Explain 3NF and BCNF and give its example. Also enlist their differences. [8]

- Q3)** a) Suppose a transaction T_i issues a read command on data item Q. How time-stamp based protocol decides whether to allow the operation to be executed or not using time-stamp based protocol of concurrency control. Explain in detail time stamp based protocol. [9]
b) Explain the concept of conflict serializability with suitable example. Since every conflict-serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability? [9]

OR

- Q4)** a) State and explain the ACID properties. During its execution a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain the situations when each state transition occurs. [9]
b) A transaction may be waiting for more time for an Exclusive (X) lock on an item, while a sequence of other transactions request and are granted as Shared (S) lock on the same item. What is this problem? How is it solved by two phase lock protocol? [9]

P.T.O.

- Q5) a)** Explain how NOSQL databases are different than relational databases? Describe in detail the key value store NOSQL data model with example.[9]
b) Explain BASE properties with its significance. How soft state of system is depending on Eventual consistency property? [8]

OR

- Q6) a)** List the different NOSQL data models. Explain document store NOSQL data model with example. [9]
b) State and explain the concept of CAP theorem and BASE properties with example. [8]

- Q7) a)** Write short note on : [9]
i) Active databases
ii) Deductive databases
b) What is the significance of XML databases? Explain with proper example when to use XML database. [9]

OR

- Q8) a)** Difference between relational databases and object relational databases with example [9]
b) Describe the significance of JSON data type and object. Discuss with syntax all JSON data types with suitable example. [9]



Total No. of Questions : 10]

SEAT No. :

PA-550

[Total No. of Pages : 2

[5926]-570

T.E. (Information Technology)
COMPUTER NETWORK TECHNOLOGY
(2015 Pattern) (Semester - II) (314450)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) List and explain Seven messages types in Simple Network Management Protocol (SNMP). [6]

b) Explain the User Datagram Protocol (UDP) Header with diagram. [4]

OR

Q2) a) List and Explain four different timers in TCP. [6]

b) Explain in brief Multi Purpose Mail Extension (MIME). [4]

Q3) a) Explain the Internet Protocol Version 4 (IPv4) header with diagram. [6]

b) Explain how name resolution happens in DNS. [4]

OR

Q4) a) List and explain all the basic primitives used in Socket programming. [6]

b) Differentiate between POP3 and IMAP. [4]

Q5) a) Explain with diagram the architecture of IEEE 802.11 - Wireless LAN. [8]

b) Explain 802.16 (WiMaX) protocol stack and its frame format. [8]

OR

Q6) a) Explain with diagram detailed architecture of IEEE 802.15.1 standard Bluetooth. [8]

b) Compare IEEE 802.11 (WiFi), IEEE 802.15 (Bluetooth) and IEEE 802.16 (WiMaX). [8]

P.T.O.

- Q7) a)** Explain with diagram hidden and exposed station problem in wireless network. [8]
- b)** Justify need for designing a routing protocol for Ad-hoc Wireless Networks. Classify routing protocols for wireless network. [8]

OR

- Q8) a)** Discuss Design Issues and Design Goal of MAC layer for Adhoc Wireless Network. [8]
- b)** Explain with diagrams Destination Sequenced Distance Vector (DSDV) Routing protocol in detail. [8]

- Q9) a)** Describe each components of sensor node architecture with diagram. [10]
- b)** State the types of satellites with their advantages and disadvantages. [8]

OR

- Q10) a)** What are the technical building blocks of Internet of Things? List the applications of Internet of Things. Explain any one in detail. [10]
- b)** Write short note on (any two). [8]
- i) Network Neutrality
 - ii) OpenFlow
 - iii) Software Defined Networks (SDN).



Total No. of Questions : 10]

SEAT No. :

PA-551

[Total No. of Pages : 3

[5926]-571

T.E. (Information Technology)

SYSTEMS PROGRAMMING

(2015 Pattern) (Semester - II) (314451)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain TII with Example. [5]

b) How Literals are processed in Assembler. Explain with suitable example. [5]

OR

Q2) a) Explain in detail Advanced Macro Facilities to support Semantic Expansion. [5]

b) Compare Absolute loader and Compile and Go loader schemes. [5]

Q3) a) What are assembler directives? List all with proper explanation. [5]

b) What is Macro Expansion Counter? With suitable example explain the working of MEC. [5]

OR

Q4) a) Describe the data structures required in design of two pass Direct Linking Loader with suitable example. [5]

b) Apply and explain the first three phases of compiler w.r.t the following statement: [5]

Note : ^ is exponential operator

$$x = a - 10 / (c * d^e)$$

P.T.O.

Q5) a) $S \rightarrow S+S / S-S / (S) / S*S / a$ [8]

Remove ambiguity and left recursion from the given grammar.

b) Explain Handle Pruning with example. [4]

c) Explain YACC file structure. [4]

OR

Q6) Write a short note on : [16]

a) Recursive Descent Parser.

b) SLR

c) CLR

d) LALR

Q7) a) What is dependency graph? [8]

Consider the following grammar. $E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F, \quad F \rightarrow id$

Design dependency graph for the expression : $4 * 7 + 3$

b) What is Intermediate Code Form? In which phase of compiler it is used? Explain at least three forms of Intermediate Code Forms. [8]

OR

Q8) a) What are different storage allocation strategies? Explain any one in detail. [8]

b) Given the grammar below, write the syntax directed definition with the synthesized attribute val. Also draw the annotated parse tree for the expression $(3+4)*(5+6)$ [8]

$L \rightarrow E, \quad E \rightarrow T$

$E \rightarrow E_1 + T, \quad T \rightarrow F$

$T \rightarrow T_1 * F \quad F \rightarrow (E) \quad F \rightarrow digit$

- Q9)** a) Discuss the factors affecting target code generation. [8]
b) Write A short Note on [10]
i) Machine Dependent Code optimization.
ii) Machine In- Dependent Code optimization

OR

- Q10)** a) Explain machine dependent code optimization techniques with suitable example. [9]
b) Explain is Code Optimization? How Common Sub -expression elimination and Removing of loop invariants helps in code optimization? [9]



Total No. of Questions: 10]

SEAT No. :

PA-552

[5926]-572

[Total No. of Pages : 3

T.E. (Information Technology)
DESIGN & ANALYSIS OF ALGORITHMS
(2015 Pattern) (Semester-II) (314452)

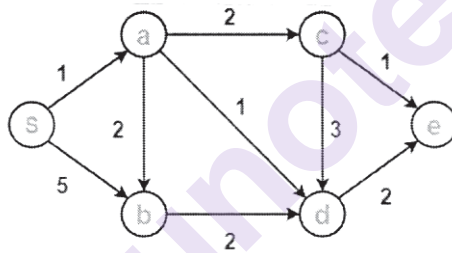
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, is necessary.

- Q1)** a) Write an algorithm for sorting n numbers using Quick Sort method. What is its time complexity? [5]
- b) Apply Dijkstra's algorithm on following graph and find all shortest paths from single source 'S'. [5]

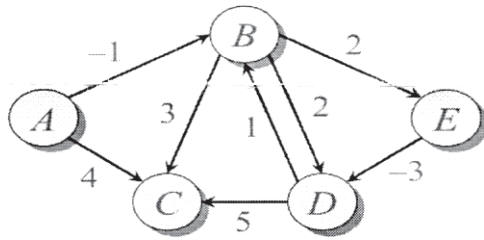


OR

- Q2)** a) Define the following asymptotic notations: [6]
- i) Ω
 - ii) O
 - iii) Θ
- b) Write a MIN-MAX algorithm using divide and conquer algorithms strategy. Give the analysis of same algorithm. [4]
- Q3)** a) Compare the following. [5]
- i) Divide-Conquer and dynamic programming
 - ii) Greedy method and dynamic programming

P.T.O.

- b) Find shortest path from node A to every other node in the graph as given below using bellman ford algorithm. [5]



OR

- Q4)** a) Solve the following instance of 0/1 Knapsack problem by Dynamic Programming $N=3$, $(p_1, p_2, p_3) = (1, 2, 5)$, $(w_1, w_2, w_3) = (2, 3, 4)$ and $m=6$ [6]

- b) What is dynamic programming? Is this optimization technique? [4]

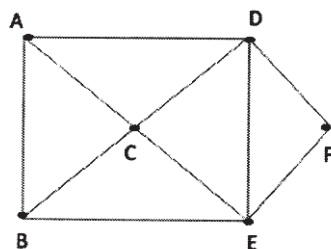
- Q5)** a) What do you mean by Backtracking? What are implicit Rules for implementation of the same? Give outline of Backtracking Algorithm. [8]

- b) Elaborate the graph colouring technique by giving a space tree diagram for coloring the nodes of a graph with node = 4 and $m = 3$. [8]

OR

- Q6)** a) What analysis can be given to improve the performance of sum-of-subset technique? Elaborate. [8]

- b) What is Hamiltonian Cycle? Find the Hamiltonian Cycle of the graph: [8]



- Q7) a)** Explain the terms: [8]
- Branch & Bound
 - Bounding function
 - Various searching techniques in branch & bound
 - Heuristic function
- b)** Solve the following instance of the knapsack problem by the branch and bound algorithm. [8]

Item	Weight	Value
1	4	\$40
2	7	\$42
3	5	\$25
4	3	\$12

The Knapsack's capacity $W=10$

OR

- Q8) a)** Differentiate between back tracking & branch and bound. Illustrate with example of 4 - Queen's problem. [8]
- b)** Solve following Job sequencing with deadline problem using Branch and Bound. [8]

Job	P	d	t
1	5	1	1
2	10	3	2
3	6	2	1
4	3	1	1

- Q9) a)** Write the difference between P and NP class problems. [9]
- b)** Explain [9]
- Computational Complexity
 - Decision problems

OR

- Q10)a)** List three problems that have polynomial time algorithms. Justify your answer. [9]
- b)** Write a Non-deterministic Knapsack Algorithm. [9]



Total No. of Questions : 10]

SEAT No. :

PA-553

[Total No. of Pages : 2

[5926]-573

T.E. (Information Technology)

CLOUD COMPUTING

(2015 Pattern) (Semester - II) (314453)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain characteristics of Cloud Computing. **[5]**

b) Compare different Cloud Delivery Models. **[5]**

OR

Q2) a) Compare private cloud verses public cloud. **[4]**

b) Explain different Google Cloud Applications. **[6]**

Q3) a) Define Hypervisor. Explain and Differentiate its Types. **[6]**

b) Write short note on : Microsoft Azure. **[4]**

OR

Q4) a) Write short note on : Open Cloud Consortium [OCC]. **[4]**

b) Explain the concept of syndication and RSS. **[6]**

P.T.O.

- Q5) a)** Explain following basic terms and concepts : [8]
- i) Confidentiality
 - ii) Integrity
 - iii) Authenticity
 - iv) Availability
 - v) Threat
 - vi) Vulnerability
 - vii) Risk
 - viii) Security Policies
- b) Explain any four types of threats and attacks on cloud specifying which security goal it affects. [8]

OR

- Q6) a)** Explain hardened virtual server images. [8]
- b) Explain any four cloud security mechanisms in detail. [8]
- Q7) a)** Write a short note on 'Online social and professional networking'. [8]
- b) Elaborate on any four innovative IoT applications. [8]

OR

- Q8) a)** What are Cloudlets? Compare Cloudlets with clouds. [8]
- b) Elaborate the idea of Cloud Mashups and explain its advantages. [8]
- Q9) a)** Explain docker workflow. [9]
- b) Explain multimedia cloud with its advantages and challenges. [9]

OR

- Q10) Write a short note on (any three) :** [18]
- a) Location aware applications
 - b) Energy aware cloud computing
 - c) Jungle computing
 - d) Mobile cloud
 - e) Intelligent fabrics and paints



Total No. of Questions : 10]

SEAT No. :

PA-554

[Total No. of Pages : 3

[5926]-574

T.E. (Information Technology)
DATA SCIENCE & BIG DATA ANALYTICS
(2015 Pattern) (Semester-II) (314454)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption wherever necessary.

- Q1)** a) Explain with suitable diagram shared everything and shared nothing architecture. [3]
- b) What is Bloom filter? Explain working of Bloom filter with an example. [3]
- c) Explain with proper syntax the below mentioned Common Hadoop Shell Commands. [4]
- i) Command to create a directory in hdfs.
 - ii) Command to copy files from local file system to dfs.
 - iii) Command to remove directories and all its contents from hdfs.
 - iv) Command to copy files from hdfs to local file system.

OR

- Q2)** a) Big data is not substitute for a data ware house. Justify. [3]
- b) Let A & B be events on same sample space, with $P(A)=0.6$ and $P(B)=0.7$. Can these two events be disjoint? Explain. [3]
- c) List the important feature at Hadoop. [4]

- Q3)** a) Identify and list the limitations of structured data while planning the marketing strategy for a new product in the company. [3]

P.T.O.

- b) In analysing switching by business class customers between airlines the following data has been obtained by British Airwage (BA): [4]

		Next Flight by	
		BA	Competition
Last flight by	BA	0.85	0.15
	Competition	0.10	0.90

For example if the last flight by a Business class customer was by BA the probability that their next flight is by a BA is 0.85. Business class customers make 2 flights a year on average.

Currently BA have 30% of Business class market. What would you forecast BA's share of the Business class market to be after two years?

- c) Discuss concept of regions in H Base. [3]

OR

- Q4)** a) Explain the Datamart BUS approach for building a dataware house. Also list the pros and cons for same. [4]
- b) Explain the concept of distance sampling, its types and an example for each of the types. [3]
- c) Write a note on any one NoSQL database. [3]

- Q5)** a) Describe the workflow between Hive and Hadoop with suitable diagram.[6]
- b) Explain the procedure of handling missing values and categorical values before building a model. [6]
- c) What is data standardization? Explain the importance of data standardization in data analytics. [4]

OR

- Q6)** a) Explain the different steps in Data Analytics Project Life Cycle. [6]
- b) Draw and explain Architecture of Hive. [6]
- c) Explain different data transformation techniques. [4]

- Q7)** a) What are the major challenges in visualizing the big data and how to overcome these challenges. [8]
- b) List and explain 4 different tools for data visualization. [8]

OR

- Q8)** a) What is Data Visualization? Explain different techniques of data visualization in detail. [6]
- b) With proper python code, draw and explain. [6]
- i) Line plot
 - ii) Scatter plot
 - iii) Box plot
 - iv) Histogram
- c) Explain analytical techniques used in big data visualization. [4]

- Q9)** a) Write a note on user experience ramifications using Big data. [6]
- b) What is social media analytics? Explain its need with simple case study. [6]
- c) What is Text mining? Draw & explain text mining architecture and explain its needs. [6]

OR

- Q10)** a) Explain Michael Porter's value chain analysis with diagram. [6]
- b) Explain mobile analytics with suitable example. [6]
- c) Explain the roles & responsibilities of a data scientist in data analytics life cycle. [6]



Total No. of Questions : 10]

SEAT No. :

PA-555

[Total No. of Pages : 2

[5926]-575

T.E. (Instrumentation & Control)
EMBEDDED SYSTEM DESIGN
(2015 Pattern) (306261) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) List the addressing modes of 8051. Explain Register indirect addressing mode with example. [6]

b) Explain in detail the DA A instruction of 8051. [4]

OR

Q2) a) Explain the following instructions of 8051 with an example [6]

i) MUL AB

ii) DIV A,B

b) List the interrupts of 8051. Explain INT0 and INT1 interrupts. [4]

Q3) a) Define Baud Rate. Calculate Baud rate of 8051 with crystal frequency 11.0592 MHz when Mode 1 of serial communication is used with TH1 = FD H. [6]

b) Explain the working of STACK memory and its role in subroutines.[4]

OR

Q4) a) Draw and explain TCON register of 8051 microcontroller. [6]

b) Differentiate between Serial and Parallel communication. [4]

P.T.O.

- Q5) a)** With a neat schematic, explain the interfacing of ADC 0808 to 8051 microcontroller. [10]
- b)** With a neat schematic, explain the interfacing of seven segment display to 8051 microcontroller. [8]

OR

- Q6) a)** With a neat diagram, explain the interfacing of Serial EEPROM with 8051 microcontroller. [10]
- b)** With a neat schematic, explain the interfacing of RTC to 8051 microcontroller. [8]

- Q7) a)** Explain the following instructions of AVR microcontroller [8]
- ADDC
 - SUBI
 - COM
 - ROL
- b)** Draw and explain the Status Register (SREG) of AVR microcontroller. [8]

OR

- Q8) a)** Explain the interrupt structure of AVR microcontrollers. [8]
- b)** Explain the addressing modes of AVR microcontroller giving an example from the instruction set. [8]

- Q9) a)** Explain the function of Timer 0 also explain TCCR0 register of ATmega 8535 microcontroller. [8]

7	6	5	4	3	2	1	0
--	--	--	--	--	CS02	CS01	CS00

- b)** With a neat schematic, explain the interfacing of 16X2 LCD display to ATmega 8535 microcontroller. [8]

OR

- Q10)** With a neat schematic, explain the interfacing of ADC to ATmega 8535 microcontroller. Write down the algorithm to program ADC using it. [16]



Total No. of Questions : 10]

SEAT No. :

PA-556

[Total No. of Pages : 2

[5926]-576

T.E. (Instrumentation & Control)

INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

(2015 Pattern) (Semester - I) (306262)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) List out the Electroanalytical Methods? Explain with neat sketch Electrochemical cell. **[5]**

b) Compare Fourier Transform Infrared Spectroscopy with Infrared Spectroscopy. **[5]**

OR

Q2) a) Explain principal and experimental setup of Voltametry. **[5]**

b) Justify why Hollow cathode lamp is used as a Source in Atomic Absorption Spectrophotometer. **[5]**

Q3) a) Explain with neat sketch Double beam Filter Photometer. **[5]**

b) State the Laws of Photometry (Beer's Law & Lamberts Law). **[5]**

OR

Q4) a) What is back ground correction? **[5]**

b) Distinguish between Atomic Emission Spectroscopy with Atomic Absorption Spectroscopy. **[5]**

P.T.O.

- Q5) a)** Explain Nuclear Magnetic Spectroscopy w.r.t. following points: [8]
i) Chemical Shift Principle
ii) Working of NMR
b) Explain with neat diagram working construction of spectrophosphorimeter. [8]

OR

- Q6) a)** Explain with neat sketch working construction of Fourier Transform Nuclear Magnetic Resonance Spectroscopy. [8]
b) List out the Hydrocarbons. Explain any one in Detail. [8]

- Q7) a)** Explain with neat sketch Mass Spectrophotometer. [9]
b) What is High Predominance Liquid Chromatography (HPLC)? List out the Detectors used in HPLC. Explain with neat diagram working of any one type of Detector. [9]

OR

- Q8) a)** List out the carrier gases used in Gas Chromatography. Explain the role of Carrier gas in Gas Chromatography. [9]
b) Give the advantages and disadvantages of Magnetic Deflection mass analyzer over the Time of Flight mass analyzer. [9]

- Q9) a)** List out the Radiation Detectors. Give the significance of Radiation detector and explain any one type of Radiation Detector in detail. [8]
b) What is ESCA? Explain Auger Emission Spectroscopy? [8]

OR

- Q10) a)** What is Bragg's law? Explain the Instrumentation of Xray diffractometer. [8]
b) Draw and explain constructional diagram of Geiger Muller counter. [8]

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Total No. of Questions : 8]

SEAT No. :

PA-557

[Total No. of Pages : 2

[5926]-577

T.E. (Instrumentation & Control Engineering)

CONTROL SYSTEM COMPONENTS

(2015 Pattern) (Semester - I) (306263)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) List and explain temperature and pressure switches. [6]
b) Discuss the concept of Interlocking in motor control. [7]
c) List different components of pneumatic system and explain pneumatic cylinder in detail. [7]

OR

- Q2)** a) Explain construction and working of contactors. [6]
b) Explain short circuit protection and over load protection in motor control. [7]
c) Describe pneumatic power supply and its components. [7]

- Q3)** a) Draw Standard Symbols used for developing hydraulic circuits. [8]
b) Discuss Meter in and Meter out hydraulic circuit. [8]

OR

- Q4)** a) Explain hydraulic cylinder and motor. [8]
b) Draw and explain hydraulic circuit for sequencing of cylinders. [8]

- Q5)** a) Explain construction, working and applications of Computing relay. [8]
b) Discuss operating principle and need for circuit breaker in detail. [10]

OR

P.T.O.

- Q6)** a) Explain desirable characteristics and materials of fuses. [8]
b) Explain working and application of flow totalizer with suitable diagram. [10]

- Q7)** a) List Fluidic Control Devices and explain any one in detail. [8]
b) Explain encapsulation and sealing in safety instrumentation. [8]

OR

- Q8)** a) Discuss intrinsic safety technique in detail. [8]
b) Explain Zener barriers in safety instrumentation. [8]



Total No. of Questions : 10]

SEAT No. :

PA-558

[Total No. of Pages : 3

[5926]-578

T.E. (Instrumentation & Control)
CONTROL SYSTEM DESIGN
(2015 Pattern) (Semester - I) (306264)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Electronic Pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Determine pole and zero of transfer function of lead compensator if dominant poles are located at $-2 \pm 3j$ and angle of contribution is 36° . [5]
b) Discuss properties of lead and lag compensator. [5]

OR

- Q2)** If the open loop transfer function is given by $G(s)H(s) = \frac{K}{((s+2)(s+5))}$,
and if % overshoot required is 30 %, steady state error ≤ 0.25 rad., peak time $t_p = 1.5$ sec. Determine suitable compensator to match the required performance and obtain transfer function of same. [10]

- Q3)** Apply Bode plot method to design a lag compensator for unity feedback system having. $G(s) = \frac{k}{(s(s+1)(s+5))}$ Such that P.M. $\approx 50^\circ$ G.M. at least 30dB and $ess = 0.1$ rad for unit ramp input. [10]

OR

- Q4)** Find tuning constants of P, PI, and PID controller for following process [10]

$$G(s) = \frac{(2e^{-8s})}{(10s+1)}$$

P.T.O.

- Q5) a)** Design a controller if the process open loop transfer function is given by $G(s) = \frac{1}{(10s+1)}$ and desired close loop behaviour is given by

$$G(s) = \frac{1}{(5s+1)} \quad [8]$$

- b) Design a PID controller if open loop transfer function is given by $G(s) = \frac{10}{(s(s+2)(s+3))}$ so that P.M. Is 40° at $\omega = 6$ rad/sec. [8]

OR

- Q6) a)** Design a PID controller for a open loop transfer function $G(s) = \frac{4}{(s(s+2)(s+3))}$ so that $K_v = 30 \text{ sec}^{-1}$ and PM = 30° at $\omega = 4$ rad/sec. [8]

- b) Design a controller if the process open loop transfer function is given by $G(s) = \frac{1}{(10s+1)}$ and desired close loop behaviour is given by $G(s) = \frac{1}{(15s+1)}$. [8]

- Q7) a)** Derive the equation for solution of state space equation. [8]
b) Check whether following system is controllable and observable or not.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -8 & -4 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 5 \end{bmatrix} u \quad y = \begin{bmatrix} 2 & 4 & 5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad [8]$$

OR

- Q8) a)** Find the state transition matrix if $A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$ using Similarity theorem. [12]

- b) State properties of state transition matrix. [4]

Q9) Determine feedback, gain matrix so that poles of given system should placed to

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 1 & 7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

so that desired poles can be placed at $-1, -6, -7$ [18]

OR

Q10) Design a full state observer for a system given so that desired poles are $-3, -7, -4$ [18]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -18 & -27 & -10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 4 & 1 & 5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$



Total No. of Questions : 10]

SEAT No. :

PA-559

[Total No. of Pages : 2

[5926]-579

T. E. (Instrumentation & Control)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(2015 Pattern) (Semester - I) (306265)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the Functions of Managements. [5]
b) Describe the usefulness of SWOT analysis for a business enterprise. [5]

OR

- Q2)** a) Explain the following quality standards: [5]
i) ISO-9000
ii) ISO-14000
b) Explain Inspection objectives and qualities of inspector. [5]

- Q3)** a) Write a short note on 'Supply Chain management'. [5]
b) Write a note on Quality circle. [5]

OR

- Q4)** a) Explain the role of R & D. [5]
b) What is Outsourcing? Why it is required and when. [5]

- Q5)** a) What is capital? What are the two types of capital? Give the different source of finances. [8]
b) What is inventory? What are the benefits of inventory management to a manufacturing industry? [8]

OR

P.T.O.

- Q6)** a) What is SPC? What are its advantages? [8]
b) Explain the concept of Performance Appraisal. [8]
- Q7)** a) Discuss the functions of money market and capital Market. [9]
b) Classify capital. Describe the need of fixed and working capital. [9]

OR

- Q8)** a) List the objectives and functions of financial management. [9]
b) List the methods of capital budgeting. Discuss any two of them. [9]
- Q9)** Explain the following: [16]
a) Business ethics, Professional ethics.
b) ERP-Enterprise Resource Planning.

OR

- Q10)** a) Explain management information system. [8]
b) Describe briefly e-business, its advantages and disadvantages. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1442

[Total No. of Pages : 3

[5926]-58

T.E. (Computer Engg.)

THEORY OF COMPUTATION

(2019 Pattern) (Semester-I) (310242)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figure to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Convert the following grammar to Chomsky Normal form (CNF) [9]

$S \rightarrow a \mid aA \mid B$

$A \rightarrow aBB \mid \epsilon$

$B \rightarrow Aa \mid b$

b) Convert the following grammar to GNF. [9]

$S \rightarrow XB \mid AA$

$A \rightarrow a \mid SA$

$B \rightarrow b$

$X \rightarrow a$

OR

Q2) a) Show that the following grammar is ambiguous. [6]

$S \rightarrow iCtS$

$S \rightarrow iCtSes$

$S \rightarrow a$

$C \rightarrow b$

b) Convert the following grammar to chomsky normal form (CNF) [6]

$G = (\{S\}, \{a, b\}, P, S)$

$P = \{S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb\}$

P.T.O.

- c) Consider the following grammar. [6]

$E \rightarrow E + E \mid E - E \mid id$

Derive the string $id-id*id$ using

- i) Leftmost derivation
- ii) Rightmost derivation.

- Q3)** a) Find the transition rules of PDA for accepting a language

$L = \{ w \in \{a,b\}^* \mid w \text{ is of the form } a^n b^n \text{ with } n \geq 1 \}$ through both empty stack and final state and demonstrates the stack operation for the string $aaabbb$. [9]

- b) Design a PDA for accepting a language $\{ a^n b^{2n} \mid n \geq 1 \}$ [9]

Simulate this PDA for the input string “ $aaabbbbbb$ ”.

OR

- Q4)** a) Design a PDA for accepting a language $\{ 0^n 1^m 0^n \mid m, n \geq 1 \}$.

Simulate this PDA for the input string “ 0011100 ”. [9]

- b) Construct a PDA for $L = \{ 0^n 1^m 2^m 3^n \mid m, n \geq 0 \}$ [6]

- c) Compare FA and PDA. [3]

- Q5)** a) Write a short note on Halting problem of Turing machine. [4]

- b) Design a Turing Machine for the following language by Considering transition table and diagram. [9]

i) TM That erases all non blank symbols on the tape where the sequence of non blank symbols does not contain any blank symbol B in between.

ii) TM that find 2's complement of a binary machine.

- c) Design a Turing Machine that reads a string representing a binary number and erases all leading 0's in the string. However, if the string comprises of only 0's it keeps one 0. [5]

OR

- Q6)** a) Write short notes on: [4]
- i) Reducibility
 - ii) Multi-tape Turing Machine
- b) Construct a Turing Machine for $R=aba^*b$ [6]
- c) Design a TM that multiplies two unary numbers over $\Sigma=\{1\}$. Write simulation for the string $11*111$. [8]

- Q7)** a) Justify “Halting problem of Turing machine is undecidable” [8]
- b) Define and compare class P and class NP problem with suitable diagram [8]

OR

- Q8)** a) Explain in brief the term “recursively enumerable”. [6]
- b) Explain examples of problems in NP. [6]
- c) Differentiate between P Class and NP class. [4]



Total No. of Questions : 10]

SEAT No. :

PA-560

[Total No. of Pages : 3

[5926]-580

T.E. (Instrumentation & Control Engineering)

DIGITAL SIGNAL PROCESSING

(2015 Pattern) (Semester - II) (306268)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of calculator is allowed.

Q1) a) Determine the output of LTI system excited with $x(n) = \{2, 1\}$ and impulse response $h(n) = \{1, 2, 2\}$. [6]

b) Compare between Discrete Time and Continuous Time systems. [4]

OR

Q2) a) Sketch the discrete time signal $x(n) = \{1, 2, 1\}$ for $-1 \leq n \leq 1$ and obtain [6]

i) $y_1(n) = 2x(n) + \delta(n)$

ii) $y_2(n) = x(n) \delta(n + 1) + x(n) (3 * \delta(n - 1))$

b) Draw the pole-zero diagram of the system with impulse response

$$h(n) = \left(\frac{1}{2}\right)^n u(n). \quad [4]$$

Q3) a) Determine the inverse z-transform of the system described by

$$H(z) = \frac{z(z - 0.7)}{(z - 0.5)(z - 1)}. \quad [4]$$

b) Draw the direct-form structure of the causal LTI system with system

$$\text{function } H(z) = 1 - \frac{1}{3}z^{-1} + \frac{1}{6}z^{-2} + z^{-3}. \quad [6]$$

OR

P.T.O.

- Q4)** a) Find the Fourier transform of the unit impulse sequence $x(n) = \delta(n)$. [4]
 b) Prove the following properties of the z-transform [6]
 i) Linearity property
 ii) Time Shifting property

- Q5)** a) Compute the 8-point DFT of the sequence $x(n) = \{1, 0, -1, 0, 1, 0, -1, 0\}$ using radix-2 decimation-in-time (DIT) FFT algorithm. [12]
 b) Compute the 4-point DFT of the sequence $x(n) = \cos(n\pi)$ for $0 \leq n \leq 3$ using matrix method. [6]

OR

- Q6)** a) Compute the circular convolution between the following sequences $x_1(n) = \{1, 2, 2\}$ and $x_2(n) = \{1, 2, 3, 4\}$. [12]
 b) Explain the Bit reversal technique in FFT Algorithm for $N = 8$ - point DFT. [6]

- Q7)** a) Transform the analog filter transfer function $H_a(s) = \frac{4s+7}{s^2+5s+4}$ into a digital filter $H(z)$ using impulse-invariant method at $F_s = 2\text{Hz}$. [6]
 b) Design an IIR low-pass Butterworth filter using bilinear transformation for the following specifications : [10]

$$\text{Passband : } 0.8 \leq |H(e^{j\omega})| \leq 1 \quad \text{for } |\omega| \leq 0.2\pi$$

$$\text{Stopband : } |H(e^{j\omega})| \leq 0.2 \quad \text{for } 0.6\pi \leq |\omega| \leq \pi$$

Assume $T = 1\text{sec}$

OR

- Q8)** a) For the given specifications of LPF : $\Omega_p = 1$, $\Omega_s = 2.33$, $A_p = 0.5\text{dB}$ and $A_s = 22\text{dB}$ compute the Filter order for Chebyshev and Butterworth analog filter. [6]
 b) Design a Chebyshev analog filter with a maximum pass-band attenuation of 2.5dB at $\Omega_p = 20 \text{ rad/sec}$ and a minimum stop-band attenuation of 30dB at $\Omega_s = 50 \text{ rad/sec}$. [10]

- Q9) a)** Give the advantages and disadvantages of the digital filters. [6]
- b)** Design an linear-phase FIR LPF with the following desired frequency response [10]

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & 0 \leq |\omega| \leq \frac{\pi}{4} \\ 0 & \frac{\pi}{4} \leq |\omega| \leq \pi \end{cases}$$

Use Rectangular window

OR

- Q10)a)** A low-pass digital filter is specified by the relative specifications [6]

$$\omega_p = 0.3\pi \quad A_p = 0.1\text{dB}$$

$$\omega_s = 0.5\pi \quad A_s = 35\text{dB}$$

Determine absolute specifications δ_p and δ_s

- b)** Design an ideal FIR HPE of length $M = 5$ with a frequency response [10]

$$H_d(e^{j\omega}) = \begin{cases} 1 & \frac{2\pi}{5} \leq |\omega| \leq \pi \\ 0 & |\omega| \leq \frac{2\pi}{5} \end{cases}$$

Using Fourier series method.

x x x

[5926]-581

T.E. (Instrumentation & Control)
PROCESS LOOP COMPONENTS
(2015 Pattern) (306269) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data if necessary.*

Q1) a) Explain the use of DPT for level measurement. Explain zero elevation and zero suppression. **[6]**

b) Explain the following terms related to various control actions. **[4]**

i) Offset

ii) Integral time

OR

Q2) a) Define and identify the following with respect to a typical flow control loop. **[6]**

i) Controlled variable

ii) Manipulated variable

b) Explain the concept of rate before reset. **[4]**

Q3) a) Explain Multi-position control action in detail. Give its suitable application. **[6]**

b) Draw block diagram of Digital controller. Give the advantages of digital controller over analog controller. **[4]**

OR

P.T.O.

- Q4) a)** Define tuning of controller. Explain Ziegler-Nichols method of tuning. [6]
- b)** Explain following w. r. t I/P convertor : [4]
- i) Need
 - ii) Application

- Q5) a)** Explain following terms with respect to PLC : [8]
- i) Scan time
 - ii) Programming techniques
 - iii) Input module
 - iv) Output Module
- b)** Develop physical ladder diagram for a motor with following: NO start P.B., NC stop P.B., thermal overload limit switch opens on high temperature, green light when running and red light for thermal overload. [8]

OR

- Q6) a)** Give the specification of Industrial grade PLC (any 8 specifications). Also list various manufacturers of PLC (min. 4 manufacturers). [8]
- b)** State the advantages of Programmable Logic Controller over relay based system. [8]

- Q7) a)** Write short notes on : [8]
- i) Types of Control valve
 - ii) Selection criteria of control valve
- b)** Why sizing is necessary in control valve? List the different criteria's for control valve selection. [8]

OR

- Q8) a)** Explain w. r. t control valve : [8]
- i) Turn Down
 - ii) Discharge Coefficient
 - iii) Control valve Coefficient
 - iv) Actuator
- b)** Compare double seated and single seated globe valves. [8]

- Q9)** a) Level is being controlled in a tank using a control valve. The flow range is 100 to 1000 gpm. The liquid is mineral oil and has a specific gravity of 0.88 Line pressure is 100 to 150 psi and the throttling pressure drop varies from 50 to 110psi. The temperature may vary from 70 to 140° F. Find Cv. [10]
- b) Compare cavitations and flashing? List techniques to reduce it. [8]

OR

- Q10)** a) Explain fail safe action Air to Open (ATO) and Air to Closed (ATC) valve applications. [10]
- b) Define and give the significance of valve coefficient. Give the equations of Valve coefficient for gas, liquid and vapor services. [8]



Total No. of Questions: 12]

SEAT No. :

PA-562

[5926]-582

[Total No. of Pages : 2

T.E. (Instrumentation and Control)

UNIT OPERATIONS AND POWER PLANT INSTRUMENTATION

(2015 Pattern) (Semester-II) (306270)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) Whether crushing and grinding are examples of Unit Operations or Unit Processes? Justify your answer? Give one application each of it? [6]

OR

Q2) Explain the different motions of screens with proper diagrams? Explain various techniques of agitation used while screening along with suitable diagrams? [6]

Q3) Express mathematically the power (in watts) produced by the Hydroelectric plant? Differentiate between Run-of-River Hydroelectric plant and Pumped storage Hydroelectric plant? Draw a neat diagram of Run-of-River plant and explain its working in brief? [8]

OR

Q4) Mathematically express the power (in watts) produced by the wind turbine or wind mill? Draw the diagrams of Horizontal and vertical axis wind turbine? [8]

Q5) Explain with suitable diagram the working of concurrent flow and counter current flow double tube type heat exchanger? [6]

OR

Q6) Draw a typical Boiling Point diagram? What is its application and importance? [6]

Q7) a) Explain working and basic principle of working of Fluidized Bed Combustion with neat diagram? Compare it with Pulverized coal fired combustion system? [8]

b) Draw and explain the three element drum level control system unit in boiler? [8]

OR

P.T.O.

- Q8)** a) Explain water treatment system used in thermal power plant? [8]
b) Enlist various interlocks in boilers? Explain the operation and importance of each of them? [8]

- Q9)** a) Explain the working of effluent treatment or management system used in thermal power plant with proper block diagram? [8]
b) Compare Solar thermal power plant and wind power plant with respect to Performance, Efficiency, Site selection, and Pollution and other environmental impact? [8]

OR

- Q10)** a) Explain the procedures of input/output and Heat loss methods of boiler efficiency calculations? [8]
b) Explain how thermal stress control system works in turbine at the time of its start-up and load changing? [8]
- Q11)** a) Explain measurement and control techniques used for parameters such as speed, vibration, bearing temperature, lubricating oil parameters and shell temperature in turbine? [9]
b) State the requirements of excess air for combustion in boiler and its effect? Draw a graph of excess air and Oxygen in flue gas? [9]

OR

- Q12)** a) Explain working of any one types of turbines used in thermal power plant? Draw diagram of it? [9]
b) What is mean by Condition monitoring and power distribution instrumentation in thermal power plant? Explain? [9]



Total No. of Questions : 12]

SEAT No. :

PA-1153

[Total No. of Pages : 2

[5926]-583

T.E. (Instrumentation & Control)
INSTRUMENT AND SYSTEM DESIGN
(2015 Pattern) (Semester - II) (306271)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 and Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What are NEMA standards? [5]

b) What are IP standards? [5]

OR

Q2) a) What is testing of any instrument? [5]

b) Explain operational environment. [5]

Q3) a) What is difference between EMI and EMC effects minimization methods? [5]

b) What are the methods of protection against EMI noises? [5]

OR

Q4) a) What are the aspects of aesthetic design? [5]

b) What are the various sources of noises? [5]

Q5) a) Draw block diagram of Linear opto isolator HCNR201. [6]

b) Explain an application using Linear opto isolator HCNR201. [6]

OR

Q6) a) Draw block diagram of Signal conditioners AD594/595. [6]

b) Explain an application using Signal conditioners AD594/595. [6]

P.T.O.

- Q7)** a) Draw block diagram of Power drivers ULN2803. [7]
b) Explain an application using Power drivers ULN2803. [6]

OR

- Q8)** a) Draw block diagram of V to I converters XTR110. [7]
b) Explain an application using V to I converters XTR110. [6]
- Q9)** a) Comment on Artwork of PCB. [6]
b) What are the rules for digital PCB design? [6]

OR

- Q10)** a) Explain the soldering techniques of PCB. [6]
b) What are the materials required for soldering PCB board? [6]
- Q11)** a) Distinguish between MTBF and MTTF. [6]
b) Explain MTTF? [5]
c) What is reliability? [2]

OR

- Q12)** a) What is importance of quality assurance in system design? [7]
b) What is Weibull and Gamma Distribution? [6]



Total No. of Questions : 10]

SEAT No. :

PA-563

[Total No. of Pages : 2

[5926]-584

T.E. (Instrumentation & Control)
BIO-MEDICAL INSTRUMENTATION
(2015 Pattern) (Semester-II) (306272)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever needed.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What is Electrode-Electrolyte interface? Differentiate polarizable and non-polarizable. **[6]**

b) Enlist skin surface electrodes. Explain micro-electrode. **[4]**

OR

Q2) a) Draw & explain basic biomedical instrumentation system. **[6]**

b) What is cardiac cycle? Explain Analog signal processing of Bio-signals? **[4]**

Q3) a) Design and explain photo-plethysmography. **[5]**

b) Explain dye dilution technique for cardiac output measurement. **[5]**

OR

Q4) a) Describe in brief various techniques used for BP measurement. **[5]**

b) Explain Magnetic blood flow meter. **[5]**

Q5) a) What is an EEG? Explain the various types of EEG electrode. **[8]**

b) Draw and explain the structure of Neuron. Write short note on Neuro muscular transmission. **[8]**

OR

P.T.O.

- Q6)** a) Define Evoked response. List different waves from different parts of the brain. [8]
- b) What is the principle of EMG? Draw and explain the block diagram of EMG. [8]

- Q7)** a) What is Audiometer? Briefly explain basic Audiometer. [8]
- b) Draw and explain anatomy of Eye. Explain various errors in vision with its ways of correction. [8]

OR

- Q8)** a) What is the mechanism of hearing? Explain sound conduction system. [8]
- b) What are Rods and Cones in the human vision system? Explain the function performed by each of them. [8]

- Q9)** a) Explain natural process of breathing. Draw and explain any one type of Spirometer. [10]
- b) Draw and explain oxygen gas Analyzer. [8]

OR

- Q10)** a) Explain the breathing physiology with active and passive respiration. [10]
- b) Explain Oxygenator. Draw and explain basic block diagram of Ventilator. [8]



Total No. of Questions : 10]

SEAT No. :

PA-564

[Total No. of Pages : 4

[5926]-585

T.E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING

(2015 Pattern) (Semester - II) (302049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to the right indicate full marks.*

- Q1)** a) State the applications of refrigeration and air conditioning separately; four each. [4]
b) The COP of a vapour compression refrigeration system is 3.0. If the compressor motor draws power of 10.5 kW at 91% motor efficiency. What is the refrigeration effect in TR of system? [6]

OR

- Q2)** a) Draw schematic of three fluid vapour absorption system. Write the role of H_2 gas. [4]
b) Draw the schematic and p-h diagram of two evaporator with individual compressors and individual expansion valves and common compressor vapour compression cycle. Formulate compression power and COP of the system. [6]

- Q3)** a) How are inorganic refrigerants designated? Write chemical formula of R729 and R744. [2]
b) A R134a refrigeration unit has two evaporators at -10°C and -20°C with cooling load of 25 TR and 40 TR respectively. The refrigerant liquid coming out the condenser at 40°C enters the two evaporators through individual expansion valve. A pressure reducing valve brings the pressure of high temperature evaporator to suction pressure of compressor. A compressor is used in the system. The condenser operates at 40°C temperatures. Determine: [8]
i) Mass flow rate of refrigerant in each evaporator in kg/min,
ii) Compressor power input in kW, and
iii) COP of the system.

OR

P.T.O.

- Q4) a)** Discuss the effect of reducing the evaporator pressure and increase of condenser pressure on performance of Vapor compression cycle. The process on p-h and T-s diagrams for both cases. [6]
- b) Draw schematic and p-h diagram for a Cascade refrigeration system [4]

- Q5) a)** Define effective temperature and discuss the effect of [6]
- i) Climate and Seasonal Variation and
 - ii) Density of Occupation on optimum effective temperature.
- b) The atmospheric air at 25°C DBT and 12°C WBT is flowing at a rate of 100 m³/min through a duct. The dry saturated steam at 100°C is injected into the air stream at a rate of 72 kg/h. Draw process on psychrometric chart and calculate the specific humidity, DBT, WBT, relative humidity and enthalpy of air leaving the duct. Take enthalpy of vaporization at 100°C as 2676 kJ/kg. [10]

OR

- Q6) a)** What is infiltration in HVAC? State any two reasons of infiltration. [4]
- b) An air-conditioner plant is to be designed for a small office for winter conditions: [12]

Outdoor conditions 10°C DBT and 8°C WBT

Indoor conditions 20°C DBT and 60%

Amount of free air circulation 0.3 m³/min/person

Seating capacity of office = 50 persons

The required conditions are achieved first by heating and then by adiabatic humidifying. Show the process on psychrometric chart and find:

- i) heating capacity of coil in kW and surface temperature, if the bypass factor of the coil is 0.32, and
- ii) capacity of the humidifier.

- Q7) a)** Draw the schematic of summer air conditioning and explain its working. [6]
- b) Explain the working of screw compressor with a schematic. [6]
- c) Draw a thermostatic expansion valve and explain its operation. [6]

OR

- Q8) a)** Draw schematic of flooded evaporator. Explain its working and advantages over dry evaporator. [6]
- b) State the advantages and disadvantages three each for air-water refrigeration system. [6]
- c) Explain the working of a split air conditioner with a line diagram. [6]
- Q9) a)** Prove that the equivalent diameter of rectangular duct for same air flow rate is given by [8]

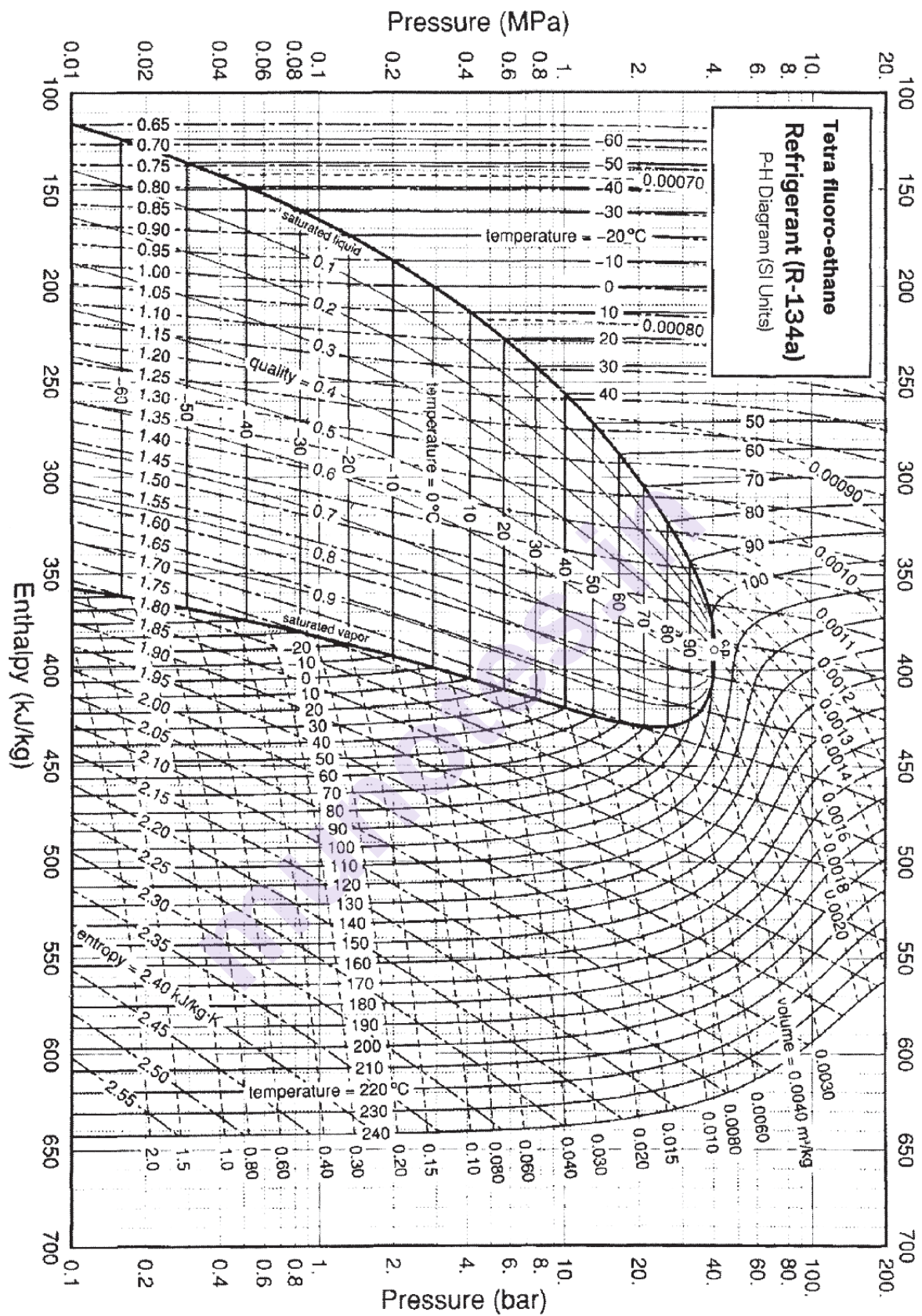
$$D_{eq} = 1.265 \left[\frac{(ab)^3}{(a+b)} \right]^{1/5}$$

where a/b is aspect ratio.

- b) Compare velocity reduction method with equal friction method of duct design. [4]
- c) State two advantages each of pan type and ventilation type air distribution systems. [4]

OR

- Q10)a)** Draw an air handling unit and state its components with their function(s). [8]
- b) Draw the perimeter type and extended plenum system of duct arrangements. Discuss their features. [8]



x x x

Total No. of Questions : 10]

SEAT No. :

PA-565

[Total No. of Pages : 5

[5926]-586

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS-II

(2015 Pattern) (Semester-II) (302048)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer five questions from following.*
- 2) *Neat sketch must draw wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronics pocket calculator is allowed.*
- 5) *Use of programmable calculator is not permitted.*
- 6) *Assume suitable data if necessary.*

Q1) a) Derive the equation for virtual number of teeth on bevel gear. **[4]**

b) A single-row deep groove ball bearing is subjected to a radial force of 8kN and a thrust force of 3kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75 mm and Bearing No. 6315 (C=112000 N) is selected for this application.

i) Estimate the life of this bearing, with 90% reliability.

ii) Estimate the reliability for 20000 hrs life. **[6]**

OR

Q2) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle is 25° . The face width is 40 mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40C8 ($S_{ut}=600 \text{ N/mm}^2$) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and Calculate the power transmitting capacity of gears. Use following data:

Lewis form factor $Y=0.484-2.87/Z'$

Load-stress factor, $k=0.16 (\text{BHN}/100)^2 \text{ N/mm}^2$, $C_v=5.6/5.6+\sqrt{v}$ **[10]**

P.T.O.

Q3) a) What are the advantages and disadvantages of straight bevel gears over spiral bevel gears? [4]

b) It is required to design a spur gear speed reducer for a compressor running at 250 rpm driven by a 7.5 kW, 1000 rpm electric motor. The centre distance between the axes of the gear shafts should be exactly 250 mm. The starting torque of the motor can be assumed to be 150% of the rated torque. The gears are made of carbon steel 50C4 ($S_{ut}=700 \text{ N/mm}^2$). The pressure angle is 20° . The factor of safety is 2 for preliminary design based on the use of velocity factor. Estimate of module based on beam

strength. Use Lewis form factor $Y=0.34$, and velocity factor $C_v = \frac{3}{3+V}$ [6]

OR

Q4) A single-row deep groove ball bearing No. 6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Find the expected life that 50% of the bearings will complete under this condition. Use following data: [10]

Principal Dimensions (mm)			Basic load ratings (N)		Designation
d	D	B	C	C_0	
15	24	5	1560	815	61802
	32	9	5590	2500	6002
	35	11	7800	3550	6202
	42	13	11400	5400	6302

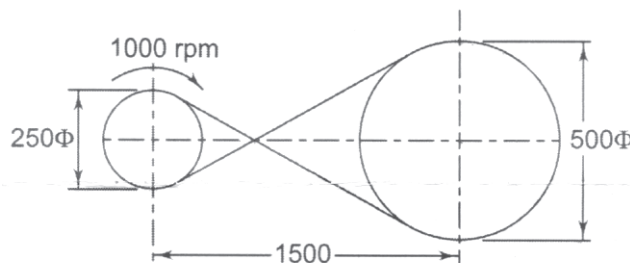
Table: X and Y factors for single row deep groove ball bearings.

$\left(\frac{Fa}{Co}\right)$	$\left(\frac{Fa}{Fr}\right) \leq e$		$\left(\frac{Fa}{Fr}\right) \geq e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2	0.22
0.040	1	0	0.56	1.8	0.24
0.0170	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

- Q5)** a) Why the soft material like phosphor bronze is chosen for worm gear and alloy steel for worm? [4]
- b) What are the advantages of double-enveloping worm-gear drives over single-enveloping worm gear drives? [4]
- c) Derive equations with diagram for face width of worm wheel and length of the root of the worm wheel teeth. [8]

OR

- Q6)** a) What are the advantages and drawbacks of worm gear drives? [4]
- b) What are single-enveloping and double-enveloping worm gear drives? Where do you use them? [6]
- c) A worm gear box with an effective surface area of 1.5 m^2 is operating in still air with a heat transfer coefficient of $15 \text{ W/m}^2\text{°C}$. The temperature rise of the lubricating oil above the atmospheric temperature is limited to 50°C . The worm gears are designated as, 1/30/10/8. The worm shaft is rotating at 1440 rpm and the normal pressure angle is 20° . The coefficient of friction is 0.024. Calculate efficiency of worm gear drive and power transmitting capacity based on the thermal considerations. [6]
- Q7)** a) What are the advantages, disadvantages, and applications of V-belt drive? [6]
- b) What are the desirable properties of belt material? [6]
- c) The layout of a crossed leather belt drive transmitting 7.5 kW is shown in Fig. The mass of the belt is 0.55 kg per meter length and the coefficient of friction is 0.30. Calculate [6]
- the belt tensions on the tight and loose sides, and
 - the length of the belt



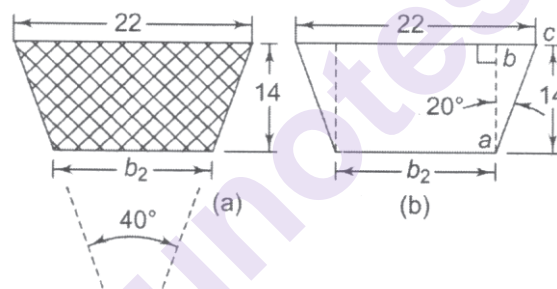
OR

- Q8)** a) What is the polygonal action in roller chain? How will you reduce it? [6]
 b) The following data is given for a V-belt drive connecting a 20 kW motor to a compressor. [12]

	<i>Motor-pulley</i>	<i>Compressor-pulley</i>
<i>Pitch diameter (mm)</i>	300	900
<i>Speed (rpm)</i>	1440	480
<i>Coefficient of friction</i>	0.2	0.2

The center distance between pulleys is 1 m and the dimensions of the cross-section of the belt are given in Fig. (a). The density of the composite belt is 0.97 g/cc and the allowable tension per belt is 850 N. Calculate

- The belt tensions on the tight and loose sides
- Power rating per belt
- Number of belts are required for this application.



- Q9)** a) State desirable properties of a good lubricant. [4]
 b) Explain basic modes of lubrication. [6]
 c) Explain with sketches how to generate pressure within the system in Hydrodynamic Bearing. [6]

OR

- Q10)** The following data is given for a 360° hydrodynamic bearing: [16]

Radial load=10 kN

Journal speed=1440 rpm

Unit bearing pressure=1000 kPa

Clearance ratio (r/c)=800

Viscosity of lubricant=30 mPa s

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing and $l/d=1$, calculate:

- Dimensions of bearing,
- Coefficient of friction,
- Power lost in friction,
- Total flow of oil,
- Side leakage and
- Temperature rise

Table *Dimensionless performance parameters for full journal bearing with side flow*

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{\max.}}\right)$
1	0	1.0	∞	(85)	∞	π	0	-
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0



[5926]-587

T.E. (Mechanical / Mechanical - S/W)

MECHATRONICS

(2015 Pattern) (302050) (Semester - II)

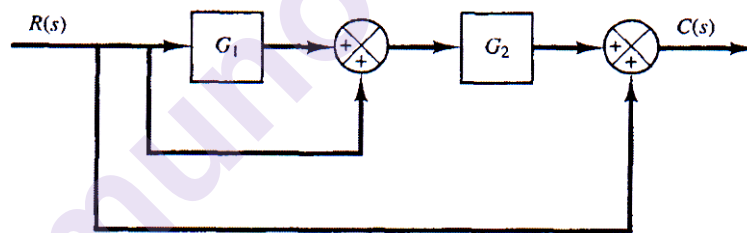
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption wherever necessary.

- Q1)** a) Draw a suitable diagram and explain the construction and working of absolute encoder. [6]
- b) Reduce the block diagram shown in below and determine the transfer function of the system. [7]



- c) Explain different parts / components of Successive Approximation Method of Analog to Digital Conversion. [7]

OR

- Q2)** a) A load cell is calibrated in an environment at a temperature of 21°C and has the following deflection/load characteristic : [6]

Load(kg)	0	50	100	150	200
Deflection (mm)	0.0	1.0	2.0	3.0	4.0

When used in an environment at 35°C, its characteristic changes to the following :

Load(kg)	0	50	100	150	200
Deflection (mm)	0.2	1.3	2.4	3.5	4.6

Determine the sensitivity at 21°C and 35°C.

P.T.O.

- b) Using a suitable block diagram explain the working of Automatic Conveyor System. [7]
- c) Explain the working of R-2R ladder type DAC R-2R. [7]

Q3) a) Draw a ladder diagram for the following sequence. [10]

Two Push buttons PB1 and PB2 are used to operate Green and Red lamps.

When PB1 is pushed alone it should switch off Green lamp and switch on Red lamp.

If PB2 is pushed alone, No lamp should glow.

- b) Explain the role played by following elements in PLC. [8]
 - i) Program Memory
 - ii) Input Module
 - iii) Analog I/O Module
 - iv) Bus System

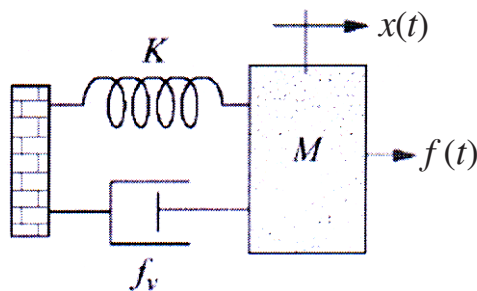
OR

Q4) a) In a certain bank each of three bank officers has a unique key to the vault. The bank rules requires that two out of three officers be present when vault is opened, draw the ladder diagram that will unlatch the door and turn on the light when two of the three keys are inserted. [10]

- b) Explain with block diagram Architecture of Programmable Logical Controller. [8]

Q5) a) Define stability and what is the necessary condition for stability? [5]

- b) Find the transfer function $X(s) / F(s)$ for the system given below (Mass, spring, and damper system). [6]



- c) Explain the building blocks of a rotational mechanical system [5]

OR

Q6) a) Draw pole zero plot and response for transfer function $\frac{C(s)}{R(s)} = \frac{9}{s^2 + 9s + 9}$ [5]

b) Derive the transfer function of mercury in simple glass thermometer. [5]

c) Explain stability analysis using Routh- Hurwitz criterion. Test the system stability whose characteristics equation is

$$9S^5 - 20S^4 + 10S^3 - S^2 - 9S - 10 = 0. \quad [6]$$

Q7) a) Explain the feature of Proportional controller. [5]

b) Explain the term PID tuning and explain the steps for manual PID tuning. [6]

c) An Integral controller is used for speed control with a set point of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The constant $K_i = -0.15\%$ controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2 sec. for constant ep. [5]

OR

Q8) a) Explain derivation control with neat diagram. Why derivation controller cannot be used alone? [5]

b) What are the advantages of PID controller. [6]

c) Discuss the role of transient specification w.r.t. the performance of the PID controller. [5]



Total No. of Questions : 10]

SEAT No. :

PA-567

[Total No. of Pages : 4

[5926]-588

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS - I
(2015 Pattern) (Semester - I) (302041)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10 from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Explain the terms Factor of Safety and Service Factor. Why is it necessary to use factor of safety? [4]
- b) Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. [6]

OR

- Q2)** What is the difference between rigid and flexible couplings? For a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used: Shear stress for shaft, bolt and key material = 40 MPa; Crushing stress for bolt and key = 80 MPa; Shear stress for cast iron = 8 MPa. Design : [10]

- | | |
|----------------|----------------|
| a) Hub; | b) Square Key; |
| c) Flange and; | d) Bolts. |

- Q3)** a) Explain the modified Goodman diagram for bending stresses. [4]
- b) What is stress concentration? What are the causes of stress concentrations? Explain methods to reduce stress concentration. [6]

OR

P.T.O.

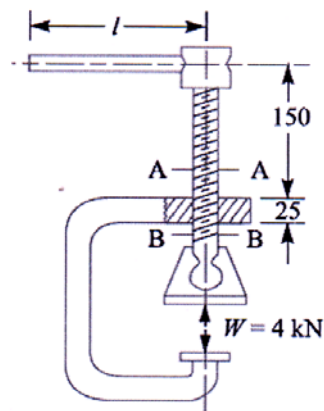
Q4) A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley. [10]

Q5) a) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm^2 , find: 1. the torque required to rotate the screw; 2. the stress in the screw; 3. the number of threads of nut in engagement with screw and; 4. efficiency of screw. State the condition of screw. [10]

b) Prove that for self-locking screw the efficiency is less than 50%. [6]

OR

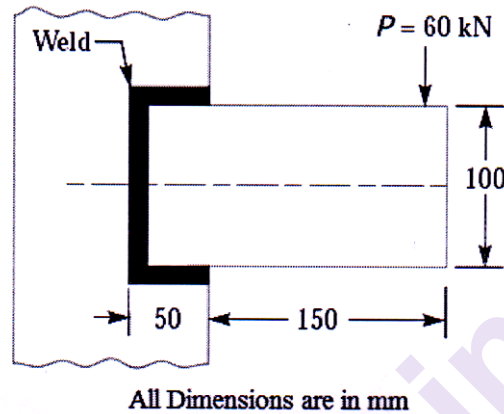
Q6) a) A C-clamp, as shown in Figure, has trapezoidal threads of 12 mm outside diameter and 2mm pitch. The coefficient of friction for screw threads is 0.12 and for the collar is 0.25. The mean radius of the collar is 6 mm. If the force exerted by the operator at the end of the handle is 80 N, find 1. The length of handle; 2. The maximum shear stress in the body of the screw at section A-A and B-B; 3. The bearing pressure on the threads and; 4. Efficiency of C-Clamp. [10]



All dimensions in mm.

b) What is re-circulating ball screw? What are the advantages, disadvantages and applications of re-circulating ball screw? [6]

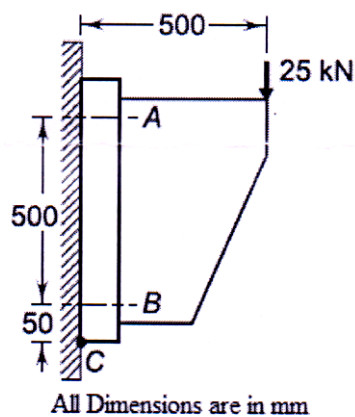
- Q7) a) i)** Explain with neat sketches any four types of screw fasteners. [4]
ii) What are the advantages and disadvantages of welded joints compared with threaded joints? [4]
b) A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load 60 kN, as shown in Figure. Determine the weld size if shear stress in the same is not to exceed 140 MPa. [10]



OR

- Q8) a) i)** Explain with neat sketch, bolts of uniform strength. [4]
ii) What are the assumptions made in the design of welded joint? Also discuss the procedure to find maximum shear stress for circular fillet weld subjected to torsion. [4]
b) A wall bracket is attached to the wall by means of four identical bolts, two at A and two at B, as shown in Figure. Assuming that the bracket is held against the wall and prevented from tipping about the point C by all four bolts and using an allowable tensile stress in the bolts as 35 MPa. Determine the size of the bolts on the basis of maximum principal stress theory. [10]

Designation	M 20	M 24	M 30	M 36	M 42
Tensile stress Area (mm ²)	245	353	561	817	1120



- Q9)** a) Explain the following terms: [6]
- i) Surge in spring;
 - ii) Concentric spring
- b) Design a helical spring for a spring loaded safety valve for the following conditions: Diameter of valve seat = 65 mm; Operating pressure = 0.7 N/mm²; Maximum pressure when the valve blows off freely = 0.75 N/mm²; Maximum lift of the valve when the pressure rises from 0.7 to 0.75 N/mm² = 3.5 mm; Maximum allowable stress = 550 MPa; Modulus of rigidity = 84 kN/mm² Spring index = 6. Take least gap between adjacent coils is 01 mm Draw a neat sketch of the free spring showing the main dimensions having loop at both ends. [10]

OR

- Q10)** a) Draw the constructional diagram of Leaf spring and write the final equations for the load on the clip bolts, final stress in spring leaves and length of the leaf spring leaves. [8]
- b) A composite spring has two closed coil helical springs. The outer spring is 15 mm larger than the inner spring. The outer spring has 10 coils of mean diameter 40 mm and wire diameter 5mm. The inner spring has 8 coils of mean diameter 30 mm and wire diameter 4 mm. When the spring is subjected to an axial load of 400 N, find : [8]
- i) Compression of each spring;
 - ii) Load shared by each spring; and
 - iii) Shear stress induced in each spring. The modulus of rigidity may be taken as 84 kN/mm².



Total No. of Questions : 10]

SEAT No. :

PA-568

[Total No. of Pages : 4

[5926]-589

T.E. (Mechanical Engineering)

TURBO MACHINES

(2015 Pattern) (Semester - I) (302044)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable scientific calculator is permitted.*
- 5) *Use of steam table is permitted.*

Q1) a) A 6 mm diameter jet of water having a velocity of 30 m/s strikes a flat plate, the normal from which is inclined at 33° to the axis of the jet. Find the force exerted by jet on plate in the direction of motion of plate when : [6]

- i) the plate is stationary and
 - ii) the plate is moving with a velocity of 18m/s away from the jet.
- Determine the power and efficiency of the jet when the plate is moving.

b) Derive the relation for force exerted by jet of water on inclined fixed plate in the direction of jet. [4]

OR

Q2) a) A jet of water moving with 'V' m/s strikes at center of a curved vane which is moving with 'u' m/s. If the outgoing jet makes an angle θ with the incoming jet, prove that : [6]

- i) Maximum efficiency $= \eta_{\max} = (1 + \cos\theta)$
- ii) Blade speed $u = V/3$

b) Write a note on the losses in the turbomachines in details? [4]

P.T.O.

- Q3)** a) A reaction (Francis) turbine runs at 450 rpm under head of 120 m. Its diameter at inlet is 120 cm and flow area is 0.4 m^2 . The angles made by the absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. [6]

Determine :

- i) Volume flow rate
 - ii) Hydraulic Power developed
 - iii) Hydraulic efficiency. Assume no whirl at outlet.
- b) What do you mean by Degree of Reaction? Explain with significance. [4]

OR

- Q4)** a) A Kaplan turbine developing 3250 kW under a head of 6 m has a draft tube with inlet diameter 2.8 m and is placed 1.5 m above the tailrace level. If the vacuum gauge connected at inlet of draft tube reads 5 m of water, determine the efficiency of turbine. Assume draft tube efficiency as 76% and take atmospheric pressure 10.3 m of water. [6]

- b) Explain causes and remedies for Cavitation in Reaction water Turbine. [4]

- Q5)** a) Derive an expression for diagram efficiency of single stage Impulse Turbine. Obtain the Condition for Maximum efficiency & its value. [8]

- b) In a single stage impulse turbine the mean diameter of the blade ring is 1 m and the rotational speed is 3000 rpm. The steam is issued from the nozzle at 300 m/sec and nozzle angle is 20° . The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading when the axial thrust on the blades is 98 N. Solve the problem graphically. [8]

OR

- Q6)** a) Enumerate the energy losses in steam turbine. [6]

- b) A 50% reaction turbine (with symmetrical velocity triangles) is running at 400 rpm has the exit angle of blades as 20° and the velocity of the steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is $1.381 \text{ m}^3/\text{kg}$. Calculate for the stage : [10]

- i) A suitable blade height, assuming the rotor mean diameter 12 times the blade height.
- ii) The diagram work.

- Q7)** a) Explain the Priming and Cavitation of Centrifugal pump? [8]
- b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm work against total head of 40 m. The velocity of flow through the runner is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 50 cm and width at outlet is 5 cm, Determine : [10]
- Vane angle at inlet
 - Work done by impeller on water per second
 - Manometric efficiency.

OR

- Q8)** a) Derive an expression of minimum starting speed of centrifugal pump? [8]
- b) A centrifugal pump running at 900 rpm is working against a head 20 m. The external diameter of the impeller is 460 mm and outlet width is 50 mm. If the vane angles at outlet is 40° and manometric efficiency is 70 %, determine : [10]
- Flow velocity at outlet
 - Absolute velocity of water leaving the vane
 - Angle made by the absolute at outlet with the direction of motion at outlet.
- Q9)** a) Explain slip and pre whirl, surging and choking in rotary compressor. [8]
- b) A centrifugal compressor delivers $10 \text{ m}^3/\text{s}$ of air when running at 10000 rpm. The air is drawn in at 1 bar and 300K and delivered at 4 bar. The isentropic efficiency is 80%.The blades are radial at outlet and constant flow velocity is 64 m/s. The outer dia. of the impeller is twice the inner dia. and slip factor may be taken as 0.9. Calculate : [8]
- Temperature of air at outlet of impeller
 - Power required driving the compressor
 - Impeller diameters at inlet and outlet
 - Impeller blade angle at inlet
 - Diffuser blade angle at inlet

OR

- Q10)** a) Explain pressure coefficient, flow coefficient and work input factor. [8]
- b) Represent and explain process involved in axial flow compressor on h-s diagram and derive an expression for isentropic efficiency and stage pressure ratio. [8]



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Total No. of Questions : 8]

SEAT No. :

PA-1443

[Total No. of Pages : 2

[5926]-59

T.E. (Computer Engineering)

SYSTEM PROGRAMMING & OPERATING SYSTEM

(2019 Pattern) (Semester - I) (310243)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat sketches must be drawn wherever necessary.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain “General loading scheme (using suitable diagram)” with advantages and disadvantages? [9]
b) Give complete design of Direct Linking Loader? [9]

OR

- Q2)** a) Give complete design of Absolute Loader with suitable example? [9]
b) What is the need of DLL? Differentiate between Dynamic and static linking? [9]

- Q3)** a) Explain the following types of Schedulers. [9]
i) Short Term
ii) Long Term
iii) Medium Term
b) Explain seven state process model with diagram? Also explain difference between Five state process model & Seven state process model? [8]

OR

- Q4)** a) Draw Gantt chart and calculate Avg. turnaround time, Avg. Waiting time for the following processes using SJF non preemptive and round robin with time quantum 0.5 Unit. [9]

Process	Burst Time	Arrival Time
P1	2	10
P2	1	10
P3	1	11
P4	1	12

- b) What is meant by Threads, Explain Thread lifecycle with diagram in detail? [8]

P.T.O.

- Q5) a)** Write a short note on following with example? [9]
- i) Semaphore
 - ii) Monitor
 - iii) Mutex
- b) Explain Deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery with example? [9]

OR

- Q6) a)** Explain producer Consumer problem & Dining Philosopher problem with solution? [9]
- b) What is deadlock? State and explain the conditions for deadlock, Explain them with example? [9]
- Q7) a)** Consider page sequence 2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2 and discuss working of following page replacement policies. Also count page faults. (use no. of frames = 3) [8]
- i) FIFO
 - ii) LRU
- b) What is meant by Fragmentation, Explain Buddy Systems Fragmentation in detail? [9]

OR

- Q8) a)** Write a short note on following with diagram [8]
- i) VM with Paging
 - ii) VM with Segmentation
- b) Given the memory partition of size 100K, 500K, 200K, 300K, 600K, how would each of the First Fit, Best Fit, Worst Fit algorithm place the processes of 212K, 417K, 426K. Which algorithm makes the most efficient use of memory? [9]



Total No. of Questions : 10]

SEAT No. :

PA-569

[Total No. of Pages : 3

[5926]-590

T.E. (Mechanical - S/W)

APPLIED COMPUTER AIDED ENGINEERING

(2015 Pattern) (Semester - I) (302061)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Use of scientific calculators is allowed.*

Q1) a) Find concatenated matrix if the transformations are performed as per the following sequence.

- i) Rotation through 45° anticlockwise.
- ii) Translation through +5 and -8 units along the x and y directions.
- iii) Rotation through 60° clockwise.

What is the effect of the above transformations on triangle having coordinates A (0,0), B (10,0) and C (0,8)? **[6]**

b) Explain the Boundary representation (B-rep) approach of solid modeling. **[4]**

OR

Q2) a) Find the equation of a two-dimensional Hermite cubic spline curve having endpoints $P_0(1,3)$ and $P_1(7,2)$. The two control points $P_2(10,8)$ and $P_3(6,0)$ are oriented in such a way that lines P_0P_2 and P_1P_3 are tangent to the curve. Plot five points on the curve. **[6]**

b) Explain the parametric solid modeling technique in detail. **[4]**

Q3) a) Define robots and explain the basic architecture of industrial robots. **[6]**

b) Define Automation and explain different types of Automation. **[4]**

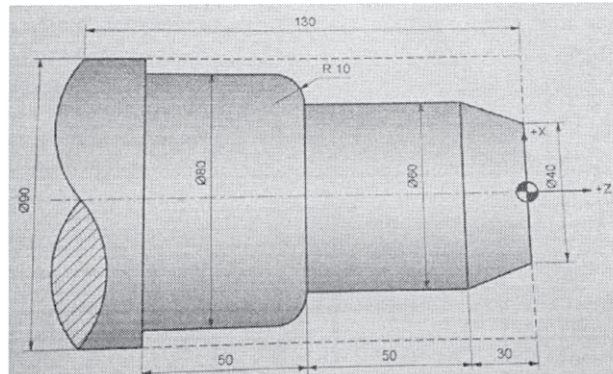
OR

Q4) a) List various types of flexible manufacturing systems. Explain types of FMS based on the type of layout in detail. **[6]**

b) Explain different generations of robots and state the advantages and limitations of robots in industry. **[4]**

P.T.O.

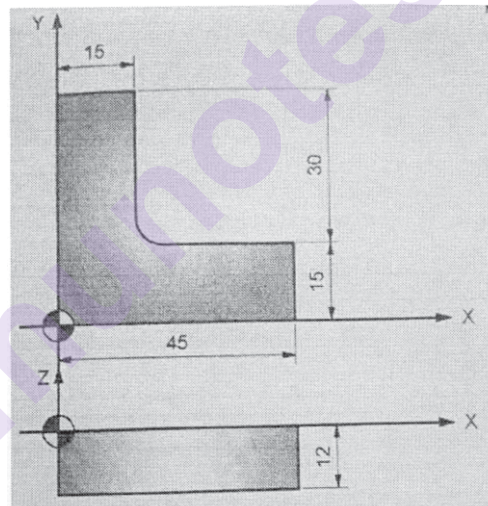
- Q5) a)** Develop a part program using G and M code to turn mild steel job of size $\phi 80 \times 120\text{mm}$ length, as shown in below figure. Assume suitable cutting parameters and various canned cycles to turn the final shape from the raw material of size $\phi 90 \times 130\text{mm}$. [10]



- b) Explain DNC machine tools with block diagram. [6]

OR

- Q6) a)** Write a NC part using G and M code to cut a slot for the component shown in the below figure by using an end mill of 10mm. Assume suitable data for machining parameters. [10]



- b) Compare absolute and incremental method of CNC programming. [6]

- Q7) a)** Explain the Laminated Object Manufacturing (LOM) process with a neat sketch. State its applications. [10]

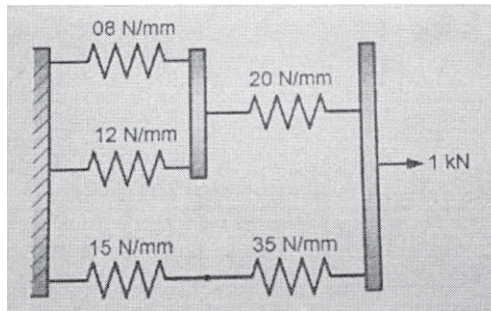
- b) Classify various rapid prototyping processes and give examples of each category. [6]

OR

- Q8) a)** Explain the Selective Laser Sintering process with a neat sketch. State its applications. [10]

- b) State advantages and limitations of the Stereolithography process. [6]

- Q9) a)** A cluster of five springs is shown in the below figure. One end of the assembly is fixed while a force of 1 kN is applied at the other end. Using the finite element method, determine the deflection of each spring. [12]

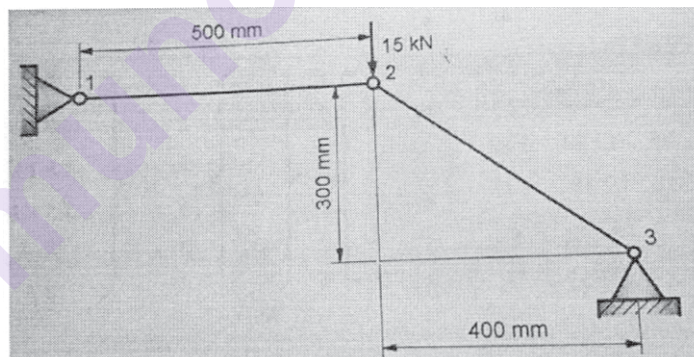


- b) Explain temperature effect in 1D elements and write the equation for thermal stress. [6]

OR

- Q10)a)** The arrangement of a two bar truss is shown in the below figure. The modulus of elasticity for material is $70 \times 10^3 \text{ N/mm}^2$ and the cross section area of each element is 200 mm^2 . Using the finite element method, determine : [12]

- Nodal displacements
- Stress in each element
- Reaction force at the support



- b) Explain Galerkin's approach in finite element analysis. [6]



Total No. of Questions : 10]

SEAT No. :

PA-570

[Total No. of Pages : 3

[5926]-591
T.E. (Mechanical Sandwich)
MACHINE DESIGN
(2015 Pattern) (Semester - I) (302062)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt all questions.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat figures wherever necessary.*
- 4) Use of scientific calculators is allowed.*

Q1) a) Explain the following : **[4]**

- i) Factor of Safety
- ii) Service Factor

b) Derive an expression for bending stress in the knuckle pin of a knuckle joint with a neat sketch. **[6]**

OR

Q2) a) Draw the following diagrams and write their equations **[4]**

- i) Goodman Diagram
- ii) Soderberg Diagram

b) What is stress concentration? What are the causes of stress concentration? Explain with sketch any two methods to reduce it. **[6]**

Q3) a) Explain self-locking screw. What is the condition for self-locking? **[4]**

b) SQ. 50*10 threads are used to lift a load of 10kN. The mean radius of friction collar is 30 mm and axial length of nut is 40mm. Coefficient of screw friction and collar friction is 0.12. **[6]**

Calculate

- i) Force required at the handle of length 500mm
- ii) Efficiency of mechanism
- iii) Bearing pressure

OR

P.T.O.

Q4) A shaft is supported by two bearings placed 1m apart. A 600 mm diameter pulley mounted at a distance of 300 mm to the right of left hand bearing and it drives a pulley placed directly below it with a maximum tension of 2.25kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and it is driven horizontally by an electric motor. The angle of contact for both the pulleys is 180° and coefficient of belt friction is 0.25. Determine shaft diameter if allowable shear stress is 42 MPa and $k_b=1.5$, $k_t=1.5$. Use ASME Code. **[10]**

- Q5)** a) Explain various Gear Teeth Failure Modes. **[6]**
- b) What are the various forces acting on worm and worm gears? Explain in brief. **[6]**
- c) Define formative or virtual number of teeth on a helical gear. Derive the expression used to obtain its value. **[4]**

OR

- Q6)** a) Explain Self Locking Property of Worm. Where it is useful? **[4]**
- b) The P.C.D of spur pinion and gear are 100mm and 300mm respectively. The pinion is made of plain carbon steel 40C8 ($S_{ut} = 600\text{N/mm}^2$) while gear is made of Gr. C.I FG300. The pinion receives 5Kw power at 500 rpm through its shaft. The service factor and factor of safety is 1.5 each. The face width of gear is ten times of module. If velocity factor accounts the dynamic load, calculate the module and the number of teeth on pinion and gear. Specify the surface hardness for a gear pair. ($K_m = 1$, 20° full depth involute system) **[12]**

- Q7)** a) Explain the procedure to select the rolling contact bearings from manufacturer's catalogue. **[6]**
- b) A ball bearing subjected to a radial load of 5 kN, is expected to have a life of 8000 hours at 1450 rpm with a reliability of 99 %. Calculate the dynamic load capacity of the bearing, so that it can be selected from manufacturer's catalogue based on reliability of 90%. **[10]**

OR

- Q8) a)** Discuss any three materials used for sliding contact bearings. [6]
- b)** A ball bearing operates on work cycle consisting of three parts: a radial load of 3000N at 720 rpm for 30 % of the cycle, a radial load of 7000N at 1440rpm for 40% of the cycle and radial load of 5000N at 900rpm for remaining part of the cycle. The dynamic capacity of the bearing is 30700N. [10]

Calculate :

- i) The rating life of bearing in hours.
- ii) The average speed of rotation;
- iii) The life of bearing with 95 % reliability.

- Q9) a)** It is stated that the speed at which a belt should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt at that speed. Prove the statement. [6]
- b)** Explain the different types of stresses induced in the wire ropes. [6]
- c)** Explain the polygon effect in case of chain drives. [6]

OR

- Q10)a)** Explain the procedure to select the V- belt from manufacturer's catalogue. [6]
- b)** Two parallel shafts whose centre lines are 4.8 m apart, are connected by an open flat belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3kN. The mass of the belt is 1.5 kg / m length. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account, calculate the power transmitted, when the smaller pulley rotates at 400 rpm. [12]



Total No. of Questions : 10]

SEAT No. :

PA-571

[Total No. of Pages : 2

[5926]-592

T.E. (Mechanical Sandwich)

MATERIALS AND MANUFACTURING ENGINEERING (Self Study - I)
(2015 Pattern) (Semester - II) (302066)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) No separate drawing sheet will be provided.

Q1) a) What are composites materials? Classify composites and name at least four engineering applications of composite material. **[4]**

b) What is polymerization? Explain any one in detail. **[6]**

OR

Q2) a) What are carbon nanotubes? Explain different application of CNT. **[4]**

b) Explain different methods for prevention of corrosion. **[6]**

Q3) a) What is corrosion? Classify and explain different corrosions. **[4]**

b) Discuss some biomaterials used for implant of human joints. **[6]**

OR

Q4) a) Discuss the need of manufacturing advancement for processing modern materials. **[4]**

b) Differentiate between dry corrosion and wet corrosion. **[6]**

Q5) a) Explain different types of broaching machines and operations. **[6]**

b) What is meant by gear shaping? Explain with neat sketch. **[6]**

c) Explain Thread grinding with a neat sketch. **[4]**

OR

P.T.O.

- Q6)** a) Explain broach tool geometry with a proper sketch. [6]
 b) Explain in details thread cutting processes with neat sketch. [6]
 c) Discuss thread rolling and thread chasing process. [4]

- Q7)** a) Explain with neat sketch abrasive flow machining. [6]
 b) Explain honing process. Discuss honing tools. [6]
 c) Explain lapping process in detail. [4]

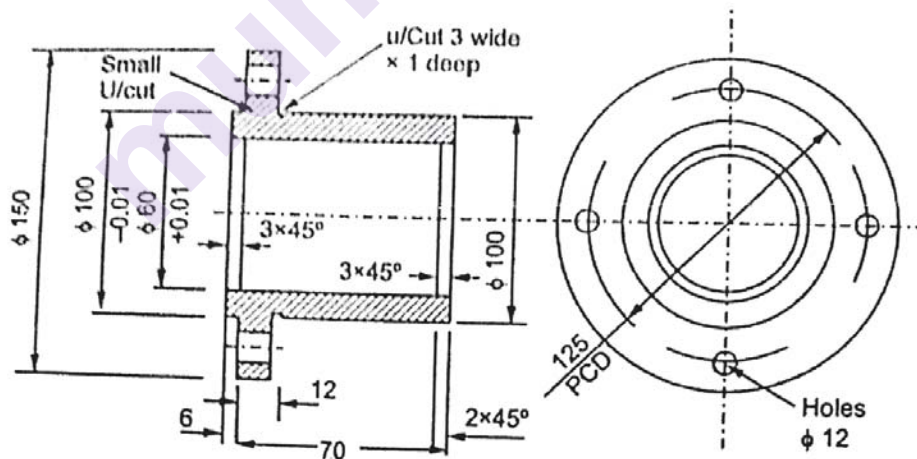
OR

- Q8)** a) Differentiate lapping and honing processes. [4]
 b) Explain Magneto-rheological Finishing process with neat sketch. [6]
 c) Discuss ION Beam Machining. [6]

- Q9)** a) What is fixture? Discuss various locating and clamping devices. [8]
 b) Differentiate between jigs and fixtures. [4]
 c) What is 3-2-1 principle? Apply 3-2-1 principle to a cube and a rectangle and draw position of all 5 pins. [6]

OR

- Q10)a)** Design and draw an index drill Jig to drill 3 holes of $\Phi 12$ mm for the component shown in fig below. [14]



- b) Explain the use of different clamping and locating devices while designing a jig in above example. [4]



Total No. of Questions : 10]

SEAT No. :

PA-572

[5926]-593

[Total No. of Pages : 2

T.E. (Mechanical Sandwich)
INDUSTRIAL ENGINEERING AND TECHNOLOGY
MANAGEMENT (Self Study-II)
(2015 Pattern) (Semester-II) (302067)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain function & application of Industrial Engineering. [6]
b) Define material handling. List material handling equipment and describe any two of them. [4]

OR

- Q2)** a) Explain Maslow's hierarchy of needs. [6]
b) Explain product layout with advantages and disadvantages. [4]

- Q3)** a) Describe single and multi facility location problems. [6]
b) Explain Role of production planning and control in Industry. [4]

OR

- Q4)** a) Write short note on material requirement planning (MRP). [6]
b) Explain ABC analysis. [4]

- Q5)** a) Explain in details procedure of Work Study & list various tools used. [8]
b) Why allowances are considered in time study? What are various allowances to be considered? [8]

OR

- Q6)** a) Explain importance of ergonomics in the industry. [8]
b) What are different work measurement techniques? Explain any two of them. [8]

P.T.O.

- Q7)** a) Define process planning and write down steps in process planning. [8]
b) Explain different types of floats. [9]

OR

- Q8)** a) Write short note on. [8]
i) Process flow chart
ii) Make or buy decision
b) Find critical path and calculate slack time for each event for given data [9]

Activity	Time (Week)
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-10	5
9-10	7

- Q9)** a) Describe revolution and growth of technology. [8]
b) Explain role of government in technology development. [9]

OR

- Q10)** a) Explain impact of technology on society and business. [8]
b) Explain linkage between technology, development and competition. [9]



Total No. of Questions : 8]

SEAT No. :

PA-574

[Total No. of Pages : 3

[5926]-596

T.E. (E & TC)

DIGITAL COMMUNICATION

(2015 Pattern) (Semester - I) (304181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of calculators is allowed.

- Q1)** a) Explain the generation of Delta modulated signal with a neat block diagram. Also explain the limitations of Delta modulation. [8]
- b) With a neat block schematic explain AT&T multiplexing hierarchy. A random process $X(t) = A \cos(\omega_c t + \theta)$, where A & ω_c are constant while θ is a random variable with uniform Pdf. [6]
- c) $f_\theta(\theta) = 1/2\pi$, $-\pi < \theta < \pi$ Find mean, auto correlation function and PSD of $X(t)$. [6]

OR

- Q2)** a) The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy of $\pm 0.1\%$ full scale accuracy. The analog voltage waveform has a bandwidth of 100 Hz and an amplitude range of -10 to 10 volts. [8]
- i) Determine the minimum sampling required.
 - ii) Determine the no. of bits in each PCM word.
 - iii) Determine the minimum bit rate required in PCM system.
 - iv) Determine minimum absolute channel bandwidth required for the transmission of PCM signal.
- b) Explain desirable properties of line code? [6]
- c) Explain Gaussian process with its properties in detail. [6]

P.T.O.

- Q3)** a) Derive the expression for error probability of a matched filter in the presence of white noise. [8]
- b) A received signal is either $+2V$ or $-2V$ held for a time T . The signal is corrupted by WG noise of PSD 10^{-6} volts²/Hz. If the signal is processed by an Integrate & dump receiver, what is the minimum time T during which a signal must be sustained if the probability of error is not to be exceed 10^{-4} . $\text{erf}(0.9998) = 2.5$ [8]

OR

- Q4)** a) Derive expression for signal to Noise ratio of integrator and Dump receiver. [8]
- b) Explain principle of maximum likelihood receiver. [4]
- c) Explain any two properties of Matched filter. [4]
- Q5)** a) Explain generation and reception of coherent BFSK. [6]
- b) If the digital message input data rate is 24kbps and average energy/bit is 0.05 units. Find bandwidth, Euclidean for [8]
- i) BPSK
- ii) 8-PSK
- iii) MSK
- iv) 16 QAM
- c) Compare BPSK and DPSK. [4]

OR

- Q6)** a) Explain M-ary PSK transmitter and receiver. [8]
- b) With mathematical expression and the block diagram explain operation of offset QPSK. [6]
- c) Compare the performance of BFSK and BPSK. [4]
- Q7)** a) Explain DS-SS system with coherent BPSK? [8]
- b) State and explain properties of PN sequence. [4]
- c) Explain need and classification of Spread Spectrum technique. [4]

OR

- Q8)** a) Explain Frequency Hop Spread Spectrum system. How is FHSS advantages over DSSS? [8]
- b) A slow FH/MFSK system transmits two symbols per frequency hop. And has a PN sequence generator with 3 out puts. Calculate PG. Draw the spectrum if input message is [00 10 11 11 01 10 11 00]. Let PN sequence be 0011101. 00111 [8]



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[5926]-597
T.E. (E & TC)
DIGITAL SIGNAL PROCESSING
(2015 Pattern) (Semester - I) (304182)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Neat diagrams must be drawn while illustrating the concepts.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*

- Q1)** a) Discuss the analog and digital frequencies with respect to their relationship, their limitations (range) and the mathematical notations. Write mathematical expressions for DTFT and DFT. [6]
- b) Compare and contrast the decimation-in-time (DIT-FFT) and decimation-in-frequency (DIF-FFT) along with their butterfly algorithms, the computation method and bit reversal of input/output. [7]
- c) State and prove the convolution property of the Z-transform. [7]

OR

- Q2)** a) A signal consists of 50 Hz and 170 Hz frequencies. Apply the Nyquist criteria and choose the suitable frequency to convert it into digital frequency. Find out the $x[n]$ for given $x(t)$. [6]
- b) Consider the 4 point sequence, $x[n] = [3, 6, 9, 12]$. Find its DFT using DIT-FFT. [7]
- c) Find the z-transform of the given signal : $x(n) = a^n u(-n-1)$. Comment the ROC. [7]

- Q3)** a) Discuss the steps for impulse invariance technique of IIR filter design. [3]
- b) Convert the following analog filter to a digital filter using impulse invariance technique. $H(s) = 1/[(s+1)(s+2)]$. State your observations of this converted digital filter. [6]
- c) Discuss the frequency warping phenomenon. [2]
- Convert the analog filter, $H(S) = 1/(S+1)$ into digital filter using sampling frequency 60 samples per second and the cut-off frequency as 20 Hz. Use the first order Butterworth LPF transfer function. Use Bilinear transformation Method. [6]

P.T.O.

OR

- Q4)** a) Draw Direct Form-1 and 2 realizations for the system given by,
 $y(n) - 3/4, y(n-1) + 1/8, y(n-2) = x(n) + 1/2, x(n-1)$. [8]
- b) Discuss the Butterworth, Chebychev Type-I and Type-II and Elliptical analog filters on the basis of their frequency responses and the characteristics. [9]

- Q5)** a) Discuss the following : [9]
- i) Ideal filter requirements
 - ii) Gibbs Phenomenon
 - iii) Window technique
- b) Design a low pass filter using rectangular window for $M = 7$ and the cut-off frequency 1 rad/sec. Recall the equation for the delay and use the $hd(n)$ equation. [8]

OR

- Q6)** a) Design a low pass filter using Hamming window for $M = 5$ and the cut-off frequency 1 rad/sec. Recall the equation for the delay and use the $hd(n)$ equation. [5]
- b) Use direct form realization for the designed filter. [3]
- c) Compare any three windows based on their mathematical equations, frequency responses and the transition width. (Frequency responses should be drawn). [9]

- Q7)** Write short notes on : [16]
- a) Digital Cross-over audio systems.
 - b) Inference cancellations in ECG.

OR

- Q8)** a) Draw the block schematic of the CD player. Explain and compare it with the basic building blocks of DSP. [8]
- b) Discuss the Speech coding and compression technique with reference to the DSP concepts. [8]



Total No. of Questions : 10]

SEAT No. :

PA-575

[Total No. of Pages : 2

[5926]-598
T.E (E&TC)
ELECTROMAGNETICS
(2015 Pattern) (Semester - I) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) State and prove Divergence theorem for electrostatic field. [5]

b) Find \vec{E} at (0,3,4) due to a point charge $Q = 0.5 \mu\text{C}$ placed at origin. [5]

OR

Q2) a) Explain concept of Dielectric Polarization in detail. [5]

b) Given the potential function $V = 2x + 4y$ volts in free space, Find the stored energy in 1 m^3 volume centered at the origin. [5]

Q3) a) State and prove Ampere Circuital Law. [5]

b) Find \vec{H} on the axis of a circular current loop of radius a . Evaluate the result to the centre of the loop. [5]

OR

Q4) a) Derive boundary conditions for electrostatic dielectric-dielectric interface. [5]

b) Explain the concept of scalar and vector potential in detail. [5]

Q5) a) Write Maxwell's equations in differential and integral form for time varying fields. [8]

b) Derive the expression for emf developed in conductor in motion through time dependent field. [8]

OR

P.T.O.

- Q6)** a) State and Prove Poynting theorem, interpret each term. [8]
 b) The circular loop conductor having a radius of 0.15 m is placed in X-Y plane. This loop consists of $R = 20\Omega$. If $\vec{B} = 0.5 \sin(10^3 t) \hat{a}_z$ T. Find current flowing through this loop. [8]

- Q7)** a) What is standing wave ratio? Derive relationship between SWR and reflection coefficient. [8]
 b) Write the equations for voltage and current at any point along the length of transmission line and hence explain physical significance of general solution of transmission line. [10]

OR

- Q8)** a) What do you mean by distortion less line? Derive the expression for characteristic impedance and propagation constant for distortion less line. [8]
 b) A load connected to 200Ω transmission line has an impedance $350 + j200\Omega$, when the line is excited by 100MHz signal. If the length of line is 75 cm, then using Smith chart, calculate input impedance and VSWR. [10]

- Q9)** a) Define and explain the terms [8]
 i) Depth of penetration
 ii) Snell's law
 b) Derive the electromagnetic wave equation for free space. [8]

OR

- Q10)** a) What is polarization of wave? List types of polarization and explain any one in detail. [8]
 b) In free space, $\vec{E}(z,t) = 10^3 \sin(\omega t - \beta z) \hat{a}_y$ V/m. Obtain $\vec{H}(z,t)$. Also determine the propagation constant, given that the frequency is 95.5 MHz. [8]



Total No. of Questions : 8]

SEAT No. :

PA-576

[Total No. of Pages : 2

[5926]-599
T.E. (E&TC)
MICROCONTROLLERS
(2015 Pattern) (Semester - I) (304184)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of scientific calculator is allowed.*

- Q1)** a) Enlist register banks available in 8051? State their memory ranges and Registers associated with them. [6]
- b) LEDs are interfaced to PORT P2 of 8051. Write a program to generate the delay using timer 1 without interrupt, for flashing the LEDs continuously. [6]
- c) Explain the following instructions of 8051 with suitable example
- i) ADD A,R0
 - ii) MULAB
 - iii) DAA
 - iv) MVI R3, #12H [8]

OR

- Q2)** a) Explain PSW register of 8051 with suitable example [6]
- b) Draw and explain port structure of 8051 microcontroller. [6]
- c) Draw the Interface diagram to interface 16×2 LCD with 8051. Write an ASM program to display message “Go Green!” on it. (8 bit mode) [8]

- Q3)** a) State peripheral features of PIC18F4xxx with its significance. [8]
- b) Develop an embedded C program to generate a square wave of 2KHz with Timer0 on pin PORTD.2 (Assume 50% Duty cycle, no prescaler and XTAL = 10MHz) Compute the value to be loaded in the Timer register. [8]

OR

P.T.O.

- Q4) a)** Which are the various oscillator options present in PIC microcontroller? Enlist and illustrate any four of them with neat diagrams. [8]
- b)** Write an embedded C program to blink the LEDs interfaced to PORTD using common cathode Configuration. Write the delay () function using Timer 0 in 16 bit mode. [8]

- Q5) a)** Interface LED in common cathode and button with PIC 18FXX microcontroller, illustrate the interfacing diagram, develop a C code such that when button is pressed LED should turn ON and when button is released LED should turn OFF. [8]
- b)** Write a program to create a 2KHz PWM frequency with 25% duty cycle on CCP1 pin of PIC18FXX. Crystal frequency of 10MHz, N = 16. [8]

OR

- Q6) a)** Draw and explain block diagram of CCP module of PIC18F4xxx. [8]
- b)** Explain CCP1CON register. Find PR2 register value for 10% duty cycle, 1KHz PWM frequency. Set bit pattern of CCP1CON register accordingly. [8]

- Q7) a)** Enlist pins used of PIC18FXX used for SPI and I2C MSSP module. Explain I2C master mode. [8]
- b)** Give the importance of SPBRG register. Compute the SPBRG value in Hex for following baud rate with Fosc=4MHz. i) 2400 ii) 9600. Write the formula used. [10]

OR

- Q8) a)** Draw and explain TXSTA register. Give the significance of TXIF in serial transmission. [8]
- b)** A temperature of Furnace is monitored with LM35 connected to RAO pin of PIC18FXX and display it on LCD connected to PORTD. Draw an interface diagram and embedded C program for same. [10]



Total No. of Questions : 8]

SEAT No. :

PA-1444

[Total No. of Pages : 2

[5926]-60

T.E. (Computer Engineering)

COMPUTER NETWORKS AND SECURITY

(2019 Pattern) (Semester-I) (310244)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain Path vector routing. **[6]**

b) Give short note on: **[6]**

i) Mobile IP

ii) MPLS

c) 192.168.5.131/26 for given address find out the **[6]**

i) Subnet mask?

ii) What is first ip address for given series?

iii) What is last ip address for given series?

OR

Q2) a) Draw and explain Header format of IPV4. **[6]**

b) Give short note on OSPF. **[6]**

c) List and explain functions of Network Layer. **[6]**

Q3) a) Give the difference between TCP and UDP. **[6]**

b) Explain RTP protocol in detail. **[6]**

c) 06 32 000D 001C E2 17 using this UDP hexadecimal dump find out **[6]**

i) Source port no

ii) Destination port no

iii) Total length of user datagram.

OR

Q4) a) Explain SCTP protocol in detail. **[6]**

b) List and explain transport layer services. **[6]**

c) What is socket? What are different types of socket? Explain socket functions used in connection oriented services with diagram. **[6]**

P.T.O.

- Q5)** a) What is DHCP? Explain DHCP working with client state diagram. [9]
b) Write short notes on FTP and MIME. [8]

OR

- Q6)** a) What is HTTP? Explain HTTP request and reply messages. [9]
b) Write short notes on TELNET and Webmail. [8]

- Q7)** a) Explain IPSec in detail. [6]
b) Differentiate between Symmetric and Asymmetric Key Cryptography. [6]
c) Give short note on Firewalls. [5]

OR

- Q8)** a) Explain model for network security. [6]
b) Explain SSL in detail. [6]
c) Explain Types of Network Attacks. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1445

[Total No. of Pages : 2

[5926]-61

T.E. (Computer Engineering)

**INTERNET OF THINGS AND EMBEDDED SYSTEMS
(2019 Pattern) (Semester - I) (Elective - I) (310245 A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

- Q1)** a) Demonstrate the working of push-pull Communication model using Diagram with suitable application. [6]
- b) Illustrate any Communication API with Suitable IoT System. [6]
- c) Examine the use of each pillar of IoT with proper example. [6]

OR

- Q2)** a) Illustrate steps of IoT design methodology for weather forecasting system. [6]
- b) Demonstrate the use of RFID with the help of suitable IoT Application. [6]
- c) Classify different connectivity technologies required for IoT system development and explain any one of them in brief. [6]

- Q3)** a) Demonstrate the need of standardization of IoT Protocols. [6]
- b) Classify the different Topology of IEEE 802.15.4 with proper applications. [6]
- c) Show the use of LoRa protocol in suitable IoT application development. [5]

OR

- Q4)** a) Show the merits and demerits between RFID and SCADA protocol. [6]
- b) Illustrate the various IoT applications developed using IP protocols. [6]
- c) Examine that why ZigBee is popular than Wi-Fi and Bluetooth in IoT. [5]

P.T.O.

- Q5)** a) Demonstrate the Django framework with the suitable supporting application. [8]
b) Use the knowledge of Cloud computing to demonstrate need of [10]
i) Amazon Auto Scaling
ii) Xively Cloud for IoT.

OR

- Q6)** a) Show how WAMP, its related concepts are useful in Cloud based IoT application Development. [8]
b) Apply the concept of cloud computing to design the smart home system with proper explanation. [10]
- Q7)** a) Demonstrate the possible challenges in designing secure IoT applications. [8]
b) Show the use of classic pillars of information assurance while securing the IoT application. [9]

OR

- Q8)** a) Examine how threat model is useful in securing IoT applications. [8]
b) Use security concepts to identify different threats (at least 03 in each) in the following IoT applications: [9]
i) Smart irrigation
ii) Smart home System
iii) Smart Surveillance System



Total No. of Questions : 8]

SEAT No. :

PA-1446

[Total No. of Pages : 2

[5926]-62

T.E. (Computer)

HUMAN COMPUTER INTERFACE

(2019 Pattern) (Semester - I) (Elective - I) (310245 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) List the interaction styles and explain any one in detail. [6]
b) Explain the Iterative model and its use in Interface design. [6]
c) List and explain the important characteristics of Web User Interface. [6]

OR

- Q2)** a) Explain the Direct Manipulation interaction style with example. [6]
b) What is Usability Engineering? Explain Scenario based usability Engineering. [6]
c) Explain any three Principles of User Interface of design in detail. [6]
- Q3)** a) List the seven commandments and explain “Soliciting early and ongoing user involvement” in detail. [6]
b) List the common Usability problems and explain “Inadequate error messages, help, tutorials and documentation”. [6]
c) Explain the Cognitive Walkthrough concept with example. [5]

OR

- Q4)** a) Explain GOMS model with an example. [6]
b) What are the Heuristic evaluation methods. [6]
c) Write a note on “Usability testing in Laboratory”. [5]

P.T.O.

- Q5)** a) What is CSCW? Give example. [6]
b) In any GUI, what is the role of context-aware interaction? [6]
c) Explain the five stage search framework. [6]

OR

- Q6)** a) Write a comparison between Dynamic queries and faceted search in a user interface. [6]
b) What is the role of Pattern Recognition in HCI? Explain with example. [6]
c) In HCI, what are the important aspects related to Data entry? [6]
- Q7)** a) Explain the basic anatomy of mobile app. [6]
b) Explain the comparison between a handheld device user interface and a computer based user interface with example. [6]
c) What are the important aspects to be considered when designing help screens in a mobile app? [5]

OR

- Q8)** a) Explain the design principles for user interface in mobile devices. [6]
b) Explain the Navigation and Toolbars used in mobile apps. [6]
c) Write a short note on “Inter-app Integration and its importance in User Interface”. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1447

[Total No. of Pages : 2

[5926]-63

T.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - I) (Elective - I) (310245 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Describe the importance of clock synchronization algorithm. Explain lamport's logical clock for clock synchronization. [9]

b) What is mutual exclusion? Explain centralized algorithm in detail with example. [9]

OR

Q2) a) Explain clock synchronization algorithms in detail. [9]

b) Describe Gossip-based contribution in detail. [9]

Q3) a) Describe the following in brief [9]

- i) Flat naming
- ii) Structured naming
- iii) Attributed based naming

b) Explain file service architecture in distributed system. [8]

OR

Q4) a) Describe suns network file system in detail. [9]

b) Why naming is significance in distributed system? Describe any two types of naming. [8]

P.T.O.

- Q5)** a) Describe consistency protocols in brief. [9]
b) What is replica management? Explain techniques of replica management. [9]

OR

- Q6)** a) Describe Cache coherence protocols in detail. [9]
b) Describe Data - centric consistency models in detail. [9]
- Q7)** a) What is process resilience? Describe how process resilience can be achieved. [9]
b) Explain how reliable client server communication can be achieved. [8]

OR

- Q8)** a) Describe recovery techniques in distributed system. [9]
b) Explain how consensus achieved in faulty systems. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1448

[Total No. of Pages : 3

[5926]-64

T.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - I) (Elective - I) (310245 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

- Q1)** a) List and explain in details the objectives of activity planning? [6]
- b) Explain Sequencing and Scheduling activities with examples. [6]
- c) What is activity table? Explain activity table of forward pass. [6]

OR

- Q2)** a) With neat diagram explain formulating a network model. [9]
- b) List the activity relationships are used in software project management? Explain any two relationships in detail. [9]
- Q3)** a) Explain in detail earned value analysis. [6]
- b) List and explain different types of project status report. [6]
- c) Explain the different stages in contract placement. [5]

OR

- Q4)** a) Explain in detail about creating the framework for monitoring and control. [9]
- b) Explain in detail change control process with block diagram. [8]

P.T.O.

- Q5)** a) What is Scrum? [6]
b) What is difference between agile and traditional project? [6]
c) Explain agile team roles. [6]

OR

- Q6)** a) What is agile manifesto? What are the principles of agile software development? [9]
b) List and explain different stages of Agile? [9]
- Q7)** a) Explain influencing elements of organizational behavior. [6]
b) Explain decision making process. [6]
c) Explain all stages of team development. [5]

OR

- Q8)** a) State and explain the steps involved in a typical selection procedure. [9]
b) Explain different types of team organization. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1449

[Total No. of Pages : 3

[5926]-65

T.E. (Computer Engg.)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester-II) (310251)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks,
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Draw the diagram of data analytics life cycle in big data and briefly explain its phases. [8]
- b) Explain in detail how the model building phase is built by team in data analytics life cycle? [9]

OR

- Q2)** a) List and explain the steps in data preparation phase of data analytics life cycle. [8]
- b) Write short note on the following: [9]
- i) ETL
 - ii) Common tools for the model building.
 - iii) Model selection for data analytics.

- Q3)** a) What are the types of analytics in big data? Explain in brief. [9]
- b) Calculate the support and confidence value for all the possible item sets. [9]

Transaction ID	Items bought
1	Onion, Potato, Cold drink
2	Onion, Burger, Cold drink
3	Eggs, Onion, Cold drink
4	Potato, Milk, Eggs.
5	Potato, Burger, cold drink, Milk eggs.

OR

P.T.O.

- Q4)** a) Explain the use of logistic function in logistic regression in detail. [9]
- b) Write short note on the following:
- i) Removing duplicates from data set.
 - ii) Handling missing data
 - iii) Data transformation. [9]

- Q5)** a) Suppose that the given data the taste is to cluster points (With (x,y) representing location) into three cluster, where the points are.

A1(2,10), A2(2,5), A3(8,4), B1 (5,8)

B2(7,5) B3(6,4), C1(1,2), C2(4,9)

The distance function is Euclidean distance suppose initially we assign A1, B1 and C1 as the center of each cluster, respectively. use the k-means algorithm to show only the three cluster centers after the first round of execution with steps. [9]

- b) Explain the following text analysis steps with suitable example. [8]
- i) Part of speech (POS) tagging
 - ii) Lemmatization
 - iii) Stemming

OR

- Q6)** a) Given the confusion matrix, calculate accuracy. precision, Recall, Error rate with description on heart attack risk. [8]

		Predicted classes	
		Heart-Attack Risk-yes	Heart Attack Risk-No
Actual Classes	Heart Attack Risk-yes	80	220
	Heart Attack Risk-No	150	9,500

- b) Explain the TF/IDF (term frequency-inverse document frequency) terms in text analysis with suitable example. [9]

- Q7)** a) List the data visualization tools and discuss any four applications of data visualization along with the use of the suitable plot. [9]
- b) List the challenges of data visualization explain the types of visualization with example. [9]

OR

- Q8)** a) Explain in detail the Hadoop Ecosystem with suitable diagram [9]
- b) Write a short note on the following [9]
- i) Map reduce.
 - ii) Pig
 - iii) Hive



Total No. of Questions : 8]

SEAT No. :

PA-1450

[Total No. of Pages : 2

[5926]-66

T.E. (Computer Engineering)

WEB TECHNOLOGY

(2019 Pattern) (Semester - II) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the following: **[8]**

- i) Process of transforming XML document.
- ii) HTTP session

b) What is Servlet? Explain the life cycle of servlet. Illustrate with example. **[9]**

OR

Q2) a) Compare doGet and doPost methods in servlet. **[9]**

b) Explain XML with respect to structure, declaration syntax, namespace. **[8]**

Q3) a) Write advantages of JSP over servlet and explain lifecycle of JSP. **[8]**

b) Explain the Struts architecture with neat diagram and also explain the benefits of Struts. **[9]**

OR

Q4) a) Write a JSP program to demonstrate use of page directive, Scriptlet Expression and Comment. **[9]**

b) Write the benefits of Web services and explain SOAP, Rest and UDDI. **[8]**

P.T.O.

Q5) a) Explain the following with respects to PhP. [9]

i) Arrays

ii) Function

iii) Control statements in PhP

b) How does this array work in PhP? Explain with example. [9]

OR

Q6) a) Explain object oriented way to connect MYSQL database with PhP. [9]

b) Draw and explain .NET framework with CLR, CLI. [9]

Q7) a) Explain scalar types and their operations in Ruby. [9]

b) What are the positive aspects of Rails, explain with example. [9]

OR

Q8) a) Write short note on: [9]

i) Rails with AJAX

ii) WAP and WML

b) What is EJB? Explain types of EJBs. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1451

[Total No. of Pages : 2

[5926]-67

T.E. (Computer Engineering)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - II) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Explain Min Max and Alpha Beta pruning algorithm for adversarial search with example. [9]

b) Define and explain Constraints satisfaction problem. [9]

OR

Q2) a) Explain with example graph coloring problem. [9]

b) How AI technique is used to solve tic-tac-toe problem. [9]

Q3) a) Explain Wumpus world environment giving its PEAS description. [9]

b) Explain different inference rules in FOL with suitable example. [8]

OR

Q4) a) Write an propositional logic for the statement, [10]

i) "All birds fly"

ii) "Every man respect his parents"

b) Differentiate between propositional logic and First order logic. [7]

P.T.O.

- Q5)** a) Explain Forward chaining algorithm with the help of example. [9]
b) Write and explain the steps of knowledge engineering process. [9]

OR

- Q6)** a) Explain Backward chaining algorithm with the help of example [9]
b) Write a short note on : [9]
i) Resolution and
ii) Unification

- Q7)** a) Write a short note on planning agent, state goal and action representation. [6]
b) Explain different components of planning system. [6]
c) Explain the components of AI. [5]

OR

- Q8)** a) What are the types of planning? Explain in detail. [6]
b) Explain Classical Planning and its advantages with example. [6]
c) Write note on hierarchical task network planning. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1452

[Total No. of Pages : 2

[5926]-68

T.E. (Computer Engineering)

INFORMATION SECURITY

(2019 Pattern) (Semester-II) (Elective-II) (310254A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain Diffie-Hellman key exchange algorithm. [6]
b) Determine the value of x using the Chinese remainder theorem. [6]
$$x \equiv 2 \pmod{3}$$
$$x \equiv 3 \pmod{5}$$
$$x \equiv 2 \pmod{7}$$

c) What are the different types of attacks possible on RSA? Explain in brief. [6]

OR

- Q2)** a) Explain the “Man in the middle” attack in Diffie Hellman Key Exchange algorithm with the help of an example. [6]
b) Perform encryption and decryption using RSA algorithm for the following: $P=5; q=11; e=3; M=9$. [6]
c) Explain El-Gamal Algorithm in detail. [6]

- Q3)** a) Compare between IPSec and TLS. [6]
b) Explain the steps to create the digital certificate with diagram. [5]
c) Define hash function. List the requirements of hash function. [6]

OR

- Q4)** a) List and describe the contents of the Encapsulating Payload header in IPSec with diagram. [6]
b) Explain the contents of X.509 format of certificate with diagram. [5]
c) What is a message authentication code? What is the difference between a message authentication code and a one-way hash function? [6]

P.T.O.

- Q5) a)** Explain any two types of Intrusion detection systems? [6]
- i) Network based IDS
 - ii) Host based IDS
 - iii) Anomaly based IDS
 - iv) Signature based IDS
- b) Explain packet filtering firewall in detail. [5]
- c) Discuss operating system security in detail. [6]

OR

- Q6) a)** Write a short note on any one [6]
- i) Honeypot
 - ii) Distributed DOS attack
- b) What are the capabilities and limitations of Firewall? [5]
- c) Explain access control and its types in detail. [6]

- Q7)** Write short note on any three: [18]
- a) Cyber Terrorism
 - b) Examples of Cyber Crime
 - c) Social Engineering
 - d) Types of cyber stalkers

OR

- Q8)** Write short note on any three: [18]
- a) Phishing attack
 - b) Keyloggers and Spywares
 - c) Aim and objectives of IT act
 - d) Password Cracking



Total No. of Questions : 8]

SEAT No. :

PA-1453

[Total No. of Pages : 2

[5926]-69

T.E. (Computer Engineering)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester-II) (Elective-II) (310254B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain features of haptic representation in virtual reality. [6]
b) Differentiate between aural and haptic representation in virtual reality? [6]
c) How virtual world is represented. Explain. [6]

OR

- Q2)** a) Describe how haptic information is used in a VR experience. [6]
b) What is visual rendering systems? Explain geometrically based rendering systems. [6]
c) How to render complex haptic scenes with force displays? [6]

- Q3)** a) What is Wayfinding? Enlist real and virtual-world aids to improve wayfinding in navigation. [6]
b) Explain different types of virtual world physics. [6]
c) Explain the substance of the virtual world. [5]

OR

- Q4)** a) List out different properties of manipulation a virtual world. Explain any two in detail. [6]
b) What is Immersion? Explain its types. [6]
c) Explain the following terms (any 2) [5]
i) Aristotelian physics
ii) Choreographed physics
iii) The static world

P.T.O.

- Q5)** a) What is depth cues? Explain Monoscopic and Stereoscopic image depth in detail. [6]
b) What are different applications of AR Systems? [6]
c) Explain how augmented reality system works does. [6]

OR

- Q6)** a) Describe registration and latency related to AR systems. [6]
b) What is augmented reality? Enlist different ingredients of an augmented reality experience. [6]
c) Write short note on : [6]
i) Visual depth cues in AR
ii) Auditory depth cues in AR
- Q7)** a) Explain the functional components that are directly involved in the AR application. [6]
b) Explain the following terms related to interaction in virtual world: [6]
i) Manipulation
ii) Communication
iii) Navigation
c) Explain the Term w.r.t. augmented reality: [5]
i) Marker based tracking system
ii) Marker-less tracking system

OR

- Q8)** a) What is interaction? Between who is interaction establish in augmented reality. [6]
b) Explain software tools used for content creation in AR? [6]
c) What is mobile augmented reality? State advantages and disadvantages of mobile augmented reality. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1454

[Total No. of Pages : 2

[5926]-70

T.E. (Computer Engineering)

CLOUD COMPUTING

(2019 Pattern) (Semester - II) (Elective-II) (310254C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary

Q1) a) Describe CPU, Network and Storage Virtualization? **[9]**

b) Draw and Explain the Virtualization Architecture in detail? **[8]**

OR

Q2) a) Define Virtualization? Explain different types of Virtualizations? **[9]**

b) Differentiate between Virtualization in Grid and Virtualization in Cloud **[8]**

Q3) a) What are the components of Microsoft Azure? Explain briefly? **[9]**

b) How cloud computing can be used for business and consumer applications like ERP or CRM? **[8]**

OR

Q4) a) Describe the Amazon Database Services? **[8]**

b) Explain Google Cloud Applications in detail? **[9]**

Q5) a) What are the security issues of cloud computing identified by cloud security alliance (CSA)? Explain any three in detail? **[9]**

b) How Trusted Cloud Computing can be used to manage the risk and security in a cloud? **[9]**

OR

P.T.O.

- Q6)** a) Explain the six step risk management processes? [9]
b) Describe how to perform Secure Cloud Software Testing? [9]

- Q7)** a) What do you mean by IoT Cloud? And how IoT cloud can be used in home automation? [9]
b) Explain architecture and working of Kubernetes. [9]

OR

- Q8)** a) What are the future trends in cloud computing? Explain in brief? [9]
b) Differentiate between Distributed Cloud Computing Vs Edge Computing? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1455

[Total No. of Pages : 4

[5926]-71

T.E. (Computer Engineering)

SOFTWARE MODELING AND ARCHITECTURES

(2019 Pattern) (Semester-II) (Elective-II) (310254D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is the purpose of Sequence Diagram? Draw a Sequence diagram for any Banking scenario [9]

b) What is the purpose of Activity diagram? draw activity diagram for online shopping example [9]

OR

Q2) a) What is significance of state machine diagram? Draw state machine diagram for possible operation of ATM machine. [6]

b) What is timing diagram in UML? Explain timing diagram for railway reservation system. [6]

c) Explain Communication diagram with example [6]

Q3) a) Choose the *most appropriate architectural structure* (one) and View of 4 +1 architectural model for the 5 descriptions below. Motivate for your choice in one sentence (give reasons for choosing the structure): [10]

i) Architecture Wants to architect a system using 3-tier architecture which may support for modifiability using computationally independent execution elements (groups of software and hardware) such as database, business logic, Application logic. [2]

ii) Application is built to provide the services to various users using central server environment optimized for operational requirements and resource usage. [2]

P.T.O.

- iii) Building distributed application that consumes computational entities those are connected via a common protocol to share their services and provide high availability and scalability. [2]
- iv) Wants a distributed system with a structure that enables that service users do not need to know the nature or location of service providers. But proper version of the structure need to provide to proper user. [2]
- v) Architect a data science application that quickly can analyze enormous volumes of data by sorting the data, then provide sorted data to next level and then analyzing the grouped data. [2]
- b) To Architect the project of online payment Gateway app like Paytm etc. for payment of bills, transfer money, and other utility bills, with respect to above case study, understand the topmost Non-functional requirement. [2]

For any scenario about Non-Functional requirement generate logical, process, Development and physical view. [3]

Suggest the suitable structure for those views. [2]

OR

- Q4)** a) What is the software architecture? What are the three different views of an architecture? [7]
- b) Choose the most appropriate architectural structure. [10]

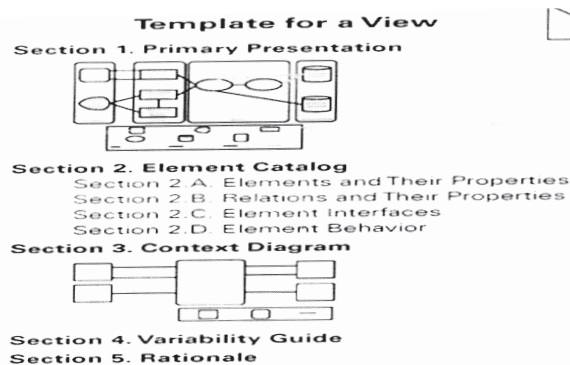
Nominees:

- i) Decomposition (Module Structure)
- ii) Uses (Module Structure)
- iii) Class (Module Structure)
- iv) Layered (Module Structure)
- v) Client-Server (Component and connector structure)
- vi) Process (Component and connector structure)
- vii) Shared data (Component and connector structure)
- viii) Deployment (Allocation structure)
- ix) Work Assignment (Allocation structure)
- x) Implementation (Allocation structure)

Choose the most appropriate architectural structure (one) for the 5 descriptions below. Motivate for your choice in one sentence (give reasons for choosing the structure):

- i) Wants to split a system into a number of computationally independent execution structures (groups of software and hardware) such as database, business logic, web interface and client, connected by some communication media. The structure is chosen to provide a specific server environment optimized for operational requirements and resource usage.
- ii) Wants to set up a set of equal distributed computational entities that are connected via a common protocol to share their services and provide high availability and scalability.
- iii) Wants a system that can be divided into reusable, loosely coupled components that can be flexibly combined and arranged to transform between various data formats.
- iv) Wants a distributed system with a structure that enables that service users do not need to know the nature or location of service providers. But proper version of the structure need to provide to proper user.
- v) Wants a system that quickly can analyze enormous volumes of data by sorting the data, then provide sorted data to next level and then analyzing the grouped data.

- Q5) a)**
- i) Variability guide is a section in the documentation package of architecture. What is the purpose of this section? Give an example. [6]
 - ii) Rational is a section in the documentation package of architecture. What is the purpose of this section?
- b)** Following the documentation package template, explain each sections in brief. [12]



OR

- Q6)** a) Define the importance of architecture structure and views. [6]
b) What are the different types of software architecture patterns? [6]
c) Explain Location & Platform transparency in service oriented architecture. [6]
- Q7)** a) What is the Design pattern? What is the purpose of design patterns? What are the different types of design patterns? What is purpose of each type of design pattern? [9]
b) What is *Behavioral Pattern*? In which situation you use the *Behavioral* pattern? What is observer *Behavioral* pattern? Explaing observer Behavioral in detail with the applicability of singleton creational pattern. [8]

OR

- Q8)** What is the purpose of design patterns? Explain the following patterns with examples. [17]
- Decorator
 - Facade
 - Flyweight
 - Proxy
 - Adapter
 - Bridge
 - Composite
 - Decorator



Total No. of Questions : 8]

SEAT No. :

PA-1456

[Total No. of Pages : 2

[5926]-72

T.E. (Electrical Engineering)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2019 Pattern) (Semester - I) (303141)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary

- Q1)** a) Explain patent format and structure in detail. [9]
b) Write a short note on HR planning and Recruitment. [9]

OR

- Q2)** a) What is Intellectual Property Rights (IPR)? Explain all its types? [9]
b) Explain types of training and development method. [9]

- Q3)** a) Explain in brief following: [8]
i) Poka Yoke (Mistake proofing)
ii) SIX SIGMA
b) Explain Quality Management system standard ISO 14001 : 2004. [9]

OR

- Q4)** a) Explain Environmental Management System Standard in details. [8]
b) What is meaning of Kaizen. How 5S is used in implementation of Kaizen. [9]

- Q5)** a) Explain in detail : [9]
i) Concept of Monopolistic competition
ii) Online Marketing
b) What is cost? Explain any four method of costing in detail. [9]

OR

P.T.O.

- Q6)** a) Explain in detail : [9]
i) Oligopoly
ii) Marketing Research
b) Describe the different types of taxes in detail. [9]

- Q7)** a) Enlist the theories of work motivation. Explain Herzberg's Two factor theory in detail. [9]
b) What are the good qualities of good leadership? Explain in details. [8]

OR

- Q8)** a) What is group dynamics? Explain the stages of group dynamics in detail. [8]
b) Explain decision making under certainty, uncertainty & risk. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1457

[Total No. of Pages : 3

[5926]-73

T.E. (Electrical)

POWER ELECTRONICS

(2019 Pattern) (Semester - I) (303142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Describe working of single phase semi converter with R load. Draw waveforms of load voltage, load current for $\alpha = 60^\circ$. [6]
- b) A single phase full converter is supplied from 230V, 50Hz source. The load consists of $R = 10\Omega$ and a large inductance so as to render the load current constant. For a firing delay of 45° determine. [5]
- i) Average output voltage
 - ii) Average output current
- c) With neat circuit diagram derive the equation for average and rms output voltage of single phase fully controlled converter connected to RL Load.[6]

OR

- Q2)** a) Draw a neat circuit diagram and explain working of a single - phase fully controlled bridge converter feeding RL load with freewheeling diode.[6]
- b) A single-phase half-controlled bridge converter feeds a load comprising of a resistance of 10 Ohm and a large inductance to provide a constant and ripple free current. Calculate average value of Output voltage and current. Firing angle is 45 degrees and input ac voltage is 120V, 50Hz.[5]
- c) Write short note on single phase dual converter. [6]

P.T.O.

- Q3)** a) Explain operation of two stage ac voltage regulator with an output waveform for RL load. [5]
- b) A three-phase half wave-controlled converter is fed from 3 phase, 400 V, 50 Hz source and is connected to a resistive load of 10 Ohm per phase. Calculate the average value of load voltage and current for a firing angle of 30 degrees. [5]
- c) Explain working of three phase fully controlled converter with RL Load and firing angle of 60 degrees. Draw output voltage waveforms. [8]

OR

- Q4)** a) With the help of circuit diagram and waveforms explain operation of Light dimmer. [5]
- b) A three phase full converter operating from 3 phase 415V, 50Hz supply with Resistive load. Determine average output voltage for $\alpha = 30$ degrees. [5]
- c) Explain working of three phase Semi controlled converter with R Load and firing angle of 30 degrees. Draw output voltage waveforms. [8]
- Q5)** a) Explain with neat labeled circuit diagram working of single - phase full bridge voltage source inverter connected to RL load. Draw output voltage and current waveforms. [5]
- b) Compare current source inverter and voltage source inverter. [5]
- c) Derive expression for output voltage in single pulse modulation by fourier analysis. [7]

OR

- Q6)** a) What is need of controlling output voltage in an inverter? Explain any one method in detail. [5]
- b) A 1ϕ half bridge inverter using transistors has a resistive load of 2 Ohm. The DC supply is 24 V. Calculate. [5]
- RMS output voltage at fundamental frequency.
 - Output power.
 - Average and peak current.
 - Peak reverse blocking voltage of each transistor.
- c) Explain Sinusoidal pulse width modulation with necessary waveforms. How voltage and frequency control is achieved. [7]

- Q7)** a) Explain working of three phase inverter with 180 degree conduction mode with neat diagram, switching sequence of switches and output voltage waveforms. **[10]**
- b) Draw circuit diagram of three level flying capacitor converter and explain its principal of operation. **[8]**

OR

- Q8)** a) Explain working of three phase inverter with 120 degree conduction mode with neat diagram, Switching sequence of Switches and output voltage waveforms. **[10]**
- b) Draw circuit diagram of three level flying capacitor converter and explain its principal of operation. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-1458

[Total No. of Pages : 2

[5926]-74

T.E. (Electrical Engineering)

ELECTRICAL MACHINES - II

(2019 Pattern) (Semester - I) (303143)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) State different methods of starting 3 phase synchronous motor. Explain any one. [4]
- b) Explain operation of synchronous motor at constant load and variable excitation using appropriate phasor diagrams. [6]
- c) A 3 phase star connected, 6.6 kV synchronous motor takes 72A at 0.8A leading power factor. Resistance and reactance per phase of the motor are 0.1 ohm and 0.9 ohm respectively. Determine e.m.f. induced and total power input. [8]

OR

- Q2)** a) Draw power flow diagram of 3 phase synchronous motor with appropriate nomenclature. [4]
- b) Compare 3 phase induction motor with 3 phase synchronous motor. [6]
- c) Draw the schematic diagram of synchronous induction motor & explain its working. How it is superior to synchronous motor. [8]

- Q3)** a) What are the various methods of speed control of 3 phase induction motor? [3]
- b) Explain speed control of 3 phase induction motor by (V/f) method. Draw the circuit diagram of the experiment with conclusion. [6]
- c) Write a short note on 3 phase induction generator. [8]

OR

P.T.O.

- Q4)** a) What is Energy efficient induction motor? State the factors which are to be improved for energy efficiency? [3]
b) Write a short note on brushless D.C. motor. [6]
c) Explain construction and working of permanent magnet D.C. motor with suitable diagram. Also state its applications. [8]

- Q5)** a) List the problems experienced by D.C. series motor operated on A.C. supply. [4]
b) Compare the conductively & inductively compensated AC series motor. [6]
c) What are the various methods of improving commutation in series motor? Explain the use of compoles in detail. [8]

OR

- Q6)** a) Draw performance characteristics curves of universal motor. Label the curves and axis. [4]
b) Compare performance of universal motor on AC and DC supply. [6]
c) A series motor having resistance $30\ \Omega$ & inductance $0.5\ \text{H}$ when connected to $250\ \text{V}$ DC supply draws a current of $0.8\ \text{A}$ and run at 2000rpm . If it is supplied by $250\ \text{V}$, $50\ \text{Hz}$ AC supply with same loading. The rotational loss is $15\ \text{W}$. Calculate (i) speed (ii) power factor (iii) Gross power developed and (iv) efficiency. [8]

- Q7)** a) Classify single phase induction motors. [3]
b) Explain the tests to determine the parameters of a equivalent circuit of a single phase induction motor. Draw circuit diagram for the test. [6]
c) Explain double field revolving theory of a single phase IM. Draw its speed-torque characteristics. [8]

OR

- Q8)** a) Elaborate the reason for single phase motor not self-starting. [3]
b) Compare single phase motor with 3 phase motor. [6]
c) Explain construction and working of split phase induction motor. Draw its torque-speed characteristics. State its two applications. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1459

[Total No. of Pages : 3

[5926]-75

T.E. (Electrical)

**ELECTRICAL INSTALLATION, DESIGN AND CONDITION
BASED MAINTENANCE
(2019 Pattern) (Semester - I) (303144)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programmable calculator is allowed.

- Q1) a)** Define and explain its significance with respect to condition monitoring:[9]
- i) Polarization Index
 - ii) Dielectric Absorption Ratio.
 - iii) Degree of Polymerization.
- b) Explain dissolved gas analysis. Illustrate its use for condition monitoring of transformer? [9]

OR

- Q2) a)** List the various fault monitoring methods of Induction Motor and write a note on Motor Current Signature Analysis. [8]
- b) How transformer oil gets contaminated? With suitable block diagram explain the reconditioning process of transformer oil. [10]

- Q3) a)** What are the essentials of estimating and costing? How the quantity of material required for internal wiring is determined? [8]
- b) Explain the following terms used in estimating and costing: [9]
- i) Price catalogue
 - ii) Schedule of labor rates
 - iii) Schedule of rates

OR

- Q4) a)** What is a tender? Prepare guidelines for inviting tenders. [9]
- b) Suggest qualities of a good estimator. [8]

P.T.O.

- Q5) a)** Write the general rules for the residential and commercial wiring work.[8]
- b)** Explain the procedure of installation and estimation of underground LT service lines. [9]

OR

- Q6) a)** A room is to be wired for single phase ac supply directly from mains which has a declared voltage of 200V. The length of the wire from the main switch to light and plug points is 30 meters. If the wire is to carry 5 amps, determine the size of the conductor. [9]

The following standard table may be used.

Size of Conductor		2 Cables D.C. or Single-phases A.C.		3 or 4 Cables of balanced 3-phase		4 Cables D.C.	
Normal area sq. mm.	Number and diameter of wire in mm.	Current rating in amperes	Approx. length of run for volt-drop in Metres	Current rating in Amperes	Approx. Length of run for 1 volt drop in meters	Current rating in Amperes	Approx. length of run for 1volt drop in metres
1.5	1/1.40	10	2.3	9	2.9	9	2.5
2.5	1/1.80	15	2.5	12	3.6	11	3.4
4.0	1/2.24	20	2.9	17	3.9	15	4.1
6.0	1/2.80	27	3.4	24	4.3	21	4.3
10.0	1/3.55	34	4.3	31	5.4	27	5.4
16.0	7/1.70	43	5.4	38	7.0	35	6.8
25.0	7/2.24	59	6.8	54	8.5	48	8.5
35.0	7/2.50	69	7.2	62	9.3	55	9.0
50.0	1/3.0 19/1.80	91	7.9	82	10.1	69	10.0

- b)** Explain the importance of [8]
- Current carrying capacity and
 - Voltage drop while determining the size of conductor.

- Q7)** a) State the different causes of accidents. Explain how these accidents can be prevented and what precautions are to be taken. [9]
- b) Give Classification of hazardous area as per NEC article 505-9, CEC Section 18, EN60079- 10, IEC 60079 - 10 [9]

OR

- Q8)** a) Explain the procedure of first aid to be provided while removing casualty from contact with live wire and administering artificial respiration. [9]
- b) Classify and explain CAT ratings and using CAT rated instruments. [9]



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Total No. of Questions : 8]

SEAT No. :

PA-1460

[Total No. of Pages : 2

[5926]-76

T.E. (Electrical)

**ADVANCED MICROCONTROLLER AND EMBEDDED
SYSTEM**

(2019 Pattern) (Semester - I) (Elective - I) (303145 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1) a)** How DC motor speed control is achieved using PWM mode of CCP module of PIC18F458. **[8]**
- b)** Draw CCPICON and list the steps involved in programming PIC18F458 microcontroller in PWM mode. **[9]**

OR

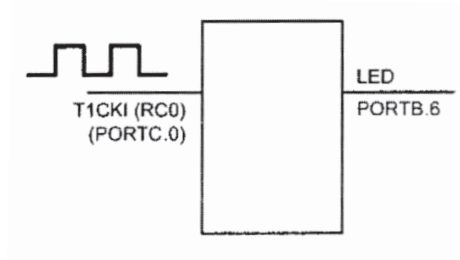
- Q2) a)** List out timers used for CCP module in PIC18F458. Also explain CCP registers used in detail. **[8]**
- b)** Write embedded C program to generate PWM of 5KHz with 40% duty cycle and Prescaler N = 4. **[9]**
- Q3) a)** Write a note on enabling and disabling interrupts and steps to enable interrupts in PIC 18. **[9]**
- b)** Assuming crystal frequency = 10MHz, write a program in C language to generate square wave form with a frequency of 25kHz on PORTB.4. Use timer 0 in 8bit mode without a Prescaler. **[9]**

OR

- Q4) a)** Write a short note on interrupt structure of PIC18F458 microcontroller. **[9]**
- b)** Write a C Program for PIC18 toggle the LED connected to pin 7 of the PORT B every time INT1 is activated by a pulse generator connected at

P.T.O.

INTI (RB1). The program will toggle the LED on falling edge of the pulse. Assume XTAL = 10 MHz. [9]



Q5) a) Explain in detail the function of following flags related to on board ADE of PIC Microcontroller. [8]

- i) ADIF
- ii) Go/Done
- iii) ADFM
- iv) ADON

b) With the help of interfacing diagram and flow chart, explain how PIC microcontroller can be used to measure temperature using LM35 sensor. [9]

OR

Q6) a) Explain features of on-board ADC of PIC18F458. Also explain in detail the functions of ADIF and ADFM bits. [8]

b) Draw a neat diagram and flow chart, explain AC voltage measurement using PIC microcontroller. [9]

Q7) a) Write a C program for the PIC18 to transfer the message “A” serially at 9600 baud, 8-bit data, 1 stop bit. Do this continuously. Assume XTAL=10MHz. [9]

b) Compare synchronous and asynchronous serial communication. Also explain the concept of baud rate with example. [9]

OR

Q8) a) Draw and explain the block diagram of USART transmitter in PIC18. [9]

b) Explain the SPBRG register uses. Also find the value to be loaded in SPBRG register to have baud rate of 4800 and Fosc =10MHz. Assume asynchronous mode and low baud rate. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1461

[Total No. of Pages : 2

[5926]-77

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (303145B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicates full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) State and prove the linear convolution property of DTFT. **[6]**

- b) For the sequence given below find the frequency response, plot magnitude and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{6}$.

$$h(n) = \begin{cases} 1 & \text{for } n = -2, -1, 0, 1, 2 \\ 0 & \text{otherwise} \end{cases} \quad [12]$$

OR

Q2) a) State and prove the linearity property of DTFT. **[6]**

- b) Determine and sketch the magnitude and phase response of $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) - x(n-1)$ **[12]**

Q3) a) Derive the relation between DFT and DTFT transform. **[6]**

- b) State and prove linearity property of DFT. **[6]**
- c) Compute DFT of the sequence $x(n) = \{1, 3, 3, 3\}$. Sketch the magnitude and phase spectrum. **[6]**

OR

Q4) a) Draw the structure of Radix-2 DIF-FFT algorithm for $N=8$. **[6]**

- b) State and prove circular time shift property of DFT. **[6]**
- c) Find the circular convolution of following sequences using matrix method $x(n) = \{1, 2, 3, 4\}$ and $h(n) = \{1, 1, 2, 1\}$. **[6]**

P.T.O.

- Q5) a)** What are the advantages and disadvantages of digital filter? [5]
b) Obtain direct form-I, direct form - II and cascade realization of the system described by $y(n) = -y(n-1) - \frac{3}{16}y(n-2) + x(n) + \frac{2}{5}x(n-1)$. [12]

OR

- Q6) a)** Compare FIR filter with IIR filter. [5]
b) Design low pass IIR filter using Butterworth technique for the following specifications. [12]

$$0.6 \leq |H(\omega)| \leq 1 \text{ for } 0 \leq \omega \leq 0.35\pi$$

$$|H(\omega)| \leq 0.1 \text{ for } 0.7\pi \leq \omega$$

Convert the designed filter in digital filter with bilinear transformation with $T = 0.1$ sec. (Hint : The second order filter is given

by $\frac{1}{s^2 + \sqrt{2}s + 1}$ at $\Omega_c = 1$ Hz).

- Q7) a)** Design an ideal low pass filter using rectangular window with a cutoff frequency 1.2 rad/sample. [10]
b) Write short note on measurement of voltage using DSP. [7]

OR

- Q8) a)** What are the different ideal frequency selective filters? Explain each type with equations and graph. [6]
b) Write short note on harmonic analysis using DSP. [6]
c) Draw the direct form structure of the FIR system described by the transfer

function $H(z) = 1 + \frac{1}{2}z^{-1} + \frac{3}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{2}z^{-4} + \frac{1}{8}z^{-5}$ [5]



[5926]-79

T.E. (Electrical)

POWER SYSTEM-II

(2019 Pattern) (Semester-II) (303148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figure to the right side indicate full marks.
- 4) Use of a calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Give the detailed classification of buses used in load flow analysis. [6]
- b) Show that per unit impedance of the transformer referred to primary and secondary is same. [6]
- c) Impedances (in pu) between buses are given in the following Fig. Calculate the Ybus of the system. [6]

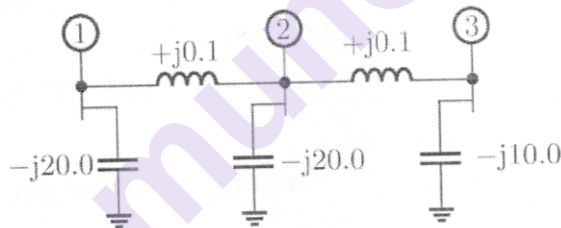


Fig Q1 C)

OR

- Q2)** a) The base of the three-phase system is 100MVA and 10kV. Calculate base impedance and base current. Let the impedance of any part is given as 0.5 pu on 100MVA, 10kV base. If the base is changed to 200MVA, 5kV. What is the base impedance? [6]
- b) Derive load flow equation for 'n' bus system. [6]
- c) What is per unit system? State the advantages and disadvantages. [6]

P.T.O.

- Q3) a)** If the three-phase fault is taken place at point F, find the fault current supplied by each generator. Take 100MVA, 11kV as a base value on the generator. [12]

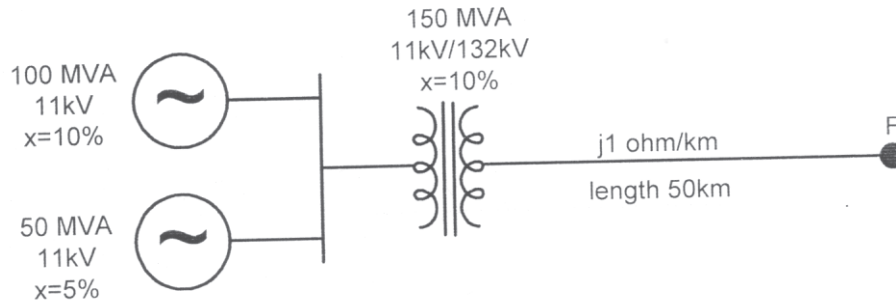


Fig. Q3A)

- b) Draw the nature of fault current, if the symmetrical fault is taken place at the terminal of an unloaded alternator. clearly mark the sub-transient, transient and steady state period. [6]

OR

- Q4) a)** Find the fault current, if there phase fault is taken place at F2, determine voltage at generator terminal and HV side of the transformer. [12]

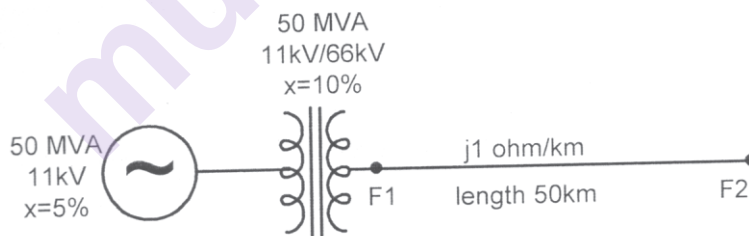


Fig Q4A)

- b) Write a short note on “Tie-bar” [6]

- Q5) a)** Prove that three-phase apparent power $S_{abc} = 3S_{012}$

Where S_{abc} = Apperant power in three phase form and

S_{012} = Apperant power in sequence quantity form. [6]

- b) Draw a zero-sequence diagram for the following transformer connection[6]
 - i) Delta-Delta transformer.
 - ii) Delta-star connected transformer with neutral grounded with impedance.
- c) For a fully transposed transmission line, Self-impedance is $J10$ ohm and mutual impedance is $J2$ ohm, calculate positive, negative and zero sequence impedances of the line. [6]

OR

- Q6)** a) Derive the equation for fault current in LL fault. [9]
- b) A 20-MVA, 6.6-kV, 3-Phase alternator is connected to a 3-Phase transmission line. The per unit positive, negative and zero-sequence impedances of the alternator are $j0.5$, $j0.05$ and $j0.04$ respectively. The neutral of the alternator is connected to the ground through an inductive reactor of $j0.05$ p.u. The per unit positive, negative and zero-sequence impedances of the transmission line are $j0.5$, $j0.5$ and $j0.3$, respectively per-unit values are based on the machine ratings. A solid ground fault occurs at one phase of the far end of the transmission line. calculate the fault current. [9]
- Q7)** a) What are the advantages of HVDC transmission line. [6]
- b) Write a short note “chandrapur-padghe HVDC line” [5]
- c) Write a short note “ Monopolar HVDC station” [5]

OR

- Q8)** a) Explain “Constant current control” in HVDC line. [6]
- b) Write the functions of the following components in HVDC system: [5]
- i) Smoothing reactor.
 - ii) Converter transformer.
- b) Write a short note “ Back to Back HVDC station” [5]



Total No. of Questions : 8]

SEAT No. :

PA-1463

[Total No. of Pages : 2

[5926]-80

T.E. (Electrical Engineering)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

(2019 Pattern) (Semester - II) (303149)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Explain the various heat dissipating modes by which heat developed in electrical machines dissipates. [6]
- b) Derive the Output equation for single transformers with usual notations. [7]
- c) Derive the equation for radial mechanical forces developed in transformers under short circuit conditions and measures to overcome the mechanical forces develop. [7]

OR

- Q2)** a) Explain the significance of mitred joint in transformer core design. [6]
- b) Explain the role of Buchholz Relay in power transformers. Where it is located. [7]
- c) Explain step by step the procedure to design the core of transformers. [7]

- Q3)** a) Derive the output equation of three phase ac machines and from the same derive the equation input kVA for three phase induction motor in terms of h.p. or kW. [8]
- b) Explain the points to be considered while selecting the value of specific magnetic loading for the design of three phase induction motor. [8]

OR

P.T.O.

- Q4) a)** Explain in detail the factors affecting the size of ac machines. [8]
b) Explain the points to be considered while selecting the stator slots of three phase induction motor. [8]

- Q5) a)** Derive the equation for end ring current in squirrel cage rotor with usual notations. [8]
b) What are different types of rotor slots? Explain any one. What are the advantages of tapered slots? [8]

OR

- Q6) a)** Why the length of air gap in an induction motor is kept minimum possible range. What factors govern the choice of air gap in induction motor. [8]
b) A 11 kW, 3-phase, 6 pole, 50 Hz star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and power factor of 0.85. The stator mmf may be assumed 85% of rotor mmf. Also find bar and end-ring sections if the current density is 5 A/mm². [8]

- Q7) a)** Explain the effect of duct on the calculation of magnetizing current of three phase induction motor. [8]
b) What are various methods to improve the starting torque of three phase squirrel cage induction motor. [10]

OR

- Q8) a)** Explain the different types of leakage flux in an induction motor. [8]
b) Explain the procedure for calculation of total mmf for the magnetic circuit of three phase induction motor.

Calculation of total mmf = mmf for air-gap + mmf for stator teeth + mmf for rotor teeth + mmf for stator core + mmf for rotor core. [10]



[5926]-81**T.E. (Electrical)****CONTROL SYSTEM ENGINEERING****(2019 Pattern) (303150) (Semester - II)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates:**

- 1) Answer any one question from each pair of questions : Q.1 & Q.2, Q. 3& Q.4, Q.5 & Q.6, Q.7 & Q.8.
- 2) Figures to the right indicate full marks.

Q1) a) Using Routh Hurwitz criterion for the unity feedback system having[9]

$$G(S) = \frac{K}{S(S+1)(S+2)(S+5)}$$

- i) Find the range of k for stability.
 - ii) Find the value of k for marginally stable and corresponding closed loop poles.
- b) Explain the terms Real axis loci, Angle of asymptotes, Centroid and Break away point to draw Root locus. [8]

OR**Q2) a)** Sketch the root locus of the following feedback systems and comment on stability. [9]

$$G(S)H(S) = \frac{K}{S(S+2)(S+3)}$$

- b) Explain Routh's stability criterion with its special cases. [8]

Q3) a) Define different frequency domain specifications. [8]

- b) Sketch the Polar plot. Determine stability of the system. [10]

$$G(S)H(S) = \frac{1}{S(S+1)(2S+1)}$$

OR**P.T.O.**

- Q4)** a) Explain how will you find stability from the polar plot? [8]
 b) Sketch the Nyquist plot. Comment on the stability. [10]

$$G(S)H(S) = \frac{1}{S(S+2)}$$

- Q5)** a) Explain how gain margin and phase margin are determined from Bode plot and stability from that. [6]
 b) Find the stability of the following unity feedback system sketching the Bode plot. [12]

$$G(S) = \frac{10(S+20)}{(S+1)(S+2)(S+3)}$$

OR

- Q6)** a) Explain the nature of bode plots for : [6]
 i) poles at origin
 ii) simple pole
 iii) simple zero
 b) Find the stability of the following unity feedback system sketching the Bode plot. [12]

$$G(s) = \frac{20(S+2)}{S(S+10)}$$

- Q7)** a) Draw electrical network for Lag compensator and derive its transfer function. Draw pole zero plot. [9]
 b) Describe working of potentiometers. [8]

OR

- Q8)** a) Draw electrical network for Lead compensator and derive its transfer function. Draw pole zero plot. [9]
 b) Explain tuning of PID controllers using Ziegler-Nichols method. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1465

[Total No. of Pages : 2

[5926]-82

T.E. (Electrical)

**IOT AND ITS APPLICATIONS IN ELECTRICAL ENGINEERING
(2019 Pattern) (Semester - II) (Elective - II A) (303151 A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) A buzzer is connected to digital pin 7 of Arduino UNO board. Write a program in C to ring the buzzer 5 times with a delay of 1 sec in each ring. **[9]**

b) List various types of operators used in Python programming and give few examples of each type of operators. **[9]**

OR

Q2) a) Explain with syntax and example, following functions from Arduino IDE. **[9]**

- i) Serial.begin ()
- ii) Pin Mode ()
- iii) Serial.println ()
- iv) analogRead ()

b) Write a program in Python to accept lower and upper limit of a range of numbers from user and print the summation of all numbers in that range. **[9]**

Q3) a) Explain in detail DHT11 sensor. Also, with a neat diagram, show interfacing of DHT11 sensor with Node MCU. **[9]**

b) Write a short note on LDR sensors. **[8]**

OR

P.T.O.

Q4) a) Write a program to read data from ultrasonic sensor HC-SR04 and display it on serial monitor using Arduino IDE. Sensor is connected to D2 pin of Node MCU. [9]

b) Describe in detail various characteristics of sensors. [8]

Q5) a) Write a short note on Zigbee communication technology. [9]

b) Describe following terms related to MQTT communication technology- [8]

i) Publish / Subscribe

ii) Messages

iii) Topics

iv) Broker

OR

Q6) a) Write a short note on Wi-fi communication technology. [9]

b) Write a short note on Bluetooth communication technology. [8]

Q7) a) What is meant by Data Visualization? Explain in short, any 4 techniques of data visualization. [9]

b) What is API in IoT Cloud? Explain in short, its 4 types. [9]

OR

Q8) a) With a suitable block diagram, explain simple IoT application of Home Automation. [9]

b) Explain in short, any 4 IoT Cloud platforms. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1466

[Total No. of Pages : 2

[5926]-83

T.E. (Electrical)

ELECTRICAL MOBILITY

(2019 Pattern) (Semester - II) (Elective - II) (303151 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

UNIT - 1

- Q1)** a) Explain coulomb Counting method used in SOC estimation. [8]
b) Explain Constant voltage charging algorithm used in battery charging.[9]

OR

- Q2)** a) Explain Thermal management system used in EVs. [8]
b) State various SOC estimation methods used in batteries, Explain any two methods. [9]

UNIT - 2

- Q3)** a) Draw Control Architecture of HEV and all electronic control systems.[10]
b) Draw schematic diagram of parallel HEV drive train and explain its working. [8]

OR

- Q4)** a) Draw diagram for regenerative braking system functioning as Antilock Brake System. [10]
b) Draw schematic diagram of series HEV drive train and explain its working. [8]

UNIT - 3

- Q5)** a) Explain various types of EV Chargers. [8]
b) Explain Advantages of BLDC drives for HEV. [9]

OR

P.T.O.

- Q6)** a) Write KW rating of AC. Fast Charger of type A, B, C, D and state applications. [8]
b) Draw charger Architecture and explain it. [9]

UNIT - 4

- Q7)** a) Draw and Explain Diagram for modelling of V2G ancillary services. [10]
b) Draw Flowchart for EV Charging Infrastructure and explain it. [8]

OR

- Q8)** a) Compare V2H, V2V and V2G (any 3 points) [10]
b) Explain V2G concept and state advantages of V2G. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1467

[Total No. of Pages : 2

[5926]-84

T.E. (Electrical)

CYBERNETICS ENGINEERING

(2019 Pattern) (Semester - II) (Elective - II) (303151 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any one question from each pair of questions: Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.

- Q1)** a) Explain the terms transfer function, poles, zero and pole-zero plot. [6]
b) How optimal control is different from adaptive control? [6]
c) What do you mean by nonlinear system? What are the different types of nonlinearities? [6]

OR

- Q2)** a) Draw the block diagram of adaptive control system and explain. [6]
b) Explain different types of control systems. [6]
c) Explain the concept of multivariable control system with example. [6]
- Q3)** a) Explain the components used in mathematical modeling for the electrical system. [6]
b) Describe the linearization process of the nonlinear system. [6]
c) State the significance of the differential equations of the physical system? [5]

OR

- Q4)** a) Elaborate the use of software tools in mathematical modeling. [6]
b) Explain the procedure to get the solution of ordinary differential equation using ODE solver? [6]
c) Derive the representation of separately excited DC motor using linear ordinary differential equations. [5]

P.T.O.

- Q5)** a) Explain in detail the computer architecture. [8]
b) Explain system components for embedded and industrial applications.[10]

OR

- Q6)** a) Explain the various analog and digital interface? [8]
b) Explain the process of data communication in the industrial environmental. [10]

- Q7)** a) What is optimization? Give at least five applications of optimization.[7]
b) Describe the particle swarm optimization method. [10]

OR

- Q8)** a) State the statement of an optimization problem in mathematical terms.[7]
b) Elaborate the Genetic Algorithm using example. [10]



Total No. of Questions : 8]

SEAT No. :

PA-1468

[Total No. of Pages : 2

[5926]-85

T.E. (Electrical)

ENERGY MANAGEMENT

(2019 Pattern) (Semester - II) (Elective - II) (303151 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stem tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain benefits and shortcomings of demand side management for consumer, utility and society. [9]

b) Discuss the implementation demand side management for residential and municipal loads. [9]

OR

Q2) a) Explain Time of day (TOD) and apparent energy tariff. Also discuss their role in energy management. [10]

- b) i) Explain role of Biomass in energy conservation.
ii) Solar thermal applications for energy management.

[8]

Q3) a) Why energy audit is important? Explain steps in detailed energy audit. [9]

b) Explain in detailed cumulative sum of difference method. How energy saving can realised from this method? [8]

OR

Q4) a) Discuss use of various instruments for energy audit. [9]

b) Discuss importance of data analytics. Also discuss data quality processing of energy audit. [8]

P.T.O.

- Q5) a)** For energy conservative project initial investment of Rs. 10,00,000 is required. The revenue generation for six years is Rs. 2,00,000, Rs. 2,00,000, Rs. 1,75,000 Rs. 2,50,000 Rs 1,75,000 and Rs. 2,00,000. Using discounting factor of 12% calculate net present value of the project. [9]
- b)** Discuss the financial appraisal criteria for economic feasibility. [9]

OR

- Q6) a)** During energy audit it is decided to replace worn out induction motors with new high efficiency motors of same capacity. The specification of motors are given below. Calculate payback period by taking rate of electricity as Rs. 6/k Wh and demand rate as Rs. 350/kVA/month. [9]

Description	Old motor	Energy Efficiency Motors
Rating of machine	10HP	10 HP
Number of motors	20	20
Operating hours per annum each	6500	6500
Efficiency near full load	89%	93%
Power factor near full load	0.85 lag	0.89 lag
Capital cost	--	Rs. 60,000/- (each)
Scrap value	Rs. 7500/- (each)	--

- b)** Discuss energy audit case study of textile industry. [9]

- Q7) a)** What is topping cycle cogeneration system? With suitable example explain cogeneration systems. [9]
- b)** Explain various electrical energy efficient systems. [8]

OR

- Q8) a)** Discuss energy saving options in pumps and piping systems. [9]
- b)** Explain energy conservation in diesel generator system [8]



Total No. of Questions : 8]

SEAT No. :

PA-1469

[Total No. of Pages : 2

[5926]-86

T.E. (Electronics)

POWER AND INDUSTRIAL ELECTRONICS

(2019 Pattern) (Semester-I) (304201)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.

Q1) a) Illustrate Three Phase Controlled Rectifier Using IGBT. **[8]**

b) Elaborate single Phase Full converter for R load with suitable waveforms. **[9]**

OR

Q2) a) Explain Three Phase Semi converter for R Load with suitable waveforms. **[8]**

b) Illustrate Single Phase PWM Rectifier using IGBT. **[9]**

Q3) a) What is Chopper? Illustrate Step down chopper for R load in details. **[9]**

b) Write a short note on SMPS. **[9]**

OR

Q4) a) A chopper circuit is operating on TRC principle at a frequency of 2KHz on a 220V d.c. supply. If the load voltage is 170V, compute the conduction and blocking period of thyristor in each cycle. **[9]**

b) Explain 2-quadrant & 4 quadrant choppers in details. **[9]**

P.T.O.

- Q5) a)** Illustrate Single phase full bridge inverter for R loads. [8]
- b) Give an overview of applications of three phase PWM inverters for three phase variable frequency drives (VFDs) [9]

OR

- Q6) a)** Elaborate three phase voltage source inverter 120 degree mode for balanced star R load. [8]
- b) Write a short note on Need of PWM inverters. [9]
- Q7) a)** Explain UPS: ON-line and OFF line. [9]
- b) Elaborate Induction heating applications. [9]

OR

- Q8) a)** Write a short note on HVDC transmission system. [9]
- b) Illustrate Battery Charging Application. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1470

[Total No. of Pages : 2

[5926]-87

T.E. (Electronics)

ELECTROMAGNETIC WAVES AND PROPAGATION THEORY

(2019 Pattern) (Semester-I) (404202)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figure to the right side indicate full marks.
- 4) Use of smith chart and calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) State Maxwell's equations in point form for good conductor. [6]

b) In free space $\vec{E} = 20 \cos(\omega t - 50x) \hat{a}_y$ V/m. Calculate J_d and \vec{H} . [8]

c) State poynting Theorem and write expression for the poynting Vector. [4]

OR

Q2) a) State Maxwell's equations in integral form for dielectric medium. [4]

b) Write Maxwell's equations for static and time varying fields in point or integral form. [8]

c) In a medium $\mu = 10^{-5} \text{H/m}$, $\epsilon = 4 \times 10^{-9} \text{F/m}$, $\sigma = 0$. Find K so that each of the following pairs of field satisfies Maxwell's equations. ($P_v = 0$)

$$\vec{E} = (20y - Kt) \hat{a}_x \text{ V/m}$$

$$\vec{H} = (y + 2 \times 10^6 t) \hat{a}_2 \text{ A/m} \quad [6]$$

Q3) a) Derive Wave equations for free space. [8]

b) An electric Field in free space is given by $\vec{E} = 100 \sin(10^8 t + \beta x) \hat{a}_z$ V/m [8]

i) Find the direction of propagation.

ii) Calculate β , Hm and frequency.

c) For Uniform plane wave, explain depth of penetration. [2]

OR

P.T.O.

- Q4)** a) Derive Wave equations for lossless dielectric medium. [8]
 b) Derive expression of intrinsic impedance and depth of penetration in good conductor. [8]
 c) Find the velocity of a plane wave in a lossless medium having $\epsilon_r = 5$ and $\mu_r = 1$ [2]

- Q5)** a) Draw equivalent ckt of transmission line and find characteristic impedance of transmission line. [8]
 b) Explain standing wave Ratio (SWR) & VSWR. [4]
 c) State and explain the primary constants of transmission line. [6]

OR

- Q6)** a) Explain the term : Characteristic impedance. [2]
 b) If the attenuation constant α is 18×10^{-3} N/m. Velocity of propagation is 1.8×10^8 m/s and characteristic impedance Z_0 is 60Ω . Find the primary line constants of such distortionless line at a frequency 100MHz. [8]
 c) Derive equation of characteristic impedance for lossless transmission line and distortionless transmission line. [8]

- Q7)** a) Compare TE and Tm mode in wave guide. [4]
 b) What is waveguide? List the applications, advantages and disadvantages of waveguide.. [6]
 c) What is cavity resonator? Explain Reactive cavity resonator in detail. [6]

OR

- Q8)** a) A rectangular waveguide with dimension $a=2.5\text{cm}$ and $b=1\text{ cm}$. How many TE and TM modes the waveguide transmit if the waveguide is filled with medium characterized by $\sigma=0$, $\mu=1$, $\epsilon=4\epsilon_0$? Calculate the cut off frequencies of the modes. Consider $F_{cmn}<16\text{GHz}$. [10]
 b) A reactance guide with $a=3\text{cm}$ and $b=1\text{cm}$ is operating at a frequency 9GHz in TE₁₀ mode. calculate the maximum power handling capacity of waveguide if max. potential gradient of signal is 3KV/cm. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1471

[Total No. of Pages : 2

[5926]-89

T.E. (Electronics Engineering)

MICROCONTROLLER AND APPLICATIONS

(2019 Pattern) (Semester - I) (304204)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Interface relay with 8051 microcontroller. Write an Embedded C program to turn ON and OFF relay. [6]
- b) Explain the term opto-isolators. What are advantages of opto-isolators. Draw interfacing diagram of opto-isolator with 8051 microcontroller. [6]
- c) Draw interfacing diagram of DAC to 8051 microcontroller and write an Embedded C program to generate square wave form. [8]

OR

- Q2)** a) Interface buzzer with 8051 microcontroller. Write an Embedded C program to turn buzzer ON and OFF. [6]
- b) Explain in detail data transmission and reception process in 8051 microcontroller. [6]
- c) Draw interfacing diagram of Temperature sensor (LM35) with 8051 microcontroller using ADC 0808/0809. Write an Embedded C program for the same. [8]

- Q3)** a) List the features of PIC18 Fxx microcontroller. Also elaborate the steps for selection of PIC microcontroller depending on application. [8]
- b) Draw the block diagram of Timer 0 of PIC18 Fxx microcontroller in 8 bit mode. Also write the steps to program it in 8 bit mode. [8]

OR

- Q4)** a) Write neat diagram explain RAM memory organization of PIC18Fxx microcontroller. [8]
- b) Explain the following terms in PIC18Fxx microcontroller: [8]
- i) Power down modes
 - ii) BOD

P.T.O.

- Q5) a)** Draw the neat block diagram of Interrupt structure of PIC18Fxx and explain it in detail. [8]
- b)** Draw interfacing diagram of LED to Port B of PIC18Fxx microcontroller. Also write an Embedded C program to alternately blink led with same delay. [8]

OR

- Q6) a)** Explain the capture mode of CCP module with neat diagram for PIC 18Fxx microcontroller. Also with the algorithm for the same. [8]
- b)** Interface internal ADC of PIC18Fxx microcontroller and write an Embedded C program to convert analog to digital signal. [8]
- Q7) a)** Draw the neat block diagram of DAS using 8051 microcontroller and explain it in detail. [6]
- b)** Draw the home protection system using PIC18Fxx microcontroller. Also write an Embedded C program for same. [6]
- c)** What is need of Digital Multimeter. Draw the block diagram of Digital Multimeter using 8051 microcontroller. [6]

OR

- Q8) a)** Design water level monitoring and control system using PIC18Fxx microcontroller and write the algorithm for the same. [6]
- b)** Design frequency counter using 8051 microcontroller and display the result on LCD. [6]
- c)** Design environment Monitoring System using PIC 18Fxx microcontroller. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1472

[Total No. of Pages : 2

[5926]-90

T.E. (Electronics Engineering)
INSTRUMENTATION SYSTEMS

(2019 Pattern) (Semester - I) (Elective - I) (304205A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

- Q1)** a) Explain Static and Stagnation pressure in Pitot static tube. Compare Pitot tube and Static Pitot tube. [6]
- b) Explain capacitance type level sensor for measuring level of non-conductive liquid with suitable diagram. [6]
- c) With the help of neat diagram explain working of variable area meter/Rotameter. State its advantages and disadvantages. [8]

OR

- Q2)** a) Define flow and flow rate. Explain different types of flows. Explain the Bernoulli equation. [6]
- b) Explain Vortex Shedding flow meter. State its advantages and disadvantages. [6]
- c) With the help of neat diagram explain Ultrasonic type liquid level sensor. State its advantages and disadvantages. [8]

- Q3)** a) With the help of neat diagram explain Linear incremental optical Encoder. Compare incremental optical encoder and absolute optical encoder. [8]
- b) Explain Capacitive Displacement Transducer. [8]
- i) Capacitive Displacement Transducer.
 - ii) Piezoelectric Displacement Transducer.

OR

- Q4)** a) Draw construction diagram and explain working of photo transistor. Draw the characteristics of photo transistor. Compare photo diode and photo transistor. [8]
- b) With the help of neat diagram explain construction, working and characteristics of LVDT. Draw signal conditioning circuit for LVDT. [8]

P.T.O.

- Q5)** a) Explain Bulk Micromachining process and Surface Micromachining process and compare them. [8]
b) With the help of neat construction diagram explain Magneto-Resistive Elements (MRE) and Magneto Transistors. [8]

OR

- Q6)** a) Define MEMS. State application areas of MEMS Technology. With the help of neat construction diagram explain Hall effect Magnetic field sensors. [8]
b) Draw neat block diagram Smart sensor and explain functioning of each block. State the advantages and disadvantages of Smart Sensor. [8]

- Q7)** a) With the help of suitable circuit diagram explain working of bidirectional control of DC motor. [6]
b) Explain pressure limiting valve/self-relief valve and pressure sequence valve. [6]
c) Define electrical and mechanical actuators and compare them. [6]

OR

- Q8)** a) Explain valve gain, Rangeability and valve sizing w.r.t. to control valve. [6]
b) Explain Process Control Valve with suitable diagram. [6]
c) Using suitable diagram explain how MOSFET can be used for speed control of DC motor. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1473

[Total No. of Pages : 2

[5926]-91

T.E. (Electronics Engineering)

MACHINE LEARNING

(2019 Pattern) (Semester - I) (Elective - I) (304205)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What is knowledge Engineering in First Order Logic? Explain in short the steps required in knowledge Engineering projects? [9]
- b) What are the advantages of first-order logic on propositional logic? Write the key differences between Propositional and First Order Logic. [8]

OR

- Q2)** a) What is first-order logic in artificial intelligence? Which are the parts of first-order logic? With the help of suitable example draw the model for first-order-logic. [8]
- b) Explain the following terms: [9]
- i) Forward Chaining.
 - ii) Backward Chaining.

- Q3)** a) What is Natural Language Processing? Describe in brief all the steps in Natural Language Understanding. [9]
- b) What is Probabilistic Language Processing? Which are the Probabilistic Language Models? [9]

OR

- Q4)** a) Define the terms with reference to Natural Language Processing: [9]
- i) Ambiguity.
 - ii) Disambiguation.
 - iii) Parsing

Also compare top down and Bottom Up Parsing.

P.T.O.

- b) Which parsing approach/procedure is used in Augmented Transition Network? How Augmented Transition Networks can be used in Natural Language understanding? [9]

Q5) a) Which are the different learning paradigms? Compare supervised and unsupervised learning. [9]

- b) With suitable example, explain Inductive Learning. [8]

OR

Q6) a) Which technique is used to reduce the Overfitting in Decision Trees? Define the following terms with reference to Decision Trees. [9]

- i) Noise and Overfitting.
- ii) Decision Tree Pruning.
- iii) Cross Validation.

- b) What is Learning Decision Tree? Describe the Decision Tree Learning Algorithm. [8]

Q7) a) Define the term Fuzzy Set? With suitable example, explain any four operations on fuzzy sets. [9]

- b) Explain in short neural network based PWM controller with neat diagram. [9]

OR

Q8) a) Define the following terms with reference to Fuzzy sets. [9]

- i) Properties of Fuzzy sets (any four properties).
- ii) Membership function.
- iii) Features of the membership function.

- b) Explain in short Fuzzy logic based induction motor speed control with neat diagram. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1474

[Total No. of Pages : 2

[5926]-92

T.E. (Electronics /E & TC)

FUNDAMENTALS OF JAVA PROGRAMMING

(2019 Pattern) (Semester - I) (Elective - I) (304185 (C))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Write a program to implement single inheritance in java. **[5]**

b) Write a method called. **[8]**

String Delete (String str, int m)

that return the input string str with mth element removed.

c) What is an array? How to declare an array in Java? Compare C array with Java Array. **[5]**

OR

Q2) a) Explain static and dynamic polymorphism with suitable example. **[8]**

b) Write a program to join two strings. **[5]**

c) Write a program to sort n number given in an array. **[5]**

Q3) a) Explain implementation of interface using suitable example. **[7]**

b) List out the advantages of packages. **[5]**

c) List out Java API package. **[5]**

OR

Q4) a) Explain the concept of package using suitable example. **[8]**

b) Explain the concept of default interface with suitable example. **[9]**

Q5) a) What is Multithreading? Explain ways to create a thread in java. **[9]**

b) Explain applet and differentiate between applet and application. **[9]**

OR

P.T.O.

- Q6)** a) Explain the concept of thread priority with the help of suitable example.[9]
b) Write a java code using buffer Reader class to read name from the user.[5]
c) Explain syntax of try and catch block. [4]

- Q7)** a) Explain the Graphics class in Java. List out and explain any three drawing methods from Graphics class. [9]
b) Create application to create window in Java deriving from Frame class to display message “Welcome to World of Java”. [8]

OR

- Q8)** a) Write a Java program using Swing to display “Welcome to Java”. [7]
b) Explain the hierarchy of AWT. [5]
c) Write a code in Java to open a file for reading. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1475

[Total No. of Pages : 2

[5926]-93

T.E. (Electronics)

DATA COMMUNICATION (Elective - I)
(2019 Pattern) (Semester - I) (304205-D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume the suitable data, if necessary.*

Q1) a) The parity check bits of a (7,4) block code are generated by **[8]**

$$C_5 = d_1 + d_2 + d_3$$

$$C_6 = d_1 + d_2 + d_3$$

$$C_7 = d_2 + d_3 + d_4$$

-Where d_1, d_2, d_3 and d_4 are the message digits.

-Find the generated matrix and parity check matrix for this code.

-Find the minimum weight of this code.

-Find error detecting capability of this code.

- b) Explain hardware implementation of block codes for encoder & syndrome decoder with an example. **[10]**

OR

Q2) a) Write a note on : **[8]**

i) Stop and Wait,

ii) Hybrid ARQ

- b) A rate 1/3 convolution encoder has generating vectors as $g_1=(100)$, $g_2=(111)$, $g_3=(101)$ **[10]**

i) Sketch the encoder configuration.

ii) Draw the code tree and state diagram

P.T.O.

- Q3) a)** Apply Huffman binary coding procedure for the following message ensemble. Also determine its efficiency. [9]

x	x₁	x₂	x₃	x₄	x₅	x₆
p	0.3	0.25	0.2	0.12	0.08	0.05

- b) Define Information, information rate, entropy and Mutual Information. [8]

OR

- Q4) a)** Apply Shannon - fano coding procedure for the following message ensemble. Also determine its efficiency. [9]

x	x₁	x₂	x₃	x₄	x₅	x₆	x₇	x₈
p	1/4	1/8	1/16	1/16	1/16	1/4	1/16	1/8

- b) Prove that, [8]

i) $H(x,y)=H(x/y)+H(y)$

ii) $H(x,y)=H(y/x)+H(x)$

- Q5) a)** Explain QPSK modulation and demodulation with spectrum and output equation. [9]

- b) Explain BFSK modulation and demodulation diagram with spectrum and bandwidth. [8]

OR

- Q6) a)** Explain principle and block diagram of OFDM. [9]

- b) Explain the generation and reception of QAM with the help of neat block diagram. [8]

- Q7) a)** Compare FDMA, TDMA and CDMA. [6]

- b) The information bit duration in DS-BPSK spread spectrum communication system is 10msec while the chipping rate is 1MHz. Assuming an average error probability is 10^{-6} for proper detection of message signal, calculate the jamming margin. [6]

- c) Write a short note on CSMA. [6]

OR

- Q8) a)** Explain the operation of DS-SS transmitter with the help of block diagram. [6]

- b) Write short note on FH-SS communication [6]

- c) Write short note on pure ALOHA and slotted ALOHA. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1476

[Total No. of Pages : 2

[5926]-94

T.E. (Electronics Engineering)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (Elective - I) (304205)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt all the questions out of Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Draw the HDLC Frame format. Explain the control field used in HDLC for different frame types. **[8]**

b) What are different line codes used in Ethernet, Fast Ethernet and Gigabit Ethernet communication? **[4]**

c) Write short note on Gigabit Ethernet. **[6]**

OR

Q2) a) State and Explain multiple access protocols in brief. **[8]**

b) Explain functions of datalink layer. **[6]**

c) Compare FDMA, TDMA and CDMA. **[4]**

Q3) a) Explain various IPv4 address formats. **[9]**

b) Compare TCP and UDP services for transport layer. Under what circumstance you will use them. **[8]**

OR

Q4) a) Explain various IPv6 packet formats. **[9]**

b) What are the duties of transport layer? List the services provided by transport layer to upper layers. Also explain how QoS is improved by transport layer? **[8]**

P.T.O.

- Q5) a)** Explain basic functions of electronic mail. [6]
b) Write short note on i) WWW, ii) Role of SMTP in email system.[12]

OR

- Q6) a)** Explain DNS in Internet. [6]
b) Write short note on i) Telnet ii) HTTP [12]

- Q7) a)** Explain UTP Cabling for PC-to-PC communication and their standards. [9]
b) What is DSL technology? What are services provided by the telephone companies using DSL? [8]

OR

- Q8) a)** Write a short note on Network Tester. [8]
b) What are different types of cabling for PC-to-PC communication? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1477

[Total No. of Pages : 2

[5926]-95

T.E. (Electronics)

FUNDAMENTALS OF HDL

(2019 Pattern) (Semester-II) (304212)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Figures to the right side indicate full marks.

Q1) a) Explain the following terms related to CPLD. **[7]**

- i) Functional Blocks/PAL Blocks
- ii) I/O Blocks

b) Differentiate between CPLD and FPGAs? **[7]**

c) List the basic types of programmable logic devices. **[6]**

OR

Q2) a) With neat schematic explain the architectural building block of FPGA. **[7]**

b) Describe in brief types of FPGA technologies. **[7]**

c) Explain macrocell with neat diagram. **[6]**

Q3) a) Explain different verilog operators with example in detail. **[8]**

b) Find the value of following expressions if the two unsigned variables A=4' B10001 and B=4' B0001 **[8]**

- i) {A&&B}
- ii) (A|B)
- iii) {A,B}
- iv) A<<2

OR

P.T.O.

- Q4)** a) Write down short notes on following: [8]
i) Arrays
ii) variables & Constant declaration.
b) Explain Verilog Modeling styles. [8]

- Q5)** a) Explain procedure syntax with example. [8]
b) What do you understand by a subprogram? What is subprogram overloading? Explain with VHDL example. [8]

OR

- Q6)** a) Write HDL description of a full adder using procedure and task. [8]
b) Explain difference between task and function. [8]
Q7) a) Implement 4 bit synchronous counter using behavioral modeling in verilog HDL. [8]
b) Implement 2:4 decoder using data flow modelling in verilog HDL. [6]
c) Write Verilog code for Half adder in dataflow modeling. [4]

OR

- Q8)** a) Write Verilog code for the following flip flops using behavioral modeling in verilog HDL
i) D Flip Flop
ii) JK Flip Flop [8]
b) Implement 2:1 multiplexer using case statement in verilog HDL. [6]
c) Write Verilog code for full adder in dataflow modeling. [4]



Total No. of Questions : 8]

SEAT No. :

PA-1478

[Total No. of Pages : 2

[5926]-96

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS AND APPLICATIONS

(2019 Pattern) (Semester - II) (304213)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) What is the function of Pin Connect Block of LPC 2148? Explain the function of PINSEL0 and PINSEL1 registers. [6]
- b) Draw pin diagram of 16×2 LCD. Explain the functions of the pins. [6]
- c) Draw architecture of LPC2148 processor. Explain the functions of each block in brief. [8]

OR

- Q2)** a) What are steps in PLL programming of LPC2148 processor? Explain need of VPB divider with suitable diagram. [6]
- b) Interface LED's to P0.0 to P0.7 port pins of LPC2148. Write an embedded C program to blink LED's. Also write algorithm. [6]
- c) Explain working of soil moisture sensor. Interface soil moisture sensor with of LPC2148 processor. Write an Embedded C program using analog output A0 of soil moisture sensor. [8]

- Q3)** a) Explain ADCR (A/D Control Register), ADDR (A/D Data Register), ADGDR (A/D Global data register) and ADGSR (A/D Global start register) of ADC LPC 2148. [8]
- b) Draw architecture of UART0 of LPC 2148 and explain the functions of each block in brief. Give the difference between UART0 and UART1. [8]

OR

P.T.O.

- Q4)** a) Write embedded C program and draw flow chart to generate triangular and square wave using on chip DAC LPC 2148. [8]
- b) Interface GSM module with LPC2148. Explain any four AT commands. Write an algorithm and draw flow chart for sending the message through GSM module. [8]

- Q5)** a) List the features of CORTEX M3 Processor. Explain operating modes of the ARM Cortex-M3 processor. [8]
- b) Compare ARM classical series and ARM Cortex series. State advantages of ARM Cortex series for embedded system design. [8]

OR

- Q6)** a) Draw interfacing of CORTEX based controllers using CMSIS standard. Draw and explain the structure of CMSIS standard. [8]
- b) State the features and applications of ARM Cortex A, Cortex R, Cortex M Series processors. Give difference between ARM Cortex R and Cortex M Series. [8]

- Q7)** a) Explain case study of Waste Management for Smart City using IoT with detailed diagram. [6]
- b) Explain Sensors and Actuators with suitable examples. Give difference between Sensors and Actuators. [6]
- c) Draw architecture of Internet of Things. Explain functions of different layer. [6]

OR

- Q8)** a) Define Embedded System. Explain the characteristics of Embedded System. [6]
- b) Draw and explain the block diagram of Embedded system with of IoT. [6]
- c) Explain case study of Smart energy meter using IoT with detailed diagram. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1479

[Total No. of Pages : 2

[5926]-97

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester - II) (304214)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Illustrate types of quality - quality of design, conformance and performance, phases of quality management. [8]

b) Write a short note on Quality Management Assistance Tools. [9]

OR

Q2) a) Discuss in details - The ISO - Quality Management System Standard. [8]

b) Elaborate Six sigma Quality Management Standards. [9]

Q3) a) Elaborate Social Audit in details. [9]

b) Illustrate Social Responsibility of Business in details. [9]

OR

Q4) a) Write a short note on Services sector. [9]

b) Differentiate between Private sector and Cooperative sector in details. [9]

Q5) a) Elaborate Social Audit in details. [8]

b) What do you mean by Changing Concepts and Objectives of Business? [9]

OR

P.T.O.

- Q6)** a) Differentiate between Sole Proprietorship and Partnership firms in details. [8]
b) Illustrate Joint stock companies - their features, relative merits, demerits & suitability. [9]

- Q7)** a) Explain Business plan in details. [9]
b) What are Government policies and incentives for a Business? [9]

OR

- Q8)** a) Explain Concept of entrepreneurship, Identification of business opportunities in details. [9]
b) Illustrate Preparation of business proposal with suitable example. [9]

Total No. of Questions : 8]

SEAT No. :

PA-1480

[Total No. of Pages : 2

[5926]-98

T.E. (Electronics)

PLC & AUTOMATION

(2019 Course) (Semester - II) (Elective - II) (304215 - A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) a)** Explain the Principle of Operation of PLC and list its advantages and disadvantages? [7]
- b) Draw a ladder diagram for AND, OR, XOR, NAND gate? [7]
- c) List and explain in details data handling Instructions? [6]

OR

- Q2) a)** Compare PLC vs Computers on basis of their characteristics? [7]
- b) Draw the block diagram of Processor memory organization? [6]
- c) Design ladder logic for a system using comparisons instructions,
Motor 1 starts as soon as the PLC starts as soon as PLC starts. After 10 seconds, Motor 1 goes OFF and Motor 2 starts. After 5 seconds Motor 2 goes OFF and Motor 3 Starts. After another 10 seconds Motor 2 restarts and after 5 seconds it stops and Motor 1 starts and cycle is repeated? [7]

- Q3) a)** List the parameters need be check while PLC installation? Write in your own words how do you protect PLC from Electrical noise and Voltage variation and Surge? [6]
- b) What do you mean by Program Editing and Commissioning of PLC? List general steps followed when commissioning a PLC system? [6]
- c) Explain in details Grounding of PLC systems in industrial aspect? [4]

OR

- Q4) a)** Extend your view on Troubleshooting of a PLC system for following sections, [6]
- i) Processor module,
 - ii) Input and Output malfunctions

P.T.O.

- b) Which are the preventive maintenance tasks should be carried for PLC systems? [6]
- c) Which are circuit protections are used in PLC explain any one in details. [4]

- Q5)** a) Explain with block diagram SCADA system. [7]
- b) What is RTU? Explain its functions? [7]
 - c) Discuss PID Control sytem in brief? [4]

OR

- Q6)** a) What is HMI? Explain Interfacing technique of PLC with HMI. [7]
- b) Illustrate MTU operating interfaces & applications? [7]
 - c) What is structure of control systems? [4]

- Q7)** a) List the Types of communication interface? Explain Serial communication with its advantages? [6]
- b) Explain working of Modbus and Fieldbus? [6]
 - c) Which Types of networking channels used in PLC? Discuss any one in brief? [4]

OR

- Q8)** a) What is CAN? Explain working principle of it in detail? [6]
- b) List Advantages of standard industrial network? [6]
 - c) Write the characteristics of Profibus-DP? [4]

