Total No. of Questions : 12]

SEAT No. :

P4148

[Total No. of Pages : 3

# [5460]-1

# T.E. (Mechanical Engg./Auto Mobile) (Semester - I)

# INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***

## SECTION - I

***Q1)*** a) Briefly discuss various leadership styles adopted in industry. **[8]**

b) Briefly discuss various motivation methods adopted in industry. **[8]**

OR

***Q2)*** a) Explain the role of material handling principles in improving the productivity of a firm. **[8]**

b) Discuss types of plant layout and explain combination layout in detail. **[8]**

***Q3)*** a) Explain the term industrial engineering and method study procedure. **[8]**

b) Discuss the SIMO in industrial engineering. **[4]**

c) What are Therbligs? Give any six Therbligs with symbols. **[4]**

OR

***Q4)*** a) Define work measurement. Explain the procedure for work measurement. **[8]**

b) Explain productivity improvement methods for organization. **[4]**

***P.T.O.***

c) Following are the element times of a turning operation. The corresponding rating and relaxation allowances are given in tabular record as under: **[4]**

| Element | Observed time (min.) | Performance rating | Relaxation |
|---|---|---|---|
| l. Locate the tool | 0.15 | 80 | 13% |
| 2. Start Machine | 0.05 | 85 | 13% |
| 3. Adjust tool centre | 0.55 | 90 | 10% |
| 4. Carry out turning operation | 1.00 | 95 | 12% |
| 5) Return the tool | 0.10 | 90 | 13% |

Assuming contingency allowance of 3% of normal time.

***Q5)*** a) A manufacturing company requires 3600 units per year. Ordering cost is Rs. 80 per order and carrying cost is Rs 1.2/unit/annum. Purchase price per unit is Rs. 35. Determine: **[6]**

i) EOQ,

ii) Optimum number of orders,

iii) Average annual inventory cost,

iv) Optimum period of supply/order.

b) What do you understand by Break-even analysis? Explain. **[6]**

c) Explain VED and ABC Analysis. **[6]**

OR

***Q6)*** Write notes on (Any Three) **[18]**

a) PMTS, b) Two handed process chart

c) Element of Cost d) Importance & Types of merit rating.

## SECTION - II

***Q7)*** a) Explain 'Technology Management' and its significance. **[8]**

b) Discuss the various important steps in product development. **[8]**

OR

***Q8)*** a) Differentiate between 'Product Technology' and 'Process Technology'. **[5]**

b) Write a short note on Forms of Technology. **[5]**

c) Explain the role of Government in the development of Technology. **[6]**

***Q9)*** a) What do you mean by Technological Forecasting? Explain various techniques used in Technology Forecasting. **[8]**

b) Explain the following in brief : **[8]**

i) Technological Leadership

ii) Mission flow diagram

OR

***Q10)*** a) Explain in brief the following. **[8]**

i) Growth cures.

ii) Technology Monitoring

b) What do you mean by Technology diffusion. **[8]**

***Q11)*** a) Explain the steps involved in formulating technology planning. **[6]**

b) Explain the various key principles for developing technology strategy. **[6]**

c) Explain the concept of Technology transfer and its categories. **[6]**

OR

***Q12)*** Write short notes on the following: (any three) : **[18]**

a) Technology assessment,

b) S-Shaped curve of Technology Adoption,

c) Status of IPR Activities in India.

d) Foreign Direct Investment (FDI)

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4360

[Total No. of Pages : 2

# [5460]-4
# T.E. (Computer Engineering) (Semester - I)
# DATA COMMUNICATIONS
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

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

## SECTION - I

***Q1)*** a) Explain difference in Bit rate and baud rate. **[4]**

b) Differentiate between analog and digital signals. Explain any two analog modulation techniques. **[8]**

c) Explain anyone multiplexing techniques. **[6]**

OR

***Q2)*** a) Explain statistical TDM with diagram. What are issues in TDM? **[10]**

b) Explain FSK, PSK and ASK technique. **[8]**

***Q3)*** a) Explain different analog modulation techniques. **[8]**

b) Explain pulse code modulation technique **[8]**

OR

***Q4)*** a) Explain with block diagram PCM Encoder and decoder. **[8]**

b) Explain effect of Gaussian noise on digital transmission. **[8]**

***Q5)*** a) Explain Huffman Code with example. **[8]**

b) Explain ARQ - Stop and Wait protocol. **[8]**

OR

***P.T.O.***

*Q6)* a) Explain following terms related to codes : **[8]**

i) Code word

ii) Code rate

iii) Code efficiency

iv) Hamming distance

b) Write short note on linear block codes. **[8]**

## SECTION - II

*Q7)* a) Explain architecture of Bluetooth protocol. **[8]**

b) Comment on the TCP/IP protocol stack? How it is different than OSI seven layer model. **[10]**

OR

*Q8)* a) Write short note on SONET. **[8]**

b) Explain in detail seven layers ISO-OSI reference model. **[10]**

*Q9)* a) Comparison of optical fiber with coaxial and twisted pair cable. **[8]**

b) Define bridges and explain with neat diagram different types of bridges. **[8]**

OR

*Q10)*a) Explain packet switching network. **[8]**

b) What is static and dynamic channel allocation? **[8]**

*Q11)*a) Write a short note on CSMA. **[8]**

b) Explain stop and wait protocol. **[8]**

OR

*Q12)*a) Write short note on one bit siding window protocol. **[8]**

b) Write a short note on CSMA. **[8]**

Total No. of Questions : 12]

SEAT No. :

P4149

[Total No. of Pages : 3

# [5460]-5

# T.E. (Computer)

# MICROPROCESSORS AND MICROCONTROLLERS

# (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer Question No. 1 OR 2, 3 OR 4 and 5 OR 6 from Section I and Q. No. 7 OR 8,9 OR 10 and 11 OR 12 from Section II.***
2) ***Answers to the two Sections should be written in separate answer books.***
3) ***Neat diagram must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

## SECTION - I

***Q1)*** a) Explain following pins of the Pentium. **[4]**

i) ADS# ii) D/C#

b) With the help of neat diagram explain architecture of the Pentium processor. **[8]**

c) Explain Floating Point Unit of the Pentium? **[6]**

OR

***Q2)*** a) Describe on-chip cache organization. **[6]**

b) What is the function of Prefetch buffer and Branch target buffer in the Pentium processor? **[6]**

c) What is branch prediction in the Pentium? Explain with diagram. **[6]**

***Q3)*** a) How pipelined bus cycles are different than non-pipelined bus cycles? Explain with timing diagram. **[8]**

b) What is the purpose of control registers? Explain significance of CRO in working of cache and paging unit. **[8]**

OR

***P.T.O.***

*Q4)* a) With the help of neat diagram, explain non-pipelined read bus cycle of the Pentium. **[8]**

b) Describe various addressing modes of the Pentium with suitable examples. **[8]**

*Q5)* a) What are the privilege checks performed by the Pentium when FAR JMP or FAR CALL instruction is executed? Under what circumstances privilege level is changed by the Pentium? Explain with the help of diagram. **[8]**

b) Explain rules designed to protect data or code of the Pentium. **[8]**

OR

*Q6)* a) How logical address is translated to physical address in the Pentium. Draw the required data structures. **[8]**

b) How pages can be protected in the Pentium? Give details. **[8]**

## SECTION - II

*Q7)* a) What is multitasking? Explain registers & descriptors involved to support this feature in the Pentium. **[8]**

b) What is difference between interrupt, Fault Trap and Abort? **[6]**

c) Explain nested task in the Pentium. **[4]**

OR

*Q8)* a) How interrupts are handled in protected mode? Explain with the help of neat diagram. **[8]**

b) What is I/O permission bit map? When it is referred? **[6]**

c) Differentiate between real mode and virtual mode of the Pentium. **[4]**

*Q9)* a) Explain addressing modes of 8051 microcontroller. Explain with suitable example. **[6]**

b) Explain following 8051 instructions **[6]**

i) POP ii) ANL iii) MUL AB

c) What is the function of EA# and PSEN# **[4]**

OR

***Q10)*** a) Explain the features of 8051 Microcontroller. **[6]**

b) Draw and explain Program Status Word of 8051 microcontroller. **[6]**

c) Explain following 8051 instructions : **[4]**

i) MOVC ii) MOVX

***Q11)*** a) Describe different timer modes of 8051 Microcontroller. **[8]**

b) What are the different sources of interrupts in 8051? Explain interrupt handling mechanism in 8051. **[8]**

OR

***Q12)*** a) Explain features and architecture of 8096 microcontroller. **[8]**

b) Describe serial port on 8051 with the help of SCON. **[8]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4361

[Total No. of Pages : 2

# [5460]-6
# T.E. (Computer Engineering)
# DIGITAL SIGNAL PROCESSING
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in separate answer books.***
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.***

## SECTION - I

***Q1)*** Explain any four properties of discrete time system with suitable example. **[16]**

OR

***Q2)*** a) Define a different standard discrete time signals and prove that $\delta(n) = u(n) - u(n-1)$. **[8]**

b) Explain the A to D conversion process as sampling, quantization and encoding. **[8]**

***Q3)*** a) Compare : **[8]**

i) DFT and DTFT

ii) Linear convolution and circular convolution

b) Obtain Fourier transform of : **[10]**

i) $x(n) = a^n u(n)$

ii) $x(n) = a^{-n} u(-n-1)$

OR

***Q4)*** a) Explain how N-point DFT and IDFT can be obtained by means of linear transformation matrix. **[8]**

b) Perform the circular convolution of following two sequences (Use IDFT method) **[10]**

$x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{2, 1, 1, 2\}$

***P.T.O.***

***Q5)*** a) What is meant by radix-2 FFT? How many multiplications and additions are required to compute N-point DFT using radix-2 FFT? Draw the 4-point radix-2 DIT FFT butterfly structure for DFT. **[8]**

b) State and prove linearity property of z-transform. **[8]**

OR

***Q6)*** a) State and prove convolution property of Z-transform. **[8]**

b) Find z-transform of : **[8]**

i) $x(n) = a^n u(n)$

ii) $x(n) = a^n u(n-1)$

## SECTION - II

***Q7)*** a) Find the response of system characterized by impulse response $h(n) = (½)^n u(n)$ to input signal $x(n) = u(-n)$. **[8]**

b) Determine impulse response for a causal system $y(n) - y(n-1) = x(n) + x(n-1)$ **[8]**

OR

***Q8)*** a) Determine impulse response of $y(n) = 2x(n) - x(n-1) - 3y(n-1) - 2y(n-2)$. **[8]**

b) Explain the simple geometric construction method to obtain the phase and frequency response of the system. **[8]**

***Q9)*** a) Compare impulse invariance method with bilinear transformation method. Explain the concept of frequency warping and prewarping. **[10]**

b) Design the digital high pass filter for cutoff frequency of 30 Hz and sampling frequency of 150 Hz using BLT method. **[8]**

OR

***Q10)***a) Explain the impulse invariance method for the design of IIR filters. What are the problems associated with this method. **[10]**

b) What is Gibbs phenomenon? How FIR filter is design using windowing method? **[8]**

***Q11)***a) Explain cascade form structure of FIR filter and obtain realization of **[10]**

$$H(z) = (1 + \frac{1}{4}z^{-1} + z^{-2})(1 + \frac{1}{8}z^{-1} + z^{-2}).$$

b) Compare DSP processor with general purpose microprocessor. **[6]**

OR

***Q12)***a) Explain the significance of barrel shifter, MAC, ALU and DAG. **[12]**

b) Obtain linear phase FIR filter of $H(z) = 1 + \frac{1}{2}[z + z^{-1}]$. **[4]**

♣ ♣ ♣

Total No. of Questions : 12]

SEAT No. :

P4150

[Total No. of Pages : 3

# [5460]-7
# T.E. (Computer Engg.)
# PRINCIPLES OF PROGRAMMING LANGUAGES
## (2008 Pattern) (Semester - II)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in sepatate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary.***



## SECTION - I

***Q1)*** a) What are characteristics of good programming language? **[8]**

b) What are the various programming language paradigms? **[8]**

OR

***Q2)*** a) i) Justify the statement "scope of variable ≠ life time of variables". **[8]**

ii) List & explain in brief different runtime element of program that needs storage at run time.

b) What do you mean by type checking? Explain static and dynamic type checking. **[8]**

***Q3)*** a) What are desirable and undesirable characteristics of procedural programming. **[8]**

b) Define the stages through which a program goes before it is executed. **[4]**

c) Explain user defined data types in PASCAL. **[4]**

OR

***Q4)*** a) Explain the scope rules and nested procedural calls in PASCAL. **[8]**

b) Explain the conditional structure with example in PASCAL. **[8]**

***P.T.O.***

*Q5)* a) Explain inheritance, polymorphism in java. **[8]**

b) What do you mean by checked exceptions? What are pros and cons of it. **[10]**

OR

*Q6)* a) What is Exception and explain how to create user defined exception. **[8]**

b) What is Applet and demonstrate the life cycle of applet with an example. **[10]**

## SECTION - II

*Q7)* a) What do you mean by Garbage Collection? Why it is important? **[4]**

b) Explain exception handling mechanism in C#. **[6]**

c) Describe the structure of C# program. **[6]**

OR

*Q8)* a) Draw and explain various component of .NET framework. **[8]**

b) Explain the inheritance, interface and sealed class in C#. **[8]**

*Q9)* a) What is Logic Programming? Explain applications of logic programming. **[6]**

b) What is cut operator in PROLOG? **[4]**

c) Explain following PROLOG statements : **[6]**

i) fact statement ii) rule statement iii) goal statement

OR

*Q10)* a) With suitable example demonstrate merits and demerits of searching methods used in Logic Programming. **[8]**

b) What are different searching techniques supported by logic programming? **[8]**

***Q11)*** a) Define a LISP functions to determine whether two given lists are equal. **[4]**

b) Define following terms with respect to Functional Programming. **[8]**

i) Ambiguity ii) Reductions

c) What is output of following LISP functions? **[6]**

i) (EXPT 4 3) ii) (RECIP 5)

iii) (> 6 6) iv) (ONE P 1.0)

v) (SETQ X' (1 2 3)).

OR

***Q12)*** a) Explain the any three expression evaluation in LISP. **[6]**

b) Explain in brief functions for reading and writing from files in LISP. **[8]**

c) What are different applications of Functional Programming? **[4]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

**P4151**

[Total No. of Pages : 3

# [5460]-8

## T.E. (Computer Engg.)

## SYSTEM PROGRAMMING & OPERATING SYSTEM

## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary.***

### SECTION - I

***Q1)*** a) Which data structures are required in design of two pass macro processor? Give their formats. **[8]**

b) What is the use of conditional expansion of macro? Which pseudo ops are used to support conditional expansion? Give example. **[8]**

OR

***Q2)*** a) Draw and explain the flow chart of 1 pass Assembler **[8]**

b) What are the language Processing activities? **[8]**

***Q3)*** a) What is loader? What are its basic functions. **[6]**

b) Write a note on MS-DOS linker. **[6]**

c) Explain the difference between .Exe and .DLL file **[4]**

OR

***Q4)*** a) What are the databases required for design of direct Linking Loader? Give their formats **[8]**

b) Draw flowchart for Pass I of two pass direct linking loader. **[8]**

***Q5)*** a) Write short notes on (any 4) **[12]**

i) Distributed OS
ii) Multiprogramming
iii) Real time Scheduling
iv) Library functions
v) System Calls

b) Describe the difference between short time, medium term and long term scheduler? **[6]**

OR

***P.T.O.***

***Q6)*** a) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: **[12]**

| Process | Burst Time | Priority |
|---|---|---|
| P1 | 10 | 3 |
| P2 | 1 | 1 |
| P3 | 2 | 3 |
| P4 | 1 | 4 |
| P5 | 5 | 2 |

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.

b) Define the essential properties of the following operating system. **[6]**

i) Batch

ii) Time Sharing

iii) Real Time

## SECTION - II

***Q7)*** a) What is mutual exclusion'? What are the hardware approaches for Mutual Exclusion. **[10]**

b) Explain deadlock detection algorithm with suitable example. **[8]**

OR

***Q8)*** a) Describe the producer consumer problem and give solution for it. **[10]**

b) Consider the following snapshot of a system: **[8]**

| | Allocation | Max | Available |
|---|---|---|---|
| | ABCD | ABCD | ABCD |
| P0 | 0012 | 0012 | 1520 |
| P1 | 1000 | 1750 | |
| P2 | 1354 | 2356 | |
| P3 | 0632 | 0652 | |
| P4 | 0014 | 0656 | |

Answer the following questions using the banker's algorithm:

a) What is the content of the matrix Need?

b) Is the system in a safe state? If yes give the safe sequence

***Q9)*** a) Write a short note on: Demand paging. **[8]**

b) Explain the following allocation algorithms with example: **[8]**

i) First-fit

ii) Best-fit

iii) Worst-fit

OR

***Q10)***a) Discuss and compare with example various page replacement policies.**[8]**

b) What is the variable partitioning scheme? Differentiate between external and internal fragmentation. **[8]**

***Q11)***a) Write an algorithm for disk scheduling algorithm using "shortest seek time first" **[8]**

b) Write and explain file structure and file attributes. **[8]**

OR

***Q12)***a) What is RAID? Explain different RAID levels **[8]**

b) Why I/O buffering is necessary? state and explain different I/O buffering techniques. **[8]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4152

[Total No. of Pages : 2

# [5460]-9

# T.E. (Computer Engg.)

# FINANCE & MANAGEMENT INFORMATION SYSTEMS

## (2008 Pattern) (Semester - II) (Theory)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data if necessary.***



## SECTION - I

### UNIT - I

***Q1)*** a) Enlist functions of manager & explain? What are responsibilities of manager? **[8]**

b) Define Management .What are different levels of management? Explain in detail. **[8]**

OR

***Q2)*** a) Define term quality? Explain total quality management. **[8]**

b) What is meant by international management? Explain cultural differences in international management. **[8]**

### UNIT - II

***Q3)*** a) What is mean by shares & debentures? Explain different types of shares. **[8]**

b) What is mean by capital? Enlist types of capitals & explain in details. **[8]**

OR

***Q4)*** a) Enlist Financial Statements & explain each with suitable example? **[8]**

b) Define Financial Management. Explain its goals and principles. **[8]**

### UNIT - III

***Q5)*** a) What is DSS (Decision Support System)? Discuss application of DSS. **[8]**

b) Explain following: **[10]**

***P.T.O.***

i) Knowledge Management System.
ii) Business processing reengineering.

OR

*Q6)* a) What is the concept of Management information System? Explain in detail. **[8]**

b) Explain following: **[10]**

i) Knowledge Management System.
ii) Role of Management information system in DSS.

## SECTION - II

## UNIT - IV

*Q7)* a) What is e-commerce? Explain different business model used in ecommerce. **[8]**

b) Explain the mode of payment making in e-commerce with suitable examples. **[8]**

OR

*Q8)* a) Describe the essential process for the successful operation & management of CRM. **[8]**

b) Describe the different tools of security management in e-commerce. **[8]**

## UNIT - V

*Q9)* a) Explain Supply chain management (SCM)? Explain the benefits & challenges of SCM. **[8]**

b) What is Customer Relation Management? How does it support global businesses? **[8]**

OR

*Q10)* a) Describe the architecture of ERP system? Explain the benefits of ERP system. **[8]**

b) Explain cultural, political & geo-economic challenges involved in global IT management. **[8]**

## UNIT - VI

*Q11)* a) Explain the importance of IT Act to stop the cyber-crime in e-business? **[9]**

b) Explain right to information act in detail. Is it beneficial for the society? **[9]**

OR

*Q12)* a) Explain patents, copyright, and trademarks in detail. **[9]**

b) Explain cyber crime and cyber laws in brief. What are the advantages of cyber laws? **[9]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

**P4153**

[Total No. of Pages : 4

# [5460]-10

# T.E. (Electronics)

# FEEDBACK CONTROL SYSTEMS

## (2008 Pattern) (Semester - I)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

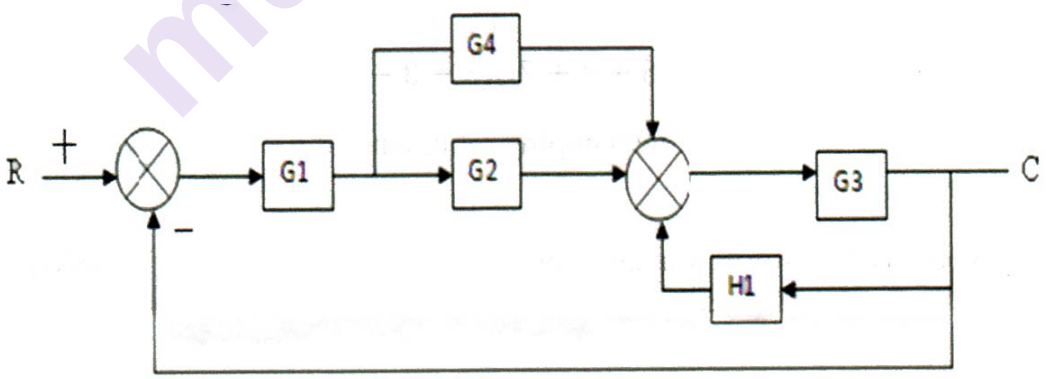
1) ***Answers to the two sections should be written in separate books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume Suitable data, if necessary.***
6) ***Use of logarithmic tables slide rule, electronic pocket calculator is allowed.***



## SECTION - I

***Q1)*** a) Explain linear & non-linear control systems with suitable example of each. **[6]**

b) Reduce the following block diagram into a single equivalent block using block diagram reduction techniques. **[10]**




OR

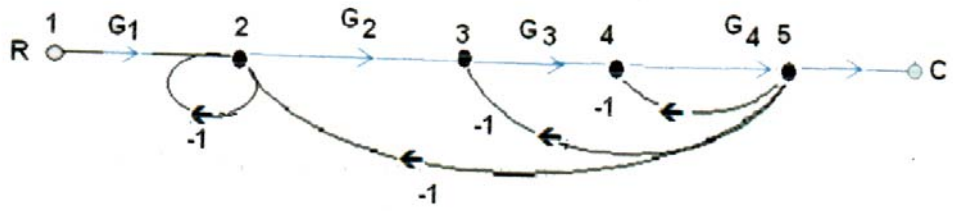
***Q2)*** a) Write short notes on: **[8]**

i) Feedback & feedforward control system

ii) Stepper motor

***P.T.O.***

b) Find transfer function for signal flow graph shown below. **[8]**




***Q3)*** a) State Routh's criteria. A unity feedback control system has $G(S) = \dfrac{K}{S(S+1)(S+2)(S+5)}$ Find the range of k for the stability of the system using Routh's criteria. **[8]**

b) Comment on different test signals used in control system? When are they applied? **[8]**

OR

***Q4)*** a) For the system with transfer function

$$G(S) = \frac{1}{(S+3+7j)(S+3-7j)}$$

Draw the pole zero plot & find the damping ratio, natural frequency, peak time & maximum overshoot. **[8]**

b) Using Routh Hurwitz criterion determine the **[8]**

i) No. of roots in left half of S-plane

ii) No. of roots in right half of S-plane

iii) The stability of the system whose characteristic equation is

$S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$

***Q5)*** a) Explain the following Terms & state their importance. **[6]**

i) Phase Margin ii) Gain Margin

b) A unity feedback control system has a open loop transfer function as

$$G(S) = \frac{10}{S(1+0.5S)(1+0.1S)}$$ **[12]**

Sketch Bode Plot & determine from it

i) Gain crossover frequency ii) Phase crossover frequency

iii) Gain margin iv) Phase margin

OR

*Q6)* a) Write a short note on compensating network. **[6]**

b) Write a short note on Time domain analysis Vs Frequency domain analysis. **[6]**

c) State the advantages of Nyquist plot? **[6]**

## SECTION - II

*Q7)* a) Define the terms **[8]**

i) State ii) State Variables

iii) State Vector iv) State Space

b) Obtain the state transition matrix for system: **[8]**

$$\begin{bmatrix} X1 \\ X2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} X1 \\ X2 \end{bmatrix}$$

OR

*Q8)* a) What are the advantages of state space analysis over conventional control system. **[8]**

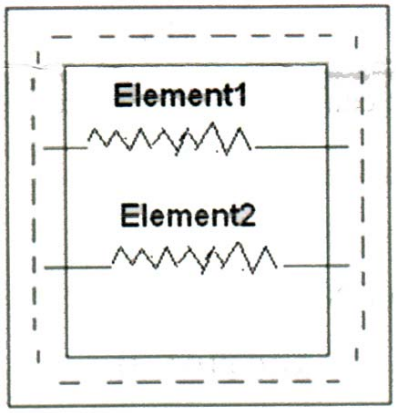
b) Evaluate controllability & observability of the following state model **[8]**

$$A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & -1 \end{bmatrix}$$

*Q9)* a) Draw the diagram of architecture of PLC & explain its working briefly. **[8]**

b) Draw the ladder diagram for the furnace shown in figure. **[10]**

A small electric furnace has two heating elements. When switched on, first element starts & after 2 minutes second starts. A temperature sensor is used to shut down the furnace if overheating occurs.




OR

***Q10)*** a) Explain the integral control mode? State its characteristics. **[8]**

b) What is PLC? Explain scan time of PLC. **[6]**

c) State Controller equations for the P, P + I, P + D and PID control actions. **[4]**

***Q11)*** a) What is Fuzzification & Defuzzification. **[8]**

b) What is Fuzzy set & membership function? Explain with suitable example. **[8]**

OR

***Q12)*** a) Explain neural network based controller. **[8]**

b) Explain the following terms w.r.t. neural networks. **[8]**

i) Concept of neural network.

ii) Application of neural network in control system.

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

**P4154**

[Total No. of Pages : 3

# [5460]-11
## T.E. (Electronics)
## MICROCONTROLLERS
## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I.***
2) ***Attempt Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn whenever necessary.***
5) ***Assume suitable data, jf necessary.***

## SECTION - I

***Q1)*** a) Compare Microprocessor and Microcontroller with respect to general architecture and feature **[8]**

b) Show the design of an 8051 based system with 8 Kbyte of Program ROM and 8 Kbyte of data ROM, assume suitable address. **[8]**

OR

***Q2)*** a) Write a program to generate a square wave of frequency 1KHZ on port pin P1.2. Assume that crystal frequency equal to 22MHz **[8]**

b) Compare the Von Newman and Harvard architecture **[8]**

***Q3)*** a) Explain the Timer in mode-2? What are the programming steps for timer in mode- 2?. Assume that XTAL Frequency =11.0592Mz, write a program to generate square wave of 1.83597KHz on port pin P1.0. Use timer one mode-2. Which value is to be loaded in to TH to get smallest frequency? What will be smallest frequency? **[10]**

b) Describe the addressing modes of 8051 microcontroller with example **[8]**

OR

***Q4)*** a) Explain the following instructions with suitable example. **[10]**

i) INC @ Ri
ii) MOVX A,@ DPTR
iii) XCH A@ Ri
iv) CJNE A, direct ,rel
v) ORL A,#data

***P.T.O.***

b) Ten hex numbers are stored in RAM location 50H onwards. Write a program to find the biggest number in the set. the biggest number should finally be saved in 60H. **[8]**

***Q5)*** a) Draw an interfacing diagram for 16 × 2 LCD with 8051 microcontroller and write an assembly language program for displaying 'HELLO' on 1st line. **[8]**

b) Draw an interfacing diagram for 4X4 Keyboard with 8051 microcontroller. With the help of flowchart explain how the scanning of Key is performed by microcontroller? **[8]**

OR

***Q6)*** a) Draw and explain working principle of stepper motor. **[8]**

b) Draw an interfacing diagram for interfacing ADC 0804 with 8051 microcontroller and state the features of ADC0804. **[8]**

## SECTION - II

***Q7)*** a) Compare RS485 Vs. RS232.Why MAX232 Chip is required in serial Communication **[8]**

b) Write short note on CAN protocol with suitable diagram **[10]**

OR

***Q8)*** a) Write an ALP to transfer serially 'Maharashtra' continuously with baud rate 9600. Explain how to calculate Baud rate. **[8]**

b) Explain all the conditions of l2C protocol using timing diagram **[10]**

***Q9)*** a) Draw an interfacing diagram of LED with PORT B of PIC l8Fxx and write an embedded C programme for flashing of LED. **[8]**

b) Explain the program and data memory organization in PIC Controller **[8]**

OR

***Q10)***a) Draw and explain architecture of ATMEGA 32 **[10]**

b) Explain the Instruction pipeline in PIC Controller **[6]**

***Q11)*** Design 8051 microcontroller based system for control of ROBOT arm in 90°clockwise direction and 90° anticlockwise directions. The direction of ROBOT arm is control by a key. Stepper motor is having teeth's having a step angle of 1.8°. Find out the number of steps required for rotating 90°. Draw appropriate interfacing circuitry flow chart and write a program to drive the motor through with a delay of.5 sec (500 ms). **[16]**

**OR**

***Q12)*** Draw the Block Diagram of Data Acquisition system and explain in brief various steps involved in designing of data acquisition system. **[16]**

i) selection of sensor
ii) Design of signal conditioning circuit
iii) Selection of ADC
iv) Selection of Microcontroller.

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4362

[Total No. of Pages : 2

# [5460]-12
# T.E. (Electronic Engineering) (Semester - II)
# MICROCOMPUTER BASED SYSTEM
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Attempt Q.1 or Q.2 , Q.3 or Q.4, Q.5 or Q.6 from section - I.***
2) ***Attempt Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

## SECTION - I

***Q1)*** a) Draw and discuss flag register of 8086 in brief with suitable example. **[8]**

b) With suitable figure explain interaction between 8087 coprocessor and 8086 microprocessor. **[8]**

OR

***Q2)*** a) Explain the concept of segmented memory? What are its advantages? Explain the physical address formation in 8086. **[8]**

b) Explain the function of following signals of 8086. **[8]**

i) NMI ii) INTR iii) HOLD iv) HLDA

***Q3)*** a) Write an 8086 microprocessor assembly language program, to find out biggest number among unordered 8-bit numbers array, stored in the location at known address. **[10]**

b) Draw the interrupt vector table. Explain the different conditions which causes the 8086 microprocessor to perform following interrupts : **[8]**

i) Type 0 ii) Type 1 iii) Type 2 iv) Type 3

OR

***Q4)*** a) Design 8086 processor based system in MINIMUM mode with following specifications. **[10]**

i) 32K RAM using 4 chips of 8K each

ii) 16K EPROM using 2 chips of 8K each

Draw the complete interfacing diagram and memory map.

***P.T.O.***

b) Write an 8086 microprocessor assembly language program for arrange the 20 data bytes in the descending order. Assume the starting location is from BFFF0H. **[8]**

***Q5)*** a) Draw and explain the architecture of 80386 processor. **[8]**

b) Draw and explain the structure of descriptors supported by 80386. **[8]**

OR

***Q6)*** a) What do you mean by paging? What are advantages and disadvantages? **[8]**

b) Draw and explain the flag register of 80386 in detail. **[8]**

## SECTION - II

***Q7)*** a) State and explain the features of USB interface? **[10]**

b) Explain the architecture of CRT controller 6845 with the help of block diagram. **[8]**

OR

***Q8)*** a) With the suitable block diagram explain the PCI bus interface to the system. **[10]**

b) Describe different date transfer types supported by USB interface. **[8]**

***Q9)*** a) Explain the Data flow model of ARM processor. **[8]**

b) Explain various branch instructions in ARM processor. **[8]**

OR

***Q10)***a) Describe ARM processor privilege and non-privilege modes. **[8]**

b) With the suitable example explain role of Barrel shifter in ARM. **[8]**

***Q11)***Design and explain ARM7/8086 processor based person counting machine installed at the entrance of a hall. The count is to be display on LCD. **[16]**

a) Draw the complete interfacing diagram

b) Draw the flowchart

c) Explain important design steps

OR

***Q12)***Design ARM7/8086 processor based Humiditymonitoring system with alphanumeric display. **[16]**

a) Design signal conditioning circuit

b) Draw the complete interfacing diagram

c) Draw the flowchart

Total No. of Questions : 12]

SEAT No. :

P4363

[Total No. of Pages : 3

# [5460]-13
# T.E. (Electronics) (Semester - II)
# DRIVES AND CONTROL
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer section - I and section - II in separate answer books.***
2) ***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 or Q.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume Suitable data if necessary.***

## SECTION - I

***Q1)*** a) Draw Torque & Power versus Speed characteristics of a separately excited dc motor and explain below rated an above rated speed control of dc motor. **[8]**

b) A 15 hp, 220V, 200 rpm separately excited dc motor controls a load requiring a torque of 45 Nm at rated speed of 1200 rpm. The field circuit resistance is 147Ω, the armature circuit resistance is 0.25Ω and the voltage constant of a motor is $K_V$ =0.7032V/A rad/s. The field voltage is 220V. The armature current is assumed to be continuous and ripple free. Determine: **[8]**

i) Back emf
ii) Required armature voltage
iii) Rated armature current

OR

***Q2)*** a) Draw and explain the operation of single phase full converter fed dc drive for separately excited dc motor. Explain with typical waveforms, the operation in continuous current mode. **[8]**

b) Explain with circuit diagram the operation of single phase dual converter fed drive for a separately excited dc motor. **[8]**

***Q3)*** a) What is the need of braking? Explain in detail dynamic and regenerative braking for dc machines. **[8]**

b) With the help of block schematic and transfer function explain the open loop control of dc motor drive. **[10]**

OR

***P.T.O.***

***Q4)*** a) Compare chopper fed and converter fed drives. **[6]**

b) What are the advantages of Microprocessor based drives? With the help a neat block diagram, explain the operation of Microcontroller based dc drive. **[6]**

c) Explain in brief with block diagram PLL based speed control of a dc motro. State the advantages of this control. **[6]**

***Q5)*** a) With the help of diagram explain the working of three phase CSI fed three phase induction motor drive. **[8]**

b) What is the need of Vector Control? With the help of block schematic explain the working principle of Vector control used in three phase induction motor drive. **[8]**

OR

***Q6)*** a) Explain the operation of Cycloconverter fed three phase induction motor drive. State the limitations of this scheme. **[8]**

b) Explain the operation of various protection circuits used for three phase induction motro drive. **[8]**

## SECTION - II

***Q7)*** a) With the help of block schematic explain Scalar control of a three phase induction motor drive. **[8]**

b) Draw and explain briefly the torque speed characteristics of synchronous reluctance motor at constant voltage and frequency. **[8]**

OR

***Q8)*** a) Draw and explain the operation of a self controlled synchronous motor fed from a three phase inverter. **[8]**

b) Explain the operation of a cylindrical rotor motor drive. **[8]**

***Q9)*** a) Explain the operation of switched reluctance motor drive. Also list the advantages of SRM that have sparked interest in its use as adjustable speed drive. **[10]**

b) With the help of neat block schematic explain the operation of a three phase BLDC motor drive. **[8]**

OR

***Q10)*** Write Short notes on : **[18]**

a) Stepper motor drives

b) Three phase Permanent magnet synchronous motor drive

c) Difference between variable reluctance & permanent magnet stepper motor.

***Q11)*** a) Enlist different applications of neural network in drives and control. Explaint the operation of Fuzzy logic based three induction motor drive. **[8]**

b) Explain the operation of vector controlled induction motor drive with neural network based estimator. **[8]**

OR

***Q12)*** a) What is Neuro fuzzy system? Explain Adaptive network based Fuzzy Interface System. **[8]**

b) Explain the operation of neural network based PWM controller. **[8]**

Total No. of Questions : 12]

SEAT No. :

P4155

[Total No. of Pages : 2

# [5460]-14
# T.E. (Electronics)
# SENSORS AND INTERFACES
## (2008 Pattern) (Semester - II)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in sepatate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary.***



## SECTION - I

***Q1)*** a) Explain principle of flow measurement. Describe Pitot tube used for flow measurement. **[8]**

b) Explain various types of Optical proximity sensors. **[8]**

OR

***Q2)*** a) Explain with neat diagram working of a combination type PH Electrode. **[8]**

b) Explain selection criterion for choosing a sensor. **[8]**

***Q3)*** a) Explain the use of Wheatstone bridge along with instrumentation amplifiers as a signal conditioning circuit. **[8]**

b) Explain any one technique for level and humidity measurement. **[8]**

OR

***Q4)*** a) Explain with neat diagram I/P convertor and P/I converter. **[8]**

b) Write a short note on SMART transmitter. **[8]**

***Q5)*** a) What are the different types of ADCs? Explain any one of them. Write a note on specifications of ADC. **[9]**

b) Describe working of R-2R ladder type DAC. How it is advantageous over Weighted register DAC. **[9]**

***P.T.O.***

OR

***Q6)*** a) Describe working of a typical flash ADC for n bit operation. **[10]**

b) Enlist different types of DAC and explain any one type of DAC with specifications. **[8]**

## SECTION - II

***Q7)*** a) Explain the block diagram of data logger and make comparison between DAS and data logger. **[8]**

b) Write short note on: **[10]**

i) IEEE 488 bus standard

ii) 12C protocol.

OR

***Q8)*** a) Write short note on Foundation Field-bus. **[8]**

b) Explain multichannel DAS and enlist its objectives and applications. **[10]**

***Q9)*** a) Explain with neat diagram Pressure control valves. **[8]**

b) Explain with neat diagram working of: **[8]**

i) Spool valve ii) Poppet valve

OR

***Q10)*** a) Explain principle of operation of DC motor. State various types of DC motors. **[8]**

b) Explain lift system to move the load up and down using Pneumatic actuators. **[8]**

***Q11)*** a) With block diagram explain PLC architecture. **[8]**

b) Explain the PLC operating cycle. **[8]**

OR

***Q12)*** a) Explain current source and current sink configuration of input and output channel. **[8]**

b) With suitable assumption draw the block diagram of a bottle filling plant and develop a PLC ladder diagram for the automatic operation of bottle filling plant. **[8]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4364

[Total No. of Pages : 4

# [5460]-15
# T.E. (E & TC)
# NETWORK SYNTHESIS AND FILTER DESIGN
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in separate books.***
2) ***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 or Q.12.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume Suitable data if necessary.***

## SECTION - I

***Q1)*** a) List the properties of positive real function. **[6]**

b) Determine whether the polynomials F(s) are Hurwitz **[8]**

i) $F(s)=s^4+s^3+5s^2+3s+4$

ii) $F(s)=s^4+s^3+2s^2+3s+2$

c) For a two port network, define all the transfer functions. **[4]**

OR

***Q2)*** a) Explain the significance of poles and zeros in network synthesis. Also discuss effect of poles and zeros on response. **[6]**

b) Determine whether the following function is positive real function **[4]**

$$Z(S)=\frac{s^2+1}{s^3+4s}$$

c) For the network shown in Fig. 1, find current transfer ratio $\alpha_{12}(s)$ and transfer impedance $Z_{21}(s)$. **[8]**

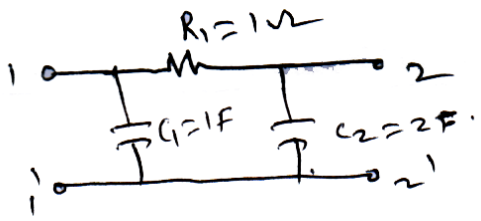



Fig. 1

***P.T.O.***

***Q3)*** a) Synthesize the following one port network function in both foster forms **[8]**

$$Z(S)=\frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$$

b) Synthesize the following one port network function in both Cauer forms **[8]**

$$Z(S)=\frac{3(s+2)(s+4)}{s(s+3)}$$

OR

***Q4)*** a) List properties of one port RC driving point impedance function. **[6]**

b) Indicate with reasons which of the following driving point functions are RC, LC or RL. Out of that realize only RL function in first foster and first Cauer forms. **[10]**

i) $Z(S)=\frac{s^3+2.6s}{s^4+4s^2+3}$

ii) $Y(S)=\frac{s^2+2.5s}{s^2+5s+6}$

iii) $Y(S)=\frac{2(s+1)(s+3)}{(s+2)(s+6)}$

***Q5)*** a) Define constant resistance network. For a constant resistance Lattice or Bridge T network prove that $Z_aZ_b=R^2$ **[8]**

b) Synthesize $Z_{21}(S)=\frac{s^3}{s^3+3s^2+4s+2}$

as a LC ladder with 1 Ω termination. **[8]**

OR

***Q6)*** a) Synthesize the all pass function. **[6]**

$\frac{V_o}{V_{in}}=\frac{s^2-2s+2}{s^2+2s+2}$ as a lattice network terminated into 1Ω.

b) Synthesize voltage ratio

$$\frac{V_2}{V_1}=\frac{s+2}{s+3}$$

as a constant resistance bridge T network terminated by 1Ω. **[6]**

c) Identify the zeroes of transmission for the network in Fig.2. **[4]**

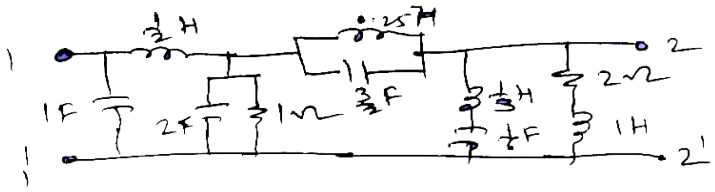



Fig. 2

## SECTION - II

***Q7)*** a) Explain the need and concept of magnitude and frequency normalization in context with filter designing. **[6]**

b) Realize a third order Butterworth low pass filter transfer impedance terminated in load of 500 Ω with a cut off frequency of $10^4$ rad/sec. Also convert it into high pass of same specifications. **[12]**

OR

***Q8)*** a) Compare Butterworth and Chebyshev approximation. **[6]**

b) Design a Chebyshev approximated low pass filter with not more than 1 dB ripple in pass band and 20 dB attenuation at 2 rad/sec. **[12]**

***Q9)*** a) What are different biquad feedback topologies used in active filter design. **[8]**

b) Synthesize a 2nd order high pass filter having cut off frequency 1kHz using the Sallen and Key circuit based on positive feedback. **[8]**

OR

***Q10)***a) What is cascade approach in active filter synthesis? Explain in detail and list its advantages. **[8]**

b) Design a second order Butterworth low pass active filter having upper cut off frequency 1kHz. **[8]**

***Q11)***a) Define sensitivity and its significance. Derive the property of sensitivity,

$$S_x^{y_1+y_2} = \frac{y_1 S_x^{y_1} + y_2 S_x^{y_2}}{y_1 + y_2}.$$ **[8]**

b) Find the transfer function ($V_2/I_1$) of a passive network shown in Fig.3. Also compute the sensitivities of K, $\omega_p$ and $Q_p$ with respect to elements. **[8]**

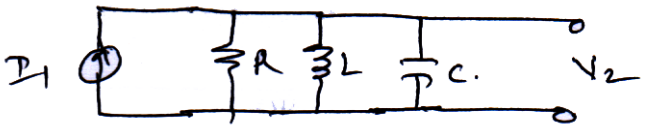



Fig. 3

OR

***Q12)***a) Describe the properties of op-amp such as dynamic range, slew rate, offset voltage, input bias and input offset currents and common mode signal in contest of filter design. **[8]**

b) Derive the sensitivity properties : **[8]**

i) $S_x^{y^n} = nS_x^y$

ii) $S_{x^n}^{y} = \frac{1}{n} S_x^y$

iii) $S_x^y = S_p^y S_x^p$

iv) $S_x^{pq} = S_x^p + S_x^q$

Total No. of Questions : 12]

SEAT No. :

P4156

[Total No. of Pages : 4

# [5460]-16

# T.E. (Electronics & Telecommunication Engg.)

# CONTROL SYSTEMS

# (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer three questions from Section - I and three questions from Section -II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data, if necessary.***
6) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***

## SECTION - I

***Q1)*** a) Explain the block diagram reduction rules. **[8]**

b) Determine the transfer function Y(s)/R(s) of the system shown in figure No.1 **[8]**

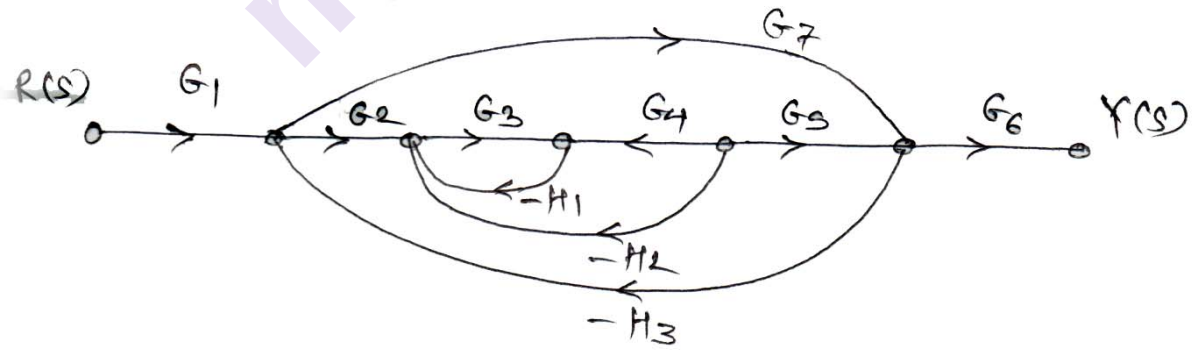



Figure No. - 1

OR

***Q2)*** a) Obtain force to voltage and force to current analogies between mechanical and electrical systems. **[8]**

***P.T.O.***

b) Determine the transfer function Y(s)/R(s) of the system shown in figure No. 2. **[8]**

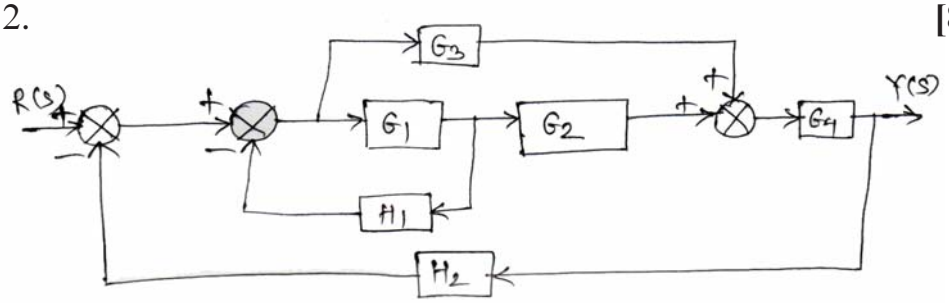



Figure No. - 2

***Q3)*** a) For the system with closed loop transfer function $G(s) = \dfrac{25}{s^2 + 8s + 25}$ determine $\zeta$, $w_n$, $w_d$, $t_d$, $t_r$, $t_p$, $m_p$, and $t_s$. **[8]**

b) For the system with open loop transfer function

$$G(s) = \frac{k}{s(s+4)(s^2+6s+10)}$$, determine range of k for stability, value of k at marginal stability and frequency of oscillations at marginal stability. **[8]**

OR

***Q4)*** a) For the system with $G(s) = \dfrac{50}{s(s+4)(s+6)(s+10)}$, H(S) = 1 determine static error constants and steady state error for ramp input. **[4]**

b) Sketch root locus of system with open loop transfer function

$$G(s) = \frac{k}{s(s+4)(s+6)}.$$ **[12]**

***Q5)*** a) Explain the correlation between time and frequency domain specifications. **[6]**

b) Sketch Bode plot of unity feedback system with open loop transfer function $G(s) = \dfrac{100}{s(s+2)(s+5)}$. Determine $w_{gc}$, $w_{pc}$, gain margin, phase margin and investigate the stability. **[12]**

OR

***Q6)*** a) Explain Nyquist stability theorem. **[6]**

b) Sketch Nyquist plot of unity feedback system with open loop transfer function $G(s) = \dfrac{20}{(s+1)(s+2)(s+5)}$.

Determine $w_{pc}$, Gain margin and comment on stability. **[12]**

## SECTION - II

***Q7)*** a) Determine the controllable canonical and observable canonical state model of the system with transfer function $G(s) = \dfrac{4s^2 + 9s + 10}{s^3 + 5s^2 + 9s + 4}$. **[8]**

b) Investigate for complete state controllability and state obsenability if state space model matrices are

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & -12 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \qquad \textbf{[8]}$$

OR

***Q8)*** a) Determine state transition matrix of $A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}$ **[8]**

b) State and derive properties of state transition matrix. **[8]**

***Q9)*** a) Sketch step and ramp response of P, PI and PID controllers. **[8]**

b) Describe architecture of PLC. **[8]**

OR

***Q10)*** a) Write a short note on PID controller. **[8]**

b) Explain PI and PD controllers with the help of their equation, transfer function and block diagram. **[8]**

***Q11)*** Write short notes on :

a) Self tuning regulator. **[9]**

b) Digital control **[9]**

OR

***Q12)*** Write short notes on :

a) Distributed control system. **[9]**

b) SCADA **[9]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4396

[Total No. of Pages : 3

# [5460]-17

# T.E. (E & TC) (Semester - II)

# COMPUTER ORGANISATION AND ARCHITECTURE

## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two Sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks..***
4) ***Assume suitable data, if necessary.***
5) ***Solve Q.1 or 2, Q.3 or 4, Q.5 or Q.6 from Section I and Q.7 or 8, Q.9 or Q.10, Q.11 or 12 from Section II.***



## SECTION - I

***Q1)*** a) Compare Von-Neumann and Harvard architecture. **[6]**

b) Perform (4) × (–5) using Booth's multiplication algorithm. **[12]**

OR

***Q2)*** a) With the help of flow chart explain floating point division operation. **[8]**

b) Describe different IEEE standards for representing floating point numbers. Represent the following in single precision format: **[10]**

i) (10.25)

ii) (–32)

iii) (18)

***Q3)*** a) Draw and explain organization of single bus CPU with control signals. **[8]**

b) What are advantages and disadvantages of Hardwired and micro-programmed control? **[8]**

OR

***P.T.O.***

***Q4)*** a) Write control sequence of Instruction SUB R3,R1 using single bus organization. **[8]**

b) Using input output gating for the registers in single bus organization explain operation of **[8]**

i) Fetching a word from memory

ii) Storing a word in memory

***Q5)*** a) Write short note on cache memory. **[8]**

b) What are the different methods of handling multiple I/O devices by CPU? **[8]**

OR

***Q6)*** a) Explain interface between keyboard and processor. Also explain communication between them. **[8]**

b) Explain the concept of virtual memory. How virtual address is translated to physical address? **[8]**

## SECTION - II

***Q7)*** a) With neat diagram explain the architecture of 8086 processor. **[10]**

b) Explain following instructions: **[8]**

i) MOV AL,[BX]

ii) MOV DL, [1202H]

iii) MOV CX,BX

iv) MOV DL,03H

OR

***Q8)*** a) Explain the minimum and maximum modes of operation in 8086 and pins associated With it. **[10]**

b) Explain any four assembler directives. **[8]**

***Q9)*** a) Explain architecture of 80386 with the help of neat diagram. **[8]**

b) State different types of descriptors and explain in detail segment descriptor. **[8]**

OR

***Q10)***a) What is paging? How 32 bit physical address is generated in 80386 with paging enabled? **[10]**

b) Explain task switching in 80386. **[6]**

***Q11)***a) Compare RISC and CISC architectures. **[8]**

b) Explain role of Barrel shifter in ARM core data flow model. **[8]**

OR

***Q12)***a) Write short note on (any two) : **[8]**

i) Instruction pipelining

ii) Superscalar processor

iii) Tightly couples and loosely coupled Multiprocessor

b) Give classification of various computer architecture for Flynn's classification. **[8]**

Total No. of Questions : 12]

SEAT No. :

P4157

[Total No. of Pages : 3

# [5460]-18
# T.E. (Information Technology)
# PROGRAMMING PARADIGMS
# (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer questions 1 or 2, 3 or 4, and 5 or 6 from section-I and question 7 or 8, 9 or 10, and 11 or 12 from section-II.***
2) ***Answers to the two sections should be written in separate answer book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume Suitable data if necessary.***

## SECTION - I

***Q1)*** a) Why there is a need to study programming language explain with **[8]**

i) Choice of PL

ii) Use of existing PL

iii) Design a new language

b) What are characteristic of good programming language. **[8]**

OR

***Q2)*** a) i) Explain the any one type of programming paradigms? **[2]**

ii) Explain the concept of data types. Describe specifications of data types. **[6]**

b) Define the term Binding". With suitable example in particular language Explain which bindings are done at. **[8]**

i) Language implementation time

ii) Translation time

iii) Execution time.

***Q3)*** a) Draw a layout of a typical activation record of a Pascal. **[8]**

b) Write a short note on : **[8]**

i) Static scope rule ii) Dynamic scope rule

iii) Lifetime of a variable iv) Scope of a variable

OR

***P.T.O.***

***Q4)*** a) Compare Programming language 'C' and 'Pascal' with respective **[8]**

i) Data types ii) Subprogram declaration

iii) Control structures iv) Pointers

b) Discuss various parameter passing methods with suitable examples. **[8]**

***Q5)*** a) What do you mean by applet and further explain life cycle of applet with proper example. Write difference between **[9]**

i) Applet and Application ii) AWT and SWING

b) Explain difference between $C^{++}$ and JAVA. **[9]**

OR

***Q6)*** a) Why java doesn't support for multiple inheritances? Explain how interfaces plays role for it with suitable example. **[9]**

b) What do you mean by multithreading? Explain the life cycle of threading? How it is achieved in JAVA. **[9]**

## SECTION - II

***Q7)*** a) What is output of following functional compositions? **[9]**

i) (CDR (CDR '(A B C)))

ii) (CAR (CAR '((A B) B C)))

iii) (CDR (CAR '(A B C) D )))

iv) (CONS (CAR '(A B))(CDR '(A B)))

v) (Member 'B '(A C D E))

vi) (CONS 4 (CONS 6 (CONS 8 NIL)))

vii) (LENGTH (A B C D E))

viii) (nth 2 (CDR (A B C D E)))

ix) (CAR(CDDR(A B C D E)))

b) Explain Unification and Backtracking with example in prolog. **[9]**

OR

***Q8)*** a) Change the following sentences into Prolog facts and rules **[9]**

i) Anyone passing the Artificial Intelligence exam and winning the lottery is happy.

ii) But anyone who studies or is lucky can pass all their exams.

iii) Ali did not study but he is lucky.

iv) Anyone who is lucky wins the lottery.

From above facts find out "Is Ali happy?" Use resolution refutation procedure to prove your answer.

b) Define following terms with respect to declarative and functional programming : **[9]**

i) Facts, Rules and Queries

ii) Lambda Calculus

iii) Reduction

***Q9)*** a) Explain the Flynn's classification of computer architectures. **[8]**

b) Explain different synchronization mechanisms of parallel programming language. **[8]**

OR

***Q10)*** a) Explain message passing and shared address space. **[8]**

b) Draw data flow diagram for computation for $X = B^2 - 4 * A * C$ and control flow methods. **[8]**

***Q11)*** Write short notes on following : **[2 × 8 = 16]**

a) Internet Programming

b) Design principles of Database programming

OR

***Q12)*** Write short notes on following : **[2 × 8 = 16]**

a) Socket Programming in Java

b) Mapping and Granularity

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4414

[Total No. of Pages : 2

# [5460]-19
# T.E. (Information Technology)
# HUMAN COMPUTER INTERACTION AND USABILITY
# (2008 Pattern)

*Time :3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, from section - I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

## SECTION - I

***Q1)*** a) Discuss general principles and goals of user interface design. **[8]**

b) Explain significance of sensory memory in interface design. **[8]**

OR

***Q2)*** a) Define Ergonomics. Explain with example. **[8]**

b) List and explain five human senses and identify those that are most important to HCI. **[8]**

***Q3)*** a) Describe briefly four different interactions styles used to accommodate the dialog between user and computer. Specify advantages and disadvantages of each interaction style. **[10]**

b) What are the different life cycle models in HCI? Explain any one lifecycle model in detail. **[8]**

OR

***Q4)*** a) List different interaction styles. Explain command line interface and menus interface with advantages and disadvantages. **[10]**

b) Express your opinion -"A design should be User-Centric". **[8]**

***Q5)*** a) Evaluate Microsoft Power Point interface using the "Eight golden rules of interface design". **[8]**

b) With respect to Human Diversity how to accommodate users with disabilities and elderly users. **[8]**

OR

***P.T.O.***

*Q6)* a) Why is context important in selecting and applying guidelines and principles for interface design? Illustrate your answer with examples. **[8]**

b) Explain how practical usability engineering process can be incorporated for developing an online hospital management system. **[8]**

## SECTION - II

*Q7)* a) Discuss the characteristics, guidelines and principles of good web page design. **[8]**

b) Explain any two evaluation paradigms for UI design. **[8]**

OR

*Q8)* a) What usability standards are necessary in designing home page for e-governance websites? **[8]**

b) Compare: Formative Evaluation versus Summative Evaluation. **[8]**

*Q9)* a) Hierarchical Task Analysis (HTA) is used to describe the interactions between a user and a software system. Draw and explain HTA to online bus reservation system. **[8]**

b) What is Cognitive Model? Discuss with example. **[8]**

OR

*Q10)*a) Explain status event analysis with example. **[8]**

b) Give any two diagrammatic or textual notations used to design dialogs in effective user interface. justify your notations with respective examples.**[8]**

*Q11)*a) What is Groupware? Explain synchronous and asynchronous groupware in brief. **[8]**

b) Consider following two shared application: **[10]**

- Shared PCs and shared window systems
- Shared editors.

What are the main issues that need to be addressed in the design of these applications?

OR

*Q12)*Write short notes on ANY THREE of the followings : **[18]**

a) Information and data visualization.

b) Synchronous and asynchronous groupware applications.

c) Any three devices for virtual reality.

d) Ubiquitous computing.

Total No. of Questions : 12]

SEAT No. :

P4158

[Total No. of Pages : 2

# [5460]-20
# T.E. (Instrumentation and Control)
# ELECTRONIC INSTRUMENTATION
# (2008 Pattern) (Semester - I)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary.***

## SECTION - I

***Q1)*** a) Explain practical Q-meter. **[10]**

b) Explain significance of Automatic Test Equipment (ATE) with its advantages & limitations. **[6]**

OR

***Q2)*** a) Draw and explain the block diagram of DMM. **[8]**

b) Explain auto-zeroing and auto-ranging in digital instruments. **[8]**

***Q3)*** a) What is sine wave synthesis? Explain sampled sine wave synthesis. **[10]**

b) Explain typical pulse characteristics. **[8]**

OR

***Q4)*** a) With the help of neat block diagram/circuit diagram, explain working of Ramp generator. **[8]**

b) Explain different types of pulse jitters. **[8]**

c) Give two differences between function generator and frequency synthesizer. **[2]**

***Q5)*** a) Explain ALT and CHOP modes in dual trace CRO. **[8]**

b) Explain with neat circuit diagram 10:1 probe. **[8]**

OR

***P.T.O.***

*Q6)* a) Explain with neat block sampling oscilloscope. **[8]**

b) How response time of a relay can be measured using DSO? **[8]**

## SECTION - II

*Q7)* a) Explain dual slope ADC. **[8]**

b) Explain R - 2R type of DAC. **[8]**

c) Determine the conversion time required for 10 bit SAR type if clock frequency is 100 kHz. **[2]**

OR

*Q8)* a) Explain counter type of ADC. **[8]**

b) Write short notes on - sample and hold circuit and analog multiplexer. **[10]**

*Q9)* a) Explain time interval and frequency ratio modes of universal counter. **[8]**

b) A digital frequency meter has a time base derived from 1 MHz clock generator divided by decade counters. Determine the measured frequency when a 1.512 KHz sine wave is applied and time base uses - **[8]**

i) six decade counters ii) four decade counters

OR

*Q10)* a) Explain digital capacitance meter with neat block or circuit diagram. **[8]**

b) What are the different measurement errors in universal counter? **[8]**

*Q11)* a) Write a note on harmonic distortion meter. **[8]**

b) Explain spectrum analyzer with swept super heterodyne technique. **[8]**

OR

*Q12)* Write short notes on - **[16]**

a) Virtual instrumentation

b) Data logger

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

P4419

[Total No. of Pages : 3

# [5460]-21

## T.E. (Mechanical)

## INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer any three questions from each Section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***



### SECTION - I

***Q1)*** a) Define the plant layout and plant location. What are various site selection factors for good plant? **[8]**

b) Discuss various leadership styles adopted in industry. **[8]**

OR

***Q2)*** a) What is meant by scientific management? Explain in brief various functions of management. **[8]**

b) Define material handling. Explain the role of material handling principles in improving the productivity of a firm. **[8]**

***Q3)*** a) Explain what do you understand by industrial engineering. What is its importance? **[8]**

b) What are Therbligs? Give any six Therbligs with symbols. **[8]**

OR

***Q4)*** a) Explain productivity improvement methods for organization. **[8]**

b) Define method study. Explain the procedure for method study. **[8]**

***P.T.O.***

***Q5)*** a) Explain the man - machine system and its three aspects. **[9]**

b) Describe the four factors to be considered while designing of Workspace. **[9]**

OR

***Q6)*** Write notes on (Any Three) **[18]**

a) Zero based Budgeting.

b) SIMO Chart.

c) ABC Analysis.

d) Time Study.

## SECTION - II

***Q7)*** a) Explain process technology and product technology. **[8]**

b) Discuss the process of Managing Research and Development activities with neat block diagram. **[8]**

OR

***Q8)*** a) Explain the significance of technology and management. **[8]**

b) Explain the role of Government in the development of Technology. **[8]**

***Q9)*** a) What do you mean by Technological Forecasting? Explain various techniques used in Technology Forecasting. **[8]**

b) List the various methods of Technology Acquisition. Explain any two in detail. **[8]**

OR

***Q10)***a) Explain the following in brief. **[10]**

i) Technological Leadership

ii) Technology Monitoring

b) What do you mean by technology assessment? **[6]**

***Q11)***a) Explain the steps involved in formulating technology planning. **[9]**

b) Explain the various key principles for developing technology strategy.**[9]**

OR

***Q12)***Write short notes on the following: (any three) **[18]**

a) S-Shaped curve of Technology Adoption.

b) Technology transfer and its categories.

c) Status of IPR Activities in India.

Total No. of Questions : 12]

SEAT No. :

P4405

[Total No. of Pages : 6

# [5460]-22

# T.E.

# REFRIGERATION AND AIR-CONDITIONING

## (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answers to the two Sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks..***
5) ***Use of Calculator is allowed.***
6) ***Use of psychrometric chart is allowed.***
7) ***Assume suitable data if necessary, state clearly the assumption made.***



## SECTION - I

***Q1)*** a) With neat schematic explain the working of steam jet refrigeration system. Explain its applications. List its disadvantages. **[8]**

b) Air enters the compressor of an ideal Brayton Refrigeration Cycle at 101 kPa and 270 K with a volumetric flow rate of 2 $m^3/s$. If the compressor pressure ratio is 3.0 and the turbine inlet temperature is 300 K, determine, **[8]**

i) The net power input

ii) The refrigeration capacity

iii) Coefficient of performance

Take $\gamma = 1.4$ and $C_p = 1.005$ kJ/kg.K

OR

***Q2)*** a) Explain methods to produce low temperature. **[8]**

b) Explain various processes in Bell-Coleman cycle. Derive the expression for COP of Bell Coleman cycle. **[8]**

***P.T.O.***

***Q3)*** a) i) Prove that the maximum COP of an ideal vapour absorption refrigeration system is given by

$$COP_{max} = \left( \frac{T_L}{T_C - T_L} \right) \times \left( \frac{T_G - T_C}{T_G} \right)$$

Where $T_L$ = Evaporator temperature, $T_C$ = Condenser temperature and $T_G$ = Generator temperature.

ii) Compare vapour compression with vapour absorption system. **[8]**

b) A cold storage is to be maintained at –5 °C while surrounding are at 35 °C. The heat leakage of the surrounding into the cold storage is estimated to be 29 kW. The actual COP of the refrigeration plant is 1/3rd of an ideal COP of the plant working between the same temperature. Find actual COP and power required to drive the plant.

Determine percent change in COP and power required when surrounding temperature is 55 °C keeping all other conditions same. **[8]**

OR

***Q4)*** a) Draw neat diagram of water-ammonia refrigeration system. Explain its working. What is the use of analyzer and rectifier in this system? **[8]**

b) Discuss the effect of operating parameters on performance of VCC with the help of p-h or T-s diagram. **[8]**

***Q5)*** a) A vapor compression system using ammonia as refrigerant works between 2 bar and 14 bar. Two flash chambers are fitted in the system at 6 bar and 10 bar and vapours are sent to the respective compressors where these compressors handle only flash gas. If the load on the evaporator is 18 TR, find the power required to run system and its COP.

What is the COP? Is it works on simple saturated VCC? **[10]**

b) Explain the desirable properties of refrigerant. List some eco-friendly refrigerant and state why eco-friendly refrigerant must be used? **[8]**

OR

***Q6)*** a) Explain pumped circulation system with neat diagram. **[7]**

b) What is flash inter-cooling? Draw its p-h and T-s diagram for two stage VCC with flash intercooling. **[6]**

c) Explain in brief : Montreal Protocol and Kyoto Protocol. **[5]**

## SECTION - II

***Q7)*** a) Explain: thermodynamic wet bulb temperature. **[4]**

b) Prove that the specific humidity is given by **[6]**

$$\omega = 0.622 \frac{p_v}{p - p_v}$$

Where $p$ = total pressure of air, and

$p_v$ = partial pressure of moisture in air.

c) Air at 35°C and 60% RH is cooled to 24°C DBT. It is achieved by cooling and dehumidification. Air flow rate is 50 cmm. Using psychrometric chart, calculate: **[8]**

i) Dew point temperature

ii) Mass of water drained per hour

iii) Capacity of cooling coil and

iv) If by-pass factor of coil is 0.15, find ADP.

OR

***Q8)*** a) Explain : thermodynamic wet bulb temperature. **[4]**

b) Prove that the specific humidity is given by **[6]**

$$\omega = 0.622 \frac{p_v}{p - p_v}$$

Where $p$ = total pressure of air, and

$p_v$ = partial pressure of moisture in air.

c) Moist air at 40°C & 80% RH passes through an air conditioning plant and attains the final condition 24°C & 60% RH. Assuming constant pressure of 100 kPa, determine capacity of cooling coil and rate of moisture removal in kg/h for mass flow rate of 2 kg/s. Show the process on psychrometric chart. **[8]**

***Q9)*** a) Draw schematic of central air conditioning systems. Compare various types of central air conditioning systems. **[6]**

b) Explain: RSHF, GSHF and ESHF. **[6]**

c) What is selection criterion of condenser coil in an air conditioning system? Explain. **[4]**

OR

***Q10)***a) Explain the various types of compressors used in refrigeration systems. Discuss the working of screw compressor. **[7]**

b) Discuss the procedure to calculate ventilation load? **[4]**

c) What is variable air volume air conditioning system? **[5]**

***Q11)***a) What are desirable properties of duct materials? **[4]**

b) Explain the various types of food preservation techniques. **[6]**

c) A rectangular duct section 500 mm × 350 mm carries 75 cmm of air having density of 1.12 kg/m$^3$. Calculate the equivalent diameter of circular duct for **[6]**

i) Same quantity of air handling in both cases.

ii) Same velocity of air in both cases.

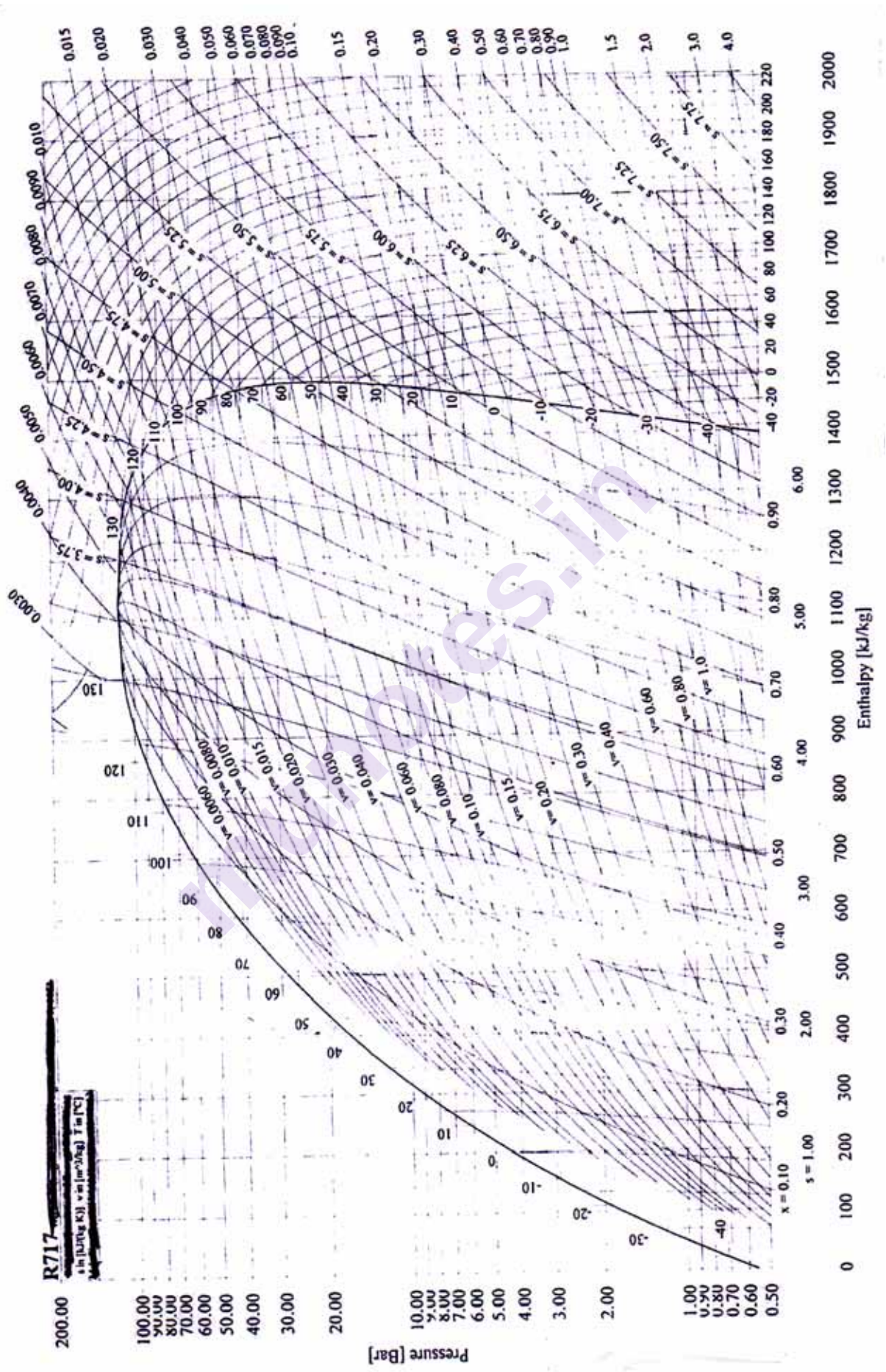
iii) If $f = 0.001$ for sheet metal, find the paper drop per 100 m length of duct.

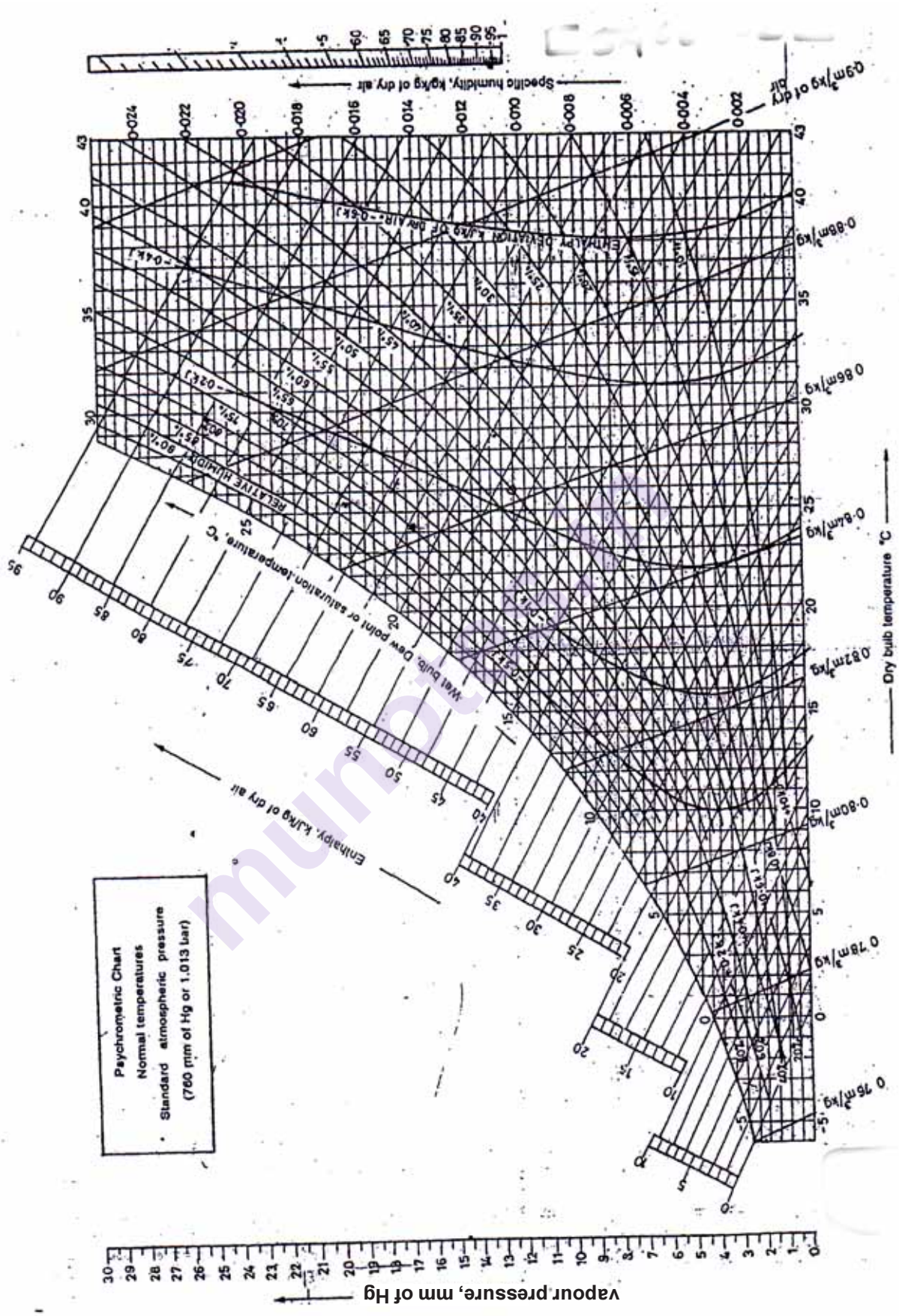
OR

***Q12)***a) What are dynamic losses in duct? Explain. **[4]**

b) Explain static regain method for duct design. **[6]**

c) Write short note on : cold chain. **[6]**




Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Enthalpy, kJ/kg of dry air
Wet bulb, Dew point or saturation temperature, °C
Specific humidity, kg/kg of dry air
Dry bulb temperature °C
vapour pressure, mm of Hg
RELATIVE HUMIDITY

Total No. of Questions : 12]

SEAT No. :

P4159

[Total No. of Pages : 5

# [5460]-26
# T.E. (Petroleum Engineering)
# NATURAL GAS ENGINEERING
# (2008 Pattern)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer Q. No.1 or 2, Q. No.3 or 4, Q. No.5 or 6 from section-I and Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 11 or 12 from section-Il.***
2) ***Answers to the two sections must be written in separate answer book.***
3) ***Figures to the right indicates full marks.***
4) ***Neat diagram should be drawn wherever necessary.***
5) ***Use a non programmable calculator.***
6) ***Assume suitable data if necessary and clearly state it.***

## SECTION - I

***Q1)*** a) Explain the relevance of z-factor in natural gas engineering. **[6]**

b) What do you mean by critical pressure and temperature? Explain. **[5]**

c) Calculate the reserves in a gas field of 1600 acres , with 20ft sand thickness,18% porosity,15%water saturation, BHP=2000 Psi gauge, BHT=200 F. The natural gas has the following weight composition: Ci = 0.85, C2 = 0.05, N2 = 0.1. **[7]**

OR

***Q2)*** a) Find viscosity, molecular weight, specific gravity, pseudocritical properties, Z factor, Bg. Gas data: Pci, Tci are: 668,708,493 psia; 343, 520, 227R. ωi and μi' are 0.01,0.09,0.04 and 0.001,0.002,0.0015cp respectively. **[13]**

b) How are computations handled in natural gas engineering, when impurities are present? **[5]**

***P.T.O.***

***Q3)*** a) Why is gas flow in porous media different from liquid flow? **[4]**

b) Explain the process of gas flow metering. **[8]**

c) Explain difference between isochronal and modified isochronal testing. **[4]**

OR

***Q4)*** a) Write a short note on pseudo-pressure, and its importance in gas well testing. **[8]**

b) A 50-in x 100 Ib gauge has a differential pressure range of Rh = 50 inches and static pressure range of Rp = 100 psi. If a square root chart shows a reading of 7.2 for differential pressure and 9.4 for static pressure, calculate differential pressure and static pressure. **[4]**

c) Write short notes on square root charts **[4]**

***Q5)*** a) For a well with a following parameter: D = 7000 ft, gas gravity is 0.7, Pts =2300 Psia, and average temperature of the flow string is 117 F. Gas flow rate = 10 MMscfd, Dia = 2inches Twf = 160 F, Ttf = 83 F Ptf = 2122 psia, length of tubing = 5700 ft, well is vertical. State your assumed values clearly and only do one iteration to find the flowing bottom hole pressure, static bottom hole pressure and temperature. Tpc = 358 R, Ppe = 672 psia, f = 0.015, z = 0.79. **[8]**

b) Explain tubing pressure transverse with figure? **[4]**

c) Explain the various flow regimes in multi-phase flow. **[4]**

OR

***Q6)*** a) What do you mean by sonic flow? What is the difference between this and sub-sonic flow? **[4]**

b) Write short notes on temperature at choke. **[4]**

c) A 0.65 specific gravity gas flows from a 1.5-in pipe through a 1-in orifice-type choke. The upstream pressure and temperature are 850 psia and 75 F, respectively. The downstream pressure is 200 psia (measured 2 ft from the orifice). The gas-specific heat ratio is 1.3. **[8]**

i) What is the expected daily flow rate?

ii) Does heating need to be applied to assure that the frost does not clog the orifice?

iii) What is the expected pressure at the orifice outlet?

C = 0.62, assume NRe is very high, $\mu$ = 0.01245

## SECTION - II

***Q7)*** a) What is the criterion for choosing a CO2 removal process? **[8]**

b) Write short note on horizontal and vertical separator? **[4]**

c) What do you mean by Alkanolamine process? Explain. **[4]**

OR

***Q8)*** a) Draw the process diagram for glycol dehydration and explain the design considerations. **[6]**

b) Explain selection and working of spherical separator with a neat sketch? **[6]**

c) Explain amine sweetening process with a neat process flow diagram? **[4]**

***Q9)*** a) Explain in detail two stage compressor cycle. **[4]**

b) Expain in detail, a centrifugal compressor **[4]**

c) What is the HP required in compressing 1 MMSCFD from 100 psia and 80 F to 1600 psia using adiabatic equation? The gas is cooled to 80 F between stages. What is the discharge temperature of the gas? k =1.28, gas gravity = 0.6, Z at 400 and 1600 psia are 0.985, 0.94 respectively. **[8]**

OR

***Q10)*** a) Find the horsepower required with and without intercooling when compressing 16,000 cfm of natural gas, k = 1.28, measured at 60 F and 14.7 psia from atmospheric pressure of 14.4 to 125 psig. Inlet temperature is 70 F. Allow a 4% discharge at each stage. **[7]**

b) What is the difference between a reciprocating and centrifugal compressors? **[3]**

c) Write a note on Compressor selection. **[3]**

d) Explain the use of Mollier charts in compressor design. **[3]**

***Q11)*** a) Calculate the gas flow rate in cubic ft / hr through a horizontal pipeline. Data given: D =12.09, L = 1000 miles, e = 0.0006 in, T = 80 F, Specific gravity of gas = 0.7, Tb = 520 R, Pb = 147 psia, P1 = 600 psia, P2 = 200 psia, f = 0.01223, Z = 0.9188, $\mu$ = 0.0099 cp. **[6]**

b) Explain effect of liquid loading in gas wells? **[3]**

c) Explain Turner's method in detail? **[3]**

d) Write short note on In-line inspection tools? **[3]**

e) Explain inspection and maintenance of natural gas pipeline? **[3]**

OR

*Q12)* a) Write short note on Pipeline efficiency? **[3]**

b) Write short note on Transmission factor? **[3]**

c) Give solutions for liquid loading problem? **[3]**

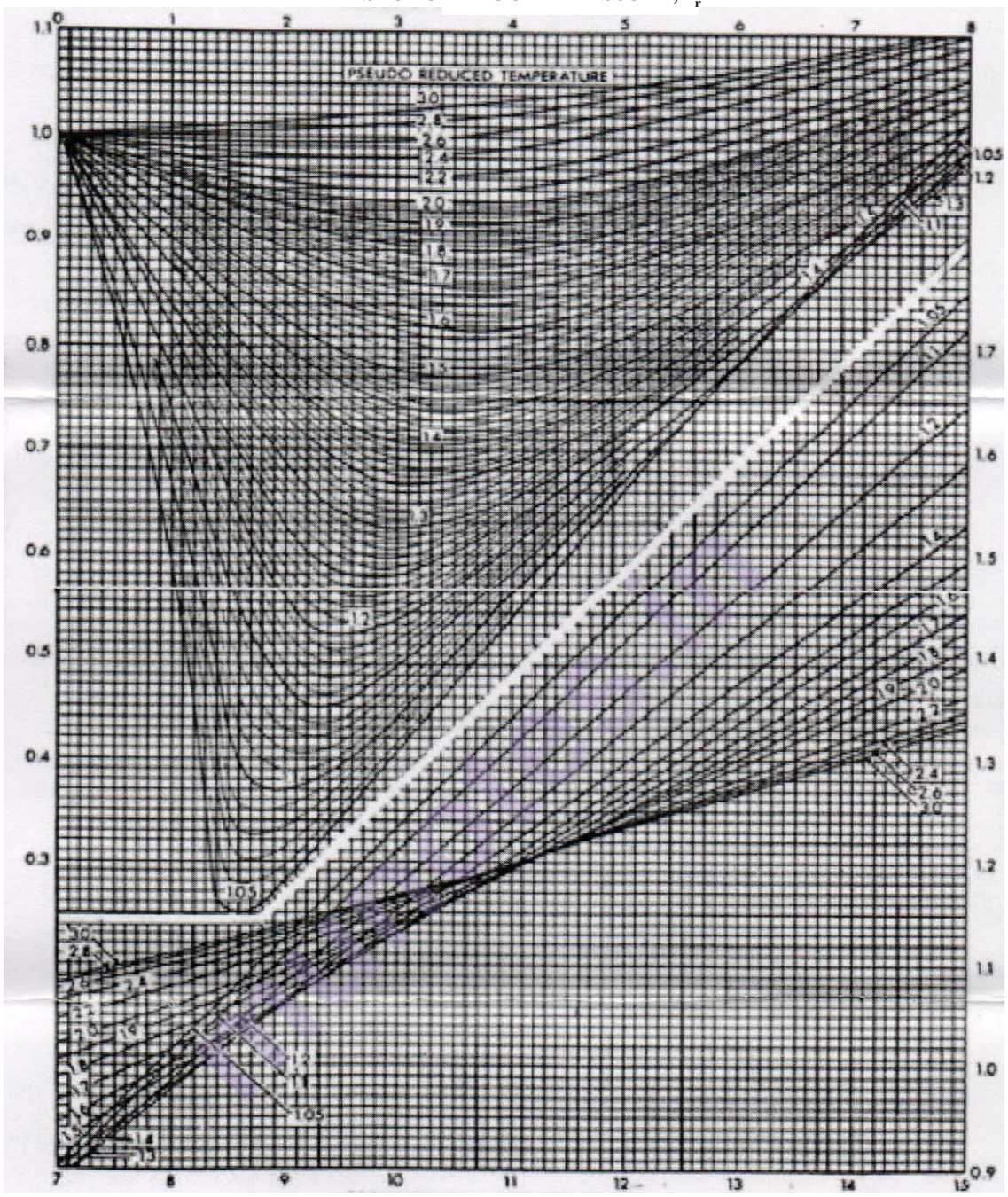
d) Write note on preventing hydrate formation? **[3]**

e) Write short note on pipeline cleaning and utility pigs? **[3]**

f) Write short note on pipeline economics. **[3]**

| Compound | Chemical Composition | Symbol (for Calculations) | Molecular Weight | Critical Pressure (psi) | Critical temp (R) |
|---|---|---|---|---|---|
| Methane | $CH_4$ | $C_1$ | 16.04 | 673 | 344 |
| Ethane | $C_2H_6$ | $C_2$ | 30.07 | 709 | 550 |
| Propane | $C_3H_8$ | $C_3$ | 44.09 | 618 | 666 |
| iso-Butane | $C_4H_{10}$ | i-$C_4$ | 58.12 | 530 | 733 |
| n-Butane | $C_4H_{10}$ | n-$C_4$ | 58.12 | 551 | 766 |
| iso-Pentane | $C_5H_{12}$ | i-$C_5$ | 72.15 | 482 | 830 |
| n-Pentane | $C_5H_{12}$ | n-$C_5$ | 72.15 | 485 | 847 |
| n-Hexane | $C_6H_{14}$ | n-$C_6$ | 86.17 | 434 | 915 |
| n-Heptane | $C_7H_{16}$ | n-$C_7$ | 100.2 | 397 | 973 |
| n-Octane | $C_8H_{18}$ | n-$C_8$ | 114.2 | 361 | 1024 |
| Nitrogen | $N_2$ | $N_2$ | 28.02 | 492 | 227 |
| Carbon Dioxide | $CO_2$ | $CO_2$ | 44.01 | 1,072 | 548 |
| Hydrogen Sulfide | $H_2S$ | $H_2S$ | 34.08 | 1,306 | 673 |

PSEUDO REDUCED PRESSURE, $P_r$




PSEUDO REDUCED PRESSURE, $P_r$

⌘⌘⌘

**Total No. of Questions :10]**

**SEAT No. :** ____

**P1511**

**[Total No. of Pages : 2**

# [5460]-101
## T.E. (Civil)
## HYDROLOGY AND WATER RESOURCE ENGINEERING
## (2012 Course) (Semester-I) (301001)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

***Instructions:***

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) How hydrology plays important role in all disciplines of science. **[5]**

b) Explain Thiessen Polygon method with neat sketch. **[5]**

OR

***Q2)*** a) State the formula to calculate optimum number of raingauges . Explain the terms in the formula. **[5]**

b) Explain methods to improve duty. **[5]**

***Q3)*** a) Differentiate between furrow irrigation and Drip irrigation system. **[5]**

b) Explain with neat sketch bubbler gauge to determine the stage of river and also state the advantages of this gauge. **[5]**

OR

***Q4)*** a) Derive the formula to calculate discharge of a well in a confined aquifer. **[6]**

b) State various types of tube wells and explain construction of Slotted Type Tube well. **[4]**

***Q5)*** a) What is hydrograph? Explain all the parts of the typical hydrograph. Explain fern shaped catchment. **[8]**

b) Maximum values of 24hr precipitation (mm) at a Rainguage station are 140, 113, 132, 115, 130, 118, 127, 123, 121. Estimate maximum and minimum precipitation having a recurrence interval of 5 and 15 years. Use Hazen's Method. **[10]**

OR

***P.T.O.***

***Q6)*** a) What is S-Curve hydrograph? Explain its construction with sketch. **[8]**

b) In a 10 hr storm rainfall depths occurred over a the catchment are

| Hour | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depths (cm/hr) | 1 | 1.5 | 5 | 6 | 10.5 | 8.5 | 9 | 7 | 1.5 | 1.5 |

Surface runoff resulting from the storm is equivalent to 20 cm of depth over the catchment. Determine (i) Average infiltration, and (ii) Average rate of infiltration. **[10]**

***Q7)*** a) Explain how will you fix the capacity of reservoir using annual inflow and outflow. **[8]**

b) Explain fixation of reservoir capacity using elevation capacity curve and dependable yield. **[8]**

OR

***Q8)*** a) What are various reservoir losses. What are various measures to control these losses. **[8]**

b) What is reservoir sedimentation? What is the significance of trap efficiency? Explain with neat sketch. **[8]**

***Q9)*** a) Write a note on ancient system of water distribution which still exist in North Maharashtra. **[8]**

b) Explain Global Water partnership. (GWP) **[8]**

OR

***Q10)***a) What is water logging? Explain tile drain method and also state formula for spacing of tile drains. **[8]**

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. **[8]**

❖ ❖ ❖

Total No. of Questions : 10]

SEAT No. :

**P1512**

[Total No. of Pages : 2

# [5460]-102
# T.E. (Civil)
# INFRASTRUCTURE ENGINEERING
## (2012 Pattern) (Semester - I) (301002) (End Sem.)

*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) Discuss scope of infrastructure engineering in national development. **[5]**

b) Write short note on : Coning of wheel. **[5]**

OR

***Q2)*** a) Discuss the importance of Metro rail as a mode of transportation. **[5]**

b) What are the functions of ballast? **[5]**

***Q3)*** a) Write short note on : Types of crossings. **[5]**

b) Explain in detail Jump form technique. **[5]**

OR

***Q4)*** a) Write down the ideal requirement of rail joint. **[5]**

b) Discuss in brief different types of cranes & their application. **[5]**

***Q5)*** a) State advantages & disadvantages of tunnel over open cut. **[6]**

b) Write short note on : Trenchless Tunneling. **[6]**

c) Discuss in brief various types of TBM. **[4]**

OR

***Q6)*** a) Explain in brief Full-face heading method of tunneling. **[6]**

b) Discuss in detail various operation to be done in tunneling work. **[6]**

c) Explain in brief NATM method of tunneling. **[4]**

***P.T.O.***

***Q7)*** a) Explain in brief classification of Harbour based upon location. **[6]**

b) Explain in detail vertical wall breakwater. **[6]**

c) Differentiate between natural and artificial harbour. **[4]**

OR

***Q8)*** a) Discuss site selection criteria for Harbour. **[6]**

b) With a neat labeled sketch, explain the term jetty. Discuss various factors to be considered in design of a jetty. **[6]**

c) Write short note on Tetra odes. **[4]**

***Q9)*** a) Construction machinery costs Rs. 8 crores. The salvage value of the same is 10%. Its useful life is 10 years. Estimate the depreciation of the equipment using following methods. **[6]**

i) Straight line method

ii) Double-Decline Balance Method

b) Discuss various factors affecting output of a shovel. **[6]**

c) Write short note on : **[6]**

i) Record Keeping of Equipments

ii) Operating Cost

OR

***Q10)*** a) With suitable examples, explain why scraper is considered as versatile earthwork equipment. **[6]**

b) What is Depreciation? Explain any one method of Depreciation. **[6]**

c) Explain any two terms from the following: **[6]**

i) Repair cost

ii) Economic life

iii) Labour Cost

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

**P1513**

[Total No. of Pages : 3

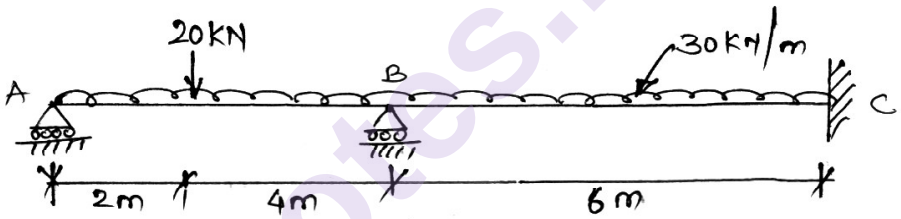
# [5460]-104
# T.E. (Civil)
# STRUCTURAL ANALYSIS - II
# (2012 Pattern) (Semester-I)

*Time : 2 ½ Hours]* *[Max. Marks : 70*

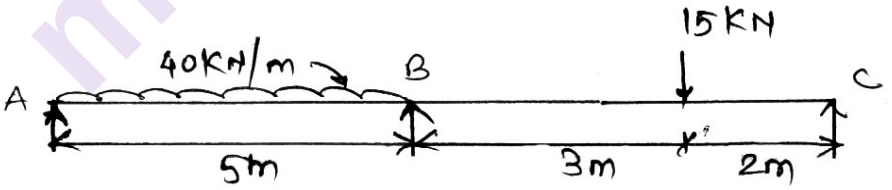
***Instructions to the candidates:***

1) ***Answer questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***If necessary, assume suitable data & indicate clearly.***
4) ***Use of electronic pocket calculator is allowed.***

***Q1)*** a) Analyse the beam by slope deflection method. Draw BMD & SFD. Take EI=3900 kN-m$^2$. **[10]**

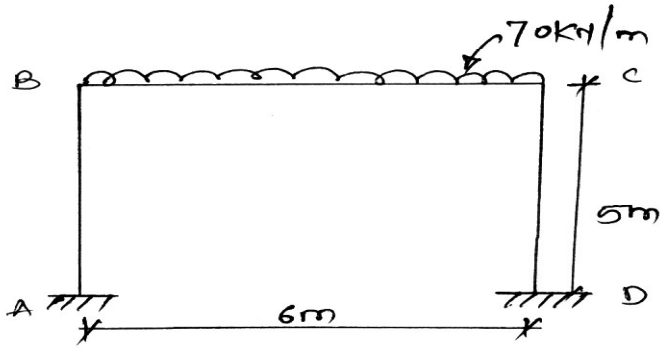



b) Analyse the continuous beam shown in figure below using the Flexibility method & draw the bending moment diagram. **[10]**



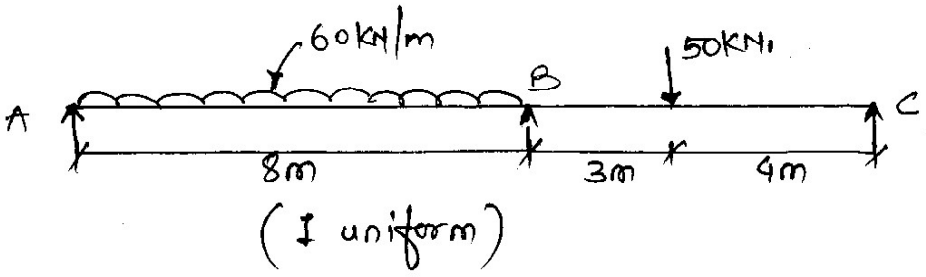

OR

***Q2)*** a) Analyse the frame by slope deflection method. Draw BMD. **[10]**




***P.T.O.***

b) Analyse the continuous beam shown in figure below by method of moment distribution. **[10]**

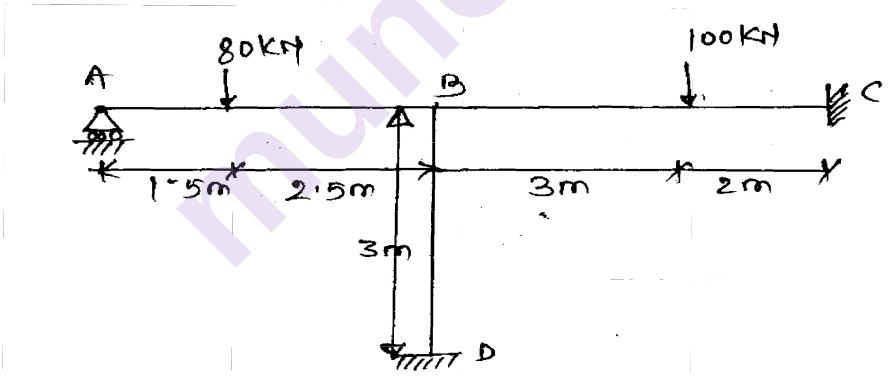



***Q3)*** Find the end moments of the beams as shown in figure by stiffness matrix method. Draw SFD & BMD. **[16]**

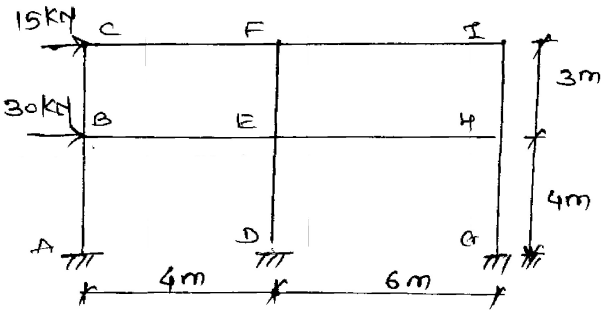
Take EI = 3800 kNm$^2$


OR

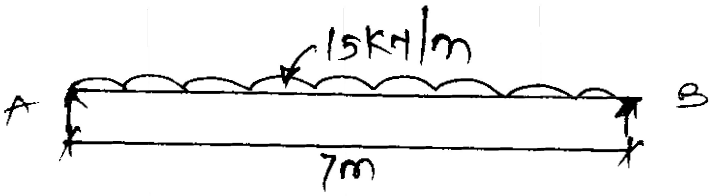
***Q4)*** Analyse the frame by matrix stiffness method & sketch the bending moment diagram. **[16]**




***Q5)*** a) Analyse the frame shown in figure below by portal method. **[10]**



b) A simply supported beam of length 7 m is loaded as shown in figure. Determine the maximum deflection. **[8]**




OR

***Q6)*** a) Analyse the frame as shown in figure Q.5 (a) by cantilever method. **[10]**

b) A cantilever beam loaded with udl of 30 kN/m, find the maximum deflection span of the beam is 2m **[8]**

***Q7)*** a) Explain **[8]**

i) Nodes

ii) CST

iii) LST

iv) QST

b) Explain shape function for Quadratic rectangular element. **[8]**

OR

***Q8)*** a) Differentiation between Axisymmetric & Iso parametric elements. **[8]**

b) Explain rectangular elements. **[8]**

**Total No. of Questions : 12]**

**SEAT No. :** ____

**P1514**

**[Total No. of Pages : 3**

**[5460]-105**

# T.E. (Civil)

# FLUID MECHANICS - II

## (2012 Pattern) (Semester-I) (301005) (End Semester)

***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. 7or Q.8, Q. 9 or Q. 10, Q. 11 or Q.12.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data jf necessary.***

***Q1)*** a) Explain one complete cycle of the water hammer phenomenon giving details of each stage. **[6]**

OR

***Q2)*** a) A spherical balloon 2 m in diameter is filled with hydrogen and held stationary in air by anchoring it to the ground with the help of a string of negligible weight. The balloon is subjected to an upward force of 25 N. Determine the inclination of the string with the ground if the wind is flowing with a velocity of 18 km/hr. Also find the tension in the string. Take density of air = 1.2 kg/$m^3$ and Cd = 0.5. **[4]**

b) Distinguish between: Stream lined and bluff body. **[2]**

***Q3)*** a) Derive the continuity equation for open channel flow. **[4]**

b) Explain the necessity of ventilation of suppressed weir. **[2]**

OR

***Q4)*** a) In a 5.5 m wide rectangular channel, uniform flow takes place with a depth of 2.1 m. The channel bed slope is 0.0004 and Manning's n = 0.016. Determine the maximum width to which the channel can be constricted to obtain the critical flow condition at that section. **[6]**

***Q5)*** a) Derive Chezy's formula. **[4]**

b) Define — i) conveyance, ii) section factor **[2]**

OR

***P.T.O.***

***Q6)*** In hydraulic type energy dissipater the energy loss is 9 m and pre jump Froude Number 7.5. Determine the sequent depths and the rate of flow. What is the efficiency of the jump? **[6]**

***Q7)*** a) Free jet impinging centrally on series of symmetric curved vane mounted on a wheel. For this case derive expressions for

i) force exerted by jet,

ii) work done per unit time,

iii) efficiency,

iv) condition for maximum efficiency. **[10]**

b) Explain —

i) Pumps in series,

ii) Pumps in parallel **[8]**

OR

***Q8)*** a) A centrifugal pump running at 1150 rpm works against a total head of 85m. The external and internal diameters of the impeller are 550 mm and 275 mm, respectively. The width at outlet is 50 mm. The velocity of flow through the impeller is constant at 4 m/s. If the blade angle at outlet is 30°, determine

i) Vane angle at inlet,

ii) Work done by the impeller,

iii) manometric efficiency. **[9]**

b) A jet of water having a velocity of 40 m/s impinges without shock a series of vanes moving at 17 m/s, the direction of motion of the vanes being inclined at 23° to that of the jet. The relative velocity at outlet is 0.92 times of that at inlet, and the absolute velocity of the water at exit is to be normal to motion of the vanes. Find

i) Vane angles at inlet and outlet,

ii) Work done on vanes per unit weight of water supplied by the jet and

iii) Hydraulic efficiency. **[9]**

***Q9)*** a) A Pelton wheel has to be designed for the following data. Power to be developed = 5000 kW. Net head available = 250 m, speed = 450 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. **[8]**

b) Derive expressions for unit quantities. Also explain the importance of these quantities. **[8]**

OR

***Q10)*** a) Sketch a layout of typical hydroelectric power generation plant and explain in brief function of each element. **[8]**

b) A hydraulic turbine is to operate at 180 rpm under a head of 35 m. The discharge is 26 $m^3/s$ and the overall efficiency is 85 %. Determine the speed, discharge, and output power when head is reduced to 15 m. **[6]**

c) Define specific speed. **[2]**

***Q11)***a) Derive differential equation for GVF. State the assumptions made. **[8]**

b) A wide rectangular channel carries a discharge of 4 $m^3/s/m$. 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. **[10]**

OR

***Q12)***a) Write short notes on $M_1$, $M_2$ and $M_3$ profiles. State their practical examples. **[10]**

b) Explain the graphical method of integration of computation of GVF profile. **[8]**

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1515**

**[Total No. of Pages : 3**

**[5460]-106**

# T.E.

# (CIVIL)

## Advanced Surveying

## (2012 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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) Define,

i) Well conditioned triangle

ii) Strength of a figure

iii) Accuracy of triangulation

iv) Geodetic Surveying

v) Indivisibility of stations **[5]**

b) Define triangulation, state the object of triangulation and state its applications. **[5]**

OR

***Q2)*** a) Describe briefly various applications of Global Positioning System. **[5]**

b) State any five advantages of space based positioning systems. **[5]**

***Q3)*** a) Describe in brief how location survey for pier of a bridge is carried out at site. **[5]**

b) Explain the three point problem and method of solution of three point problem using any one graphical method. **[5]**

OR

***Q4)*** a) State various methods of locating the position of boat in hydrographical surveying and explain briefly. **[5]**

i) location by two angles from Boat.

ii) location by one angle from shore and the other from the Boat.

b) Describe the procedure for setting out a tunnel, explain with a sketch.**[5]**

***P.T.O.***

***Q5)*** a) What do you mean by a spherical excess and how do you find out the Area of a spherical triangle? **[5]**

b) Define the following terms. **[5]**

i) Mistake

ii) True error

iii) Most probable value

iv) Conditioned equation

v) Weight of an observation

c) Following observation were recorded for an angle under identical condition. **[8]**

| | | |
|---|---|---|
| 162° 20' 00" | 162° 21' 20" | 162° 21' 40" |
| 162° 20' 40" | 162° 19' 40" | 162° 21' 20" |

Calculate a) the most probable error of single observation,

b) the most probable error of mean,

c) the most probable value of the angles

OR

***Q6)*** a) Explain laws of weight. **[5]**

b) Explain step by step procedure for figure adjustment for a geodetic quadrilateral without central station. **[5]**

c) Neglecting the spherical excess, adjust the angle of triangle of which observed values are **[8]**

| Angle | Weight |
|---|---|
| Angle A = 48° 18' 22" | 3 |
| Angle B = 76° 32' 47.2" | 1 |
| Angle C = 55° 08' 53.8'' | 3 |

***Q7)*** a) Write a stepwise procedure of determine air base distance using mirror stereoscope. **[5]**

b) Write short notes on: Crab and Drift **[5]**

c) The scale of aerial photograph is 1: 12000. The size of aerial photograph is 250 mm x 250 mm. The longitudinal overlap is 60% and side overlap is 30%. Determine the number of photographs required to cover an area of 250 sq.km. **[6]**

OR

***Q8)*** a) Define the following terms.

1) Air base distance.

2) Relief displacement.

3) Oblique photograph.

4) Principal point.

5) Mosaic. **[5]**

b) Define Ground Control Points, state their role in photogrammetry and bring out difference between pre marked and post marked Ground Control Points (GCP). **[5]**

c) Find the number of photographs (size 250 x 250mm) require to cover an area of 20 km x 16 km if the longitude overlap is 60% and the side overlap is 30%. Scale of photograph is 1cm; 150m. **[6]**

***Q9)*** a) What are the components of a GIS? **[5]**

b) Explain the applications of GIS in Visibility analysis and slope analysis. **[5]**

c) What is GIS? State various GIS software's and explains how remote sensing and GIS are linked? **[6]**

OR

***Q10)*** a) Define remote sensing. State importance of digital image processing. **[5]**

b) Discuss in brief the various data sources to build GIS for civil engineering applications such as watershed development. **[5]**

c) Enlist advantages and limitations of remote sensing. **[6]**

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1516**

**[Total No. of Pages : 3**

# [5460]-107
## T.E. (Civil)
## PROJECT MANAGEMENT AND ENGINEERING ECONOMICS
## (2012 Pattern) (Semester - II) (End - Sem)

***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) ***Figures to the right indicate full marks.***

***Q1)*** a) What are the objectives and importance of Project management? **[2+3=5]**

b) Explain with sketch any organizational structure. **[2+3=5]**

OR

***Q2)*** a) Define Activity, event and critical event, critical path and slack. **[5]**

b) Explain Project Management Book of Knowledge {PMBOK} – Different Domain Areas. **[5]**

***Q3)*** a) Following data is for small construction Project. Draw a network. Calculate expected mean time for each activity. **[2+3=5]**

| Activity | Estimated duration in days | | |
|---|---|---|---|
| | Optimistic | Most likely | Pessimistic |
| 1-2 | 4 | 10 | 22 |
| 2-3 | 2 | 5 | 8 |
| 2-4 | 4 | 7 | 16 |
| 2-5 | 4 | 7 | 10 |
| 3-5 | 4 | 7 | 22 |
| 4-5 | 5 | 8 | 17 |
| 5-6 | 6 | 9 | 18 |

b) When to update the network? Write steps to update the network. **[2.5+2.5=5]**

OR

***P.T.O.***

***Q4)*** a) Listed below are the activities of a project along their durations. **[3+2=5]**

| Activity | 1-2 | 2-3 | 2-4 | 2-5 | 3-10 | 4-6 | 4-7 | 5-10 | 6-8 | 7-8 | 8-9 | 9-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Duration (days) | 4 | 5 | 7 | 4 | 15 | 7 | Dummy | 10 | 6 | 7 | 12 | 10 |

Draw network and calculate the total project duration.

b) What is crashing of network? Explain step by step procedure. **[2+3=5]**

***Q5)*** a) Define inventory and list out step by step process to conduct ABC analysis. **[2+3=5]**

b) How do you inspect quality of material like sand and aggregate on your site? **[2+3=5]**

c) What safety precautions would you take to avoid accidents on Flyover site? Explain safety programme undertaken. **[8]**

OR

***Q6)*** a) Comment on Project management software's and their applications in Infrastructure projects. **[1+4=5]**

b) Define lead time and safety stock with suitable examples. **[2+3=5]**

c) Segregate and items as per their annual usage and plot ABC curve. **[8]**

| S.N. | Item | Annual Usage (Rs.) |
|---|---|---|
| 1 | Cement | 7,000 |
| 2 | Sand | 5,000 |
| 3 | Bricks | 3,000 |
| 4 | Paint | 2,000 |
| 5 | Steel | 6,000 |
| 6 | Oil | 1,000 |

***Q7)*** a) Explain Importance of Project economics and its importance in construction industry. **[6]**

b) How to calculate simple and compound interest? What is the difference between the simple interest and compound interest payable on a principal of Rs. 15,000 in 3 years at the rate of 20% p.a. **[2+4=6]**

c) Explain Equilibrium Price, Equilibrium Amount and Factors affecting Price Determination. **[2+2=4]**

OR

***Q8)*** a) Explain Concept of Cost of Capital & Time Value of Money. **[3+3=6]**

b) Explain Types of Capital - Fixed and Working. **[3+3=6]**

c) Mrs. Mayuri brought a refrigerator for Rs. 20,000; she paid tax of Rs. 1,000 and Rs. 200 for transport. If she sold it to a customer for Rs. 23,500, What is the percentage profit or loss? **[4]**

***Q9)*** a) What are the different types of appraisals required to undertake any Project? Explain any one in detail. **[2+4=6]**

b) Write a short note on (with formula and selection criteria) **[3+3=6]**

i) NPV, ii) Pay-Back Period

c) Explain IRR method with formula, selection criteria. **[2+2=4]**

OR

***Q10)*** a) Following are the details of Project A and B. Suggest which one is to be accepted by using BCR (i = 8%). **[6]**

| Years | Project A | Project B |
|---|---|---|
| 0 | 4,00,000 | 4,50,000 |
| 1 | 1,20,000 | 1,40,000 |
| 2 | 1,25,000 | 1,45,000 |
| 3 | 78,000 | 76,000 |
| 4 | 80,000 | 65,000 |
| 5 | 75,000 | 60,000 |
| 6 | - | 90,000 |

b) What is the role of Project Management Consultants in Pre-tender and Post-tender of a Project? **[3+3=6]**

c) Explain study of Project Feasibility report with example. **[2+2=4]**

⌘⌘⌘

**Total No. of Questions : 12]**

**SEAT No. :** ____

**P1517**

**[Total No. of Pages : 3**

# [5460]-108
# T.E. (Civil)
# FOUNDATION ENGINEERING
# (2012 Pattern) (301009) (End Sem.)

***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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of 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 1m wide, with the base located at the depth of 1m below ground surface. Soil properties are $\gamma$ = 18.5 kN/m$^3$, c = 3.0 kN/m$^2$ and $\phi$ = 20°. Determine safe bearing capacity using F.S. = 3. Assume soil fails by local shear, for $\phi$ = 20°, $N_c$ = 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 settlement

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, and coefficient of permeability is $3.4 \times 10^{-7}$ mm/sec. Determine. **[7]**

a) Change in void ratio if stress is increased by 9 $kN/m^2$.

b) Settlement if soil is 4m thick.

c) Time required for 40% consolidation for one way drainage. ($T_v$) = 0.125664.

## 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 any of following three methods. **[8]**

i) Fled's rule

ii) Block Failure

iii) Converse Labbare's Formula

iv) Individual

Pile group consisting of 15 piles arranged in 3 rows, diameter of pile is 300 mm, depth of pile 8m, c = 25$kN/m^2$, Spacing of pile = 0.8 m c/c. $\alpha$ = 1.0, Unit weight of soil = 10 $KN/m^3$.

b) Explain with figures the following difficulties and their rectification. **[8]**

i) Tilt

ii) Hanging up

iii) Sand blow

***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) Discuss the factors affecting selection of type of Cofferdam and explain the suitability of various 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) A sheet pile has following details: **[4]**

i) Embedment depth –5m

ii) Cantilever height 4m

iii) $\phi = 30^0$ determine factor of safety against overturning.

***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) What is geosynthetics? Enlist the advantages of geosynthetics materials for reinforcement and What are its functional requirements? **[6]**

c) Enlist and explain different types of seismic waves. **[6]**

⌘⌘⌘

Total No. of Questions : 12]

SEAT No. :

**P1518**

[Total No. of Pages : 5

# [5460]-109
# T. E. (Civil Engineering)
# STRUCTURAL DESIGN - II
# (2012 Pattern) (Semester - II)

*Time : 3 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, Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of IS 456-2000 and non programmable calculator is allowed.***
5) ***Mere reproduction from IS code as answer, will be given full credit.***
6) ***Assume suitable data, if necessary.***

***Q1)*** a) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[3]**

b) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. **[3]**

OR

***Q2)*** Explain the terms bond stress and development length. Calculate development length for 16 mm diameter bar in compression and tension by both method's (WSM and LSM). Use M25 concrete and Fe 500 steel. **[6]**

***Q3)*** A calculate the moment of resistance by LSM for flanged beam section detailed as below : **[8]**

a) Width of rib = 230mm

b) Effective flange width = 1450mm

c) Thickness of flange = 115mm

d) Effective depth = 450mm

e) Tension steel = 2 – #16 through plus 2– #12 curtail at midspan.

f) Use M20 grade of concrete and Fe 415 grade of steel.

OR

***Q4)*** A rectangular beam section, 230mm wide and effective depth 415mm is reinforced with 4 bars of 16mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe 415 grade of steel. **[8]**

***P.T.O.***

***Q5)*** Design a cantilever slab for effective span of 1.7m subjected to floor finish of 2kN/m$^2$ and live load 3kN/m$^2$. Use Concrete of grade M20 and Fe 415 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

OR

***Q6)*** Design a simply supported one way slab for a room with clear inner size 3.5m × 7.8m. The slab is supported by beams of width 230mm along all the edges. The slab is subjected to floor finish of 1.5 kN/m$^2$ and live load 3kN/m$^2$. Use concrete of grade M20 and Fe500 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

***Q7)*** Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B Span AB = 4.0m, BC=5.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 16 kN/m. The beam supports 115mm slab on both sides. Calculate design moment for span AB and BC after 15% redistribution of moments by considering proper load case. Design beam for flexure and shear. Draw the reinforcement details. Material-Concrete of grade M25, Fe 500 reinforcement. **[16]**

OR

***Q8)*** Design a continuous beam ABCD for flexure only using IS Code coefficients. AB=BC=CD=4m. The beam supports 120mm slab on both sides. The beam carries dead load of 18 kN/m (including its self-weight) and live load of 15 kN/m. Take material M25 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[16]**

***Q9)*** A rectangular RC beam of span 6m, size 300 mm × 600 mm with effective cover 40 mm is subjected to following actions : **[16]**

i) Factored BM = 150 kN.m

ii) Factored SF = 60 kN

iii) Factored Torsional Moment = 75 kN.m

Design the beam for flexure and shear using M 25 & Fe 500 grade materials.

OR

***Q10)*** Design an axially loaded short column to carry a working load of 700 kN. The unsupported length of column is 3.5 m. The column is held in position and not restrained against the rotation at both ends. Also design the footing for this column only flexure and one way shear. Take SBC = 200 kN/m$^2$.

Material M 20 and Fe 500 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation. **[16]**

***Q11)*** Design a bi-axial rectangular short column by limit state method with material M25 and Fe 415 to carry a working load of 900 kN. Working moment of 100 kN-m about major axis bisecting the depth of column and 50 kN-m about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.8m and 3.4m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. **[16]**

OR

***Q12)*** Design an uniaxial square short column by limit state method with material M25 and Fe 415 to carry ultimate load of 800 kN and working moment of 100 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4m. The column is fixed at one end and hinged at the other. Also design the footing for this column only for flexure and punching shear. Take SBC = 210 kN/m$^2$. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[16]**

**Chart 5 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides**

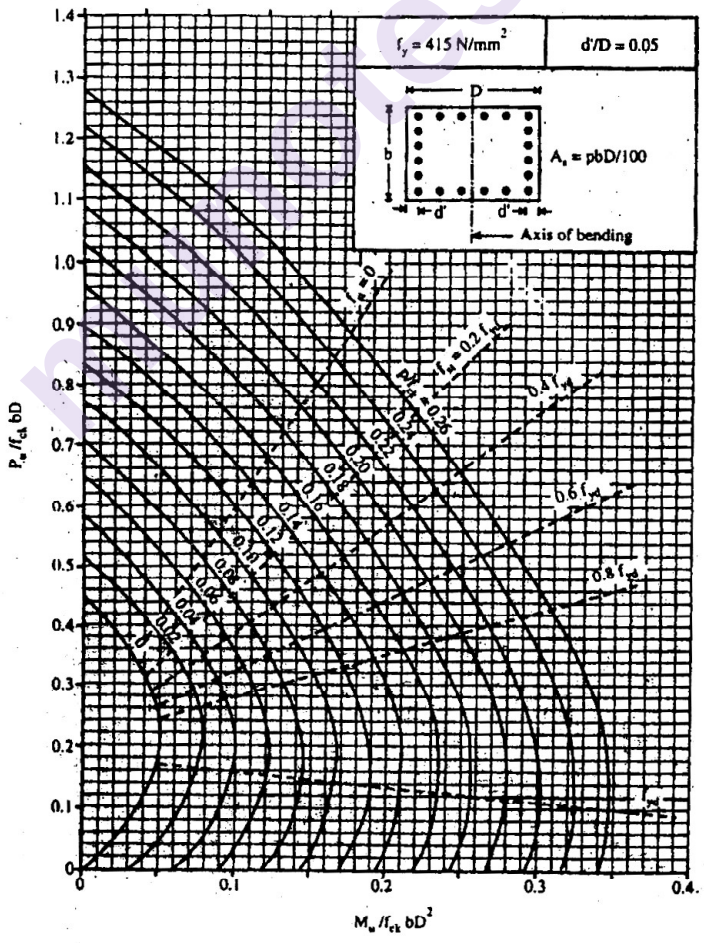



**Chart 5**

**Chart 6 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides**

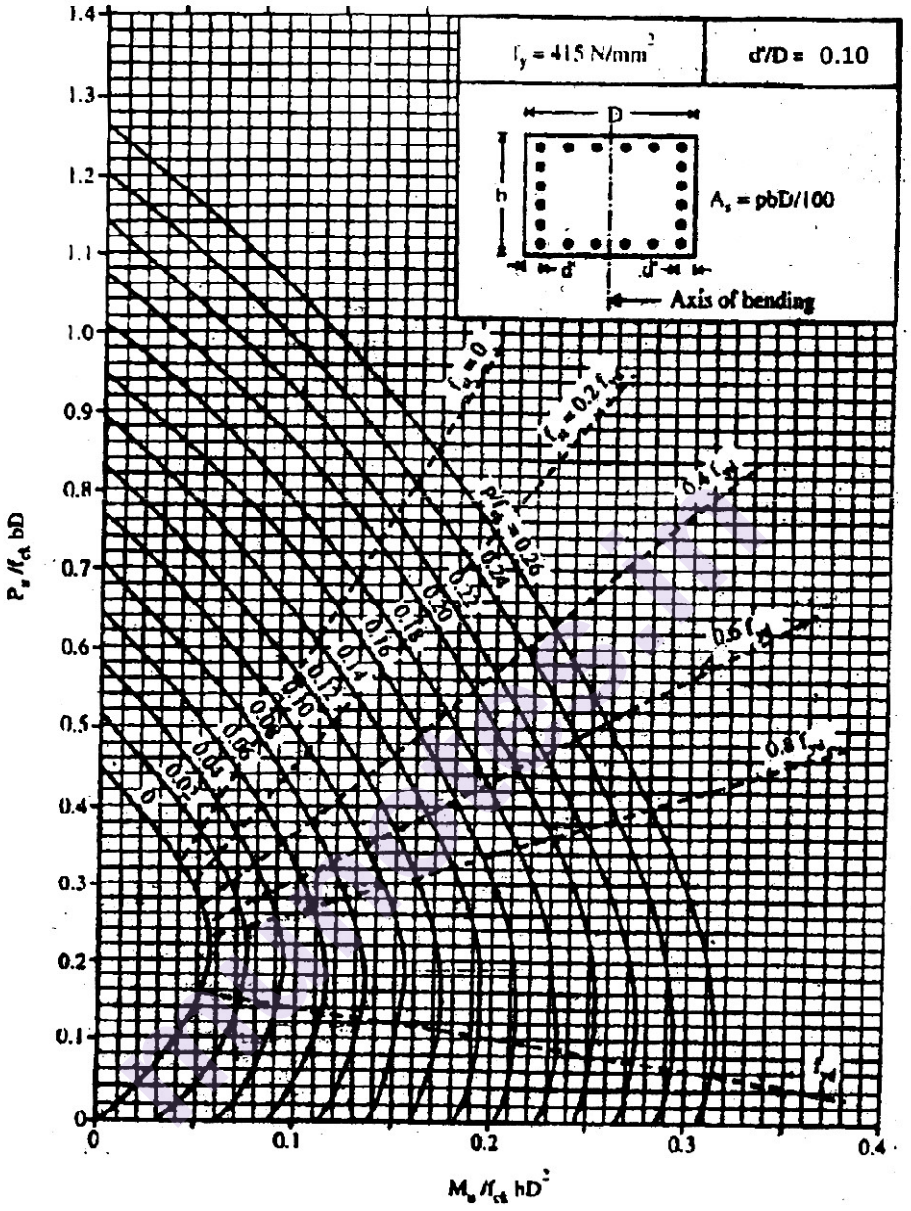
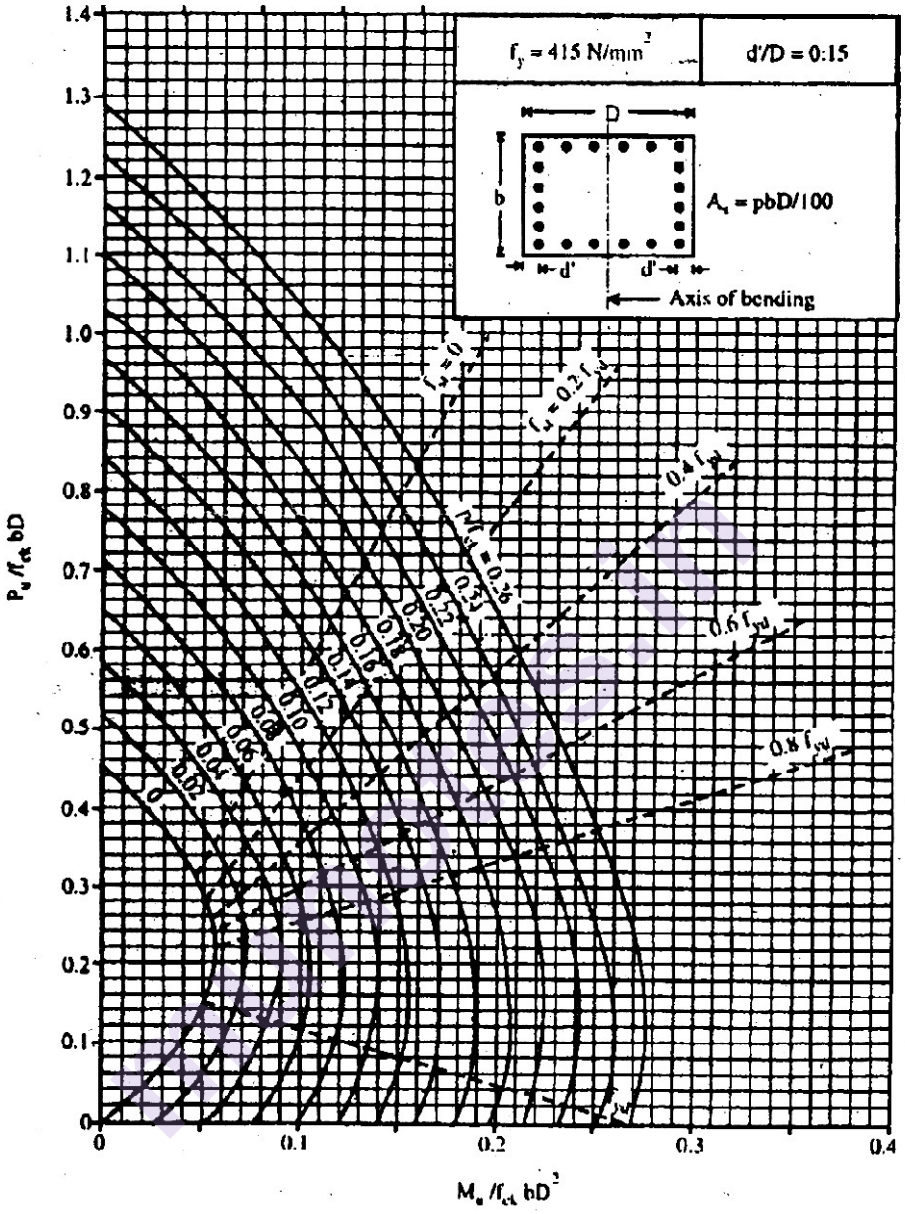



Chart 6

**Chart 7 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides**



Total No. of Questions :10]

SEAT No. :

**P1519**

[Total No. of Pages : 2

# [5460]-110
# T.E. (Civil)
# ENVIRONMENTAL ENGINEERING - I
# (2012 Pattern) ( Semester - II) (End - Sem.)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Solve Q.1 or Q.2, Q.3or Q.4, Q.5or Q.6, Q.7or Q.8,Q.9or Q.10***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithimic tables, slide rule Mollier charts, electronic pocket calculator and steam tables are allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** a) Enlist different methods of population forecasting and Explain in detail one of them. **[6]**

b) Write a note with a sketch on Electro Static Precipitator. **[4]**

OR

***Q2)*** a) Convert the following sound pressure into decibel units. **[6]**

i) P = 0.0002 microbar

ii) P = 0.2 microbar

iii) P = 20,000 microbar

b) What is design period? State its importance in water supply system design. **[4]**

***Q3)*** a) Explain with a neat sketch, inlet and outlet arrangements adopted for a rectangular sedimentation tank. **[6]**

b) Explain the purpose of aeration. What are its limitations? **[4]**

OR

***Q4)*** a) Prove that theoretically, the surface loading (Q/A) and not the depth is a measure of effective removal of particles in a sedimentation tank. **[6]**

b) List the physical characteristics of water. State the IS standards recommendation for any two. **[4]**

***P.T.O.***

***Q5)*** a) What is coagulation? What are the factors on which the dosages of coagulants depend. **[8]**

b) Draw a neat sketch of a rapid sand gravity filter and show various components. Explain mechanisms of rapid sand gravity filter. **[8]**

OR

***Q6)*** a) Design a mechanical flocculator to treat water for a population of one lakh, water being supplied at the rate of 150 litres per capita per day. The temperature of water is 30°C, detention time is 30 minutes and paddle speed is 3 r.p.m kinematic viscosity at 30°C = $0.8039 \times 10^{-6}$ $m^2$/sec. **[8]**

b) Explain break point chlorination with sketch. **[8]**

***Q7)*** a) Explain **[8]**

i) Chlorine demand

ii) Combined available chlorine

ii) Free available chlorine

iv) Residual chlorine.

b) Explain fluoridation and defluoridation of water. **[8]**

OR

***Q8)*** a) What do you mean by disinfection? Discuss the factors affecting efficiency of disinfection. Enlist at least four disinfectants used in water treatment plant and discuss anyone in detail. **[8]**

b) Explain zeolite process in detail with a neat sketch. **[8]**

***Q9)*** a) Explain RO process with a neat sketch. **[9]**

b) Describe the various layouts of distribution networks in water supply scheme and state their advantages and disadvantages. **[9]**

OR

***Q10)***a) What is packaged water treatment plant? What are the advantages of packaged water treatment plant? **[9]**

b) What do you mean by rain water harvesting? write a necessity of rain water harvesting system. Draw a sketch of Roof Top Rain Water Harvesting system for a bungalow. **[9]**

Total No. of Questions :10]

SEAT No. :

**P1520**

[Total No. of Pages :5

# [5460] - 111
## T.E. (Mechanical)
## DESIGN OF MACHINE ELEMENTS - I
## (2012 Course) (Semester - I) (302041)

*Time : 3 Hours]* *[Max. Marks :70*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Figures to the right side indicate full marks.***

***Q1)*** a) Explain in brief various design considerations in machine design. **[4]**

b) Discuss applicability of knuckle joint. Two rods are connected by means of a knuckle joint. The axial force 'p' acting on rods is 25 kN. The rod and pin are made of plain carbon steel 45 C 8 ($\sigma_{yt}$ = 380N/mm$^2$) and factor of safety = 2.5. The yield strength in shear is 57.7% of yield strength in tension. Calculate **[6]**

i) Diameter of rods

ii) Diameter of pins

OR

***Q2)*** a) Classify keys. Explain the use of key with suitable example. **[4]**

b) A steel bracket is subjected to a load of 4.5 kN. Determine the thickness required at section A-A if the stress is to be limited to 70 N/mm$^2$ (Refer fig 2(b)) **[6]**

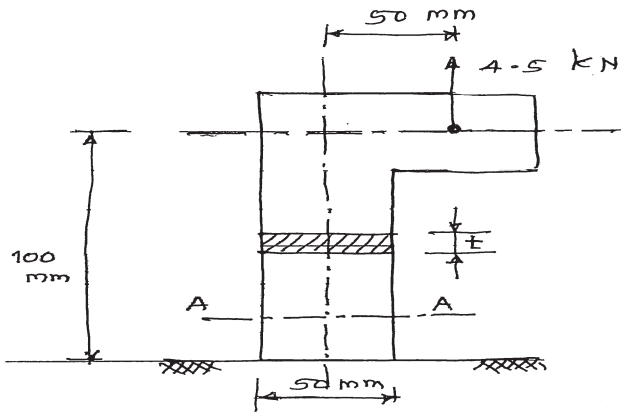



Fig - 2 (b)

***P.T.O.***

***Q3)*** a) Explain with neat sketch protected flange coupling. **[4]**

b) A cantilever beam is loaded as shown in fig 3(b) below. Ultimate tensile strength and yield strength in tension for the beam material are 0.6 GPa and 0.38 GPa respectively. Load F varies from -50 N to +150 N. Take factor of safety as 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam at the fillet cross - section, using Gerber parabola as a failure criteria. **[6]**

Use $k_a = 0.77$, $k_b = 0.85$, $k_c = 0.897$ and $k_t = 1.44$ (at fillet section)

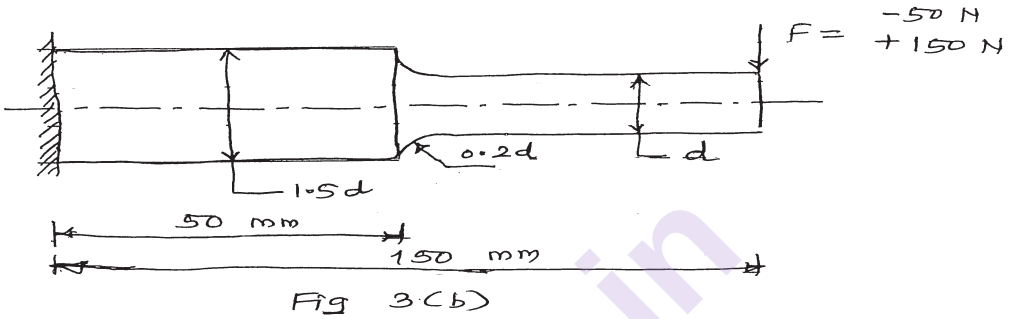


Fig 3(b)

OR

***Q4)*** a) Discuss any two criteria for the design of component subjected to fluctuating stresses for infinite life. **[6]**

b) A transmission shaft is subjected to maximum torsional moment of 600 N.m and a maximum bending moment of 1000 N.m. The loads are suddenly applied for which shock and fatigue factors in bending and torsion may be taken as 2.0 and 1.5 respectively. If the shaft material has ultimate tensile strength of 600 MPa and yield strength of 380 MPa, determine the shaft diameter considering keyway effect as per ASME code. **[4]**

***Q5)*** a) Explain with neat sketch differential and compound screws. **[4]**

b) A square threaded power screw is used in screw jack with following specifications **[12]**

i) Triple start
ii) Nominal diameter of screw = 44 mm
iii) Pitch of thread = 7 mm
iv) Load to be lifted = 5 kN
v) Coefficient of friction at thread = 0.12
vi) Collar friction is Negligible
vii) Length of nut = 42 mm

Calculate

1) Maximum shear stress in screw
2) Direct shear stress in screw & nut
3) The bearing pressure.

State whether screw is self - locking.

OR

***Q6)*** a) Derive an equation for maximum efficiency of square threaded screw. **[6]**

b) It is required to design C-clamp having trapezoidal threads as shown in Fig 6(b) below. **[10]**

i) Maximum force exerted by an operator at lever end = 80 N
ii) Maximum force exerted by the clamp = 4 kN
iii) Outside diameter of trapezoidal threads = 12 mm
iv) Pitch of threads = 2 mm
v) Coefficient of friction for screw = 0.12
vi) Coefficient of friction for collar = 0.25
vii) Mean collar radius = 6 mm

Find

1) The length of handle
2) The maximum shear stress in the body of screw and location of it.
3) The bearing pressure on the threads.
4) Efficiency of the clamp.

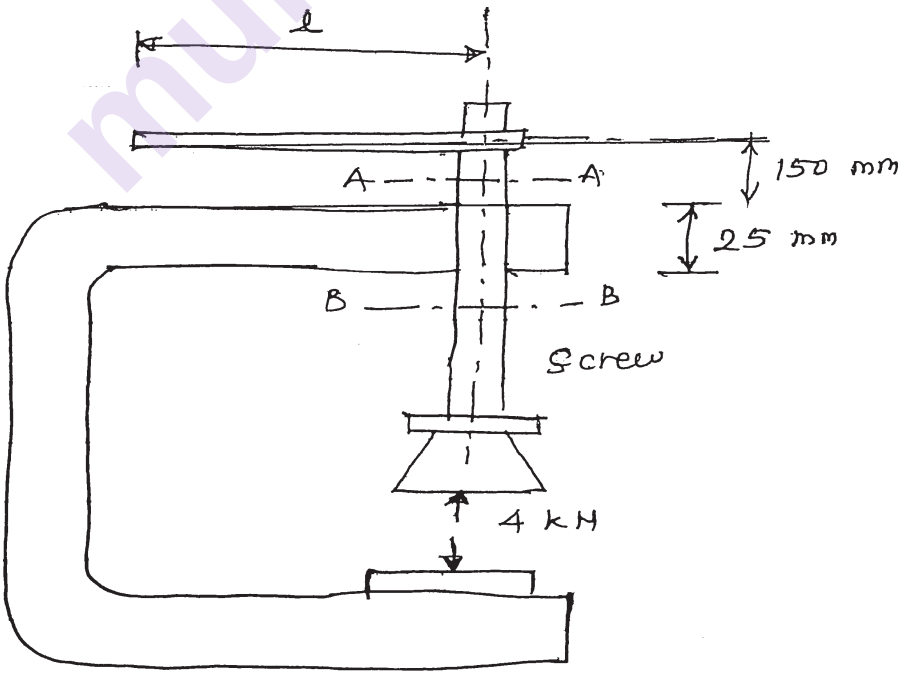



Fig 6 (b)

***Q7)*** a) List basic types of screw fastenings. Explain the design of bolted connection subjected to eccentric load perpendicular to axis of bolt. **[8]**

b) A bracket is subjected to a load of 15000 N as shown in fig 7 (b) below, and is fixed to a vertical column by four identical bolts. Bolts are made of carbon steel ($\sigma_{yt}$ = 400 N/mm$^2$) and factor of safety is 2.5. Determine the size of bolt. **[10]**

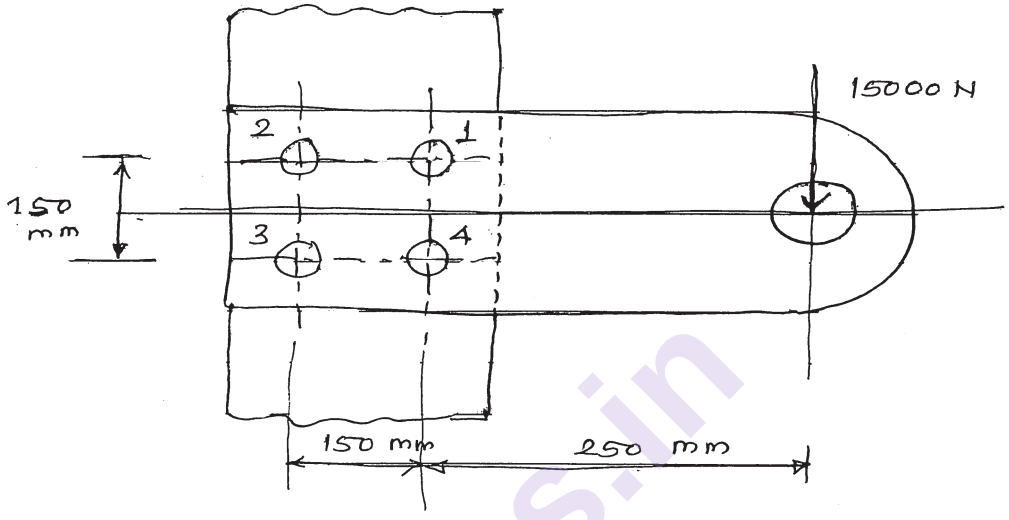



Fig 7 (b)

OR

***Q8)*** a) List commonly used weld types and comment on stresses induced in one of the weld type. **[6]**

b) A bracket is welded as shown in fig 8 (b) below. It carries a load of 80 kN. Calculate size of bolt if allowable stress in weld is 90 N/mm$^2$. **[12]**

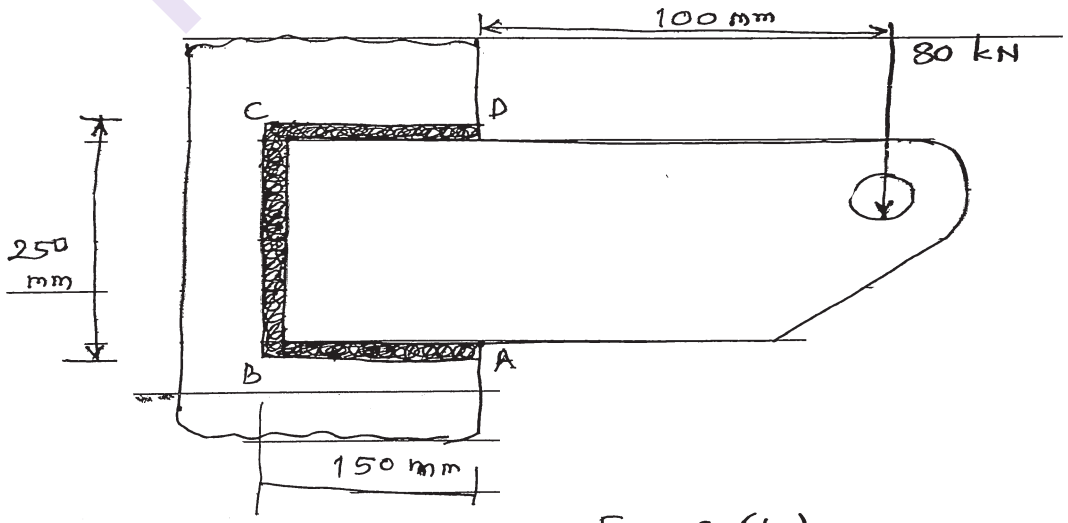



Fig 8 (b)

***Q9)*** a) Draw following for stresses in helical compression spring. **[6]**

i) Torsional shear stress.

ii) Direct shear stress.

iii) Resultant torsional shear and direct shear stress.

Also list equations for above stresses

b) A composite spring has two helical springs arranged in a concentric manner with one inside the other. Both springs have same free length and carry a total load of 3200 N. Data for these springs are as follows. **[10]**

| | | Outer spring | Inner Spring |
|---|---|---|---|
| 1. | Mean diameter (mm) | 84 | 60 |
| 2. | Wire diameter (mm) | 12 | 10 |
| 3. | Number of coils | 8 | 12 |

Use $G = 80 \times 10^3$ N/mm$^2$.

Determine

i) The maximum load carried by each spring

ii) Deflection of each spring

iii) Shear stress in each spring

OR

***Q10)***a) Discuss functions and applications of any four springs. Also suggest suitable materials for these applications. **[8]**

b) It is required to design a helical compression spring of circular wire, subjected to an axial load, which varies from 2500 N to 3500 N. For this load range, the deflection of the spring is limited to 5 mm. The spring index is 5. The spring has square and ground ends. For spring wire material $\sigma_{ut}$ = 1050 MPa and G = 81.37 GPa.

The permissible shear stress for the spring wire should be taken as 50% of the $\sigma_{ut}$. **[8]**

Calculate:

i) Wire diameter and mean coil diameter

ii) Number of active coils and total number of coils

iii) Solid length of spring.

iv) Free length of spring.

v) Required spring rate and

vi) Actual spring rate

Total No. of Questions : 10]

SEAT No. :

**P1521**

[Total No. of Pages : 3

# [5460]-112

## T.E. (Mechanicalf / S/W /Automobile)

## HEAT TRANSFER

## (2012 Course) (Semester - I) (End Semester) (302042)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.***
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) Define : **[4]**

i) Thermal diffusivity.

ii) Thermal resistance.

b) Explain use of charts in analyzing transient heat conduction problems. **[6]**

OR

***Q2)*** a) Explain any one boundary condition with a neat sketch. **[4]**

b) The heat flux at the surface of electrical heater is 6000 $W/m^2$. The heater temperature is 120ºC when it is cooled by air at 70ºC. What is the average convective heat transfer coefficient? What will be the heater temperature if heat flux is reduced to 2000 $W/m^2$? **[6]**

***Q3)*** a) Define : **[4]**

i) Time Constant and

ii) Response of Thermocouple.

b) A thermocouple bid is sphere of 1 mm diameter. It is initially at room temperature and suddenly placed in a 200ºC gas flow. The average heat transfer coefficient is 250 $W/m^2K$ and the effective values of k, ρ and c are 45 W/mK, 9300 $kg/m^3$ and 0.16 kJ/kg.K respectively. Check validity of Lumped Analysis and hence evaluate the response of thermocouple? **[6]**

OR

***P.T.O.***

***Q4)*** a) Enlist the applications of extended surfaces. **[4]**

b) Derive an expression for efficiency of an infinitely long fin. **[6]**

***Q5)*** a) Explain physical significance of Reynolds' number and Rayleigh number. **[4]**

b) Compare : Natural Convection and Forced Convection. **[4]**

c) Air at 20ºC moving at 15 m/s is heated by an isothermal at 110ºC, 0.5 m X 0.5 m size. Find the average heat transfer coefficient and heat transfer rate. Take following properties of air at mean film temperature : **[8]**

Pr = 0.707, $\nu = 19.4 \times 10^{-6}$ m$^2$/s.

Use the following correlations :

$Nu = 0.664\ Re_L^{1/2} Pr^{1/3}$.

OR

***Q6)*** a) Define and explain the physical significance of Nusselt number and Prandtl number. **[6]**

b) A 6m long section of an 8 cm diameter horizontal hot water pipe shown in fig below passes through a large room whose temperature is 20ºC. If the outer surface temperature of the pipe is 70ºC, determine the rate of heat loss from the pipe by natural convection. **[10]**

Use the following correlations :

$$Nu = 0.6 + \left\{ \frac{0.387\,Ra^{1/6}}{\left[1 + (90.559 / Pr)^{9/16}\right]^{8/27}} \right\}$$

Take properties of air at 45ºC as follows :

Cp = 1005 J/kgK; k = 0.02699 W/mK

$\nu = 1.749 \times 10^{-5}$ m$^2$/s, Pr = 0.7241.

***Q7)*** a) What is shape factor? Explain its reciprocity theorem and summation theorem. **[6]**

b) Determine the net radiation heat transfer between two large parallel plates maintained at temperatures 800 K ($\in$ = 0.2) and 500 K ($\in$ = 0.7). **[4]**

c) What is black body, grey surface and an opaque surface. **[6]**

OR

***Q8)*** a) Write a note on : **[8]**

i) Radiation shield.

ii) Kirchoff's law and Weins' displacement law.

b) Saturated liquid nitrogen at 80 K flows through a pipie of 6.5 O.D. stainless steel ($\in = 0.2$) inside a vacuum chamber. The chamber walls are at 230 K and are at some distance from line. Determine the heat gain of line per metre length. If a second stainless tube, 12.7 mm in diameter, is placed around the line to act as a radiation shield, what is the extent of heat gain reduction? **[8]**

***Q9)*** a) Discuss design criteria for heat exchangers. **[8]**

b) Water enters the tubes of a small single – pass heat exchanger at 20ºC and leaves at 40ºC. On the shell side, 25 kg/min of steam condenses at 60ºC. Calculate the overall heat transfer coefficient and the required flow rate of water if the area of the exchanger is 12 $m^2$. Take latent heat of evaporation at 60ºC as 2358.7 kJ/kg. **[8]**

c) Write an expression for LMTD of parallel flow heat exchanger. **[2]**

OR

***Q10)***a) How heat exchangers are classified? **[4]**

b) Compare : Drop wise condensation and Film wise condensation. **[6]**

c) Derive the expression for effectiveness of counter flow heat exchanger. **[8]**

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1522**

**[Total No. of Pages : 3**

**[5460]-113**

# T.E. (Mechanical. Auto. S/W)

# THEORY OF MACHINES - II

## (2012 Course) (Semester - I) (302043)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

1) ***Answer five questions from the following.***
2) ***Draw neat labeled diagrams wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of electronic calculator is permitted.***
5) ***Use of Programmable calculator is not allowed.***
6) ***Assume suitable/standard data if necessary.***

***Q1)*** a) What is interference in involute gears? How it can be avoided? **[4]**

b) The addendum on each wheel of two mating gears is to be such that the line of contact on each side of the pitch point is half the maximum possible length. The number of teeth on the two gears is 18 and 54. The teeth are of 20° pressure angle involute with a module of 6 mm. Determine the addendum for the pinion and gear also find the contact ratio. **[6]**

OR

***Q2)*** a) The annalus of an epicyclic gear train rotates at 300 rpm about the axis of fixed sun which has 80 teeth. The three armed spider is driven at 180 rpm. Determine the number of teeth required on the planet. **[6]**

b) Explain the force analysis of bevel gears. **[4]**

***Q3)*** a) State true or false and justify your answer (any 3): **[6]**

i) Contact ratio of spiral gear is greater than the spur gear.

ii) For higher pressure angles, the performance of the gear improves.

iii) If the length of path of contact is more, the efficiency is more.

iv) If the input and output torques in an epicyclic gear train acts in same direction,the holding torque also acts in same direction.

v) Cycloidal profile is chosen for power transmission applications.

b) The center distance between the meshing gears is 150 mm and the angle between the shaft axes is 60°. The velocity ratio is 2 and the normal circular pith is 10 mm. The driven gear has a helix angle of 25º; determine the number of teeth on each wheel. **[4]**

OR

***P.T.O.***

***Q4)*** a) What is the significance of helix angle in the worm gears? **[4]**

b) Obtain an expression for minimum number of teeth to avoid interference in a rack and pinion. **[6]**

***Q5)*** a) Compare stepped and step less regulation of speeds. **[4]**

b) A 2.2 tonne racing car has a wheel base of 2.4 m and a track of 1.4 m. The centre of mass of the car lies at 0.6 m above the ground and 1.4 m from the rear axle. The equivalent mass of engine parts is 140 kg with aradius of gyration of 150mm. The back axle ratio is 5. The engine shaft and flywheel rotate clockwise when viewed from the front. Each wheel has a diameter of 0.8 m and a moment of inertia of 0.7 kg $m^2$. Determine the load distribution on the wheels when the car is rounding a curve of 100 m radius at a speed of 72 km/hour to the (i) left and (ii) right. **[12]**

OR

***Q6)*** a) The turbine rotor of a ship has a mass of 2.2 tonnes and rotate at 1800 rpm clockwise when viewed from the aft. The radius of gyration of the rotor is 320 mm. Determine the gyroscopic couple and its effect when the **[12]**

i) Ship turns right at a radius 250 m with a speed of 25 km/hour.

ii) Ship pitches with bow rising at an angular velocity 0.8 rad/s

iii) Ship rolls at an angular velocity of 0.1 rad/s.

b) Explain what is Self-tightening effect in conical displaceable variators?**[4]**

***Q7)*** a) An umbrella mechanism is to be designed for the following relationships between the input and output parameters. **[12]**

i) The relative displacements of the slider 10 mm and 40 mm from the initial position (50 mm from the reference coordinate axis).

ii) The corresponding angular displacements of the output crank are 20º and 75º from initial position.

Use Inversion method to determine the dimensions of the basic mechanism. **[4]**

b) Define the following terms

i) Accuracy points.

ii) Structural error

iii) Function generation

iv) Pole and relative pole.

OR

***Q8)*** a) Explain Function generation using Relative Pole method for slider crank mechanism to coordinate three positions of slider and crank. **[8]**

b) Design a four link mechanism to coordinate three positions of the input and output link for the following angular displacements of the input and output links. Assume the following data: Initial positions of rocker is 60º with respect to horizontal measured anticlockwise;

$\theta_{12} = 70^{o}; \phi_{12} = 20^{o}; \theta_{13} = 100^{o}\, \phi_{13} = 40^{o}$

Take length of fixed link 100 mm and length of the rocker 50 mm. Use relative pole method. **[8]**

***Q9)*** a) Design a cam profile to operate an inline roller follower using following data **[14]**

i) Base circle of the cam: 30 mm

ii) Radius of the roller: 10 mm

iii) Maximum lift of the follower: 40 mm

iv) Angle of ascent: 120°

v) Angle of dwell: 30°

vi) Angle of descent: 80°

vii) Motion of follower during Ascent: SHM

viii) The follower immediately falls by 10 mm at the end of dwell in highest position and further descents with Uniform velocity.

The cam rotates at uniform speed in clockwise direction. Also draw the pitch circle for.

b) Explain what is undercutting of cams? **[4]**

OR

***Q10)***a) Explain the following advanced cam curves. Mention the application of each.

i) Simple polynomial cam **[6]**

ii) 3-4-5 polynomial cam

b) Derive and expression for the cam jump of an eccentric cam operating a flat faced follower. **[6]**

c) Explain the effect on the cam profile by varying **[6]**

i) Base Circle Diameter and

ii) Pressure angle

Total No. of Questions : 9]

SEAT No. :

**P1523**

[Total No. of Pages : 2

# [5460]-114
# T.E. (Mechanical )
# METROLOGY AND QUALITY CONTROL
## (2012 Pattern) (Semester - I) (End Semester) (302044)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***All questions are compulsory. ie. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q7.or Q8 Question no 9 is compulsory.***
3) ***Assume suitable data, if necessary.***
4) ***Use of calculator is allowed***
5) ***Figures to the right side indicate full marks.***

***Q1)*** a) State different types errors in measurement, explain any two with example. **[6]**

b) State errors in thread measurements explain any two. **[4]**

OR

***Q2)*** a) State and explain Taylor's Principle of Gauge Design with example. **[6]**

b) Explain Gauge R & R. **[4]**

***Q3)*** a) Explain with neat sketch construction & working of sigma comparator. **[6]**

b) Write a note on NPL interferometer. **[4]**

OR

***Q4)*** a) Explain online and offline measurement system. **[6]**

b) Write a note on surface texture. **[4]**

***Q5)*** a) Write in details Juran's Trilogy approach. **[8]**

b) Enlist seven new quality control tools and explain any two in details. **[8]**

OR

***Q6)*** a) Explain in details different quality costs. **[8]**

b) Explain quality circle and criteria for National Quality awards. **[8]**

***P.T.O.***

***Q7)*** a) A subgroup of 4 items is taken from the manufactured items. After 20 subgroups the values of x and R were found out to be $\sum \bar{x} = 350$ and $\sum R = 8.5$. The specification limits of the part are $17.5 \pm 0.23$. Assuming the process is in control, what conclusion would you draw about the ability of the process to produce the items within specified limits? Assume for subgroup of 4, $A_2 = 0.729$, D3=0, D4=2.283, $d_2 = 2.059$, n=4, N=20. **[8]**

b) State difference between single sampling, double sampling and multiple sampling plain. **[8]**

OR

***Q8)*** a) Construct a control chart for C, i.e., number of defects from the following data pertaining to the number of imperfections in 20 pieces of cloth of equal length in a certain make of polyester and infer whether the process is in a state of control. **[8]**

2, 3, 5, 8, 12, 2, 3, 4, 6, 5, 6, 10, 4, 6, 5, 7, 4, 9, 7, 3.

b) Calculate sample size and AOQ for single sampling plan using following data: **[8]**

- Probability of acceptance of 0.5% defectives in a lot is 0.525
- Lot size = 10,000 units
- Acceptance number = 1
- np=1.6
- Detectives found in the sample are not to be replaced

***Q9)*** Write short notes on following (Any Three) **[18]**

a) Six sigma

b) TPM

c) Kanban

d) Five S

e) QFD

f) JIT

**Total No. of Questions : 8]**

**SEAT No. :** ____

**P1524**

**[Total No. of Pages : 3**

# [5460]-115
# T.E. (Mechanical)
# HYDRAULICS AND PNEUMATICS
# (2012 Pattern) (Semester - I) (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) ***Figure to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** a) Explain in brief the areas of application of fluid power system. **[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 98.4cm$^3$. It delivers 0.00152m$^3$/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 the benefits from conditioning of the hydraulic fluid? **[6]**

b) State the criteria for selection of sealing devices. **[8]**

c) State Pascal's law and explain applied to simple hydraulic jack with analysis. **[6]**

***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

***P.T.O.***

***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 control 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]**

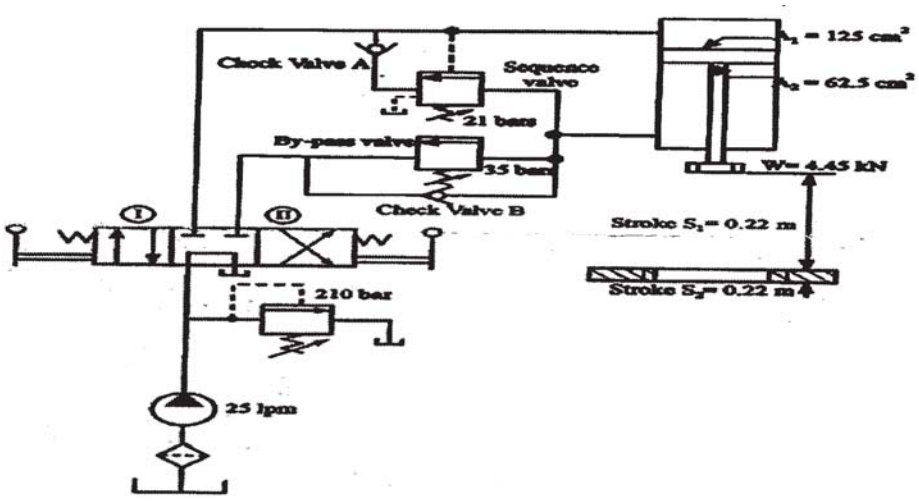
i) Pneumatic motor actuation circuit.

ii) Draw a pneumatic circuit equivalent to AND gate.

b) Draw a typical symbol of FRL unit and explain the working principle of lubricator. **[6]**

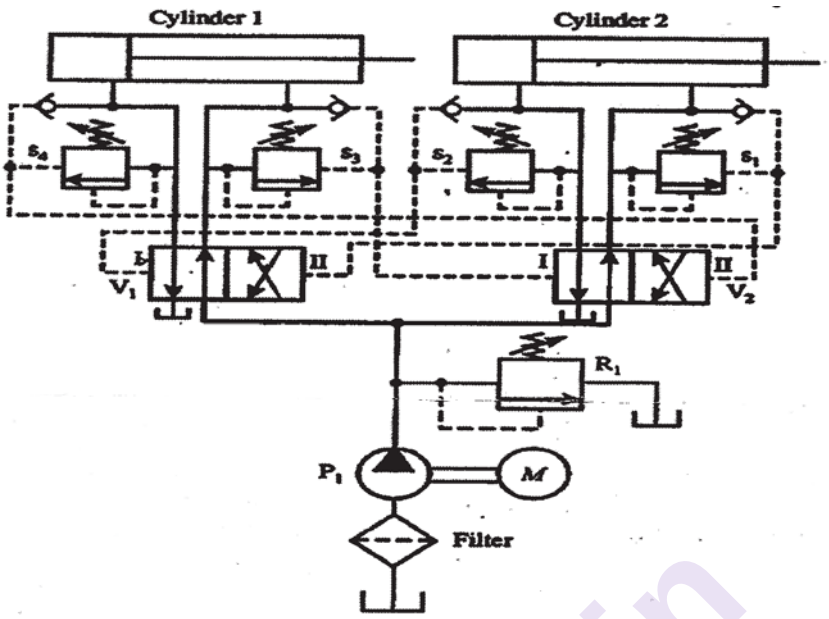
c) Write in brief on applications of pneumatics in low cost automation. **[4]**

***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 : 12]

SEAT No. :

**P1525**

[Total No. of Pages : 2

# [5460]-116

## T. E. (Mechanical / Automobile)

## NUMERICAL METHODS AND OPTIMIZATION

## (Semester-II) (2012 Pattern) (End Semester) (302047)

*Time : 2.30 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 programmable calculator is not permitted.***
4) ***Assume suitable data if necessary.***

***Q1)*** Explain the types of errors with examples. (Any Three) : **[6]**

OR

***Q2)*** Using Newton Raphson Method, find out root of the equation $exp(x)^* cos(x) - 1.4 = 0$ up to three Point accuracy. **[6]**

***Q3)*** Solve following set of simultaneous equations using Gauss Elimination Method. **[6]**

$2X1 - 3X2 - 4X3 = 11$

$9X1 + 2X2 - 8X3 = 1.9$

$15X1 - 8X2 + 6X3 = 14.7$

OR

***Q4)*** Draw the flowchart for Gauss Seidal Method. **[6]**

***Q5)*** Explain the following optimization technique : **[8]**

a) Genetic Algorithm(GA)

b) Simulating Annealing (SA)

OR

***Q6)*** Use simplex Method to **[8]**

Maximize $Z = 14X_1 + 20X_2$

Subjected to $20X_1 + 6X_2 \leq 1000$

$40X_1 + 8X_2 < 500$

$X_1, X_2 \geq 0$

***P.T.O.***

***Q7)*** a) Using Least Square method fit a curve of the formy $y = a \cdot b^x$ to the following data: **[8]**

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 4 | 11 | 35 | 100 |

b) Draw the flowchart for Lagrangian Interpolation method. **[8]**

OR

***Q8)*** a) A set of values of $x$ & $y$ are given in the following table. Using Newtons forward difference interpolation method find y(1.105). **[10]**

| x | 1 | 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 |

b) Draw a flowchart to fit a straight line to the given database using least square method. **[6]**

***Q9)*** a) Using Trapezoidal rule evaluate $\int_0^1 \cdot \int_1^2 \frac{(2xy)}{\left((1+x^2).(1+y^2)\right)} dxdy$. **[10]**

b) Draw the flowchart for Simpsons 1/3rd method. **[6]**

OR

***Q10)***a) Using simpsons 1/3rd method evaluate the integration $\int_1^2 \frac{e^x}{x} dx$. **[10]**

b) Explain graphically the method of integration using Trapezoidal rule. **[6]**

***Q11)***a) Using Runge kutta second order method find $y(0.2)$ for $dy/dx = x+y$ given $y(0) = 1$ and $h = 0.1$. **[10]**

b) Draw the Flowchart for Eulers method. **[8]**

OR

***Q12)***a) A steel plate of 750mm × 750 mm has its two adjacent sides maintained are 100°C. While two other sides are maintained at 0°C. What will be the steady state temperature at interior points assuming a grid size of the 250mm. **[10]**

b) Explain the procedure for the solution of simultaneous ordinary differential equations using the Runge Kutta second order method. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1526**

[Total No. of Pages : 3

# [5460]-117
## T.E. (Mechanical)
## DESIGN OF MACHINE ELEMENTS - II
## (302048) (2012 Pattern) (End Semester - II)

*Time : 3 Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer questions 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 pocket calculator is allowed.***
5) ***Use of programmable calculator is not allowed.***
6) ***Assume suitable data, if necessary.***

***Q1)*** a) Discuss the modes of gear tooth failure. **[6]**

b) What do you understand by **[4]**

i) Hunting tooth.

ii) Crowning of Gear Tooth.

OR

***Q2)*** A pair of spur gears with 20º full depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while face width is 40 mm. The material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm$^2$. The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5.

Determine the rated power that the gears can transmit. **[10]**

***Q3)*** a) For a bevel gear explain the force analysis by considering the total load is shared by one pair of teeth. **[4]**

b) Suggest suitable bearing for the following applications with Justification. **[6]**

i) Lathe spindle.

ii) Table fan shaft.

iii) Wind turbine shaft.

iv) Railway wheels axle.

v) Hand drill spindle.

vi) Household mixer grinder.

OR

***P.T.O.***

***Q4)*** A straight bevel pinion having 18 teeth is to mesh with a straight bevel gear having 40 teeth. The axes of the pinion and gear intersect at right angles. The pinion and gear are to be made of a case hardened steel having ultimate tensile strengths of 720 $N/mm^2$ and 580 $N/mm^2$ respectively. The gear pair is to manufactured by generation. The pinion shaft is connected to 15 kW, 1440 rpm electric motor. The pair is to be 350 BHN, design a gear pair with factor of safety of 1.5. Assume velocity factor accounts for the dynamic load. **[10]**

***Q5)*** a) Derive an expression for the length of the cross belt drive. **[6]**

b) Explain the procedure for the selection of flat belt from manufacturer's catalogue. **[6]**

c) Discuss the modes of Rollar chain failure. **[6]**

OR

***Q6)*** a) Explain the procedure for the selection of Rollar chains from manufacturer's catalogue. **[6]**

b) A pulley of 750 mm diameter is driven by an open flat belt from 20 kW, 720 rpm electric motor. The pulley on motor shaft is of 400 mm diameter and centre distance between the shafts is 2.5 m. The allowable tensile stress for belt material is 2 $N/mm^2$ while the coefficient of friction between belt and pulley is 0.3. The density of belt is 900 $kg/m^3$. If the width of belt is 100 mm, determine : **[12]**

i) the thickness of belt.

ii) the length of belt.

iii) the initial tension required in belt.

***Q7)*** a) Discuss the advantages and limitations of worm gear drives. **[4]**

b) A pair of worm and worm wheel is designated as 2/72/10/6. The worm transmit 8 kw at 1800 r.p.m. to a worm wheel. The permissible bending strength is 110 $N/mm^2$. The wear load factor is 0.83 $N/mm^2$. If the coefficient of friction is 0.05 and normal pressure angle is 20°. Determine : **[12]**

i) the factor of safety against bending.

ii) the factor of safety against wear and

iii) The factor of safety against heat.

OR

***Q8)*** a) Write modes of failures in worm gear pair. **[4]**

b) Derive the expression for efficiency of worm and worm gear pair. Discuss factors affecting efficiency of worm gear pair. **[12]**

***Q9)*** a) Classify sliding contact bearing based on relative motion between contacting surfaces. **[4]**

b) The following data is given for a 360º hydrodynamic bearing : **[12]**

i) Radial Load = 3.2 kN.

ii) Journal dia = 50 mm

iii) Bearing length = 50 mm

iv) Journal speed = 1490 r.p.m.

v) Radial clearance = 50 microns

vi) Viscosity of Lubricant = 25 cP

vii) Density of Lubricant = 860 kg/$m^3$

viii) Sp. heat of Lubricant = 1.76 kJ/kgºC

Assuming that the total heat generated in the bearing is carried by the total oil flow in the hearing calculate :

i) the minimum oil film thickness.

ii) the coefficient of friction.

iii) the power lost in friction.

iv) the total flow rate of Lubricant in l/min.

v) the side leakage

vi) the temperature rise.

OR

***Q10)***a) Explain the desirable properties of the material used for the sliding contact bearing. Also suggest the suitable materials mapped with the desirable properties. **[8]**

b) Discuss Design procedure for Hydrodynamic journal bearings in detail. **[8]**

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1527**

**[Total No. of Pages : 3**

# [5460]-118
# T.E. (Machanical)
# TURBO MACHINES
## (2012 Pattern) (Semester - II) (302049) (End - Semester)

***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) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume data wherever necessary and mention it.***
5) ***Draw neat and suitable figures wherever necessary.***

***Q1)*** a) Derive fundamental governing equation of turbomachines. **[4]**

b) The three jet Pelton is required to produce 10,000 kW under a net head of 400 m. The blade angle at outlet is 15° and reduction in relative velocity while passing over the blade is 5%. If the overall efficiency of the wheel is 80%, Cv = 0.98, speed ratio = 0.46, then **[6]**

Determine :

i) The total flow in LPS

ii) Diameter of the jet

iii) Force exerted by a jet on the buckets

OR

***Q2)*** a) Define the Unit speed and Unit discharge and derive expression for the same. **[4]**

b) The external and internal diameters of an inward flow reaction turbine are 2.0 m and 1.0 m respectively. The head on the turbine is 60 m. The width of the vane at inlet and outlet are same and equal to 0.25 m. The runner vanes are radial at inlet and discharge is radial at outlet. The speed is 200 rpm and discharge is 6 $m^3/s$. **[6]**

Determine :-

i) The vane angle at inlet and outlet of the runner.

ii) The hydraulic efficiency.



***P.T.O.***

***Q3)*** a) Define specific speed of turbine and state its significance. **[4]**

b) Steam at 300 m/s is supplied to single stage impulse turbine through a nozzle. The nozzle angle is 25°, the mean diameter of the blade rotor is 100 cm and it has speed of 2000 rpm. Find suitable blade angles if there is no axial thrust. If blade velocity coefficient is 0.9 and steam flow rate 10 kg/s find the power developed. **[6]**

OR

***Q4)*** a) Compare impulse and reaction steam turbine. **[4]**

b) A Kaplan turbine produces 30 MW under a head 9.6 m, while running at 65.2 rpm. The discharge through is 350 $m^3/s$. The tip diameter of the runner is 7.4 m. The hub diameter is 0.432 times the tip diameter. **[6]**
Determine :

i) The turbine efficiency ii) Specific speed

iii) Speed ratio iv) Flow ratio

***Q5)*** a) Derive an expression of minimum starting speed of centrifugal pump. **[6]**

b) Explain the necessity and methods of primping of centrifugal pump. **[4]**

c) A centrigugal pump impeller whose external diameter and width at the outlet are 0.8 m and 0.1 m respectively is running at 550 rpm. The angle of impeller vanes at outlet is 40°. The pump delivers 0.98 $m^3$ of water per second under an effective head of 35 m. If the pump is driven by a 500 kW motor, Determine : **[8]**

i) The manometric efficiency
ii) The overall efficiency
iii) The Mechanical efficiency

OR

***Q6)*** a) Derive an expression of specific speed of centrifugal pump. **[6]**

b) Explain the necessity of multistaging of centrifugal pump. **[4]**

c) A three stage centrifugal pump has impeller 400 mm diameter and 20 mm wide. The vane angle at outlet is 45° and the area occupied by the thickness of the vanes may be assumed 8% of the total area. If the pump delivers 3.6 $m^3$ of water per minute when running at 920 rpm, Determine : **[8]**

i) Power of the pump
ii) Manometric head
iii) Specific speed

Assume Mechanical efficiency as 88% and Manomateric efficiency as 77%.

***Q7)*** a) Derive an expression of isentropic efficiency of centrifugal compressor with the help of T-S diagram. **[6]**

b) Define Slip and slip factor of centrifugal compressor. **[4]**

c) Air is compressed in centrifugal compressor from 27°C to 150°C and pressure from 1 bar to 3 bar. Determine the isentropic efficiency of the compressor and power developed if mass flow rate of 28 kg/min. **[6]**

OR

***Q8)*** a) A centrifugal compressor runs at a speed of 15000 rpm and delivers 30 kg of air per second. Exit radius is 0.35 m, relative velocity at the exit is 100 m/s at an exit angle of 75°. Determine : **[8]**

i) The torque

ii) Power required to drive the compressor

iii) Idal head developed

iv) Workdone

b) Compare Centrifugal compressor and axial flow compressor. **[4]**

c) Discuss the various losses in centrifugal compressor. **[4]**

***Q9)*** a) Explain Surging and Choking in axial flow compressor. **[6]**

b) An axial compressor has a mean diameter of 60 cm and runs at 15000 rpm. If the actual temperature rise and pressure ratio developed are 30°C and 1.3 respectively, Determine : **[10]**

i) Power required to drive the compressor while delivering 57 kg/s of air, assuming mechanical efficiency 86% and initial temperature of 35°C

ii) Stage efficiency

iii) The degree of reaction if temperature at the rotor exit is 55°C.

OR

***Q10)*** a) Explain the construction and working of axial flow compressor. **[6]**

b) In an eight stage axial flow compressor, the overall stagnation pressure ratio achieved is 5:1 with an overall isentropic efficiency of 92%. The inlet stagnation temperature and pressure are 290K and 1 bar. the work is divided equally between the stages. The mean blade speed is 160 m/s and 50% reaction design is used. The axial velocity through the compressor is constant and equal to 90 m/s. Determine the blade angles and power required. **[10]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1528**

[Total No. of Pages : 3

# [5460]-119
# T.E. (Mechanical)
# MECHATRONICS
## (2012 Pattern) ( Semester - II) (302050)

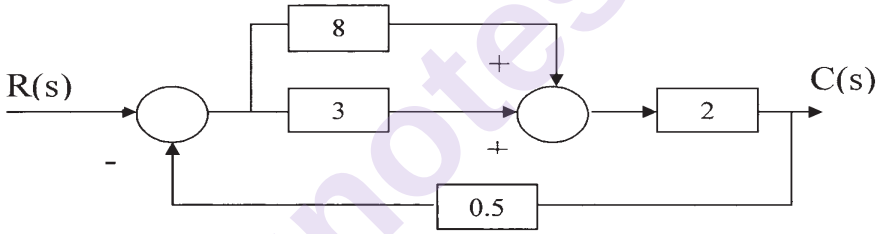
*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

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

***Q1)*** a) List types of proximity sensors. Using suitable diagram explain construction and working of any one Proximity sensor. **[6]**

b) Determine the transfer function of following diagram. **[4]**



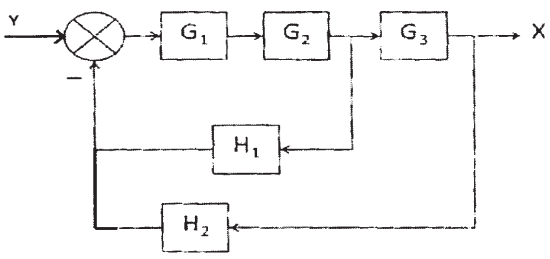

OR

***Q2)*** a) Draw suitable diagram and explain Dishwasher as a mechatronic system. **[6]**

b) An analog transducer having an input of 8 volt is able to distinguish 1 m V in its input signal. Calculate the no. of bits A/D converter should have in order to achieve a resolution not lower than 1mV. **[4]**

***Q3)*** a) Explain Successive Approximation ADC. **[6]**

b) Determine the transfer function of following diagram. **[4]**




OR

***P.T.O.***

***Q4)*** a) A rotary potentiometer is used for angle measurement. It is supplied with 10V and is set at 60°. The range of this single turn pot is 360°. Calculate output voltage for 60°. **[4]**

b) Using suitable diagram explain construction and working of DAQ. **[6]**

***Q5)*** a) Draw a suitable block diagram of SCADA and explain its architecture. **[8]**

b) Explain the role played by following elements in PLC. **[8]**

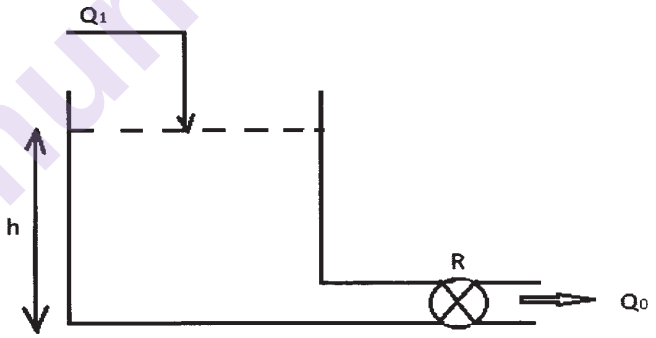
a) Program Memory
b) Input Module
c) Analog I/O module
d) Bus system

OR

***Q6)*** a) What is the function of counters in PLC programming? Classify and explain any two types of counters. **[8]**

b) In a certain bank each of three bank officers have a unique key to open the vault. The banks rule requires that two out of three officers must be present when the vault is opened. Draw the ladder logic diagram that will unlatch the door and turn on the light if any two of the three keys are inserted. **[8]**

***Q7)*** a) A Simple Liquid - level system is as shown below. Obtain transfer function of the system relating to inflow and outflow. **[8]**




b) Define following terms. **[8]**

i) Steady state error
ii) Gain margin
iii) Damping frequency
iv) % overshoot

OR

***Q8)*** a) Using suitable diagram explain Transient response specifications. **[8]**

b) Calculate the poles and zeros for the system with the transfer function.

$$G(s)\frac{6(s+3)}{s^2+2s+2}$$ **[8]**

***Q9)*** a) Draw a suitable diagram and derive transfer function of Proportional Integral and derivate (PID) controller in series. Compare it with PID in parallel as well. **[10]**

b) Explain P-D control with neat diagram and equation. Why derivative controller cannot be used alone? **[8]**

OR

***Q10)***a) An integral controller is used for speed control with a set point of 12 rpm within a range of 8 to 16 rpm. The controller output is 20% initially. The constant $K_I$= -0.15% controller output per second per percentage error. If the speed jumps to 14.5 rpm Claculate the constant output after 2 sec. for a constant $e_p$. **[8]**

b) Discuss the role of transient specifications with respect to performance of PID. **[10]**

Total No. of Questions : 10]

SEAT No. :

**P1529**

[Total No. of Pages : 3

# [5460]-120
# T.E. (Mechanical)
# MANUFACTURING PROCESS - II
## (2012 Pattern) (Semester - II) (End - Semester)

*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) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** a) Determine machining time for plain milling a rectangular surface of length 100 mm and width 50 mm by a helical fluted plain HSS milling cutter of diameter 60 mm, length 75 mm and 6 teeth. Assume approach length = over travel length = 5 mm, cutting speed = 40 m/min and feed rate = 0.1 mm/tooth. **[6]**

b) Differentiate between Boring and Reaming. **[6]**

OR

***Q2)*** a) Explain working principle of Centerless Internal Grinding with neat labeled sketch. **[4]**

Justify : Specific energy consumption in grinding process is high. **[2]**

b) Differentiate between lapping and honing. **[6]**

***Q3)*** a) State the conditions under which positive and negative rake angles are recommended. **[4]**

b) A cutting tool, cutting at 22m/min, gave a life of one hour between regrinds when operating on roughing cuts with mild steel. What will be its probable life when engaged on light finishing cuts? Take n = 1/8 for roughing cuts and n = 1/10 for finishing cuts in Taylor's equation $VT^n = C$. **[4]**

OR

***P.T.O.***

***Q4)*** a) Explain the characteristic of cutting tool materials and enlist various types of tool material. **[4]**

b) Derive a mathematical expression for shear angle in terms of chip reduction ratio or chip compression factor. **[4]**

***Q5)*** a) Explain the scheme of material removal in abrasive jet machining. **[8]**

b) Enlist the specific characteristics of ultrasonic machining process with the help of given points: Mechanics of material removal, medium, abrasives, vibration frequency & amplitude, tool material & tool-work gap, material application, shape application, limitations. **[8]**

OR

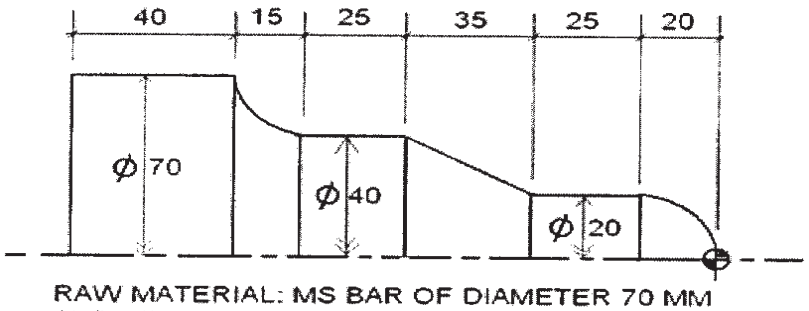
***Q6)*** a) Draw schematic diagram of electrochemical machining process and explain its effects on product in comparison with conventional machining. **[8]**

b) Explain electro discharge machining process with the help of given points: Schematic diagram, principle of operation, process parameters, applications. **[8]**

***Q7)*** a) Classify numerical control system on the basis of give criteria's:

Motion control,control loops, transducers, positioning system. **[8]**

b) Figure given below shows the final profile to be generated on a bar stock by using a CNC turning centre. Write part program for turning operations being carrid out on a CNC turning centre. **[8]**




RAW MATERIAL: MS BAR OF DIAMETER 70 MM
AND LENGTH 160 MM
DIAGRAM NOT TO SCALE
ALL DIMENSIONS ARE IN MM

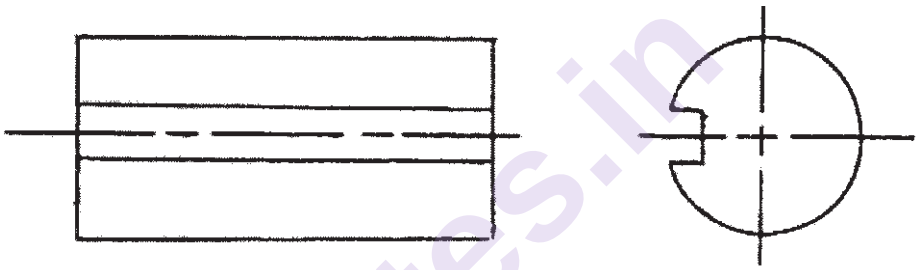
OR

***Q8)*** a) Write a note on CNC machining centers. **[8]**

b) Explain word address format used in manual part programming and the significance of preparatory code and miscellaneous code. **[8]**

***Q9)*** a) Differentiate between Jigs and fixtures. **[8]**

b) A through rectangular section slot has to be cut on a rod as shown in figure. A fixture or jig is to be designed for cutting the slot in batch production. **[10]**



OR

***Q10)*** a) Explain modular fixture. **[8]**

b) Differentiate between drilling fixtures and milling fixtures. **[4]**

c) i) Enlist types of clamping device and types of turning fixtures. **[6]**

ii) Draw neat labeled diagram of fixed type V-locator and state its significance.

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

P3694

[Total No. of Pages : 3

# [5460]-121

## T.E. (Mechanical/Mechanical S/W Engineering)

## MECHATRONICS

## (2012 Pattern) (Semester - 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, 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.*

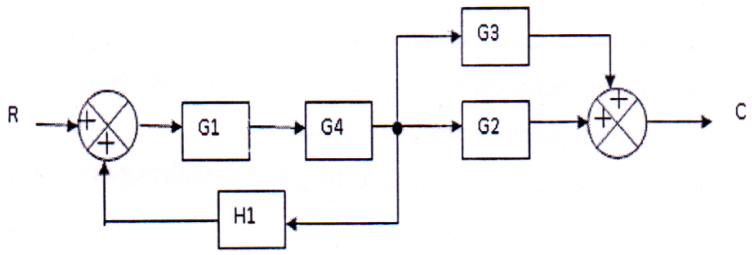
***Q1)*** a) Explain with neat sketch, the use of potentiometer for linear and angular displacement measurement. **[6]**

b) With suitable block diagram, explain the automatic washing machine as a mechatronics system. **[4]**

OR

***Q2)*** a) Discuss optical proximity sensor with respect to principle, types, advantages and application. **[6]**

b) Carry out block diagram reduction for the following system shown in Figure. **[4]**




***Q3)*** a) Enumerate the importance of DAQ system in mechatronics. Using suitable sketch, explain single channel and multi channel DAQ. **[8]**

b) Write any one distinct advantage and limitation of transfer function. **[2]**

OR

***P.T.O.***

***Q4)*** a) What is mean by sampling? Define and explain the following with neat sketch. **[8]**

i) Sampling theorem,

ii) Aliasing.

b) Enlist any four applications of closed loop control system. **[2]**

***Q5)*** a) Using a suitable schematic list the components in PLC and explain the significance of each components. **[8]**

b) Using suitable example, draw a ladder diagram and explain how timer is implemented. **[8]**

OR

***Q6)*** a) A small electric furnace has two heating elements. When 'ON' switch is pressed, first element starts and after 2 minutes the second starts. Using single 'STOP' switch, system can be shut down. A temperature sensor is used to shut down the furnace if overheating occurs. Draw ladder diagram. **[8]**

b) Using suitable example and sketch, explain the working of following in a PLC. **[8]**

i) Latching

ii) Counter.

***Q7)*** a) Explain the building blocks of a translational mechanical system and derive the equation for same system. **[8]**

b) Explain stability analysis using Routh- Hurwitz criterion and test the system stability whose characteristics equation is : $S^3+4S^2+S+16 = 0$. **[8]**

OR

***Q8)*** a) A second order system is given by transfer function = $25/(S^2+6S+25)$. Find its rise time, peak time, peak overshoot and settling time, if subjected to unit step input. **[8]**

b) Draw suitable sketch to depict the unit step response of a second order system when **[8]**

i) System poles are negative and real.

ii) System poles are an imaginary pair with no real part.

iii) System poles are positive and real.

iv) System poles are complex conjugate pair with negative real part.

***Q9)*** a) An integral controller is used for temp. control with a set point of 22°C within a range of 20°C to 30°C. The controller output is 32% initially. The constant $K_I$ = – 0.20% controller output per second per percentage error. If the temperature jumps to 24.5°C, calculate output after 2 seconds for a constant $e_p$. **[10]**

b) Using a suitable block diagram, explain the working of PID control in parallel form. **[8]**

OR

***Q10)***a) Explain proportional plus derivative control with neat diagram and equation. Why derivative controller can not be used alone. **[10]**

b) What is PID tuning. Enlist the methods of PID tuning. Explain any one method of PID controller tuning. **[8]**

Total No. of Questions : 12]

SEAT No. :

**P1530**

[Total No. of Pages : 2

# [5460]-122

## T.E. (Mechanical Sandwich )

## Numerical Methods & Computational Techniques (302061)

## (2012 Pattern) (Semester-I) (End Semester)

*Time : 2.30 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)*** Find the forth root of 28, using Newton Raphson method. Take accuracy 0.01. **[6]**

OR

***Q2)*** Use Simpson's $3/8^{th}$ rule to evaluate **[6]**

$F(x) = (\sin(x) + \cos(x))^{1/2}$ between the limits 0 to $\pi/2$. Take strip size=$\pi/6$

***Q3)*** Find f(9) using Lagrange's Interpolation **[6]**

| X | 5 | 7 | 11 | 13 | 17 |
|---|---|---|---|---|---|
| F(x) | 150 | 392 | 1452 | 2366 | 5202 |

OR

***Q4)*** Draw flowchart for Newton's forward difference table. **[6]**

***Q5)*** Using Gauss Elimination method, solve the following set of simultaneous equations **[8]**

$2X + Y + Z = 10$

$3X + 2Y + 3Z = 18$

$X + 4Y + 9Z = 16$

OR

***Q6)*** Solve the following simultaneous equations by Gauss Seidal Method five iterations only **[8]**

$6X + 15Y + 2Z = 72$

$X + Y + 54Z = 110$

$27X + 6Y - Z = 85$

***P.T.O.***

***Q7)*** a) What are different types of errors, explain them with example. **[8]**

b) The pressure (p) and volume (v) of a gas are related by the equation $PV^{\gamma}=C$, where $\gamma$ and C being constants. Fit this equation to the following set of observations. **[8]**

| $p(kg/cm^2)$ | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
|---|---|---|---|---|---|---|
| V(liters) | 1.62 | 1.00 | 0.75 | 0.62 | 0.52 | 0.46 |

OR

***Q8)*** a) Explain Least Square Technique to fit the second order polynomial. **[8]**

b) Explain with suitable examples. **[8]**

i) Error Propagation

ii) Truncation Error

***Q9)*** a) Draw flow chart for Runge Kutta 4th order method for solving ordinary differential equations. **[8]**

b) Solve the equation $\frac{dy}{dx}=\frac{y+xy}{x}$, Given initial condition y (1.0) = 2.718 find y (1.2) taking step size of 0.1 and accuracy 0.001. Use Modified Euler's method. **[8]**

OR

***Q10)***a) Using Runge Kutta 4th order method, find y(0.1) and y(0.2) Given $\frac{dy}{dx}=\frac{y-x}{y+x}$ & y(0) = 1.0. **[8]**

b) Draw flow chart for Euler's Method for solving ordinary differential equations. **[8]**

***Q11)***a) Draw flowchart to solve Laplace equation. **[8]**

b) Determine temperature distribution (u) in a conducting rod. Ends of the rod are kept in contact with ice and the initial temperature distribution in the rod is given by (i) u=2x for x between 0 to ½ and (ii) U = 2(1–x) for x, between ½ to 1. Assume the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$. Take $\Delta x$ = 0.1 and $\Delta$t 0.001, Calculate values of u for five time intervals. Take length of rod as unity. **[10]**

OR

***Q12)***a) Explain Crank Nicolson method. State its advantages and limitations. **[8]**

b) Draw flowchart to solve Hyperbolic equation. **[10]**

☼☼☼☼

Total No. of Questions : 10]

SEAT No. :

**P1531**

[Total No. of Pages : 4

# [5460]-123

## T.E. (Mechanical Sandwich Engineering)

## MACHINE DESIGN

## (2012 Pattern) (Semester - I) (302062)

*Time : 3 Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer questions 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 pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) Why is it necessary to use factor of safety in design? **[4]**

b) What are the advantages and disadvantages of hollow shaft over the solid shaft? Give any two examples where hollow shafts are used. **[6]**

OR

***Q2)*** a) Why is in cotter joint cotter provided with a tapper and also why tapper is provided only in one side? **[4]**

b) What is the difference between rigid and flexible coupling? Give practical applilcation of rigid and flexible coupling. **[6]**

***Q3)*** a) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements : **[6]**

i) $\pm$ 350 N/mm$^2$ for 85% of time

ii) $\pm$ 400 N/mm$^2$ for 12% of time

iii) $\pm$ 500 N/mm$^2$ for 3% of time

The material for the component is 50C4 ($S_{ut}$ = 660 N/mm$^2$) and the corrected endurance limit of component is 280 N/mm$^2$. Determine the life of component.

b) What is the 'self-locking' of power screw? State the condition for 'self-locking'. Also state the application where the 'self-locking' is essential. **[4]**

OR

***P.T.O.***

***Q4)*** a) Design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile stress and modulus of rigidity of spring material are 1090 N/mm$^2$ and 81370 N/mm$^2$ respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Spring has square and ground ends. Calculate :

i) Wire diameter.

ii) Mean coil diameter.

iii) Total number of coils. **[6]**

b) What is reinforcement in weld? What are its advantages and disadvantages? **[4]**

***Q5)*** a) Derive formula for beam strength of spur gear tooth. **[6]**

b) A spur gear pair (20º full depth involute), made of steel (allowable banding stress = 160 MPa, BHN = 300), transmits 7.5 kW at 1440 rpm from the pinion having 18 teeth, to a gear running at 480 rpm. Centre distance is 216 mm. Face width is 10 times the module. Pinion and gear have combined teeth error of 12 microns. Deformation factor is 11500 times the total teeth error, N/mm. Considering Buckingham's equation to account for dynamic load, determine the factor of safety against bending failure and factor of safety against pitting failure. **[12]**

OR

***Q6)*** a) What is dynamic load in gears? Explain the methods to estimate the dynamic load? **[6]**

b) A helical pinion made of steel ($S_{ut}$ = 720 MPa), having 21 teeth, running at 1000 rpm, transmits 10 kW to a gear made of steel ($S_{ut}$ = 580 MPa), running at 300 rpm. The service factor and load concentration factor are 1.25 and 1 respectively. The factor of safety is 1.25. Tooth system is 20º full depth involute, face width is 10 times the normal module and helix angle is 25º. The gear and pinion is hardened to 300 BHN and 350 BHN respectively. Design the gear pair using the following factors. The deformation factor is 11500. eN/mm. **[12]**

$$K_v = \frac{5.6}{5.6 + \sqrt{V}};$$

$$e = 8.0 + 0.63\left[ m_n + 0.25\sqrt{d} \right] \text{ and}$$

$$F_d = \frac{21V\left[ bC\cos^2\psi + F_t \max \right]\cos\psi}{21V + \sqrt{bC\cos^2\psi + F_t \max}}$$

***Q7)*** a) Derive Stribeck's equation for basic static load rating of ball bearing. **[6]**

b) A transmission shaft is supported by two deep groove ball bearings at both ends. The centre distance between the bearings is 160 mm. A load of 300 N acts vertically downwards at 60 mm distance from left side bearing and a load of 550 N acts horizontally at 50 mm distance from right side bearing. Shaft speed is 3000 rpm and expected life is 7000 hours with 95% reliability. It is intended to use same sized bearing at both ends. Service factor is 1.5. Determine the required dynamic load rating. **[10]**

OR

***Q8)*** a) Explain the process of selecting ball bearing from manufacturer's catalogue. **[6]**

b) A single row deep groove ball bearing carries a radial load of 400 N at 1760 rpm for 40% of time, 600 N at 880 rpm for 30% of time, 200 N at 1000 rpm for 10% of time and no load at 1500 rpm for remaining period of cycle. If expected life is 10000 hours with 95% reliability, determine dynamic load required and average speed of operation. **[10]**

***Q9)*** a) Write a note with suitable sketch, on 'Polygonal effect in chain drive'. **[4]**

b) A pulley of 1000 mm diameter is driven by an open type flat belt from 25 kw, 1440 rpm electric motor. The pulley on the motor shaft is 250 mm in diameter and the centre distance between the two shaft is 2.0 m. The allowable tensile stress for the belt material is 2 N/mm$^2$ and coefficient of friction between the belt and pulley is 0.28. The density of the belt is 900 kg/m$^3$. If the width of belt is 125 mm, Determine : **[12]**

i) The thickness of belt.

ii) The length of belt and

iii) The initial tension required in the belt.

OR

***Q10)***a) Explain the process of 'selection of wire ropes from manufacturer's catalogue'. **[4]**

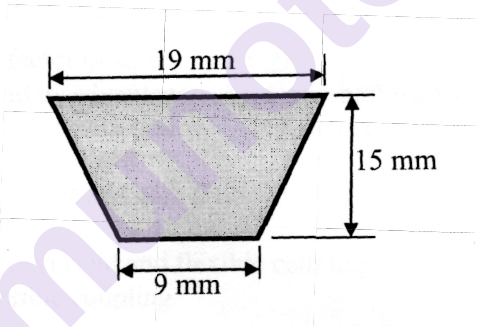
b) A V-belt drive is used to transmit 38 kw power from a three phase induction motor to a centrifugal pump. Speed of the motor is 1440 rpm and the centrifugal pump is required to be operated at 360 rpm. For the motor pulley pitch diameter is 225 mm and the groove angle is 38º. Centre distance between the pulley is 1 m. Coefficient of friction for the belt pulley combination is 0.2 and the density of belt material is 0.97 gm/cc. Allowable tension in the belt is 800N. **[12]**

Determine :

i) Number of belt required.

ii) Pitch length of belt.

Cross section of belt as shown in Fig.



Total No. of Questions : 12]

SEAT No. :

**P1532**

[Total No. of Pages : 2

**[5460]-124**

# T.E. (Mechanical Sandwich)

## MATERIALS AND MANUFACTURING ENGINEERING

## (2012 Pattern) (Semester-II) (Self Study - I) (302066) (End Sem.)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer 3 questions from Section-I and 3 questions from Section-Il.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***
6) ***Use of electronic pocket calculator is allowed.***



## SECTION-I

***Q1)*** a) What do you understand by the word 'polymer'? Classify *polymers*. **[8]**

b) Differentiate between thermoplast and thermoset polymers. **[8]**

OR

***Q2)*** a) Which are the factors affecting the properties of a polymer? Discuss. **[8]**

b) Explain the methods of manufacturing composite materials. **[8]**

***Q3)*** a) Write a note on 'Magnetic Materials". **[8]**

b) What is Shape Memory Alloys and explain its applications? **[8]**

OR

***Q4)*** a) Discuss the technological advantages of nano and Bio materials. **[8]**

b) What are Cryogenics materials? Explain use of modern materials for high/low temperatures and also at Cryogenic temperatures? **[8]**

***Q5)*** a) Explain the formation and growth of film in case of corrosion. **[6]**

b) Explain the mechanism of wet corrosion in detail. **[6]**

c) Differentiate between Galvanizing and Tin plating. **[6]**

OR

***Q6)*** Write short notes on:

a) Pitting corrosion. **[6]**

b) Season cracking. **[6]**

c) Factors affecting corrosion resistance of film. **[6]**

***P.T.O.***

## SECTION-II

***Q7)*** a) Which methods will you recommend for the manufacture of powders of the following metals? **[8]**

i) Cu ii) Fe iii) Mg iv) Ni

b) What is powder metallurgy? Discuss the advantages and disadvantages of P/M techniques over other method of fabrication. **[8]**

OR

***Q8)*** a) Explain the mechanical and physical processes of powder manufacturing. **[8]**

b) Write a note on Cermets. **[8]**

***Q9)*** a) How do you classify CNC machines? Compare open loop and closed loop control system in CNC with block diagram. **[8]**

b) Compare machining centre and conventional machining. **[8]**

OR

***Q10)***a) Write G & M codes for following functions: **[8]**

i) Spindle ON — Clockwise rotation, ii) Spindle OFF,
iii) Tool Change iv) Coolant OFF
v) Rapid Travel vi) Linear interpolation
vii) Absolute positioning viii) Metric Programming

b) Write a note on Flexible Manufacturing System (FMS). **[8]**

***Q11)***a) Discuss any one gear finishing methods with neat sketch. **[6]**

b) Write a note on Thread rolling, draw sketch. **[6]**

c) Explain Gear lapping and Gear Honing. **[6]**

OR

***Q12)***a) A bore turned to $36.5^{+0.03}$ mm diameter is to be broached to $37.00^{+0.01}$ mm dia. Length of bore is 25 mm. If recommended rise per tooth is 0.02mm and specific cutting force per square mm of chip cross section is 5000 N/mm$^2$ and if the member of finishing teeth are to be 5. Calculate the force required to pull the broach and the length of the toothed portion of the broach. **[12]**

b) Draw a neat labeled block diagram of horizontal broaching machine. **[6]**

**Total No. of Questions : 12]**

**SEAT No. :** ____

**P1533**

**[Total No. of Pages : 2**

# [5460]-125

## T.E. (Mechanical Sandwich)

## Industrial Engineering and Production Management (302067)

## (2012 Pattern) (Semester - II)

***Time : 3 Hours]*** ***[Max. Marks : 100***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***



## SECTION - I

***Q1)*** a) Explain the concept and functions of management. **[8]**

b) Briefly mention contribution of F W Taylor & Gilberth to industrial engineering. **[8]**

OR

***Q2)*** a) Explain briefly role and applications of Industrial Engineering. **[8]**

b) Briefly explain Maslow's hierarchy needs. **[8]**

***Q3)*** a) Explain the objectives of Time study. **[8]**

b) Write short note on flow diagrams and two hand chart. **[8]**

OR

***Q4)*** a) Mention tools and techniques used in method study. **[8]**

b) Write short note on Performance rating and allowances. **[8]**

***Q5)*** a) Explain concept of Productivity and Total productivity? **[8]**

b) Explain procedure of selection of plant location & layout for 4 wheeler automobile plant. **[10]**

OR

***Q6)*** Write short notes on: **[18]**

a) Qualities of Production manager.

b) Objectives of good plant layout.

c) Principles of material handling.

***P.T.O.***

## SECTION - II

***Q7)*** a) Explain Bill of materials in detail. **[8]**

b) Explain objectives and basic of EOQ. **[8]**

OR

***Q8)*** a) Describe in detail moving average method. **[8]**

b) Explain VED analysis in detail. **[8]**

***Q9)*** a) Discuss the role of product engineering department. **[8]**

b) Compare CPM with PERT. **[8]**

OR

***Q10)*** a) Write short note on factors affecting process design. **[8]**

b) Explain phases of process planning in detail. **[8]**

***Q11)*** a) Write short note JIT and lean manufacturing. **[10]**

b) Explain in detail Master production schedule. **[8]**

OR

***Q12)*** Write short notes on : **[18]**

a) TPM

b) Poka Yoke

c) Muda elimination

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1534**

[Total No. of Pages : 3

# [5460]-132

## T.E. (Automobile Engineering)

## DESIGN OF MACHINE ELEMENTS

## (316481) (2012 Pattern) (Semester - I) (End Sem.)

*Time : 3 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 hand side indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) Differentiate between rigid and flexible coupling. **[4]**

b) Explain the general design procedure of lever. **[6]**

OR

***Q2)*** a) Explain the general design procedure. **[6]**

b) Derive the expressions for stresses in keys. **[4]**

***Q3)*** a) Differentiate between transmission shafts and machine shafts. **[2]**

b) Derive an expression for torque required to raise the load in power screws. **[8]**

OR

***Q4)*** a) Determine the required length of square key if key and shaft are made up of same material. Take diameter of shaft as 40 mm. **[2]**

b) Derive an expression for torque required to lower the load in power screws. **[8]**

***Q5)*** a) A simply supported beam has a concentrated load at the center. The load fluctuates from P to 4P. The span of the beam is 500 mm, circular cross-section with diameter 60 mm. The yield stress is 390 Mpa and endurance limit is 260 Mpa and factor of safety is 1.5. Calculate P. Take fatigue stress concentration factor = 1, correction factor = 1, surface finish factor = 0.85, size factor = 1. **[10]**

***P.T.O.***

b) What are the causes of stress concentration and what are the methods of reducing stress concentration? **[6]**

OR

***Q6)*** a) Derive soderberg equation. **[10]**

b) A mass of 500 kg is being lowered by means of steel wire rope having cross sectional area 250 $mm^2$. The velocity of weight is 0.5 m/sec. When the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take $E = 0.8 \times 10^6$ Mpa. **[6]**

***Q7)*** a) Derive Petroff's equation for bearings. **[6]**

b) The following data is given for a 360º hydrodynamic bearing. Radial load = 3.2 KN, Journal speed = 1490 rpm, Journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm, viscosity of lubricant = 25 cP. Assuming that the total heat generated in the bearing is carried by the total flow in the bearing. Calculate : **[10]**

i) coefficient of friction.

ii) power lost in friction.

iii) minimum oil film thickness.

iv) flow requirement in Lit/min.

v) temperature rise.

| *l*/d | S | (r/c)f | $(h_0/C)$ | Q/rcnl |
|---|---|---|---|---|
| 1 | 0.121 | 3.22 | 0.4 | 4.33 |
| 1.5 | 0.134 | 3.49 | 0.6 | 4.89 |

OR

***Q8)*** a) Write a note on materials used for bearing. **[6]**

b) A 6306 radial ball bearing with inner ring rotation has a 10 seconds work cycle as follows. If basic dynamic capacity of the bearing is 24.25 KN, determine the expected life of this bearing. Take radial factor x = 0.56, thrust factor y = 1.43 and rotating factor v = 1. **[10]**

| | For 2 seconds | For 8 seconds |
|---|---|---|
| Radial load | 4 KN | 3 KN |
| Axial load | 2 KN | 0 |
| Speed | 900 rpm | 1200 rpm |

***Q9)*** a) Derive Lewis equation for beam strength. **[6]**

b) Design spur gear set to transmit 20 KW at 900 rpm of pinion. The transmission ratio is 3. Take 20º 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]**

OR

***Q10)***a) Derive an expression for formative number of teeth in helical gear. **[6]**

b) Design a pair of helical gears are to transmit 15 KW at 10,000 rpm of the pinion with PCD 80 mm. The transmission ratio is 3 : 1. Assume $\alpha = 20º$ FDI, $\beta = 45º$. $\sigma_d = 193.2$ 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]**

Total No. of Questions : 10]

SEAT No. :

**P1535**

[Total No. of Pages : 2

# [5460]-133
# T.E.
# AUTOMOBILE
## Automotive Electrical and Electronics
## (2012 Pattern) (Semester - I) (316482)

*Time : 2.30 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) ***Use of logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** a) Draw the simple sketch of electrical horn and explain it in brief. **[5]**

b) Write a short note on: **[5]**

i) Battery ratings

ii) Battery capacities

OR

***Q2)*** a) Explain magneto ignition systems with the help of neat sketch. **[5]**

b) List down the types spark advance mechanism? Explain Centrifugal advance with neat sketch. **[5]**

***Q3)*** a) Explain gas discharge light and LED light. **[5]**

b) With neat sketch explain the balancing coil type of temperature gauge. **[5]**

OR

***Q4)*** a) Explain the spark plug with its constructional details. **[5]**

b) What do you mean by positive and negative earth return method. **[5]**

***Q5)*** a) With the help of neat sketch explain the air flow rate sensor. **[8]**

b) Explain the solenoid actuator with neat sketch. **[8]**

OR

***P.T.O.***

***Q6)*** a) With neat sketch explain the working of idle speed rotary actuator. **[8]**

b) Explain the operation of MAP sensor with its neat sketch. **[8]**

***Q7)*** a) Explain acceleration and full load enrichment conditions. **[8]**

b) Explain cold starting and warm start conditions. **[8]**

OR

***Q8)*** a) Explain group and sequential injection techniques. **[8]**

b) Compare open loop and close loop control system. **[8]**

***Q9)*** a) Draw the simple layout of antilock braking system and explain function of each component. **[10]**

b) Explain vehicle security system and vehicle tracking system. **[8]**

OR

***Q10)*** a) Explain Supplementary Restraint System of air bag system with its layout. **[10]**

b) Explain radar warning system with simple sketch. **[8]**

⌘⌘⌘

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1536**

**[Total No. of Pages : 3**

**[5460]-134**

# T.E. (Automobile)

# DESIGN OF ENGINE COMPONENTS

## (2012 Pattern) (Semester-II)

***Time : 3 Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

1) ***Answer Five questions from the following.***
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) Explain SAE rating of lubricants. **[4]**

b) If 42.5 KW engine has a mechanical efficiency of 85%. Find the indicated power & frictional power. If the frictional power is assumed to be constant with load, what will be the mechanical efficiency at 60% of load? **[6]**

OR

***Q2)*** a) Why radiator is necessary, state its types and location, **[4]**

b) The four stroke petrol engine develops 40 KW power with mean effective pressure of 0.8 $N/mm^2$ and mean piston speed of 820 m/min. Find bore diameter, stroke length, swept volume, engine speed. **[6]**

***Q3)*** a) Define Indicated Thermal Efficiency and Brake Thermal Efficiency. **[2]**

b) The following data is given for the piston of a four stroke diesel engine: **[8]**

Cylinder bore = 250mm

Material of piston rings = Grey cast iron

Allowable tensile stress = 100 $N/mm^2$

Allowable radial pressure on cylinder wall = 0.03 MPa

Thickness of piston head = 42mm

Number of piston rings = 4

Design piston rings and piston barrel.

OR

***P.T.O.***

***Q4)*** a) State the functions of oil pump and explain any one type of oil pump. **[2]**

b) Determine the dimensions of cross section of the connecting rod for a diesel engine with following data: **[8]**

Cylinder bore = 100mm

Length of connecting rod = 350mm

Maximum gas pressure = 4MPa

Factor of safety = 6

***Q5)*** a) Draw the valve gear mechanism for 4-stroke IC Engine and explain the function of each component. **[4]**

b) The cylinder of a four stroke diesel engine has the following specifications: **[12]**

Brake power=7.5KW, speed= 1400 rpm,

Indicated mean effective pressure=0.35 MPa,

Mechanical efficiency=80%.

Maximum gas pressure=3.5MPa.

The cylinder liner and head are made of grey cast iron FG 260 ($S_{ut}$=260 N/mm$^2$ and $\mu$=0.25). The studs are made of plain carbon steel 40 C8 ($S_{yt}$ = 380N/mm$^2$). The factor of safety for all parts is 6. Calculate:

i) Bore and length of the cylinder liner

ii) Thickness of the cylinder liner

iii) Thickness of the cylinder head

iv) Size, number and pitch of studs.

Re-boring allowance for I.C. engine cylinder is:

| D | 75 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|
| C | 1.5 | 2.4 | 4.0 | 6.3 | 8.0 | 9.5 | 11.0 | 12.5 | 12.5 | 12.5 |

OR

***Q6)*** a) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore=l50mm, length of stroke = 275mm, engine speed=500 rpm, maximum gas pressure=3.5 MPa, seat angle = 45°. Calculate: **[8]**

i) Diameter of the valve port

ii) Thickness of the valve head

iii) Diameter of the valve stem

iv) Maximum lift of the valve

Assume mean velocity of the gas=50m/s, constant k for steel valve as 0.42 and permissible bending stress as 50 $N/mm^2$.

b) The Cylinder of four stoke diesel engine has the following specification,**[8]**

Cylinder bore = 150mm,

maximum gas pressure=3.5 $N/mm^2$,

Cylinder material = Grey C.I FG200 ($S_{ut}$=200MPa),

Factor of Safety = 5,

Poisson's ratio = 0.25,

Determine thickness of the wall & net circumferential stresses in the cylinder wall.

***Q7)*** a) Explain working of exhaust gas CO and HC analyzer with neat sketch.**[8]**

b) Explain the working procedure for mechanical fuel pump with neat sketch.**[8]**

OR

***Q8)*** Write a short note on. **[16]**

a) Ignition Timing

b) Cylinder compression test

c) Vacuum gauge test

d) Cylinder power balance

***Q9)*** a) Explain the Variable valve timing (VVT) with neat sketch. **[9]**

b) Explain Advanced Turbulent Flow Technology. **[9]**

OR

***Q10)***a) Explain the homogeneous charge compression ignition (HCCI). **[9]**

b) Write a note on Wankel Engine & Dual fuel engine. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1537**

[Total No. of Pages : 2

# [5460]-135
# T. E. (Automobile Engineering)
# AUTOMOTIVE TRANSMISSION
# (2012 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, 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 front engine front wheel drive layout with neat sketch. **[4]**

b) With neat sketch explain Centrifugal Clutch. **[6]**

OR

***Q2)*** a) What are the Clutch lining materials? List down the desirable properties of the lining materials. **[4]**

b) Explain Constant mesh Gearbox with neat sketch. **[6]**

***Q3)*** a) With neat sketch explain Electromagnetic Clutch. **[6]**

b) Draw and explain gear selector mechanism with neat sketch. **[4]**

OR

***Q4)*** a) Draw & explain diaphragm spring clutch in detail? Also give example. **[6]**

b) Discuss the following: **[4]**

Lubrication of Gearbox

***Q5)*** a) Enlist the different types of rear axles? Explain any one of them with neat sketch stating the different loads carried by it. **[8]**

b) What is need of differential? Explain differential in detail. **[8]**

OR

***P.T.O.***

***Q6)*** a) What is the function of the rear axle? Explain the loads acting on the rear axle. **[8]**

b) Write a note on non-slip/limited slip type of differential. **[8]**

***Q7)*** a) Explain construction and working Fluid Coupling/Flywheel with its advantages and limitations. **[9]**

b) Explain the performance characteristics of **[9]**

i) Fluid Coupling

ii) Torque Converter

OR

***Q8)*** a) Draw and explain construction and working of simple epicylic gear train and discuss gear ratio. **[9]**

b) Explain construction and working Torque converter with its advantages and limitations. **[9]**

***Q9)*** a) Can we use fully automatic transmission system for heavy duty vehicle? Elaborate your answer. **[8]**

b) List down the advantages and disadvantages of the Continuous Variable Transmission (CVT). **[8]**

OR

***Q10)*** a) With neat sketch explain the Continuous Variable Transmission (CVT). **[8]**

b) Differentiate in-between Manual and Automatic Transmission. **[8]**

⌘⌘⌘

Total No. of Questions : 6]

SEAT No. :

**P1538**

[Total No. of Pages : 1

# [5460]-136
## T.E. (Automobile Engineering)
## AUTOMOTIVE AERODYNAMICS & BODY ENGG.
## (2012 Pattern) ( Semester - II) (316486)

*Time : 2½ Hours]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** a) Explain the forces and moments acting on Vehicle, its effects on performance? **[6]**

b) Explain the role of Down force in Vehicle aerodynamics? **[4]**

OR

***Q2)*** a) What are the various body optimization techniques for minimum drag. **[6]**

b) Development of lift on Aerofoil,? **[4]**

***Q3)*** a) Explain the strategies for aerodynamic development of car? **[6]**

b) Write a short note on Fundamentals for wind tunnel technique? **[4]**

OR

***Q4)*** a) Explain with sketch open type tunnels? **[6]**

b) What are the limitation of simulation? **[4]**

***Q5)*** a) Explain the effect of dirt accumulation on vehicle? **[6]**

b) What is boat failing? **[4]**

OR

***Q6)*** a) Discuss Fast back, & square back dust flow pattern at rear of vehicle? **[6]**

b) Explain with a neat sketch effect of gap configuration? **[4]**

Total No. of Questions :8]

SEAT No. :

**P1539**

[Total No. of Pages : 2

# [5460]-141

## T.E. (Electronics)

## ELECTRICAL MACHINES AND POWER DEVICES

## (2012 Course) (Semester-I) (304201) (End Sem.)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q1 ro Q2, Q3 or Q4, or 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) Explain switching characteristics of MOSFET. **[6]**

b) Explain the two transistor analogy for SCR and derive an expression for anode current IA. **[7]**

c) Why snubber circuits are required? Also explain the protection of power devices by snubber circuit. **[7]**

OR

***Q2)*** a) Draw and explain switching characteristics of Power BJT. **[6]**

b) Explain the need for protection of power devices and State different types of protections required to ensure safety of power devices. **[7]**

c) Write note on triggering circuit of TRIAC using DIAC. **[7]**

***Q3)*** a) Explain the basic action of commutator with the help of neat sketches. **[6]**

b) Write a short note on permanent magnet DC motor. State advantages, disadvantages and applications. **[6]**

c) A 20 KW, 200 V shunt generator has a armature resistance of 0.05 Ω and a shunt field resistance of 200Ω. Calculate the power developed in the armature when it delivers rated output. **[4]**

OR

***P.T.O.***

***Q4)*** a) Why starter is necessary for a DC motor? Explain the working of four-point starter with the help of neat diagram. **[6]**

b) Distinguish between self excited and separately excited DC generator. **[6]**

c) A 4 pole, 250V, DC series motor has a wave connected armature with 200 conductors. The flux per pole is 25m Wb when motor is drawing 60A from the supply. Armature resistance is $0.15\Omega$ while series field winding resistance is $0.2\ \Omega$. Calculate the speed under this condition. **[4]**

***Q5)*** a) Explain the principle of operation of a 3-phase induction motor in detail. **[8]**

b) Explain the procedure for no load test and blocked rotor test on a three phase induction motor. How are the parameters of equivalent circuit determined from test results. **[10]**

OR

***Q6)*** a) Explain the complete torque-slip characteristics of a three phase induction motor including motoring, generating and breaking regions. **[8]**

b) A $3\Phi$ 4 pole, 50 Hz, star connected induction motor running on full load develops a useful torque of 300 N-m. The rotor emf is completing 120 cycles per minute. If the torque lost in friction is 50 Nm, calculate i) Slip ii) Net output power iii) Rotor copper loss per phase iv) Rotor efficiency v) Rotor resistance per phase if rotor current is 60 A in running condition. **[10]**

***Q7)*** a) Compare variable reluctance motor with permanent magnet stepper motor. **[8]**

b) Explain the principle of operation of capacitor start and capacitor run single phase induction motor along with the torque slip characteristics and the applications. **[8]**

OR

***Q8)*** a) Write a short note on: DC servomotor. **[8]**

b) Explain the operation of a variable reluctance motor. **[8]**

Total No. of Questions : 8]

SEAT No. :

**P1540**

[Total No. of Pages : 2

# [5460]-142
# T.E. (Electronics)
# DATA COMMUNICATION
## (2012 Pattern) (Semester - I) (End Semester) (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***
2) ***Neat diagram 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) Explain different types of transmission media. **[6]**

b) If we have a baseband channel with a 1 MHz Bw, then what will be the data rate for the channel of we use following line codes. **[8]**

c) Explain FEC and ARQ systems of error control. Also explain. **[6]**

i) Stop and wait ARQ

ii) Go back NARQ

iii) Selective repeat ARQ with neat diagram.

OR

***Q2)*** a) Draw and explain layered architecture of OSI model. **[6]**

b) Derive the expression for probability of error of matched filter. **[8]**

c) Explain in brief the various error correcting techniques. **[6]**

***Q3)*** a) What steps are involved in Huffman coding procedure? Compare it's performance with performance of shannon - fanno for large message ensembles with equal probabilities. **[8]**

b) Apply shannon fanno coding for the following sequence. **[8]**

| $x$ | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ |
|---|---|---|---|---|---|---|
| p | 0.3 | 0.18 | 0.18 | 0.12 | 0.09 | 0.07 |

***P.T.O.***

***Q4)*** a) State and explain shannon's theorems. **[8]**

b) Calculate H (*x*) and comment on results, **[8]**

i) x = {0.5, 0.5}]

ii) x = {0.1, 0.1, 0.1, 0.5, 0.1, 0.1}

***Q5)*** a) Derive the expression of error probability of PSK. **[8]**

b) A source produces NRZ - L binary data of the rate of 10 kbps. The source output is transmitted using two modulation schemes, BPJK and QPSK. Assuming that the band with of the above binary data pulses is 10 $KH_2$. Calculate bandwith of. **[8]**

i) BPSK

ii) QPSK

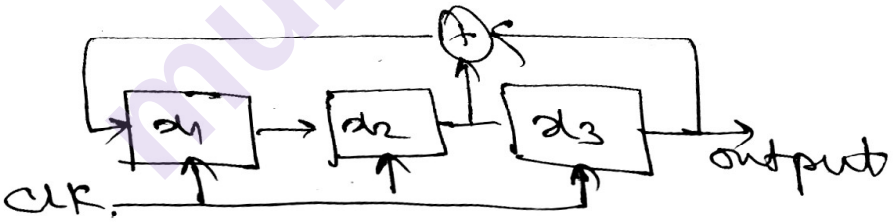
**OR**

***Q6)*** a) Explain with the help of neat block diag.16 bit QAM trasmitter and receiver. **[8]**

b) Explain the working of MPSK transmitter and receiver. **[8]**

***Q7)*** a) Explain working of DS.SS transmitter and receiver. **[10]**

b) Obtain the PN sequence for following LFSR. **[8]**




**OR**

***Q8)*** a) Explain working principle of slotted ACOHA and ALOHA. **[10]**

b) Explain with suitable block diagrams FH-SS system. **[8]**

☼☼☼☼

Total No. of Questions : 8]

SEAT No. :

**P1541**

[Total No. of Pages : 2

**[5460]-143**

# T.E. (Electronics Engineering)

## MICROCONTROLLER AND APPLICATIONS

## (2012 Course) (End 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

***Q1)*** a) Differentiate between Von Neumann architecture and Harvard architecture also differentiate Microprocessor and microcontroller. **[6]**

b) Explain steps to transmit data from microcontroller and receive data in microcontroller 8051. **[7]**

c) Draw and explain architecture of PIC18F. **[7]**

OR

***Q2)*** a) Draw and explain logic analyser in detail. **[6]**

b) Explain any four arithmetic instructions of 8051 microcontroller with suitable example. **[8]**

c) Draw and explain memory organization of PIC18F. **[6]**

***Q3)*** a) Draw an interfacing diagram and write an embedded C program to interface LCD with PIC18FXXX microcontroller to display “Diwali” message on Line 1 at 5$^{th}$ Position. **[8]**

b) What is interrupt latency. Draw and explain interrupt structure in PlC microcontroller with IVT. **[8]**

OR

***Q4)*** a) Write an embedded C program to toggle all the bits of PORT D continuously every 250ms. Use timer 0. Assume XTAL=10MHz **[8]**

b) Explain how PWM can be used to control speed of DC motor. Write algorithm for the same. **[8]**

***P.T.O.***

***Q5)*** a) Compare SPI and 12C. Draw interfacing of RS232 with PlC microcontroller and explain the Importance of MAX232. **[8]**

b) State features of ADC in PlC. Write the steps for A/D converter programming. Explain SFRs used in ADC Programming. **[8]**

OR

***Q6)*** a) Write an embedded C program to transmit message "YES" serially at 9600 baud rate, 8 bit data and 1 stop bit. Do this continuously. **[8]**

b) Draw and explain MSSP structure of PIC18FXXX. **[8]**

***Q7)*** a) Design a PIC18FXXX based data acquisition system to interface LM35. Write the corresponding C program for reading and displaying temperature on LCD. **[9]**

b) State different design considerations to design digital voltmeter. Design the digital voltmeter to measure the required voltage range. Draw the block diagram and flowchart. **[9]**

OR

***Q8)*** a) Design a data acquisition system for pressure monitoring system. (Use any suitable sensor). Write an algorithm for the same. **[9]**

b) Design frequency counter for the range from DC to 5MHz frequency using PIC18FXXX. Design and draw interfacing circuit. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1542**

[Total No. of Pages : 3

# [5460]-144

## T.E. (Electronics)

## ELECTROMAGNETIC AND WAVE PROPAGATION

## (2012 Pattern) (End Semester) (Semester - I)

*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) ***Figures to the right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume and mention suitable data if necessary.***



***Q1)*** a) State and prove Gauss Law Apply Gauss law to obtain expression for $\bar{E}$ due to infinite surface charge distribution. **[6]**

b) An electric potential is given by $V = \frac{60 \sin \theta}{r^2}$ volts' Find V and $\bar{E}$ at *P* (3, 60°, 25°) **[4]**

OR

***Q2)*** a) Derive an expression for energy stored in terms of $\bar{D}$ and $\bar{E}$. **[6]**

b) Derive the equation of capacitance of co-axial cable capacitor using Laplace's equation. **[4]**

***Q3)*** a) Derive boundary condition for the boundary existing between two perfect dielectric medium. **[5]**

b) State and prove Biot Savart law. **[5]**

OR

***Q4)*** a) A potential field is given as V = 100 $e^{-5x}$ sin 3*y*.cos 4*z* volts. Point P (0.1, π/12, π/24) is located at conductor free space boundary. At point P, find potential (V), Electric field intensity $\bar{E}$ and surface charge density $\rho_s$. **[6]**

b) Derive an expression for magnetic vector potential in the region surrounding an infinite long straight filamentary current I. **[4]**

***P.T.O.***

***Q5)*** a) Explain the importance of Faraday's law and Lenz's law in Maxwell's equation with the help of expression. **[6]**

b) Find the value of K so that following pair of fields satisfy Maxwell's equations in region where $\sigma = 0$ and $\rho_v = 0$ **[10]**

$\bar{E} = [60 \sin 10^6 t \sin 0.01 z]\ \hat{a}_x$ V/m

$\bar{H} = [0.6 \cos 10^6 t \cos 0.01 z]\ \hat{a}_y$ A/m

$\mu = K$, $\varepsilon = C_1$

OR

***Q6)*** a) Write Maxwell's equation for static and time varying fields in point and integral form. **[8]**

b) If $\bar{E} = 125\, e^{(3x-kt)} \hat{a}_y$ V/m in free space, use Maxwell's equations to find K and magnetic field intensity $\bar{H}$. **[8]**

***Q7)*** a) Derive uniform plane wave equations in general form. **[8]**

b) A lossy dielectric has $\mu_r = 1$, $\varepsilon_r = 12$ and $\sigma = 20m$ ʊ/m at 1MHz frequency. Find attenuation constant phase constant, velocity and intrinsic impedance if the uniform plane wave is travelling through this medium. **[8]**

OR

***Q8)*** a) What is polarization. Explain types of polarization of uniform plane wave. **[8]**

b) A propagation in a lossless dielectric has,

$\bar{E} = 500 \cos\left(10^7 t - \beta z\right) \hat{a}_x$ V/m and

$\bar{H} = 1.1 \cos\left(10^7 t - \beta z\right) \hat{a}_y$ A/m components.

If wave velocity is 0.5 times the velocity in free space, then find, $\mu_r, \varepsilon_r, \beta$ and $\lambda$. **[8]**

***Q9)*** a) Explain the fundamental equation for free space propagation. Derive Friis transmission equation. **[8]**

b) Explain : **[10]**

i) Ground wave propagation

ii) Sky wave propagation

iii) Space wave propagation

iv) Effect of earth's curvature on propagation.

OR

***Q10)*** a) Explain the following terms: **[8]**

i) Skip distance

ii) Virtual height

iii) Critical frequency

iv) MUF

b) Explain the characteristics of wireless channel in detail. **[10]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

**P1543**

[Total No. of Pages : 3

**[5460]-145**

# T.E (Electronics)

# NETWORK SYNTHESIS

## (Semester - I) (2012 Course) (304205)

*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 electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) Test following function for Hurwitz Polynomial **[6]**

i) $s^4+s^3+2s^2+2s+2$

ii) $s^6+s^4+s^2+s+1$

b) Synthesize the following function using partial fraction expansion method.

$$Y(s) = \frac{s^2+5s+6}{s^2+5s+4}$$ **[7]**

c) For a constant resistance bridge T N/W terminated by 1Ω synthesize Za & Zb. **[7]**

$$G_{12} = \frac{V_2}{V_1} = \frac{s^2+3s+2}{s^3+4s^2+5s+2}$$

OR

***Q2)*** a) Test the function for positive realness. **[7]**

i) $\dfrac{s^2+1}{s^3+2s}$

ii) $\dfrac{4s^2+4s+8}{(s+1)(s^2+2)}$

b) Synthesize the following $L^c$ function. **[6]**

$$Z(s) = \frac{s^5+10s^3+12s}{s^4+4s^2+3}$$

c) What is ZOT. Explain in brief. Synthesize following function. **[7]**

$$Y_{21} = \frac{s^3}{s^3+3s^2+3s+2}$$

***P.T.O.***

***Q3)*** a) Derive expression for cut off frequency $\omega_c$ and order 'n' for butterworth Low Pass filter. **[7]**

b) Find the Chebyshev approximation for a low pass filter whose requirements are characteristics by **[6]**

i) $\alpha_{max}$ = 0.5dB

ii) $\alpha_{min}$ = 20dB

iii) $\omega_p$ = 200 rad/sec

iv) $\omega_s$ = 600 rad/sec

c) Determine the order of filter for Butterworth LPF **[3]**

i) Pass band Attenuation 1 dB

ii) Stop band Attenuation 35 dB

iii) Pass band Frequency 1000 Hz

iv) Stop band Frequency 3500 Hz

OR

***Q4)*** a) Design a Chebyshev filter with maximum passband attenuation 2.5dB at 20 rad/sec & stopband attenuation of 30 dB at 50 rad/sec. **[6]**

b) Design a Low pass butterworth filter with following specification. **[7]**

i) Pass band 0.2 Mrad/sec

ii) Pass band loss $\leq$ 2dB

iii) Stop band loss $\leq$ 60 dB at 6 M rad/sec.

Also transform the LPF to HPF with $\omega_c$ = 0.1 M rad/sec.

c) Find minimum order of the filter for **[3]**

i) Stop band attenuation 40dB for $|\omega| \leq 120\pi$ K rad/s.

ii) Pass band attenuation 1dB for $|\omega| \leq 100\pi$ rad/s.

***Q5)*** a) Obtain the transfer function for Negative & Positive feedback Topology. **[6]**

b) Synthesize the HPF with practical element value for k=1 **[6]**

$$H(s) = \frac{s^2}{s^2 + 200s + 640000}$$

c) Synthesize 2nd order Band Pass filter with centre frequency at 1000 rad/s & pole Q at 10. **[6]**

OR

***Q6)*** a) Synthesize High Pass filter using RC→CR transformation where k is constant. **[6]**

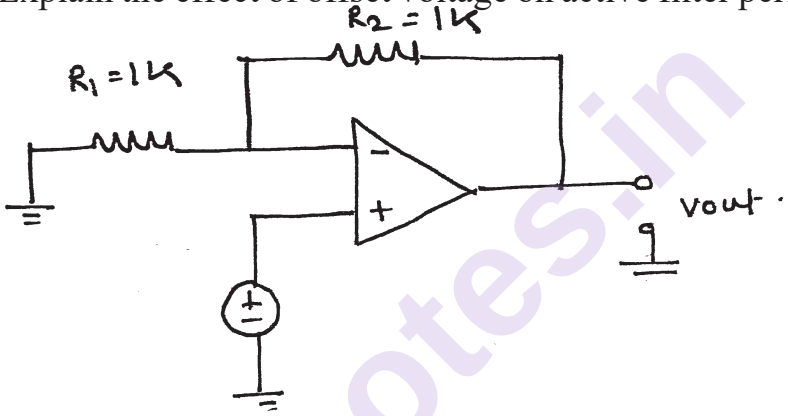
$$H(s) = k.\frac{s^2}{s^2+s+25}$$

b) Synthesize 2nd order LPF having pole frequency of 2KHz and pole Q of 10. Use sallen key circuit based on positive feedback topology. **[6]**

c) Synthesize 2nd order sallen key Band pass filter using transfer function. **[6]**

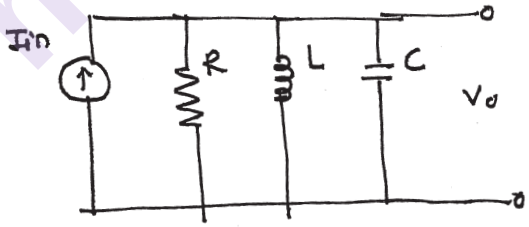
$$H(s) = \frac{400s}{s^2+4s+500}$$

***Q7)*** a) Explain the effect of offset voltage on active filter performance? **[8]**




for given circuit offset voltage is 10mV what will be the i/p offset voltage if $R_1$ $R_2$ = 10k.

b) For a given N/W find T.F. & compute sensitivity of k, $\omega_p$, $Q_p$ with R,L,C. **[8]**




OR

***Q8)*** a) Explain effect of op-amp frequency characteristics on the performance of an active filter. **[8]**

b) What is freq. compensation? Explain various techniques used for freq. compensation in detail. **[8]**

**Total No. of Questions : 8]**

**SEAT No. :** ____

**P1470**

**[Total No. of Pages : 2**

# [5460]-146
# T.E. (Electronics)
# INSTRUMENTATION SYSTEMS
# (2012 Course) (Semester - II) (304209)

***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)*** a) List and explain different types of errors with their causes. **[8]**

b) Draw the diagram of bourdon tube and explain its working. **[6]**

c) Explain principle and working of electromagnetic flow meter. **[6]**

OR

***Q2)*** a) Explain the following static characteristics of instrument in brief. **[6]**

i) Sensitivity

ii) Dead Zone

iii) Repeatability

b) Explain the principle of strain gauge and its signal conditioning circuit in full bridge configuration. **[8]**

c) Explain principle and working of orifice meter for flow measurement. **[6]**

***Q3)*** a) Explain principle and working Piezo-electric transducer for pressure measurement. **[8]**

b) Explain the steps in surface micromachining for sensor fabrication. **[8]**

OR

***Q4)*** a) Write a short note on SMART sensors. **[8]**

b) Explain principle and working of magnetoresistive sensor. **[8]**

***P.T.O.***

***Q5)*** a) Explain RS 232 serial communication standard in detail. **[10]**

b) Draw and explain the circuit diagram of current to voltage converter. **[8]**

OR

***Q6)*** a) Sketch and explain IEEE 488 GPIB. **[10]**

b) Draw the diagram of data acquisition system and explain its working. **[8]**

***Q7)*** Write short notes on: **[16]**

a) DC motor as actuator

b) Directional control valves

**OR**

***Q8)*** Write short notes on: **[16]**

a) Pneumatic actuator

b) Solid state switches

Total No. of Questions : 10]

SEAT No. :

**P1471**

[Total No. of Pages : 3

# [5460]-147

## T.E. (Electronics)

## DISCRETE TIME SIGNAL PROCESSING

## (2012 Pattern) (Semester - II) (End Semester) (304210)

*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) ***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) An analog signal is represented as $x(t) = 5\cos(2\pi 2000t) + \cos(2\pi 5000t)$, **[6]**

i) What is the Nyquist rate of the signal?

ii) Write the equation of the signal, if it is sampled at Nyquist rate.

iii) If the signal is sampled at a rate of 8 kHz, what is the folding frequency?

b) Compute the 4-point DFT of the sequence $x(n) = \{1\ 2\ 3\ 4\}$. **[4]**

OR

***Q2)*** a) Discrete time systems $h_1(n) = \{1/2\ \ 1/4\ \ 1/2\}$ and $h_2(n) = \delta(n\text{-}2)$ are connected in cascade. Determine : **[6]**

i) the overall system function.

ii) the response of the system to the input $x(n) = \delta(n+2) + 3\delta(n-1) - \delta(n-3)$.

b) List the advantages of analog signal processing over digital signal processing. **[4]**

***Q3)*** a) Perform the circular convolution of following sequences. **[4]**

$x_1(n) = \{2\ 1\ 2\ 1\}$ $\quad$ $x_2(n) = \{4\ 3\ 2\ 1\}$

b) A causal discrete time system is described by the difference equation. **[6]**

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$

i) Determine the system function.

ii) Compute the impulse response.

OR

***P.T.O.***

***Q4)*** a) Compute the Z transform of following sequences. **[7]**

i) $x(n)=2^n u(n)+3\left(\frac{1}{2}\right)^n u(n)$

ii) $x(n)=nu(n)$

iii) $x(n)=\left(\frac{1}{2}\right)^n u(n+2)+3^n u(-n-1)$

b) Discuss the computational requirement of N-point FFT algorithm. **[3]**

***Q5)*** a) What is Gibb's phenomenon? How it is reduced? **[6]**

b) Design a digital low pass FIR filter using hamming window. **[12]**
Cut-off frequency = 250 Hz
Sampling rate = 1000 Hz
Length of filter = 11.

OR

***Q6)*** a) Design a digital lowpass filter for a cut-off frequency of $\omega_c = 5\pi/9$ using frequency sampling method. Length of filter = 9. **[12]**

b) Explain different characteristics of window function. **[6]**

***Q7)*** a) Convert the analog filter with the system function **[6]**

$$H(s)=\frac{s+0.1}{(s+0.1)^2+9}$$

into a digital filter by means of impulse invariant technique.

b) Obtain direct form, I direct form II, cascade and parallel realization of the following system. **[10]**

$$y(n)=-0.1\,y(n-1)+0.2\,y(n-2)+3\,x(n)+3.6\,x(n-1)+0.6\,x(n-2)$$

OR

***Q8)*** a) Explain frequency warping in Bilinear transformation. What are the advantages of Bilinear transformation over Impulse Invariance transformation? **[6]**

b) Design a digital butterworth filter using bilinear transformation for the following specifications. Assume T = 1 sec. **[10]**

$$0.9 \le |H(\omega)| \le 1 \quad 0 \le \omega \le \pi/2$$
$$|H(\omega)| \le 0.2 \quad 3\pi/4 \le \omega \le \pi$$

***Q9)*** a) What is the principle of down sampling? What is the importance of antialiasing filter? Derive the expression for decimated signal. **[8]**

b) Draw the functional block diagram of TMS320C28XX and explain any five salient features of TMS320C28XX. **[8]**

OR

***Q10)*** a) An audio signal is to be decimated by a factor of 30. Design a two stage decimator with factors 15 and 2, that satisfy the following specifications. **[8]**

Sampling Frequency : 240 kHz

Highest frequency of interest : 3.4 kHz

$\delta p = 0.05$ $\delta s = 0.01$

b) Discuss the desirable features of a digital signal processor. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

P3663

[Total No. of Pages : 2

# [5460]-148

## T.E. (Electronics)

## EMBEDDED PROCESSORS

## (2012 Pattern) (End Semester)

*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) Explain different characteristics of Embedded systems. **[4]**

b) Describe System Control Block of ARM7. **[8]**

c) Draw interfacing diagram of GSM with LPC2148 also write algorithm for the same. **[8]**

OR

***Q2)*** a) Draw & explain ARM7 programmers model. **[4]**

b) Write embedded C program for LCD 16*2 interfacing with LPC2148. **[8]**

c) Draw interfacing diagram of GPS with LPC2148 also write algorithm/program for the same. **[8]**

***Q3)*** a) Explain need of operating system for complex application. **[6]**

b) Describe with suitable architectural block diagram of CORTEX-M3. **[10]**

OR

***Q4)*** a) Write features of operating system with it's advantages. **[6]**

b) Explain in detail CMSIS standard for ARM CORTEX. **[10]**

***P.T.O.***

***Q5)*** a) Write an embedded C program for interfacing of RGB LED with LPC1768 also draw interfacing diagram. **[8]**

b) Draw interfacing diagram for motor control using PWM with LPC1768. Write algorithm for the same. **[8]**

OR

***Q6)*** a) Writes features of CORTEX-M3 LPC1768. **[6]**

b) Draw interfacing diagram for TFT LCD with LPC1768. Write algorithm for the same. **[10]**

***Q7)*** Write short note on following blocks in LPC1768. **[18]**

a) USB

b) Ethernet

c) CAN

OR

***Q8)*** a) Draw and explain block diagram of CAN controller. **[9]**

b) Write application of Ethernet in embedded system. **[9]**

Total No. of Questions : 8]

SEAT No. :

**P1473**

[Total No. of Pages : 2

# [5460]-149

## T.E. (Electronics)

## POWER ELECTRONICS & APPLICATIONS

## (2012 Pattern) (Semester - II) (End Semester) (304212)

*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) ***Draw neat diagrams must be drawn wherever necessary.***
3) ***Figures to right indicates full marks.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

***Q1)*** a) Draw & Explain Single phase full converter with highly inductive load with input & output waveforms at 30º & 60º. **[7]**

b) The single phase full bridge inverter is operated from 48V dc supply, it has a resistive load of 2.4Ω. Determine. **[7]**

i) r.m.s. output voltage at the fundamental frequency

ii) the rms output power

iii) rms output voltage at second & third harmonic ($V_{o2}$ & $V_{o3}$)

c) Explain Four quadrant of chopper. **[6]**

OR

***Q2)*** a) Compare 120º mode with 180º mode in three phase inverter for balanced star R Load. **[5]**

b) Draw & Explain Three phase Semi converter with purely resistive load with input & output Waveforms at 30º & 90º. **[8]**

c) Draw the circuit diagram of Single phase AC Voltage controller with R Load. Explain its Operation. Draw the waveform of output voltage. **[7]**

***Q3)*** a) With the help of circuit diagram & waveforms, explain operation of SLR help bridge DC/DC Converter. **[6]**

b) Compare ZVS & ZCS. **[4]**

c) Explain with neat circuit diagram & waveform working operation of ZCS. Write advantages of Resonant Converter. **[6]**

OR

***P.T.O.***

***Q4)*** a) What is the need of resonant converter? Draw a neat circuit diagram, waveform & explain Working operation of ZVS. **[6]**

b) Compare Switched, linear & resonant converter. **[4]**

c) Define power quality. Explain the types of power line disturbances with their sources. **[6]**

***Q5)*** a) Explain ON line UPS with neat block diagram. State its specifications and applications. **[8]**

b) With the help of block schematic explain operation of Electronic ballast. What are the advantages of fluorescent lamp over conventional lamp. **[8]**

OR

***Q6)*** a) Compare ON line UPS & OFF line UPS. **[6]**

b) Write a short note on: **[10]**

i) Power Electronics in Capacitor Charging Application

ii) HVDC

***Q7)*** a) Draw block schematic & explain grid connected PV system. **[6]**

b) Write a short note on Control of Wind Turbine. **[6]**

c) Draw & explain block diagram of isolated grid supply system with multiple wind turbines. **[6]**

OR

***Q8)*** a) Distinguish between horizontal and vertical axis wind turbine generator. **[6]**

b) Explain briefly about types of PV power systems. **[6]**

c) What is meant by MPPT? Write briefly about analog and digital control methods for MPPT. **[6]**

Total No. of Questions : 8]

SEAT No. :

**P1474**

[Total No. of Pages : 2

# [5460]- 150

## T.E. (Electronics Engineering)

## INDUSTRIAL MANAGEMENT

## (2012 Pattern) (End Sem.) (304213) (Semester - II)

*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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

***Q1)*** a) Explain the features of Joint Stock Company. Differentiate between Public Ltd. Company and Private Ltd. Company. **[8]**

b) Explain project management. State the differences between CPM and PERT ? **[6]**

c) Explain in brief following : **[6]**

i) Ishikawa Diagram

ii) Continuous Improvement

OR

***Q2)*** a) Explain in brief following : **[12]**

i) SIX SIGMA

ii) Five S (5S)

iii) Break Even Analysis

b) Explain the contribution of HENRY FEYOL in the field of Management. **[8]**

***Q3)*** a) State the functions of HRM. **[5]**

b) What are the objectives of HRM. **[5]**

c) What are the objectives & process of human resource planning ? **[7]**

OR

***Q4)*** a) Explain in brief following : **[10]**

i) HR Planning

ii) Training and Development

b) What is performance appraisal ? State the objectives and types of performance appraisal. **[7]**

***P.T.O.***

***Q5)*** a) Define Entrepreneur. Explain the different traits of Entrepreneur. **[8]**

b) How business ideas are generated. Explain with a help of an example. **[8]**

OR

***Q6)*** a) State that how an individual can identify business opportunities. **[8]**

b) Define Entrepreneurship. State a case study on small scale industry of India. **[8]**

***Q7)*** a) Explain MIS. State its need, purpose & objectives. **[10]**

b) State different business models of E - Commerce. **[7]**

OR

***Q8)*** a) What are the Decision-making models ? State some examples. **[10]**

b) Describe E - Commerce. **[7]**

❄❄❄❄

Total No. of Questions : 8]

SEAT No. :

**P1475**

[Total No. of Pages : 2

# [5460]-151
# T.E. (E & TC)
# DIGITAL COMMUNICATION
# (2012 Pattern) (Semester - I)

*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) Draw and explain the block diagram of LPC transmitter & receiver. **[8]**

b) What is Synchronization? Describe Early late bit synchronizer with help of block diagram. **[6]**

c) Explain ergodic process if $x(t) = A \cos(2\pi fct + 2\varphi)$ is random process with $\varphi$ as a random variable uniformly distributed over $(0, 2\pi)$ prove that x(t) is ergodic in mean. **[6]**

OR

***Q2)*** a) What is Uniform and Nonuniform quantization? Write expression for u and A-law. **[6]**

b) the binary data 101100110101 is transmitted over a baseband channel. Draw the waveform for the transmitted data using following formats. Compare above schemes for their BW requirements **[8]**

i) Unipolar RZ ii) Unipolar NRZ

iii) Bipolar RZ iv) Split phase manchester

c) Classify Random processes & explain the different properties in brief. **[6]**

***Q3)*** a) Derive the expression of SNR for integrator and dump filter and explain working of integrator and dump filter. **[8]**

b) Explain Gram-Schmit procedure for orthogonalization. **[8]**

OR

***Q4)*** a) What is optimum filter? Derive the expressions for error probability of a matched filter in presence of white Gaussian noise. **[8]**

b) Write a note on Detection Theory. **[8]**

***P.T.O.***

***Q5)*** a) Explain the terms related to bandpass modulation with help of relevant example. **[8]**

i) Binary and M-Ary

ii) Coherent and Non-Coherent

iii) Power Spectra

iv) Probability of error

b) Compare BPSK and BFSKwith reference to euclidien distance, bandwidth, and its PSD. **[6]**

c) Calculate Euclidien distance and bandwidth for 16-QASK and draw its constellation diagram. **[4]**

OR

***Q6)*** a) Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that bit error probability is less than or equal to $10^5$ the channel noise PSD is $10^{-8}$ Watt/Hz. **[8]**

Calculate for M=16 and M=32

Give erf (0.99996) = 3.1

erf (0.99995) = 3.2

b) Draw the waveform for the sequence 11000111 of MSK and also draw its Transmitter and Receiver block diagram. **[10]**

***Q7)*** a) With a help of block diagram, explain the working of Direct Sequence Spread Spectrum. **[8]**

b) A spread spectrum system has the following parameters. Information bitduration Tb = 4.095 msec., PN chip duration $T_c$ = 1μsec. Find the processing gain. what is the number of shift registers required? Also find the jamming margin if the $Eb/N_o$ = 10 for the BPSK scheme. **[8]**

OR

***Q8)*** a) Draw the fast frequency hopped spread spectrum for the given data number of bits per MFSK Symbol K = 2, Number of MFSK tones M = $2^k$ = 4, length of PN segment per hop k = 3 (001110011001001), total number of frequency hops $2^k$ = 8. **[8]**

b) Write a short note on : **[8]**

i) Wireless telephone systems

ii) FHSS

⌘⌘⌘

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1476**

**[Total No. of Pages : 3**

**[5460]-152**

# T.E. (E & TC)

# DIGITAL SIGNAL PROCESSING

## (2012 Course) (Semester-I) (304182)

***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) With the help of example explain the concept of basis function and orthogonality. **[4]**

b) Show the mapping between analog frequencies to digital frequencies. **[3]**

c) What are the advantages of Digital singal processing over Analog singal processing. **[3]**

OR

***Q2)*** a) State and prove any two properties of Z transform. **[4]**

b) Given x(n) = {0, 1, 2, 3, 4, 5, 6, 7} and N=8, find X(K) using Decimation in Time Fast Fourier Transform (DITFFT). **[6]**

***Q3)*** a) State and prove following properties of Discrete Fourier Transform **[4]**

i) Linearity

ii) Circular convolution

b) First five points of 8 point DFT of a real valued sequence are

{28, -4+j9.656, -4+4j, -4+j1.656, -4, _____,_____,_____}. **[3]**

c) Find the Inverse Z transform of

$$X(z) = \frac{Z^3}{(z+1)(z-1)^2}$$ **[3]**

OR

***P.T.O.***

***Q4)*** a) State and prove the relationship between Z transform and Laplace transform. **[3]**

b) Find the Z transform and draw ROC of the following sequences **[3]**

1) $x(n) = coswn \quad for\ n \geq 0$

2) $x(n) = 2^{(n)}u(n)$

c) Compute the Discrete Cosine Transform of the following sequence **[4]**

f(x)= {1 2 5 7}

***Q5)*** a) The system transfer function of an analog filter is given by **[6]**

$$H(s) = \frac{s + 0.2}{(s + 0.2)^2 + 9}$$

using bilinear transformation method, determine the transfer function of digital filter. T-1s

b) What are the advantages of BLT over Impulse Invariant Method? Explain the steps used for designing an IIR filter using Impulse Invariant Method (BLT). **[6]**

c) Draw and explain the characteristics of Butterworth Filters, Elliptic filter and Chebyshev filters. **[6]**

OR

***Q6)*** a) Obtain direct form I and II realization of a system described by **[8]**

y(n) - (3/4) y(n-1)- (1/2) y(n-2) + (1/8) y(n-3) = x(n) + (5/4) x(n-2)

b) A digital filter has specification as:

Passband frequency = $w_p$ = 0.4Π, Stopband frequency = $w_s$ = 0.6Π.

What the corresponding specifications are for pass band and stop frequencies in analog domain if **[6]**

i) Impulse Invariance Technique is used for designing.

ii) Bilinear Transformation Method is used for designing.

c) Write a note on, "finite word length effect in IIR filter design". **[4]**

***Q7)*** a) What are the advantages of FIR filter over IIR filters? Compare Frequency domain Characteristics of Hamming, Hanning, Bartlett and Rectangular windows. **[8]**

b) Design FIR digital filter to approximate an ideal low pass filter with passband gain of unity, cut off frequency 850HZ and sampling frequency 5000 HZ. The length of impulse response should be 5. Use rectangular window. **[8]**

OR

***Q8)*** a) Justify FIR filters are linear phase filters. **[6]**

b) A low pass filter is to be designed the following desired frequency response. **[10]**

$$H_d(e^{jw}) = e^{-j3w} \quad \text{For} \quad -\frac{3\pi}{4} \le w \le \frac{3\pi}{4}$$

$$=0 \qquad \frac{3\pi}{4} \le w \le \pi$$

Determine $H(e^{jw})$ for m = 7 using Hamming window.

***Q9)*** a) Design a two stage decimator for the following specifications: **[10]**

Sampling rate of an input signal = 20 KHZ

Down sampler M = 100

Passband = 0 to 40 Hz

Transition band = 40 to 50 HZ

Passband ripple = 0.01

Stopband ripple = 0.002

b) Explain the application of DSP to image and Radar processing. **[6]**

OR

***Q10)***a) What are the characteristics of TMS 320 processor family? Draw and explain the architectural block diagram TMS 320C 67XX series DSP processor **[8]**

b) Write short note on. **[8]**

i) Sampling rate conversion by a non-integer factor.

ii) MAC and Barrel Shifter in digital Signal Processors.

**Total No. of Questions : 8]**

**SEAT No. :** ____

**P1477**

**[Total No. of Pages : 2**

# [5460]-153
# T.E. (E & TC)
# MICROCONTROLLER AND APPLICATIONS
## (2012 Pattern) (Semester - I) (End Sem.) (304183)

***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) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** a) Explain the factors for selecting the Microcontroller for the particular application. **[6]**

b) Explain the operational diagram of Timer/Counter of 8051 in detail. **[6]**

c) Explain with example function of ALU in PIC for transfer of data. **[8]**

OR

***Q2)*** a) With the help of neat block diagram explain the operation of Logic analyzer. **[6]**

b) Explain the operational diagram of Interrupt with vector locations of 8051 in detail. **[6]**

c) State features of PIC and explain BOD and Power down modes of PIC. **[8]**

***Q3)*** a) Draw and explain the interrupt structure of PIC with reasons of causing Interrupts. **[8]**

b) Draw an interfacing diagram 4*4 key pad and write C program to accept the key. **[8]**

OR

***Q4)*** a) Draw an interfacing Diagram to display the hex counter on LED and write C program to start up count when key 1 is pressed and down count when key 2 is pressed. **[8]**

b) Write an Embedded C program to generate PWM waveform of period = 200 μs and Duty cycle of 10% using CCPx on port pin of PIC Microcontroller. **[8]**

***P.T.O.***

***Q5)*** a) Draw and explain the I2C diagram of MSSP structure in detail. **[8]**

b) Draw an interfacing diagram to interface EEPROM using SPI protocol. **[8]**

OR

***Q6)*** a) Write an Embedded C program to toggle the bits of port C after every 10 ms using interrupt. **[8]**

b) Explain the internal block diagram of ADC in PIC and explain the ADC conversion steps. **[8]**

***Q7)*** a) Explain with flowchart and algorithm design of DMM using PIC18. **[8]**

b) Design a data acquisition system, to senses, process and display the Temp, Humidity, and air pressure. **[10]**

OR

***Q8)*** a) Design a Home alarm system considering the parameters of door safety using sensors for detection of person and its movements, Display warning on LCD. **[8]**

b) Draw and explain Design of frequency counter with display on LCD using PIC18 Microcontroller. **[10]**

⌘⌘⌘

**Total No. of Questions :8]**

**SEAT No. :** ____

**P1478**

**[Total No. of Pages :2**

# [5460] - 154

## T.E. (E & Tc)

## ELECTROMAGNETICS AND TRANSMISSION LINES

## (2012 Course) (Semester - I) (End Semester) (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 side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

***Q1)*** a) Derive the expression of electric field intensity $\vec{E}$ due to charged circular ring. **[8]**

b) A linear homogeneous, isotropic dielectric material has $\varepsilon_r$=3.6 and covering the space between z = 0 and z = 1. If V = - 6000 z volts in the material, find **[6]**

i) $\vec{E}$

ii) $\vec{P}$

iii) $\rho_s$

c) State any two properties of curl and explain physical significance of curl. **[6]**

OR

***Q2)*** a) Obtain $\vec{D}$ due to point charge Q placed at origin. Hence obtain relation between $\vec{D}$ and $\vec{E}$ . **[8]**

b) Derive the boundary conditions between two perfect dielectrics. **[6]**

c) Derive $\vec{H}$ due to infinitely long straight conductor. **[6]**

***P.T.O.***

***Q3)*** a) What is poynting vector? What is its significance? Derive the equation for average poynting vector. **[8]**

b) In a material for which $\sigma$ = 5.0 S/m and $\varepsilon_r$=1 , the electric field intensity is E = 250 sin $10^{10}$t V/m. Find the conduction and displacement current densities and frequency at which both have equal magnitude. **[8]**

OR

***Q4)*** a) Write and explain Maxwell's equations for static and time varying field. **[8]**

b) What is uniform plane wave? Derive an expression for Helmholtz wave equation. **[8]**

***Q5)*** a) Derive the relationship between primary and secondary constant. **[8]**

b) For an open wire overhead line $\beta$= 0.04 rad/km. Find the wavelength and velocity at frequency of 1600 Hz. Hence calculate the time taken by the wave to travel 90 km. **[8]**

OR

***Q6)*** a) Derive the expression for characteristics impedance and propagation constant in terms of primary constant of transmission line. **[8]**

b) If attenuation constant is $18\times10^{-3}$ N/m. Velocity of propagation is $1.8\times10^{8}$ m/s and characteristics impedance is 60 Ω. Find out the primary line constant of such distortionless line at frequency of 100 MHz. **[8]**

***Q7)*** a) Define standing wave ratio. Derive relation between standing wave ratio and magnitude of reflection coefficient. **[8]**

b) Derive the expression for input impedance for eight wave line and quarter wave line. **[10]**

OR

***Q8)*** a) What do you mean by single stub matching? Derive the equation of single stub along the line. **[8]**

b) A transmission line of 100 m long is terminated in load of (100 – j 200) Ω. Determine the line impedance at 25 m from the load end at a frequency of 10 MHz. Assume line impedance $Z_0$ = 100 Ω. Determine the input impedance and admittance using smith chart. **[10]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

**P1479**

[Total No. of Pages : 2

# [5460]-155
# T.E. E&TC
# SYSTEM PROGRAMMING AND OPERATING SYSTEM
## (2012 Course) (Semester-I) (304185)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Q.1 or Q.2, Q. 3 or Q.4, Q.5 or Q.6, Q.7or 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) List out the different data structures used for language processing with examples. **[7]**

b) What do you understand by grammar? Explain use of Terminal and non-Terminal in representing grammar with suitable example. **[7]**

c) Explain the role of lexical and syntax analyzer in compiler design and justify why they are separated out? **[6]**

OR

***Q2)*** a) Explain different data structures used to design pass I and pass II of assembler. **[7]**

b) Explain the sofware tools for program development. **[6]**

c) Define macro. State various tables used in processing the macro. **[7]**

***Q3)*** a) With respect to loader functions, state whether following statements are True or False with reason. **[6]**

i) In absolute loader relocation is done by assembler

ii) In absolute loader linking is done by programmer

iii) In compile-and-go loader loading is done by loader

b) Define process. Explain various states of process with process state diagram for five state process model **[6]**

c) How the processes are scheduled using Non-Preemptive shortest Job First (SJF) Scheduling algorithm with an example. **[6]**

OR

***P.T.O.***

***Q4)*** a) Explain with diagram how do deadlocks occur and how to avoid the deadlocks. **[6]**

b) Explain inter Process Communication (IPC) and its different problems. **[6]**

c) What is critical section problem? Give two solutions for critical section problem? **[6]**

***Q5)*** a) Explain the virtual memory system with suitable diagram. **[6]**

b) Explain the basic method for implementing paging. Draw the paging model of logical and physical memory. **[6]**

c) What is swapping? Does swapping increase the Operating system's overheads? **[4]**

OR

***Q6)*** a) Explain the differences between: **[6]**

i) Logical and physical address space

ii) Paging and segmentation

b) What is internal fragmentation and external fragmentation? How are they reduced? **[6]**

c) List one advantage and one disadvantage of having one large block size. **[4]**

***Q7)*** a) List the file types and file access methods. **[8]**

b) Explain how I/O devices communicate with CPU? What is the role of operating system to manage I/O devices? **[8]**

OR

***Q8)*** a) What are different file operations needed to define a file. **[8]**

b) List the various disk allocation methods and explain any one. **[8]**

Total No. of Questions : 8]

SEAT No. :

**P1480**

[Total No. of Pages : 2

# [5460]-156

## T.E. (Electronics and Telecommunication Engineering)

## INFORMATION THEORY AND CODING TECHNIQUES

## (2012 Pattern) (Semester - II) (End Sem) (304189)

*Time : 2.30 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) ***Use of calculator is allowed.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) What is Entropy explain with the help of equation? Find the entropy of following massages having Probabilities{1/4, 1/4, 1/2}. **[6]**

b) Prove that for the upper limit of BW the channel capacity is C=1.44 S/No. **[7]**

c) Design the encode for the (7.4) cyclic code generated by $G(x)=x^3+x+1$. Explain the working of encoder with example. **[7]**

OR

***Q2)*** a) What is variable length coding? Explain Shannon Fano Algorithm with the suitable example. What is coding efficiency? **[7]**

b) For a (6, 3) systematic LBC, three parity bits given as, **[7]**

C4 = d1 + d2, C5 = d2 + d3, C6 = d1 +d3

i) Determine generator matrix

ii) Construct code generated by this matrix

iii) Determine error capacity of the code

iv) Prepare syndrome decoding table

c) Explain with suitable example the procedure to obtain the generator matrix for systematic cyclic code. **[6]**

***P.T.O.***

***Q3)*** a) Explain in detail. **[6]**

i) Minimal Polynomial

ii) Generator Polynomial

b) Explain in detail the decoding of RS code. **[5]**

c) Construct the extension field GF ($2^3$) if m = 3 and P (x) = $1+x+x^3$ over GF (2). **[5]**

OR

***Q4)*** a) Find generator polynomial for double error correction of BCH code over GF ($2^5$) **[6]**

b) Determine the encoded massage for the following 8-bit data codes using the following CRC generating polynomial $P(x)=x^3+x^2+1$. **[10]**

i) 11001100 ii) 01011111

***Q5)*** a) Explain Viterbi Decoding Algorithm in the Convolution Coding using a suitable example. **[8]**

b) Explain in detail. **[8]**

i) LDPC

ii) Trellis Diagram

OR

***Q6)*** a) Explain with suitable example **[8]**

i) State Diagram

ii) Code Tree

b) Explain with suitable example. **[8]**

i) Sequential Decoding

ii) TURBO codes

***Q7)*** a) What are the implications of Error Probability Plan and BW Efficiency Plan? **[8]**

b) What is TCM? Explain the TCM encoder. **[10]**

OR

***Q8)*** a) Explain the parameters used in designing and evaluating the communication system. (Like power, BW etc.) **[10]**

b) Explain in detail the Set Partitioning Method for 8 PSK. **[8]**

Total No. of Questions : 8]

SEAT No. :

**P1481**

[Total No. of Pages : 2

# [5460]-157
# T.E. (E & TC)
# ANTENNA & WAVE PROPAGATION
## (2012 Pattern) (Semester - II) (End Semester)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer any one questions out of Q. NO. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 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 in detail the sky wave propagation. What are the frequency range is used for sky wave propagation? For which application sky wave propagation is used. **[6]**

b) Define antenna polarization and explain different type of polarization with relevant diagram. **[6]**

c) A free space microwave link operating at 10Ghz consists of transmitting and receiving antenna each having gain of 25dB. The distance between the two antennas is 30km and the power radiated by transmit antenna is 10W. Calculate the received power and path loss. **[8]**

OR

***Q2)*** a) Define and explain the following antenna terminologies: **[6]**

i) Radiation pattern
ii) Directivity of antenna
iii) Halh power beam width

b) An antenna has radiation resistance of 72 Ω, a loss resistance of 18 Ω and power gain of 12 dB. Determine antenna efficiency and its directivity. **[4]**

c) State the poynting theorem? Derive expression for power radiated by antenna using poynting theorem. **[10]**

***Q3)*** a) Derive power density and radiation resistance with respect to infinitesimal dipole. **[8]**

b) Draw current distribution and radiation pattern of 0.5λ and 1.5 λ dipole. **[4]**

c) Find the directivity of half dipole. **[4]**

OR

***P.T.O.***

***Q4)*** a) Explain important features of loop antenna. Describe radio direction finding. **[6]**

b) Draw and explain radiation pattern of 0.5 λ, λ, 1.5 λ length dipole antenna. **[6]**

c) What is the total power radiated by a small circular loop of radius 0.5m carrying a current 10A at 15Mhz? **[4]**

***Q5)*** a) Explain design equations for Yagi Uda antenna. Sketch modern version of 4-element Yagi Uda antenna with dimensions, inter-element spacing. **[8]**

b) Explain steps to design Binomial array. **[8]**

OR

***Q6)*** a) Draw radiation pattern of Broadside antenna array for 4 element and spacing between elements is λ/4. Find HPBW for same antenna. **[10]**

b) Derive the expression for directivity of end fire array. **[6]**

***Q7)*** a) What are electromagnetic horn antennas? What are the various types of horns? What are their practical applications? Compare these antennas with paraboloidal reflector antennas. **[9]**

b) Calculate input impedance and half power beam width for a helical antenna if directivity 14dB at 2.4Ghz. Assume circumference C = λ and spacing S = λ/4. **[9]**

OR

***Q8)*** a) Write short note on following with respect to structural detail, radiation pattern, detailed diagrams & features; **[12]**

i) Horn Antenna

ii) Turnstile Antenna

iii) Patch Microstrip Antenna

b) Explain V antenna with its structure, working, application, advantages & disadvantages. Compare V antenna with Rhombic antenna. **[6]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1482**

[Total No. of Pages : 2

# [5460]-158
# T.E. (E&TC)
# EMBEDDED PROCESSOR
## (2012 Pattern) (304191) (Semester - II)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer questions 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 indicates full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) With the help of diagram explain different clocks used in ARM 7. **[6]**

b) Explain IODIR and PINSEL Registers of LPC2148. **[4]**

OR

***Q2)*** a) Explain following instructions. **[6]**

i) SUBLT r1, r4, #3

ii) CMPNE r4, r5

iii) ADDEQ r7, r6

b) Draw and explain format of GPSR register of ARM7. **[4]**

***Q3)*** a) Draw interfacing diagram and write an embedded 'C' program to flash 8 LEDs connected at P1.15 to P1.31 of LPC 2148. **[6]**

b) Draw interfacing diagram to interface 4x4 matrix keypad with LPC 2148. **[4]**

OR

***Q4)*** a) Draw interfacing diagram and write an embedded 'C' program to display string 'SPPU-PUNE' on 16*2 LCD. **[6]**

b) With the help of interfacing diagram explain SD card interfacing with LPC 2148. **[4]**

***Q5)*** a) Compare ARM CORTEX A, CORTEX M, CORTEX R processors. **[8]**

b) Explain need of operating system in developing complex applications in embedded system. **[8]**

OR

***P.T.O.***

***Q6)*** a) Explain CMSIS standard. **[8]**

b) Explain thread and handler modes of Cortex M3. **[8]**

***Q7)*** a) State feature of LPC 1768. **[8]**

b) Interface DC motor with LPC 1768 and write a 'C' program to control speed of DC motor with 70% duty cycle. **[8]**

OR

***Q8)*** a) Draw & explain block diagram of LPC 1768. **[8]**

b) Interface RGB LED to LPC 1768 & Write a 'C' Program to display only red and blue colour with some delay. **[8]**

***Q9)*** a) Explain USB communication. **[9]**

b) Explain Ethernet based communication. **[9]**

OR

***Q10)***a) Explain CAN protocol in details. **[9]**

b) Explain PIN connects black of LPC 1768 & registers associated with this block. **[9]**

Total No. of Questions : 8]

SEAT No. :

**P1483**

[Total No. of Pages : 2

# [5460] - 159
# T.E (E & TC)
# INDUSTRIAL MANAGEMENT
## (2012 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 whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) Explain the concept of scientific management. How do today's managers use this concept ? **[8]**

b) What is 5s qulity management standard ? What are its objectives and benefits ? **[8]**

**c)** Using the following data, calculate the level of sales required to generate a profit of Rs. 10,000/-

Selling price - Rs. 35/- per unit

Variable cost - Rs. 20/- per unit

Fixed cost - Rs. 50,000/-

What is the Break even point ? **[4]**

OR

***Q2)*** a) What are the various functions of management ? Explain. **[8]**

b) What do you understand by the term quality circle ? What are its major objectives ? **[6]**

c) Define the term capital structure. What are the essentials of an optimum capital structure ? **[6]**

OR

***Q3)*** a) Define Human Resource Management (HRM).What are its objectives ? **[8]**

b) What is Human Resource Information System (HRIS) ? Explain the various steps involved in the design of such a system. **[10]**

OR

***P.T.O.***

***Q4)*** a) Explain the recruitment process from the perspective of an organization and a candidate. **[8]**

b) Explain the components of training and development within an intergrated HRM system. How do we evaluate the effectiveness of Training and Development ? **[10]**

***Q5)*** a) Write a short note on Government policies and incentives for small scale businesses in India. **[8]**

b) Differentiate between a Private Limited Company and Public Limited Company with suitable examples. **[8]**

OR

***Q6)*** a) Explain how to prepare a business proposal for starting a small scale industry. **[8]**

b) Write a short note on "Women Entrepreneurship" in India. **[8]**

***Q7)*** a) What is a Decision Support System (DSS) ?How it is different from an MIS ? **[8]**

b) Differentiate the terms Data and Infomation with appropriate examples. What are the characteristics of information ? **[8]**

OR

***Q8)*** a) Name the different types of e-commerce. Explain any one in detail. **[8]**

b) What are the components of an Information system ? What is the use of such system ? Why do we treat information as a commodity ? **[8]**

❄❄❄❄

Total No. of Questions : 8]

SEAT No. :

**P1484**

[Total No. of Pages : 2

# [5460]-160
# T.E. (E&TC Engineering)
# POWER ELECTRONICS
# (2012 Course) (Semester - II)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Draw neat diagrams & waveforms wherever necessary.***
3) ***Figures to right indicates full marks.***
4) ***Use of nonprogrammable calculators is allowed.***
5) ***Assume suitable data wherever necessary.***

***Q1)*** a) Draw steady state characteristics of SCR. Explain $I_L$, '$I_H$ $V_{BO}$, $V_{BR}$, & show them on the characteristics. **[7]**

b) Explain two transistor analogy of an SCR. Drive anode current equation of SCR. **[7]**

c) Draw the circuit diagram of UJT Triggering circuit. Explain its operation with neat waveforms. **[6]**

OR

***Q2)*** a) Draw the construction of Power MOSFET and explain steady state characteristics of IGBT. Compare it with SCR and MOSFET. **[7]**

b) For Single phase full controlled converter with resistive load determine the following: i) Average Output Voltage ii) RMS Output Voltage, if the supply voltage is 230V, 50 Hz and firing angle is 60º. **[6]**

c) Draw the circuit diagram of single phase Full Controlled Bridge converter with R-L load. Explain its operation. Draw the waveform of output voltage and Current. **[7]**

***Q3)*** a) What is DC to DC converter? Explain with circuit diagram & waveforms Operation of 4 Quadrant chopper. **[9]**

b) Draw the circuit diagram of single phase AC Voltage controller with R load. Explain its operation. Draw the waveform of output voltage. **[9]**

OR

***P.T.O.***

***Q4)*** a) In a dc chopper, the average load current is 30 Amps, chopping frequency is 250 Hz, supply voltage is 110 volts. Calculate the ON and OFF periods of the chopper if the load resistance is 2 ohms. **[9]**

b) Draw the block schematic of SMPS and explain its advantages over Linear Power Supply. **[9]**

***Q5)*** a) Explain Off-line UPS with neat block-diagram. State its specifications and applications. **[6]**

b) Explain with circuit diagram working of single phase full controlled separately excited DC motor drive. Draw neat waveforms across load. **[10]**

OR

***Q6)*** a) Compare ON-Line & OFF-Line UPS. Justify Why ON-Line UPS is better. **[8]**

b) Explain electronic ballast. What are the advantages of fluorescent lamp over conventional lamp? **[8]**

***Q7)*** a) Explain SLR half bridge DC/DC converter with neat circuit diagram and Waveforms. **[8]**

b) Explain dv/dt, di/dt and snubber circuit in detail. **[8]**

OR

***Q8)*** a) Explain with circuit diagram and neat waveforms ZCS resonant converters. **[10]**

b) Explain overvoltage and over current protection circuits. **[6]**

Total No. of Questions :10]

SEAT No. :

**P1485**

[Total No. of Pages : 2

# [5460]-161
## T.E. (Electrical)
## ADVANCED MICROCONTROLLER AND ITS APPLICATIONS
## (2012 Course) (Semester-I) (303141) (End-Semester)

*Time : 2½Hours]* *[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) ***Assume suitable data if necessary.***

***Q1)*** a) Compare RISC and CISC architectures. **[6]**

b) Explain with a diagram explain the Stack Pointer register (STKPTR). **[4]**

OR

***Q2)*** a) Write an instruction sequence in assembly language to add a data 0x0B to contents of memory location 0x200 and store the result in WREG. **[6]**

b) Draw the status register of PIC18F458 and explain any one of its flag. **[4]**

***Q3)*** a) Explain the following instructions. **[6]**

i) MOVF 0x04,0,1

ii) MOVFF fs,fd

iii) BSF PORTD,0

b) Write a program in C language which will copy the contents of WREG to port B continuously. **[4]**

OR

***Q4)*** a) Write a program in C to configure PORT C as input port and PORT D as output port. **[6]**

b) Explain any two tools used in application development using PIC microcontroller. **[4]**

***P.T.O.***

***Q5)*** a) Explain the steps to be followed while sending Data to LCD. **[8]**

b) List the steps that must be taken in programming PIC18 microcontroller to receive data serially. **[8]**

OR

***Q6)*** a) Write short note on SPI protocol. **[8]**

b) With a neat diagram of interfacing of 4x4 keypad with PIC18F458. Using a flow chart explain the method of key press detection. **[8]**

***Q7)*** a) Using PWM mode of CCP module, Write a program in C language for PIC18 microcontroller to create a 2.5kHz PWM waveform with a duty cycle of 75% on CCP1 pin. **[9]**

b) Draw CCPlCON and list the steps involved in programming PIC microcontroller in Compare mode. **[8]**

OR

***Q8)*** a) A stepper motor is interfaced with PIC18 microcontroller through lower nibble of Port B (RD0-RD3). Write program in C langauge to rotate the stepper motor in anticlockwise direction continuously. Assume the step angle of 1.8 degree's. Assume crystal frequency=10 MHz. **[9]**

b) With a flow chart explain speed control of DC motor using PIC microcontroller. **[8]**

***Q9)*** a) Write a neat diagram and flowchart explain AC voltage measurement using PIC microcontroller. **[9]**

b) Draw a neat diagram of interfacing of DAC 0808 with PIC microcontroller and write a program for generation of SAWTOOTH waveform using DAC. **[8]**

Assume i) Crystal frequency is 10 MHz

ii) DAC 0808 is interfaced with PIC microcontroller through Port B.

OR

***Q10)***a) With the help of interfacing diagram and flowchart explain how PIC18 microcontroller can be used to measure temperature using LM35 sensor. **[9]**

b) Explain in detail the functions of following flags related to onboard ADC of PIC microcontroller. **[8]**

i) ADIF

ii) Go/Done

iii) ADFM

iv) ADON

❖ ❖ ❖

Total No. of Questions : 10]

SEAT No. :

**P1486**

[Total No. of Pages : 3

# [5460]-162
# T.E.(Electrical)
# ELECTRICAL MACHINES - II
## (2012 Pattern) (Semester - I) (Endsem.) (303142)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7or 8, Q.No.9 to 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.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) With a neat diagram explain construction of three phase Alternator. **[5]**

b) A star connected three phase alternator delivers a three phase star connected load at a power factor of 0.8 lagging. The terminal voltage at no load is 2500 v and at a load of 1460 kW is 2200 v. Determine the terminal voltage when it delivers a load having resistance of 6Ω and a reactance of 8Ω per phase. Assume constant current and field excitation. **[5]**

OR

***Q2)*** a) With a neat phasor diagram explain pitch factor. **[4]**

b) Explain the procedure to determine the regulation of three phase alternator by e.m.f. method. **[6]**

***Q3)*** a) Compare three phase synchronous motor with three phase induction motor on following point. **[5]**

i) Starting
ii) Speed
iii) Power factor
iv) Cost/kVA
v) Size/KVA

b) A three phase 3.3 kV, 50 Hz star connected synchronous motor has a synchronous impedance of (0.3 + j4.9) Ω/phase. Calculate the line current for an induced emf of 4kV and an input power of 900kW at rated voltage. **[5]**

OR

***P.T.O.***

***Q4)*** a) Define regulation of an alternator. Should it have a high or a low value? Justify your answer. **[5]**

b) Compare salient pole alternator with non-salient pole alternator. **[5]**

***Q5)*** a) With a neat figure explain construction and working of burshless d.c. motor. **[8]**

b) What are different stator side speed control methods of three phase induction motor? With a neat figure explain any one method. **[8]**

OR

***Q6)*** a) With a neat figure explain construction and working of variable reluctance stepper motor. **[8]**

b) Draw complete slip-torque characteristics of three phase induction motor and explain working of induction generator. **[8]**

***Q7)*** a) Write step by step procedure to plot circle diagram of a.c. series motor. **[8]**

b) With a neat diagram explain the working of universal motor with its operating characteristics. **[8]**

OR

***Q8)*** a) Compare uncompensated a.c. series motor with compensated a.c. series motor. **[8]**

b) With a neat diagram explain conductively compensated series motor & inductively compensated series motor. **[8]**

***Q9)*** a) With neat diagram explain double revolving field theory. Hence draw torque - speed characteristics of single phase induction motor. **[8]**

b) With a suitable diagram explain no load and blocked rotor test on single phase induction motor. How equivalent parameters are obtained from these tests. **[10]**

OR

***Q10)***a) With neat diagram explain costruction and working of split phase induction motor. Draw its torque speed characteristics. **[8]**

b) The test results of a 230 volts single phase induction motor are given below: **[10]**

Blocked rotor rest: 110v, 9.5A, 450W

No-load test: 230v, 4.4A, 120W

The starting winding is kept open during blocked rotor test and stator winding resistance is 1.4Ω. Find the equivalent circuit parameters, the core and frictional and windage losses.

☼☼☼☼

Total No. of Questions : 10]

SEAT No. :

**P1487**

[Total No. of Pages : 2

# [5460]-163
## T.E. (Electrical)
## POWER ELECTRONICS
## (2012 Course) (Semester - I) (End Semester)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to candidates:***

1) ***Solve questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.***
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 gate characteristics of SCR. **[5]**

b) Describe the working of single phase half controlled converter with RLE load. Draw neat circuit diagram, and waveforms for **[5]**

i) Output voltage.

ii) Output current.

OR

***Q2)*** a) What are different methods of triggering of SCR? Explain UJT triggering method. **[5]**

b) Explain working of single phase AC voltage regulator with resistive load. **[5]**

***Q3)*** a) Draw V-I characteristics of TRIAC & explain how it can be used as voltage regulator with suitable example. **[5]**

b) Explain working of a three phase fully controlled bridge rectifier feeding highly inductive load with help of neat circuit diagram. What is the boundary of discontinuous conduction? Write expression of average output voltage. **[5]**

OR

***Q4)*** a) What is a dual converter? Explain working of Single phase dual converter with suitable diagram to give 4 quadrant operation of a motor. **[5]**

b) A single phase supply of 230 V, 50 Hz is to deliver power to a load of R = 10Ω through a half wave controlled rectifier. For a firing angle of 60°, determine : **[5]**

i) The rectification efficiency.

ii) Form Factor.

iii) Ripple Factor.

***P.T.O.***

***Q5)*** a) Draw and explain switching characteristics of IGBT. **[8]**

b) Explain the control strategies used in dc choppers to control output voltage. What are the drawbacks of FM control? **[8]**

OR

***Q6)*** a) Explain with neat diagram working of a step up chopper feeding an inductive load. Draw output voltage and current waveforms. Derive average and rms output voltages equations in terms of duty cycle. **[10]**

b) A step –up chopper has input voltage of 220 V and output of 660 V. If the conduction time of chopper is 100 μsec, compute the pulse width of output voltage. If the output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. **[6]**

***Q7)*** a) Explain with neat circuit diagram and waveforms the operation of single phase voltage source inverter feeding RL load. **[8]**

b) Explain multiple pulse width modulation technique for inverter control. Explain modulation indices and effect on harmonic control. **[8]**

OR

***Q8)*** a) How inverters are classified? What are the external and internal voltage control methods in inverter? **[8]**

b) Explain sinusoidal pulse width modulation with necessary waveforms. **[8]**

***Q9)*** a) Draw the circuit diagram of three phase inverter feeding resistive load (star connected) using 180º conduction mode. Draw the switching sequence of the devices and waveforms of output phase and line voltages. **[10]**

b) What is the necessity of controlling the voltage at the output terminals of the inverter? Explain briefly the various methods employed for the control of output voltage of inverters. **[8]**

OR

***Q10)***a) What are the types of Multilevel Inverter? Explain cascaded multilevel inverter. **[10]**

b) Compare Multilevel inverter with Multi pulse Inverter. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3695

[Total No. of Pages : 2

# [5460]-164
# T.E. (Electrical)
# ELECTRICAL INSTALLATION, MAINTENANCE & TESTING
# (2012 Pattern)

*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.***

***Q1)*** a) Explain breakdown maintenance of transformer. **[6]**

b) State and explain the common on load tap changer problems that should be condition monitored? **[6]**

c) State fault monitoring methods of the Induction Motor and explain any one. **[8]**

OR

***Q2)*** a) Explain Different Insulation stressing factors. **[8]**

b) Explain Failure modes of transformer. **[8]**

c) What are the different parameters that affect on performance of Induction Motor? **[4]**

***Q3)*** a) List out fault location methods for locating the cable fault and explain any one with diagram. **[6]**

b) Explain various abnormal conditions in working of Induction Motors. **[6]**

c) Explain abnormal conditions of Transformers. **[6]**

OR

***Q4)*** a) Write short notes on the following: **[12]**

i) Remedial action on different Induction motor faults

ii) Any one test of transformer

iii) Causes of cable failure

b) Explain Testing of capacitor banks. **[6]**

***P.T.O.***

***Q5)*** a) Classify AC & DC Supply System. **[8]**

b) Derive Kelvins Law with its limitations. **[8]**

OR

***Q6)*** a) Explain the factors which is taken into design of distribution feeder. **[8]**

b) Write short note on following : **[8]**

i) Economic choice of AC transmission voltage

ii) Compare overhead and underground system

***Q7)*** a) Explain the procedure of installation of underground LT service line. **[8]**

b) Draw and explain single bus bar system. **[8]**

OR

***Q8)*** a) Explain touch voltage and step voltage. **[8]**

b) Explain following terms: **[8]**

i) Price Catalogue

ii) Cable Sizing

Total No. of Questions : 10]

SEAT No. :

**P1488**

[Total No. of Pages : 2

# [5460]-165
# T.E. (Electrical Engineering)
# POWER SYSTEM - II
# (2012 Course) (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, Q9 or Q10.***
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) Explain the procedure for drawing the receiving end circle diagram. **[5]**

b) Draw single line diagram of HVDC transmission system and explain the components used. **[5]**

OR

***Q2)*** a) A three phase 220 kV, 50 Hz transmission line consists of 1.2 cm radius of conductor spaced 2 m at the corner of an equilateral triangle. Calculate disruptive critical voltage between the lines. Irregularity factor = 0.96, temperature = 20°C, barometric pressure = 72.2 cm of Hg. Dielectric strength of air = 21.1 kV(rms)/cm. **[5]**

b) What are the different types of HVDC links? Explain in Detail. **[5]**

***Q3)*** a) Derive power flow equation for receiving end side of transmission line. **[5]**

b) A 275 kW, three phase line has the following constants A = 0.93 $\angle$1.5º B = 115 $\angle$ 77°. If the receiving end voltage is 275 kV, determine sending end voltage required, if a load of 250 MW at 0.85 PF lagging is being delivered at receiving end. **[5]**

OR

***Q4)*** a) What is surge impedance loading? State methods to improve surge impedance loading? **[5]**

b) Compare EHVAC transmission with HVDC transmission. **[5]**

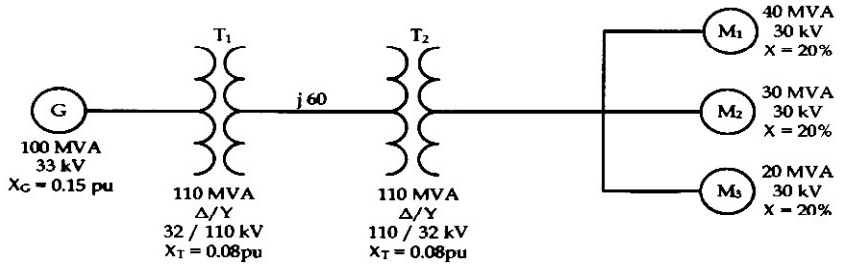
***Q5)*** a) What are the advantages of per unit system? How the base impedance is converted to per unit system? What formula is to be used if base of per unit values is to be changed? **[8]**

b) Compare Newton Raphson method with Gauss Seidal method of load flow analysis. **[8]**

OR

***P.T.O.***

***Q6)*** a) A 100 MVA, 33 kV three phase generator has a reactance of 15%. The generator is connected to three motors through transmission line and the transformer as shown in figure. Motors are rated input of 40 MVA, 30 MVA, 20 MVA at 30 kV, with 20% reactance each. Draw per unit diagram. Assume base as 100 MVA, 33 kV at generator. **[8]**




b) Derive static load flow equation for n bus system. **[8]**

***Q7)*** a) Draw sub-transient, transient and steady state reactance diagram of alternator and show that $X''_d < X'_d < X_d$ of an alternator. **[8]**

b) What is limiting reactor. Explain it with a suitable example. **[8]**

OR

***Q8)*** a) How the selection of circuit breaker is done in power system? What are the current limiting reactors? Explain its use in power system. **[8]**

b) A three phase 11kV, 10 MVA, generator has a direct axis steady state reactance of 10%. It is connected to a 5 MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV line side is connected to a transmission line having 1+j4 ohm impedance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current assuming no load prior to the fault when fault is at **[8]**

i) Sending end of the line.

ii) Receiving end of line. Take base of 11 kV, 10 MVA on generator.

**Q9)** a) Derive the expression for fault current in case of line to ground fault considering the sequence network with suitable diagram. **[9]**

b) Draw zero sequence diagram for all types of combinations of transformer. **[9]**

OR

***Q10)***a) Explain sequence network of synchronous machines. **[9]**

b) Derive formula for fault current in case of LLG fault. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1489**

[Total No. of Pages : 3

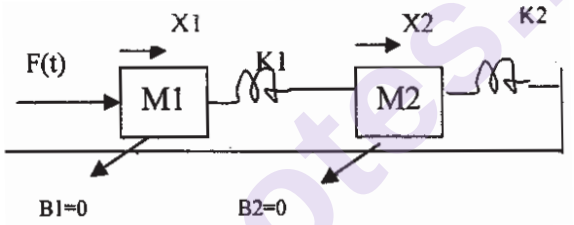
# [5460] - 166
# T.E. (Electrical)
# CONTROL SYSTEM - I
# (2012 Pattern) (End-Semester - II) (303147)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q.1or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8 and Q.9 or Q.10.***
2) ***Use of non programmable calculator is allowed.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) Explain D' Alembert's principle and find the Transfer function of write the differential equation describing dynamics of system as shown in fig. **[5]**

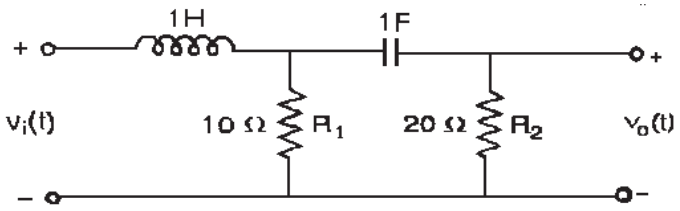



b) Draw block diagram of closed loop control system. State function of each block. Also explain why negative feedback is commonly used. **[5]**

OR

***Q2)*** a) Derive the transfer function of two tank system. **[5]**

b) Derive the transfer function of the electrical network as shown in fig & sketch the pole zero map if given L = 1 H, $R_1$ = 10 ohm, $R_2$ = 20 ohm, $C_1$ = 1 F **[5]**




***Q3)*** a) Define response of system. Explain unit step response for a first order system. **[4]**

b) For unity feedback system G(s) = 20 (s + 1)/s (s + 2)($s^2$ + 2s+ 2) find the static error coefficient and steady state error if r (t)= 10 + 20t. **[6]**

OR

***P.T.O.***

***Q4)*** a) What do you mean by potentiometer and derive the transfer function of potentiometer. **[6]**

b) Determine the values of the damping ratio and natural frequency of oscillations for each of the following systems and hence specify and draw the nature of the step response with respect to the value of the damping ratio. **[4]**

i) $C(s)/ R(s) = 8 / (s^2 + 3s + 8)$

ii) $C(s)/ R(s) = 4/ (s^2 + 16)$

***Q5)*** a) Sketch the root locus of Unity feedback system whose open loop transfer function is $G(s) = 1/s(s + 3)(s^2 + 5s+ 4)$. **[12]**

b) Define following terms: **[6]**

i) Stability

ii) Relative Stability

iii) Absolute Stability

iv) Marginal Stability

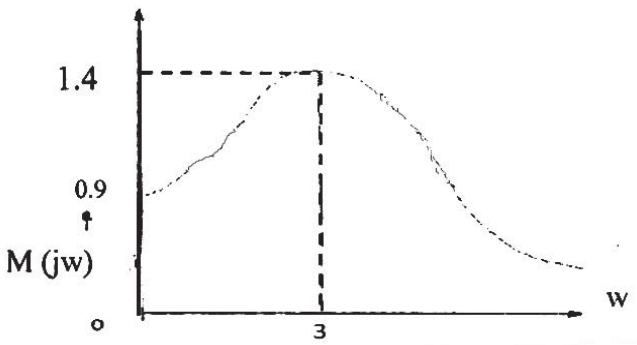
OR

***Q6)*** a) What is Routh's Hurwitz Criterion for stability analysis ? How many roots of the following polynomial are in the right half plane, the left half plane and on jw axis $P(s) = s^5+2s^4 + 2s^3 + 4s^2 + s + 2 = 0$ **[9]**

b) i) What are angle and magnitude condition for a stable system.

ii) Write a note on Root contour design concept. **[9]**

***Q7)*** a) The closed loop frequency response magnitude versus frequency of a second order system is shown in fig. Find frequency domain specifications. **[8]**




b) Sketch polar plot fot the unity feedback system with open loop tranfer function $G(s) = 1/s(s + 2)$ **[8]**

OR

***Q8)*** a) The open loop transfer function of an unity feedback system is given by $G(s) = 10 (s + 3)/s(s + 2)(s^2 + 4s + 100)$. Draw the bode plot and hence find the gain margin and phase margin. **[12]**

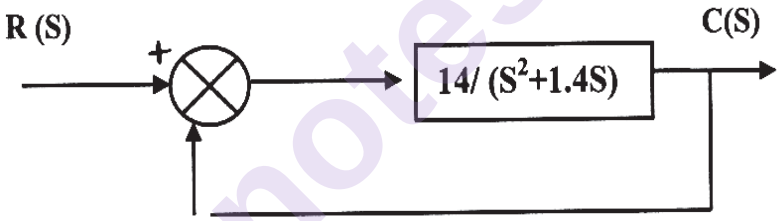
b) State and explain Nyquist Stability Criterion. **[4]**

***Q9)*** a) Explain PID controller with its characteristics and its effect on system performance. **[8]**

b) Explain tuning of PID controllers using Ziegler - Nichols Method. **[8]**

OR

***Q10)*** A closed loop control system with unity feedback is shown in figure by using derivative control the damping ratio is to be made 0.7. Determine the value of Td, also determine the rise time, peak time and maximum overshoot without derivative control and with derivative control. The input to the system is unit step. **[16]**




❄❄❄❄

Total No. of Questions : 8]

SEAT No. :

**P1490**

[Total No. of Pages : 2

# [5460]-167

## T.E. (Electrical)

## UEE - UTILIZATION OF ELECTRICAL ENERGY

## (2012 Pattern) (Semester-II) (End Sem.)

*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 logarithmic tables slide rule, mollier charts electronic pocket calculator and steam tables is allowed.***

***Q1)*** a) Write a short note on limit switches, contactor and timer. **[6]**

b) Explain with neat diagram Ajax Watt Furnace. **[6]**

c) A 4.5 kW, 200V and 1ph resistance oven employs nichrome wire as heating element. If the wire temperature is to be 1000°C and that of the charge 500°C. Estimate the diameter and length of the wire. The ρ of nichrome alloy is 42.5 μΩm. Assume k and e of the element is 1 & 0.9 respectively. **[8]**

OR

***Q2)*** a) Compare Resistance and Arc welding. **[6]**

b) Two lamps of each 300 CP are suspended at a height of 6m and 10m from the ground and are separated by a distance of 12m apart. Find the illumination just below the two lamps. **[6]**

c) Draw electric circuit diagram used in Refrigerator and explain in brief. **[8]**

***Q3)*** a) Explain in detail transformer, interrupter and circuit breaker used in traction substation. **[8]**

b) State the advantages Electric Traction system also compare AC and DC traction system. **[8]**

OR

***Q4)*** a) Sketch a neat block diagram and explain various equipment used in electric locomotive. **[8]**

b) Write a short note on Composite system of Track electrification. **[8]**

***P.T.O.***

***Q5)*** a) Define average speed and schedule speed. State the factors affecting schedule speed. **[8]**

b) Draw Speed-time curve for main line service and explain different time periods in brief. **[10]**

OR

***Q6)*** a) What is coefficient of adhesion? State the factors affecting on it. **[8]**

b) An electric train has an average speed of 42km/hr on level track between stops 1400m apart. It is accelerated at 1.7 km/hr/sec and braked at 3.3km/hr/sec. Draw the speed time curve for the run and show all the timings. Estimate specific energy consumption of the train. Take tractive resistance as 50N/T and rotational inertia of 10%. **[10]**

***Q7)*** a) State and explain desirable characteristics of traction motor. **[8]**

b) Explain Bridge transition and Series - Parallel transition for traction motor control with suitable diagram. **[8]**

OR

***Q8)*** a) Explain regenerative braking applied for DC shunt Motor. **[8]**

b) Write a short note on train signaling system. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

**P1491**

[Total No. of Pages : 2

# [5460]-168
## T.E. (Electrical)
## DESIGN OF ELECTRICAL MACHINES (303149)
## (2012 Pattern) ( Semester - II) (End Sem)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Attempt Q No.1 or Q.No.2, Q.No.3or Q.No.4, Q.No.5or Q.No.6, Q.No.7or Q.No.8.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right in bold indicate maximum marks.***
4) ***Use of non-programmable scientific calculator is permitted.***
5) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** a) What is helical winding used in transformer? Why transposition is done in helical winding. **[6]**

b) Draw the position of LV and HV winding relative to the core and state the reason for the same. **[6]**

c) Write down in detail the steps to calculate the number of tubes for cooling in an oil immersed transformer. **[8]**

OR

***Q2)*** a) Which types of material is preferred for transformer core laminations and why? What are the advantages of using mitred joints in core construction? **[6]**

b) What are different types of winding used in a transformer? Explain any one. **[6]**

c) Define and explain short time rating and continuous time rating. **[8]**

***Q3)*** a) Which factors should be considered when estimating the length of the air gap of induction motor? Why the air gap should be as small as possible? **[8]**

b) Draw a mush winding diagram for 4 pole, 24 slot three phase induction motor armature. Use full pitched coil. Show connection for all three phases. **[10]**

OR

***P.T.O.***

***Q4)*** a) What is overload capacity? What is the impact of overload capacity if higher value of ac is selected? **[8]**

b) Determine the main dimensions for three phase, 50Hz, 10kW, 400V, 4pole squirrel cage induction motor. The motor has full load efficiency of 0.85 and full load power factor 0.9 lag with winding factor of 0.96. The specific electric loading is 22000A/m and specific magnetic loading is 0.6 $Wb/m^2$.Take rotor peripheral speed of 25m/s at synchronous speed. **[10]**

***Q5)*** a) What are different methods to improve starting torque of three phase squirrel cage induction motor? Explain any one in detail. **[8]**

b) A 12 kW, three phase, 6 pole, 220 V and star connected induction motor with 72 slots having 9 conductors per slot. Calculate the value of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.9. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the area of each bar and area of each end ring if the current density is $6A/mm^2$. **[8]**

OR

***Q6)*** a) What are different types of rotor slots? Explain any one. What are the advantages of tapered slot? **[8]**

b) Derive the expression for end ring current for the rotor of three phase squirrel cage induction motor. **[8]**

***Q7)*** a) Write detail procedure to calculate full load copper loss of a designed three phase induction motor (Without performing any test). **[8]**

b) Explain the effect of ducts on the calculation of magnetizing current of three phase induction motor. **[8]**

OR

***Q8)*** a) Explain the effect of magnetic saturation during the determination of mmf of induction motor. **[8]**

b) A 20 kW, three phase, 50Hz, 8 pole, star connected induction motor has magnetizing current of 30% of full load current. Calculate the value of stator turns per phase, if the mmf required for the flux density at 60° from pole axis is 600A. Assume full load efficiency of 90% and full load power factor 0.85 lagging. Assume winding factor of 0.955. **[8]**

**Total No. of Questions : 12]**

**SEAT No. :** ____

**P1492**

**[Total No. of Pages : 2**

# [5460]-169
# T.E. (Electrical)
# ENERGY AUDIT & MANAGEMENT
# (2012 Course) (Semester - II)

***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) ***Your answers will be valued as a whole.***
4) ***Use of logarithmic tables slide rule, Mollier chart, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** Discuss long term and short term measures for securing future energy requirements of our country. **[6]**

OR

***Q2)*** Give salient features of Electricity act 2003. **[6]**

***Q3)*** Give the organisational structure of a large scale manufacturing unit in respect to energy management. Also explain constitution of Energy Committee. **[7]**

OR

***Q4)*** Explain in detailed energy management strategy. **[7]**

***Q5)*** Explain with neat block diagram process of automatic meter reading systems. **[7]**

OR

***Q6)*** What are the benefits of wave shaping the load curve? Explain with suitable examples of wave shaping of residential consumers. **[7]**

***Q7)*** a) Discuss steps involved in detailed energy audit. **[8]**

b) How least square method is used in energy audit for data analysis? **[8]**

OR

***Q8)*** a) Why planning is important in energy audit? What is action plan? Explain it with suitable example. **[8]**

b) Discuss energy audit case study of paper and pulp industry. Highlight the recommendations for energy saving. **[8]**

***P.T.O.***

***Q9)*** a) Compare Premium Efficiency Motor with Standard motor respective, size, cost, performance parameters, material used and quality of material. **[6]**

b) Explain energy efficiency measures in pumping systems. **[6]**

c) Discuss methods of reducing technical and commercial losses in distribution system. **[6]**

OR

***Q10)***a) With suitable examples explain different types of cogeneration schemes. It is recommended in the energy audit that waste heat recovery scheme must be implemented. Suggest appropriate system and justify your answer. **[9]**

b) Explain selection criteria for diesel generator. Explain effect of calorific value of fuel, turbo charger, transient loads on performance of D.G. **[9]**

***Q11)***a) Calculate Net Present Value of the proposal of energy saving in cement industry. The cost of retrofit is around Rs 12,00,000. The annual savings realised for consecutive five years are Rs.3,00,000, Rs.3,00,000, Rs.3,50,000, Rs.3,50,000 and Rs.4,00,000. The discounting factor is 12%. Comment on the economic viability of the project. **[8]**

b) Discuss energy conservation opportunities in commercial establishment identified during energy audit. **[8]**

OR

***Q12)***a) What is the time value of money? Also explain criteria for financial appraisal of economic investment. **[8]**

b) The cost and estimated savings data for an energy saving retrofit project is given in table below.

| Retrofit cost | Energy & demand savings | Maintenance cost savings |
|---|---|---|
| Rs.1,00,000 | 7,000 kWh/year & Rs.3,800/year as demand charges | Annual maintenance cost savings will be Rs.2000/- |

The key data is given below:

Energy savings are based on Rs. 3.00/kWh. There will be no changes in energy rates for 10 years. The useful life of the project is 8 years. With discounting factor of 12% calculate NPV. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1494**

[Total No. of Pages : 2

# [5460]-171

## T.E. (Instrumentation & Control)

## EMBEDDED SYSTEM DESIGN

## (Semester - I) (2012 Pattern) (306261)

*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) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q7.or Q8, Q.9 or Q.10.***

***Q1)*** a) Explain the architecture of 8051 with block diagram. Aslo Enlist the features of 8051. **[6]**

b) Explain the port 0 structure with the help of diagram. **[4]**

OR

***Q2)*** a) Draw the block diagram of timer/counter 0 and explain it's operation. **[6]**

b) Explain the difference between the execution of following two instruction of 8051. **[4]**

MOV A,#20H & MOV A, 20H

***Q3)*** a) Write a program in assembly language to generate the delay of 50ms using timer of 8051. Assume $f_{OSC}$=11.0592 MHz. **[6]**

b) Draw the interfacing diagram of 8051 to LCD display. **[4]**

OR

***Q4)*** a) Explain the interfacing of DAC 0808 to the 8051. **[6]**

b) What is the role of stack memory in execution of interrupts? **[4]**

***Q5)*** a) Draw the interfacing diagram of RTC to 8051. Explain its operation. **[10]**

b) Draw the interfacing diagram of Electromechanical relay to the 8051. **[8]**

Explain it's operation.

OR

***P.T.O.***

***Q6)*** a) Explain with the help of neat diagram interfacing of 8051 to serial ADC with neat interfacing diagram. **[8]**

b) Using 8051, design a traffic light controller. Assume suitable data if required. **[10]**

***Q7)*** a) Enlist the features of AVR microcontroller. Explain the register file of Atmega 8535 microcontroller. **[8]**

b) Explain the following instructions of AVR microcontroller. **[8]**

i) CPSE R22, R23

ii) BRCS ahead

iii) ST Y, R21

iv) LDS R21, 0x53

OR

***Q8)*** a) Explain the stack operation in Atmega 8535 AVR microcontroller. **[8]**

b) Explain the program memory organization of Atmega8535 Microcontroller. **[8]**

***Q9)*** a) Explain the timer/counter 0 of Atmega 8535 AVR microcontroller with help of neat block diagram. **[10]**

b) How the Baud rate of 4800 is selected in Atmega 8535 AVR microcontroller? **[6]**

OR

***Q10)***a) How the clock sources are selected for the timer/counter of Atmega 8535. **[8]**

b) What are the different frame formats supported by the Atmega 8535 in serial communication. Also explain how to select different frame formats. **[8]**

Total No. of Questions :10]

SEAT No. :

**P1495**

[Total No. of Pages : 2

# [5460]-172

## T.E. (Instrumentation & Control)

## INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

## (2012 Course) (Semester-I)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer three questions from section I and three question from section II***
2) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data if necessary.***

### SECTION-I

***Q1)*** a) Explain principle and experimental set up of potentiometry. **[6]**

b) Write a short notes on Integral Burner **[4]**

OR

***Q2)*** a) Explain with neat sketch multichannel filter photometer **[6]**

b) List advantages and disadvantages of Instrumental method over classical method. **[4]**

***Q3)*** a) Explain Atomic Emission Spectroscopy with neat sketch **[6]**

b) Write a short notes on Interferometer used in FTIR **[4]**

OR

***Q4)*** a) Explain DCP with neat sketch. **[6]**

b) Write a short on Photomultiplier Tube. **[4]**

***Q5)*** a) Derive Relationship between concentration and flourecesece intensity. **[10]**

b) Explain $O_2$ analyzer with neat sketch. **[8]**

OR

***Q6)*** a) What is Raman effect? Explain the application of Raman spectrometer for the measurement of turbidity of sample **[10]**

b) Explain NMR Spectrometer with neat sketch. **[8]**

***P.T.O.***

***Q7)*** a) What is Mass Spectrometer? Explain Time flight mass spectrometer with neat sketch. **[8]**

b) Explain the analogy between optical spectroscopy and Mass spectroscopy. **[8]**

OR

***Q8)*** a) Explain Gas chromatography with neat sketch. **[8]**

b) Explain any one type of high pressure pump system used in HPLC with neat sketch. **[8]**

***Q9)*** a) Explain GM counter with neat sketch. **[8]**

b) State and explain Braggs law of X-Ray Diiffractometer. **[8]**

OR

***Q10)***a) Explain Ionization chamber with neat sketch. **[8]**

b) What is ESCA explain auger emission spectroscopy. **[8]**

❖ ❖ ❖

Total No. of Questions :10]

SEAT No. :

**P1496**

[Total No. of Pages :2

# [5460] - 173

## T.E. (Instrumentation & Control)

## CONTROL SYSTEM COMPONENTS

## (2012 Course) (Semester - I) (End Semester) (306263)

*Time : 2½ Hours]* *[Max. Marks :70*

***Instructions to the candidates:***

1) ***Draw neat sketches wherever necessary.***
2) ***Answer any 5 questions.***
3) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
4) ***Assume suitable data.***

***Q1)*** a) Draw and explain the use of a flow switch in flow control application. **[5]**

b) Draw & explain pneumatic power supply. **[5]**

OR

***Q2)*** a) Draw & Explain with neat diagram reversing direction of motor. **[5]**

b) Explain with diagram construction & working of a contractor. **[5]**

***Q3)*** a) Explain with diagram ground fault & phase reversal protection of motor. **[5]**

b) Draw and explain working of a 4/3 DCV. **[5]**

OR

***Q4)*** a) Explain in detail Interlocking of motors. **[5]**

b) Draw and explain the pneumatic circuit for speed control of double acting cylinder. **[5]**

***P.T.O.***

***Q5)*** a) Enlist the types of hydraulic pumps. Explain any one in detail. **[10]**

b) Explain 4 components of hydraulic power supply. **[8]**

OR

***Q6)*** a) Draw & explain speed control of single acting & double acting cylinders in hydraulics. **[10]**

b) Explain in detail 4/3 DCV & 5/3 DCV in hydraulics. **[8]**

***Q7)*** a) Write a short note on flow totalizer. **[8]**

b) Write a short note on Dampers. **[8]**

OR

***Q8)*** a) Enlist the different types of fuses. Explain any one in detail. **[8]**

b) Explain the need of circuit breaker & its application. **[8]**

***Q9)*** a) Explain in detail proportional amplifier & its application. **[8]**

b) Explain in detail bi-stable amplifier & its application. **[8]**

OR

***Q10)***a) Explain in detail hazardous area classification & hazardous area triangle. **[8]**

b) Write a note on intrinsic safety and its types. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3696

[Total No. of Pages : 3

# [5460]-174

## T.E. (Instrumentation & Control) (Semester - I)

## CONTROL SYSTEM DESIGN

## (2012 Pattern)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) Discuss the frequency response of lead, lag and lead-lag compensator. **[6]**

b) Write atleast four comments on effect of Proportional plus Derivative controller for a first order plant. **[4]**

OR

***Q2)*** a) Design a lead compensator for a system $G(s)=\frac{K}{s(s+4)}$ such that velocity error constant is atleast 30 and phase margin should be atleast 55°. **[6]**

b) The following transfer function is obtained from step response of the system

$$G(s)=\frac{5e^{-3.5s}}{20s+1}$$

Find the parameters for PID using Cohen-Coon method. **[4]**

***Q3)*** a) The transfer function of a unity feedback system is given as

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

Find the parameters of PID using Ziegler-Nichols method. **[5]**

***P.T.O.***

b) The open loop transfer function for unity feedback network is

$$G(s)=\frac{2}{(s+1)(s+4)}$$

Design a PD controller such that phase margin is atleast 55° at ω=1.5 rad/sec. **[5]**

OR

***Q4)*** a) Explain the step response method for tuning a PID controller. List down its advantages and disadvantages. **[5]**

b) The open loop transfer function for unity feedback network is

$$G(s)=\frac{5}{(s+1)(s+5)}$$

Obtain PD controller transfer function if the desired closed loop poles are at $-1\pm j1$. **[5]**

***Q5)*** a) Derive the expression to convert state space model to transfer function model. **[6]**

b) Determine the state space model in observable canonical form for a transfer function given as $G(s)=\frac{(s+2)}{(s+1)(s+3)(s+4)}$ **[10]**

OR

***Q6)*** a) Find the transfer function of the following state space representation.

$$\dot{x}=\begin{bmatrix}3 & 1 & 0\\ 0 & 1 & 2\\ 1 & 2 & 1\end{bmatrix}x+\begin{bmatrix}0\\ 2\\ 3\end{bmatrix}u$$

$y$=[0 2 1] $x$+2$u$ **[10]**

b) Explain the terms state, state equation and state variable. **[6]**

***Q7)*** a) Define controllability and observability with an example. **[8]**

b) Determine state transition matrix using similarity transformation approach for the following state space model.

$$\dot{x}=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}x+\begin{bmatrix}0\\ 1\end{bmatrix}u$$ **[10]**

OR

***Q8)*** a) Determine state transition matrix using Cayley Hamilton approach for the following state space model.

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$ **[10]**

b) Determine controllability and observability of the following state space representation

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -8 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix} u$$

$y$=[1 2 0] $x$ **[8]**

***Q9)*** Find state feedback gain matrix for the system to place the desired closed loop poles at location s = –3, –4

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$ and $y$=[1 0]$x$ **[16]**

OR

***Q10)***Design a full order observer for the system defined by following state equation.

$$\dot{x} = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$ and $y$=[1 0]$x$

The set of desired poles for the observer to be at s=–1, –3. **[16]**

Total No. of Questions : 10]

SEAT No. :

**P1497**

[Total No. of Pages : 2

# [5460]-175

## T.E.

## INSTRUMENTATION AND CONTROL ENGINEERING

## Industrial Organization and Management

## (Semester - I) (2012 Pattern) (End Semester) (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 should be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) Enlist and Explain different functions of management. **[6]**

b) Explain Business process Re-engineering. **[4]**

OR

***Q2)*** a) Enlist ISO 9000 Inspection objectives. **[4]**

b) Explain the effects of pollution on human health. **[6]**

***Q3)*** a) Explain Purchase and Inventory Management. **[5]**

b) Elaborate Environmental norms: ISO 14000. **[5]**

OR

***Q4)*** a) Does an effective management technique help in raw material handling and storage? Justify. **[6]**

b) Explain Supply Chain Management in brief. **[4]**

***Q5)*** a) Why it is needed to train the Manpower? What are techniques to train manpower? What may be the advantages of it? **[10]**

b) Elaborate the role of HR in Selection and training of manpower. **[8]**

OR

***Q6)*** a) What is Appraisal? How it helps HR in manpower management? What is increments management? **[9]**

b) What are different methods exploring true potential amongst the people. How it is helpful in maintaining the efficient manpower? **[9]**

***P.T.O.***

***Q7)*** a) What is meant by term Capital? Classify capital. What is the need of working capital in business? **[8]**

b) Explain concept of budgeting, its objectives and types. **[8]**

OR

***Q8)*** a) Write a note on "Capital budgeting". **[8]**

b) What are the functions of capital market and money market? **[8]**

***Q9)*** Write notes on : **[16]**

a) Role of Ethics and its need in changing business environment.

b) E-business as recent business strategies.

OR

***Q10)*** a) What is ERP? How I can be used as modern tool for development of an industry? **[8]**

b) Explain role of MIS in modern business organizations. **[8]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

P3649

[Total No. of Pages : 3

# [5460]-176

## T.E. (Instrumentation & Control)

## D.S.P.

## (2012 Pattern)

*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 whenever necessary.***
3) ***Assume suitable data if necessary.***

***Q1)*** a) Classify the system. Explain with suitable example. **[6]**

b) Determine the poles & zeros of the discrete - time system described by following difference equation. **[4]**

$y(n) = 2.25y(n-1) - 3.5y(n-2) + x(n) + 5x(n-1)$

OR

***Q2)*** a) Determine the auto-correlation of the following sequence. $x(n) = \{5, 3, 2\}$. Also sketch the autocorrelation sequence. **[7]**

b) Draw the pole zero plot for the system function. **[3]**

$$H(z) = \frac{1 - z^{-2}}{1 + 2z^{-1} + z^{-2}}$$

***Q3)*** a) Find the z-transform of the term $X(s) = \frac{1}{s(s+1)}$. **[4]**

b) Find the DFT of a sequence for N = 4

$$x(n) = \frac{1}{2} \qquad 0 \le n \le 2$$
$$= 0 \qquad \text{otherwise}$$

**[6]**

OR

***P.T.O.***

***Q4)*** a) What is the relation between z-transform & DFT? **[4]**

b) What is the magnitude & phase response at 200Hz of $H(z) = 2 - 2z^{-4}$? **[6]**

***Q5)*** Compute the 8 pt DFT of the sequence $x(n)=\left\{\frac{1}{2},\frac{1}{2},\frac{1}{2},\frac{1}{2},0,0,0,0\right\}$ using

a) Radix - 2 decimation in time algorithm. **[8]**

b) Radix - 2 decimation in frequency algorithm. **[8]**

OR

***Q6)*** a) Compute the IDFT of the sequence using DIT FFT algorithm. **[12]**

$X(K) = \{4, 1 - j2.414, 0, 1 - j0.414, 0, 1 + j0.414, 0, 1 + j2.414\}$

b) What is FFT? Why FFT is needed? **[4]**

***Q7)*** Design a low pass filter with 11 coefficients for following specification. Pass band freq. edge = 250 Hz, Sampling freq = 1000Hz. Use rectangular, Hamming & Hanning window for design. **[18]**

OR

***Q8)*** a) Explain the different methods for designing FIR filter. **[6]**

b) Design a linear phase FIR filter using Hamming window for desired freq. response. **[12]**

$Hd(\omega) = e^{-j3\omega} \quad 0 \le |\omega| \le \pi/4$

$= 0 \quad \pi/4 \le |\omega| \le \pi \quad$ for N = 7

***Q9)*** a) Apply Bilinear transformation to the given transfer function. **[6]**

$$H(s)=\frac{(s+0.1)}{(s+0.1)^2+9} \quad \text{where } w_r = \pi/4$$

b) Design a Chebyshev filter with max. pass band attenuation of 2.5 dB at $\Omega_p$ = 20rad/sec & stop band attenuation of 30dB at $\Omega_s$ = 50rad/sec. **[10]**

OR

***Q10)***a) Compare the features of digital Butterworth & Chebyshev Type1 filter in terms of **[6]**

i) Filter order

ii) Transition width

b) Design a Butterworth filter using Impulse invariance method for following specification **[10]**

$0.8 \leq |H(e^{i\omega})| \leq 1 \qquad 0 \leq \omega \leq 0.2\ \pi$

$|H(e^{i\omega})| \leq 0.2 \qquad 0.6\ \pi \leq \omega \leq \pi$

**Total No. of Questions : 10]**

**SEAT No. :** ____

**P1498**

**[Total No. of Pages : 2**

# [5460]-177

## T.E. (Instrumentation & Control)

## PROCESS LOOP COMPONENTS

## (2012 Pattern) (Semester - II) (End Sem.)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

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

***Q1)*** a) Draw a typical Temperature Control Loop and identify the controlled variable,manipulated variable and the load variables **[6]**

b) List down the standard transmission signals used in industry . **[4]**

OR

***Q2)*** a) Explain the need of converters in process industries. **[5]**

b) Draw step response of P (proportional),Proportional-Integral (PI), Proportional Derivative (PD) and Proportional Integral Derivative (PID) controllers. **[5]**

***Q3)*** a) Compare 2 wire and 4 wire transmitter. **[5]**

b) Explain the concept of reset windup. **[5]**

OR

***Q4)*** a) Explain Ziegler Nichols method of tuning. **[6]**

b) What is meant by direct and reverse acting controller. **[4]**

***Q5)*** a) Explain the interfacing of PLC(Programmable Logic Controller) to pneumatic circuit. **[9]**

b) Explain in detail input module of PLC. **[9]**

OR

***P.T.O.***

***Q6)*** a) Give examples of analog inputs, analog outputs, digital inputs and digital outputs. **[8]**

b) Draw relay ladder diagram for bottle filling plant. **[10]**

***Q7)*** a) Explain the features of diaphragm type control valve. **[8]**

b) List different accessories of control valve explain anyone. **[8]**

OR

***Q8)*** a) Compare installed and inherent characteristics of control valve. **[8]**

b) Explain the features of Electro-Hydraulic actuators. **[8]**

***Q9)*** a) Write a short note on High temperature service valves. **[8]**

b) What is meant by control valve noise. Explain any one type of control valve noise. **[8]**

OR

***Q10)*** a) Compare Cavitation and Flashing. **[8]**

b) Define valve coefficient. A control valve is regulating liquid (water) flow from a tank. The water level is to be control at 20 feet by regulating the outflow. Inflow varies from 0 to 100 gpm. Find valve coefficient. **[8]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1499**

[Total No. of Pages : 2

# [5460]-178
# T.E.
# INSTRUMENTATION & CONTROL
## Unit Operations & Power Plant Instrumentation
## (2012 Pattern) ( Semester - II) (End sem.)

*Time : 2½Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q1or Q2, Q3or Q4, Q5or Q6, Q7or Q8, Q9or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side right indicate full marks.***
4) ***Assume Suitable data if necessary.***

***Q1)*** a) Define unit operation & unit process. Explain any one unit operation involved in any process industries. **[5]**

b) Explain Spray dryer with neat sketch. **[5]**

OR

***Q2)*** a) Explain in brief the selection criteria for solvent to be used for liquid - liquid extraction. **[5]**

b) Explain any one type of Evaporator with neat sketch. **[5]**

***Q3)*** a) What is Nuclear Reactor? Explain various parts of Nuclear reactor. **[5]**

b) What is energy balance and heat transfer coefficient? Discuss with suitable example. **[5]**

OR

***Q4)*** What is material balance and mass transfer coefficient? Discuss with suitable example. **[10]**

***Q5)*** a) Explain power generation method in thermal power plant. **[8]**

b) Explain the working of electrostatic precipitator and soot blower in boiler. **[8]**

OR

***P.T.O.***

***Q6)*** a) Explain the three element drum level control in boiler. **[8]**

b) Write a short notes on "Instrumentation for Boiler ancillaries" **[8]**

***Q7)*** a) Explain need of thermal stress measurement & controlled in turbine. **[8]**

b) Explain the concept condition monitoring & power distribution instrumentation in turbine. **[10]**

OR

***Q8)*** Write a short notes on (any three) **[18]**

a) Burner management systems in boiler.

b) Thermal stress control.

c) Lubricant oil temperature control - cooling system.

d) Boiler safety standards

***Q9)*** a) Compare Solar and wind power plant. **[8]**

b) Compare thermal and nuclear power plant. **[8]**

OR

***Q10)***Write a short note on the following aspects of nuclear power plant. **[16]**

a) Site selection

b) Performance

c) Efficiency

d) Economics - capital and running.

Total No. of Questions : 10]

SEAT No. :

**P1500**

[Total No. of Pages : 2

# [5460]-179

## T.E. (Instrumentation and Control Engineering)

## INSTRUMENT AND SYSTEM DESIGN

## (2012 Course) (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, Q9 or Q10.*
2) *Neat circuit diagrams should be drawn whenever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data if necessary.*

***Q1)*** a) What does IP stand for? What do the digits indicate? Give 2 examples. **[5]**

b) Draw the detailed pin diagram of XTR11O and state its transfer function. **[5]**

OR

***Q2)*** a) What is a ground loop. State various methods to eliminate formation of ground loop. **[4]**

b) With a neat labelled diagram, explain how AD594 can be used as Set Point controller. **[6]**

***Q3)*** a) State ISO/IEC definition of standard? State the factors to be considered while making standards. **[4]**

b) Using AD620 draw circuit diagram for following values of Gain: **[6]**

i) G=1

ii) G=725

OR

***Q4)*** a) Explain the methods of isolation with the help of diagrams to minimize the effects of multiple ground. **[4]**

b) With the help of a neat labelled diagram, explain how HCNR200 can be used for bipolar inputs using current sources. **[6]**

***P.T.O.***

***Q5)*** a) For ICL7107, explain working of the analog section with suitable waveforms. **[6]**

b) Draw and Explain the basic connection diagram of MM74C922 for 16-key. **[6]**

c) Draw the transistor configuration of Darlington pair. State the features of ULN2803. **[6]**

OR

***Q6)*** a) Explain the function of the following pins - **[8]**

i) PWDN pin of MT8870

ii) ALM+ pin of AD594/95

iii) INHIBIT pin of CD4046

iv) DISPLAY CONT pin of 1CM7217

b) Compare MCT2E with HCNR200 based on at least 4 salient points of differentiation. **[4]**

c) Compare Phase Comparator I of CD4046 with Phase Comparator II of CD4046 based on at least 6 salient points of differentiation. **[6]**

***Q7)*** a) What is solder mask? State its advantages and disadvantages. **[8]**

b) Explain the design rule considerations for analog PCBs. **[8]**

OR

***Q8)*** a) State selection criteria for flux. State the chareacteristics of flux. **[8]**

b) Explain mass soldering with suitable diagrams. **[8]**

***Q9)*** a) Explain the different modes of failure based on the nature of failure. **[8]**

b) Explain Weibull Distribution and Gamma Distribution. **[8]**

OR

***Q10)***a) Draw the bath tub curve and define the terms – MTTF, MTBF, MTTR. **[8]**

b) Write a short note on Maintainability and Availiability. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1501**

[Total No. of Pages : 2

# [5460] - 180
## T.E (Instrumentation & Control)
## BIO - MEDICAL INSTRUMENTATION
## (2012 Pattern) (Semester - II) (306271) (End Sem.)

*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.***

***Q1)*** a) What are the different physiological parameters of human body & list out the suitable transducers for its measurement. (Any 3) **[5]**

b) Define bio electrode. List out different bio electrodes and its material. **[5]**

OR

***Q2)*** a) Draw and explain structure of Heart. **[4]**

b) Why silver - silver chloride electrode is suitable in biomedical applications. **[6]**

***Q3)*** a) Compare the Invasive and Non-invasive blood pressure measurement techniques. **[5]**

b) What is phono - cardiogram ? Explain the types of heart sound. **[5]**

OR

***Q4)*** a) List the different types of blood flow meter. explain any one type of blood flow meter. **[6]**

b) Draw and explain the principal of photo plethysmo graphy. **[4]**

***Q5)*** a) What is Electroencephalography ? Explain with neat diagram EEG machine. **[8]**

b) Discuss with diagram 10 - 20 Electrode montage system in EEG. **[8]**

OR

***P.T.O.***

***Q6)*** a) Elaborate what is Electromyography (EMG) ? Explain with neat diagram EMG system. **[8]**

b) Enlist various parts of the Brain. Explain different waves of the brain with frequency range along with its significance. **[8]**

***Q7)*** a) What are rods and cones in the Human vision system ? Explain the function performed by each of them. **[8]**

b) List out the various errors in vision system.Explain the way of corrections of the same. **[8]**

OR

***Q8)*** a) What are three main section of Human auditory system ? And Explain the function performed by them. **[8]**

b) What is Audiometer ? Explain with neat diagram any one type of audiometer. **[8]**

***Q9)*** a) Draw and explain working of any one of spirometer. Draw the spirogram. **[10]**

b) Explain the breathing physiology with active and passive respiration. **[8]**

OR

***Q10)***a) What is Oxygenator ? List out different types of oxygenator. Explain any one type of oxygenator. **[10]**

b) Write a short note on infrared gas analyzer. **[8]**

❄❄❄❄

**Total No. of Questions : 8]**

**SEAT No. :** ____

**P1502**

**[Total No. of Pages : 2**

# [5460]-181

## T.E.(Computer)

## THEORY OF COMPUTATION

## (2012 Pattern) (Semester - I) (End Semester) (310241)

***Time : 2.30 Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

1) ***Answer four questions.***
2) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever required.***

***Q1)*** a) Construct DFA for the following: **[6]**

i) String having length at most 2.

ii) Every "a" is followed by "b".

iii) Set of all strings end with ab.

b) For the grammar given below, **[6]**

E->E+T|T

T->T*F|F

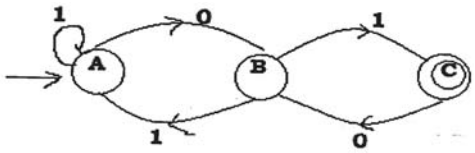
F->(E)|a|b give derivation of (a+b)*(a+b)

c) Define Pumping Lemma and prove that the language, $A = \{a^n b^n | n \geq 0\}$ is not regular **[8]**

OR

***Q2)*** a) Construct a Moore machine that takes set of all string over {0,1} and produces 'A' as output if input ends with '10' or produces 'B' as output if input ends with '11' otherwise produces 'C'. **[6]**

b) Make a use of Arden's theorem to determine the regular expression for the finite automata shown below. **[6]**




c) Define CFG? Construct a right linear grammar for the given left linear grammar, **[8]**

S->C0|A0|B1

A-> A1|C0|B1|0

B->B1|1

C->A0

***P.T.O.***

***Q3)*** a) What is Turing Machine? Give the formal definition of Turing machine? Design Turing machine for $a^nb^nc^n$ $|n \geq 1$. **[7]**

b) Write a short note on : **[7]**

i) Universal Turing Machine.

ii) Recursively Enumerable Language.

c) Define Halting Problem of Turing Machine with suitable example? **[4]**

OR

***Q4)*** a) Construct a Turing machine which accepts even numbers of 0's and odd number of 1's. **[7]**

b) What are the different ways for extension of Turing machine? Construct the two tape Turing machine to convert an input W into $WW^R$. **[7**

c) What is Post Machine? Explain the formal definition of Post Machine.**[4]**

***Q5)*** a) What is Non Deterministic Push Down Automata? Construct a NPDA for $WW^R|W \in$ (a, b) + **[8]**

b) Construct a PDA that accept a language $L = a^nb^{m+n}c^m|n, m \geq 1$. **[8]**

OR

***Q6)*** a) What is Push Down Automata? Give a formal definition of PDA? What are the different ways to construct a PDA, Explain each with example?**[8]**

b) Obtain CFG for the following Push Down Automata, **[8]**

$\delta(q0,0,Z0) -> (q0, XZ0)$

$\delta(q0,0,X) -> (q0, XX)$

$\delta(q0,1,X) -> (q1, \in)$

$\delta(q1,1,X) -> (q1, \in)$

$\delta(q1,\in,X) -> (q1, \in)$

$\delta(q1, \in, Z0) -> (q2, \in)$

***Q7)*** a) What is Clique Problem? Show that it is NP Complete Problem? **[8]**

b) What do you mean by polynomial time reduction? Describe any problem in detail that is solvable through polynomial time reduction. **[8]**

OR

***Q8)*** a) Write a short note on following: **[8]**

i) Tractable and Intractable Problem.

ii) SAT Problem.

b) What do you mean by NP Problems? Justify Why Travelling Salesman problem is a NP-Problem? **[8]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1503**

[Total No. of Pages : 2

**[5460]-182**

# T.E. (Computer Engineering)

## OPERATING SYSTEM DESIGN

## (2012 Course) (Semester-I) (End Semester) (310242)

*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.***

***Q1)*** a) State and Explain file allocation methods. **[5]**

b) Explain *getblock*( ) algorithm. **[5]**

OR

***Q2)*** a) Explain structure of regular files in UNIX System V. **[5]**

b) Explain *namei* algorithm. **[5]**

***Q3)*** a) Draw and explain process state transition diagram with 9 different states. **[6]**

b) Explain context of a process. **[4]**

OR

***Q4)*** a) Compare paging and segmentation in details. **[5]**

b) Explain Bankers Algorithm. **[5]**

***Q5)*** a) What is Inter Process Communication? Explain process tracing and ptrace( ) system call. **[6]**

b) Write down a code snippet for client server communication (TCP/UDP) using sockets. **[10]**

OR

***Q6)*** a) Differentiate message passing and shared memory IPC mechanism. **[8]**

b) What do you mean by pipe? Explain anonymous and named / FIFO pipe. **[8]**

***P.T.O.***

***Q7)*** a) Explain *make* utility with example. **[8]**

b) Explain *grep* and its variations with example. **[8]**

OR

***Q8)*** a) Explain *awk* utility with example. **[8]**

b) Explain in detail, how to make USB bootable with any open source tool. **[8]**

***Q9)*** a) Explain Real Time Systems and it's characteristics in details, **[6]**

b) Draw and explain Android OS Architecture. **[6]**

c) Explain in details : scheduling in Linux. **[6]**

OR

***Q10)***a) Write a short note on any four of the following: **[12]**

i) Palm OS

ii) Microsoft windows CE

iii) Securing handheld systems

iv) Frame of reference

v) Master Slave Architecture

b) What is embedded system? What are the characteristics of embedded system? List some exmaples. **[6]**

Total No. of Questions : 10]

SEAT No. :

**P1504**

[Total No. of Pages : 2

# [5460]-183

## T.E. (Computer)

## DATA COMMUNICATION AND WIRELESS SENSOR NETWORK

## (2012 Pattern) (End Semester) (310243) (Semester - I)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.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) 'In Adaptive delta modulation quantization error increases as slope error reduces' State true or false with proper justification. **[7]**

b) Give definitions. **[3]**

i) Baud rate

ii) Bit rate

iii) SNR

OR

***Q2)*** a) Explain Framing. Detail the methods of framing. (Fixed and variable size framing) **[5]**

b) How does Virtual Private Network work? Write applications of VPN. **[5]**

***Q3)*** a) What is Sliding window protocol? Explain 1 bit sliding window protocol. **[5]**

b) 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 micorseconds. What is approximate channel load? **[5]**

OR

***Q4)*** a) Draw and explain the software and hardware components of Wireless node or sensor node. **[5]**

b) Explain in details Sensor & robots? **[5]**

***P.T.O.***

***Q5)*** a) Describe how does STEM protocol provide solution to idle listening problem? Explain STEM-B and STEM-T. **[8]**

b) Write a note on Schedule based protocols and Contention based protocols. **[8]**

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 and gathering and detail about flooding technique in wired and wireless adhoc networks. **[10]**

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. **[8]**

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]**

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. **[6]**

c) 'IN future, WSNs are expected to be integrated into the "Internet of Things" justify the statement. **[3]**

Total No. of Questions :10]

SEAT No. :

**P1505**

[Total No. of Pages : 2

# [5460]-184

## T.E. (Computer Engg.)

## DATABASE MANAGEMENT SYSTEMS APPLICATIONS

## (2012 Course) (Semester-I)

*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 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 view and Index Objects in SQL **[5]**

b) Draw an ER diagram considering the requirements of Banking Enterprise. **[5]**

OR

***Q2)*** a) Explain Normalization, Explain 3 NF with Example. **[5]**

b) Explain advantages of DBMS over file system. **[5]**

***Q3)*** a) Cosider following structure for Mongo DB collections and write a query for following requirements in MongoDB (any 3) **[5]**

Teachers (Tname, dno, experience, salary, date_of _joining)

Students (Sname, roll_no, class)

i) Write a MongoDB query to create above collections & for insertion of some sample documents.

ii) Find the information about all teachers of dno = 2 and having salary greater than or equal to 10,000/-

iii) Find the student information having roll_no=2 or Sname =Anil

iv) Display Total no of Students of TE Class.

b) Explain BASE properties of transactions in NOSQL databases. **[5]**

OR

***P.T.O.***

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

b) What are ACID properties of Transaction? Explain Isolation Property in detail. **[5]**

***Q5)*** a) Explain Shared Nothing and shared Memory Parallel Database Architectures with suitable examples. **[8]**

b) Explain concept of distributed Database. How Distributed Transaction Works? **[8]**

OR

***Q6)*** a) What is Mongo DB Sharding? Explain How images can be stored in Mongo DB? **[8]**

b) Explain different steps required for JAVA to MongoDB database connection using JDBC. **[8]**

***Q7)*** a) What is XML ? Explain XQuery and FLWOR with example. **[7]**

b) Explain Hadoop Architecture in Detail. Explain how map reduce works. **[10]**

OR

***Q8)*** a) Write XML Document for Book Data (Category, Title, Author, and Price). Write XQuery to retrieve all book information with price>30. **[7]**

b) Write a short note on R Programming **[5]**

c) Write a short note on Hive Database **[5]**

***Q9)*** a) Explain BIS components in detail. **[5]**

b) Explain Association Rule mining Algorithm with example. **[7]**

c) Differentiate OLAP and OLTP **[5]**

OR

***Q10)***a) What is difference between Data warehousing and Data Mining? **[5]**

b) Explain K Means Clustering Algortithm with Suitable example. **[7]**

c) What is Classification? What are the different steps for Classification? **[5]**

❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

**P1506**

[Total No. of Pages : 2

# [5460]-185

## T.E. (Computer)

## COMPUTER FORENSIC AND CYBER APPLICATIONS

## (2012 Course) (Semester - I) (End Semester)

*Time : 2.30 Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** a) Enlist the important features from Indian IT act with reference to cyber crime and forensics. **[12]**

b) What is Adaptive listening and Message passing in case of Sensor MAC? **[6]**

c) What is modus operandi? **[2]**

OR

***Q2)*** a) Explain the functions of the following network components : **[12]**

i) Switch.

ii) Bridge.

iii) Gateways.

iv) Repeater.

b) Comment on language of Computer Crime Investigation. **[8]**

***Q3)*** a) Explain the following : **[8]**

i) Digital evidence as Alibi.

ii) Best evidence and Hearsay.

b) Comment on Violent crime and digital evidence. **[8]**

OR

***Q4)*** a) Enlist the levels of certainty in digital forensics. **[8]**

b) What do you mean by hardware as a contraband and information as contraband? **[8]**

***P.T.O.***

***Q5)*** a) What is FAT file system? Compare FAT and NTFS file system. **[8]**

b) Explain patents, trademark and copyrights in detail. **[8]**

OR

***Q6)*** a) Write short note on : **[8]**

i) E-mail forgery and tracking.

ii) Digital evidence on Mobile devices.

b) Explain in brief Intellectual Property Rights (IPR). **[8]**

***Q7)*** a) Enlist the steps for handling digital evidence at various Layers. **[9]**

b) Write short note on Digital Evidence on Physical and Data-Link Layers. **[9]**

OR

***Q8)*** a) What are the services provided by internet? Differentiate between static IP address and dynamic IP address. **[9]**

b) Explain different logs in TCP/IP related digital evidence. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1507**

[Total No. of Pages : 2

# [5460]-186

## T.E. (Computer Engineering)

## PRINCIPLES OF CONCURRENT AND DISTRIBUTED PROGRAMMING

## (2012 Course) ( Semester - II) (End - Semster) (310249)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Questions 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) Write a LISP program to reverse a given string without using reverse function. **[6]**

b) What is Data Flow Variables? Explain in detail. **[4]**

OR

***Q2)*** a) Explain how a file is used for IPC. **[6]**

b) What are advantages and application of LISP? **[4]**

***Q3)*** a) Explain classification of parallel architecture. **[6]**

b) Write short note on shared memory. **[4]**

OR

***Q4)*** a) Define Speed up with respect to parallel algorithms. **[6]**

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

***Q5)*** a) What is DCE? Explain it along with its components. **[8]**

b) Explain the following terms with respect to operating system: **[8]**

i) System image.

ii) Fault Tolerance Capability.

OR

***Q6)*** a) Why is scalability an important feature in the design of a Distributed OS? Discuss the guiding principles for design scalable distributed system. **[8]**

b) Enlist and explain various models used in distributed computing environment. **[8]**

***P.T.O.***

***Q7)*** a) Explain the Xen virtual environment and hypervisor. **[8]**

b) Explain Domain0 in Xen. **[4]**

c) What are the advantages of virtualization? **[4]**

***Q8)*** a) Explain virtualization with respect to- **[8]**

i) Types

ii) Need

iii) Advantages

iv) Limitations

b) Explain difference between para virtualization and full virtualization? **[4]**

c) Why virtual server is used? State its advantages and disadvantages. **[4]**

***Q9)*** a) Write a CUDA program for multiplication of two matrices. **[8]**

b) Write short notes: **[10]**

i) CUDA threads

ii) CUDA blocks

iii) CUDA grids

iv) CUDA wraps

Draw the suitable diagram to explain above concepts.

OR

***Q10)***a) Explain multi-GPU model in single-node systems in CUDA. **[8]**

b) Explain the concept of cloud computing with respect to the following points. **[10]**

i) Services provided by cloud computing.

ii) Characteristics

iii) Types of clouds

iv) Advantages

v) Challenges before cloud computing.

Total No. of Questions : 10]

SEAT No. :

**P1508**

[Total No. of Pages : 2

# [5460]-187
# T.E. (Computer Engineering)
# EMBEDDED OPERATING SYSTEMS
## (2012 Pattern) (End - sem) (Semester - II) (310250)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Questions 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) Name and explain the different operating modes of ARM. **[6]**

b) What are the message pipes? How they are useful to Kernel? **[4]**

OR

***Q2)*** a) What are the quality points that rate a scheduling algorithm? **[4]**

b) Give total number of registers found in ARM mode of ARM architecture? Give reason for their existence. **[4]**

c) List four Real Time Operating Systems. **[2]**

***Q3)*** a) What is bootstrap loader? What are its components? **[4]**

b) What are the following with respect to Linux kernel? **[3]**

i) zImage ii) vmlinuz

c) Write short note on flash memory. **[3]**

OR

***Q4)*** a) Explain the following: **[6]**

i) head.o ii) main.o

b) What is Busy Box? Give details of Busy Box configuration. **[4]**

***Q5)*** a) How DHCP/BOOTP protocols are useful for embedded Linux development? **[5]**

b) Name and explain a Linux utility used for partitioning the block devices. **[6]**

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

OR

***P.T.O.***

***Q6)*** a) Explain the following Linux utilities:
i) fdisk ii) mke2fs iii) e2fsck **[6]**

b) What is journaling? Give the names of two file systems where it is used. **[6]**

c) Write a note on MTD subsystem. **[5]**

***Q7)*** a) Explain in detail Embedded Graphics Processing. **[7]**

b) Write in short GDB, DDD, cbrowser/cscope. **[6]**

c) What is SSH? When do you use it? **[4]**

OR

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

b) What are the challenges faced by developer while debugging Linux kernel code. **[6]**

c) What is JTAG probe debugging? **[4]**

***Q9)*** a) With the help of neat diagram, explain embedded android Architecture. **[8]**

b) How different latency periods affect the real-time process execution? **[8]**

OR

***Q10)***a) Explain the following terms with respect to embedded android. **[8]**
i) Launcher ii) Activity manager iii) DalvicVM

b) What is real-time scheduling in Linux? **[4]**

c) How to port Linux on target board. **[4]**

Total No. of Questions : 10]

SEAT No. :

**P1509**

[Total No. of Pages : 2

# [5460]-188

## T.E. (Computer Engineering)

## COMPUTER NETWORKS

## (2012 Course) (Semester - II) (End Semester)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Figures to the right indicate full marks.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Assume suitable data, if necessary.***

***Q1)*** a) What is difference between persistent and non persistent HTTP? Also explain HTTP message format. **[6]**

b) Explain working of DHCP. **[4]**

OR

***Q2)*** a) What is DNS? Explain its various resource records with one example. **[6]**

b) Write short note on MIME. **[4]**

***Q3)*** a) What is silly syndrome problem? Suggest two solutions to overcome the problem. **[6]**

b) Explain Three- way handshake in TCP. **[4]**

OR

***Q4)*** a) Explain various parameters for QoS (Quality of Service) in a network. **[4]**

b) Distinguish between IPv6 and IPv4 with respect to header format. **[6]**

***Q5)*** a) Explain the working of DCF and PCF? **[6]**

b) Explain 802.11 wireless LAN frame format. **[6]**

c) Explain Bluetooth Architecture (Piconet and Scatternet) **[4]**

OR

***Q6)*** a) Explain Bluetooth(802.15) Protocol Stack. **[6]**

b) What is Hidden station and Expose station problem in WLAN. **[6]**

c) Explain CSMA/CA. **[4]**

***P.T.O.***

***Q7)*** a) Explain VoIP Architecture? **[8]**

b) Explain concept of Delay tolerant network. **[8]**

OR

***Q8)*** a) What is VoIP? Explain SIP (Session Initiation Protocol) in detail. **[10]**

b) Write a short note on Vehicular network. **[6]**

***Q9)*** a) Explain the concept of virtualization. **[8]**

b) Explain Architecture of ATM network. **[6]**

c) Write short note on GMPLS. **[4]**

OR

***Q10)***a) Describe Client Layers of the Optical Layer. **[8]**

b) Explain ATM layers. **[6]**

c) Explain Propagation of Signals in Optical Fiber. **[4]**

**Total No. of Questions : 8]**

**SEAT No. :** ____

**P1510**

**[Total No. of Pages : 2**

# [5460]-189

## T.E. (Computer Engineering)

## SOFTWARE ENGINEERING

## (2012 Pattern) (Semester - II) (310252)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

1) ***Solve question number 1 or 2, 3, or 4, 5 or 6 and 7 or 8.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***



***Q1)*** a) Describe the different box specification in Cleanroom engineering? Explain. **[7]**

b) For banking system, make your assumptions about the scope of the system, identify four use cases and depict them in diagram. **[7]**

c) Explain data centered layered architectures with neat diagrams. **[6]**

OR

***Q2)*** a) Explain the characteristics of SRS? **[6]**

b) What do you mean by CRC? Write the steps for identifying analysis classes using CRC modeling. **[7]**

c) Explain Component-Level Design for WebApp. **[7]**

***Q3)*** a) What is unit testing? Explain unit testing process. **[5]**

b) Distinguish i) White box testing and Black Box Testing
ii) Regression testing and Retesting **[6]**

c) Draw the flow graph for finding maximum of three numbers and derive the test case using cyclomatic complexity. **[6]**

OR

***Q4)*** a) Explain Boundary value analysis testing and orthogonal Array testing. **[5]**

b) Explain the Testing Concepts for WebApps. **[6]**

c) What are the objectives of testing? What are Testing strategies for conventional and object oriented software? **[6]**

***P.T.O.***

***Q5)*** a) What is process decomposition? What are the work tasks for communication process using process decomposition? **[5]**

b) Explain metric for object oriented projects. **[6]**

c) Explain Process-Based Estimation. **[6]**

OR

***Q6)*** a) What is the difference between Measure and Metric? What are attributes of effective Software Metric? **[5]**

b) What is Software configuration management? Explain the change control mechanism in software configuration management. **[5]**

c) What is Risk identification? What are the different categories of risks? **[7]**

***Q7)*** a) Explain Aspect oriented software engineering? **[5]**

b) Describe Z specification Language? **[5]**

c) Discuss architectural patterns in details. **[6]**

OR

***Q8)*** a) Discuss client server computing? Explain. **[5]**

b) What are the benefits and problems of reusing software when developing new systems? **[5]**

c) Explain Distributed software engineering? **[6]**

⌘⌘⌘

Total No. of Questions : 10]

SEAT No. :

**P1663**

[Total No. of Pages : 2

# [5460]-190
# T.E.(Computer Engineering)
# DIGITAL SIGNAL PROCESSING APPLICATIONS
# (2012 Pattern)

*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 diagram must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

***Q1)*** a) How the linear convolution operation can be used to represent any arbitrary DT sequence and a DT system? **[5]**

b) Obtain the Z — Transform (ZT) of a DT signal - **[5]**
$x(n) = -a^n u\ (-n-1)$ Sketch the ROC.

OR

***Q2)*** a) A CT signal having frequency 50 Hz is sampled at a rate of 1200 samples/sec. Obtain - **[5]**

i) Number of samples per cycle.
ii) Digital/Discrete frequency f and ω.
iii) Minimum sampling rate to avoid aliasing effect.
iv) Period of a DT signal.

b) State and prove the periodicity property of Fourier Transform (FT). Define it for DFT. **[5]**

***Q3)*** a) What is the convolution property of DFT? Compare Linear Convolution with Circular Convolution. **[5]**

b) Derive the first stage of Radix-2 DIT FFT Algorithm. **[5]**

OR

***Q4)*** a) State the relation between FT and DFT. Define N point DFT by means of twiddle factor and obtain the twiddle factors for 4 point DFT. **[5]**

b) Obtain the system function and impulse response of the given system described as- **[5]**

$$y(n)-\frac{5}{6}y(n-1)+\frac{1}{6}y(n-2)=x(n)-\frac{1}{2}x(n-1)$$

***P.T.O.***

***Q5)*** a) Derive the Direct Form - I IIR filter structure from the system function H(Z) and realize it using multipliers, adders and delay elements. **[9]**

b) Obtain and realize linear phase FIR filter structure having impulse response. **[9]**

$$h(n)=\delta(n)+½\,\delta(n-1)-\frac{1}{4}\delta(n-2)+½\,\delta(n-3)+\delta(n-4)$$

OR

***Q6)*** a) Obtain and draw the cascade form realization for IIR filter having transfer function - **[9]**

$$H(Z)=\frac{Z^2-Z}{Z^2-0.2Z-0.15}$$

b) Represent the mathematical form of $M^{th}$ order FIR filters by means of system function H(Z). Draw the Direct Form filter structure and determine the number of multipliers, adders and delay elements required to realize the filter. **[9]**

***Q7)*** a) Explain the features of SHARC DSP processor. List the number of DAGs with its capabilities and memory pointer registers supported by DAG. **[8]**

b) What is OMAP? Explain the features and applications of OMAP in brief. **[8]**

OR

***Q8)*** a) Compare conventional Microprocessor with DSP Processor architecture. Draw and explain basic building blocks of DSP processor. **[8]**

b) Draw and explain the SIMD (Single Instruction Multiple Data) architecture of SHARC DSP processor. **[8]**

***Q9)*** a) Draw and explain Human Speech Model in speech synthesis and recognition. **[8]**

b) How digital image is represented by means of digital computer? How gray scale image is different than colour image? What is Histogram of an image? **[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) With mathematical form, explain any two gray level transforms used for image enhancement. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1664**

[Total No. of Pages : 2

# [5460]-191
# T.E.(Information Technology)
# COMPUTER NETWORK TECHNOLOGY
# (2012 Pattern)

*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) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) Compare between IPv4 and IPv6. **[6]**

b) Explain 3 way handshaking with diagram. **[4]**

OR

***Q2)*** a) Differentiate between POP3 and IMAP. **[6]**

b) Explain the concept of ARP. **[4]**

***Q3)*** a) Explain leaky bucket algorithm. **[6]**

b) Differentiate between FTP and TFTP. **[4]**

OR

***Q4)*** a) What is socket? Explain various socket primitives used in TCP. **[6]**

b) Explain various transport layer servicers. **[4]**

***Q5)*** a) Differentiate between IEEE 802.11 and IEEE 802.16. **[8]**

b) Describe MAC layer mechanism of IEEE 802.11. **[8]**

OR

***Q6)*** a) Describe Bluetooth protocol stack. **[8]**

b) Explain in detail CSMA/CA. **[8]**

***Q7)*** a) What are the operating environment constraints in WSN? **[8]**

b) Describe each component in sensor node architecture. **[8]**

OR

***Q8)*** a) State different MAC protocols in sensor network? Explain S-MAC in detail. **[8]**

b) List and explain any four applications of sensor network. **[8]**

***P.T.O.***

***Q9)*** a) List different routing protocols used by WSN. Explain any two protocols with example. **[10]**

b) Differentiate between content based & geographic routing. **[8]**

OR

***Q10)*** Write short note on: (Any two): **[10]**

a) i) IoT

ii) SPIN

iii) SDN

b) What are different design issues and challenges of wireless sensor network? **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1665**

[Total No. of Pages : 3

# [5460]-192
# T.E.(Information Technology)
# THEORY OF COMPUTATION
# (2012 Pattern) (End Semester)

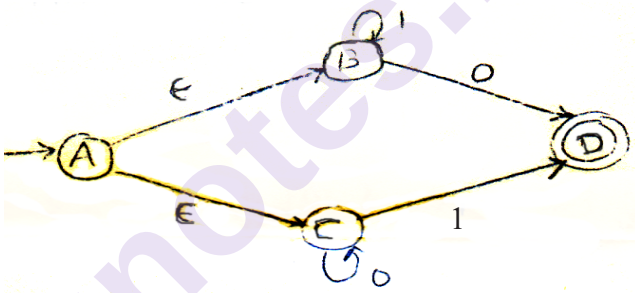
*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Neat diagram must be drawn wherever necessary.***
2) ***Assume suitable data if necessary.***

***Q1)*** a) Write formal definition of Moore & Mealy Machine with suitable examples. Compare them. **[5]**

b) Convert the following NFA$\in$ into NFA without $\in$-moves. **[5]**




OR

***Q2)*** a) Write a short note on each of the following: **[5]**

i) DFA

ii) Relative powers of NFA and DFA.

b) Construct NFA for the following: **[5]**

i) L={x|$\sum$={a,b}; 'x' contains any number of a's followed by at least one b}

ii) L={x|$\sum$={0,1};x starts with '1' and |x| is divisible by 3}

***Q3)*** a) Find regular expression for the following over $\sum$={a,b} **[5]**

i) The language that contains strings with even number of a's

ii) The language that contains strings without any double letter.

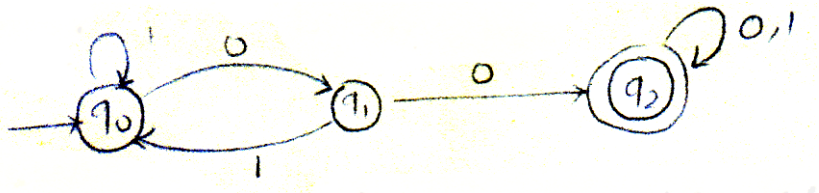
b) Show that the following language is non regular using pumping lemma.

L={ww|w$\in$(0,1)*} **[5]**

***P.T.O.***

OR

***Q4)*** a) Find the regular expression for the given DFA. **[5]**




b) Express the following grammas using CNF.

$S \rightarrow bA|aB$

$A \rightarrow bAA|as|a$

$B \rightarrow aBB|bs|b$ **[5]**

***Q5)*** a) Let $L=\{a^n b^n c^m d^m | n,m \geq 1|\}$ Design a PDA that accepts L. Simulate PDA for a string. **[8]**

b) Define context free language. Explain closure properties of CFL in brief. **[8]**

OR

***Q6)*** a) Design a post machine for well formedness of parenthesis. **[8]**

b) Define PDA and Post machine with suitable example. Compare them. **[8]**

***Q7)*** a) Design a turing Machine accepting the following langauge. **[10]**

$L=\{a^i b^j | i<j\}$

Simulate TM for "aaabbbb"

b) Write a short note on:

i) Universal TM

ii) Multi-tape TM **[8]**

OR

***Q8)*** a) Design a Turing machine for 2'S complement of a given binary number. Simulate TM for "1101011". **[10]**

b) Define the following with suitable example.

i) Post correspondance problem

ii) Non-Deterministic TM. **[8]**

***Q9)*** a) Show that for two recursive languages $L_1$ & $L_2$, each of the following language is recursive. **[8]**

i) $L_1 \cup L_2$

ii) $L_1 \cap L_2$

b) Write a short note on the following: **[8]**

i) Turing reducibility.

ii) Decidability.

OR

***Q10)***a) Prove that the halting problem of Turing Machine is unsolvable. **[8]**

b) Explain recursive Language and recursively enumerable language with suitable example. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1666**

[Total No. of Pages : 2

# [5460]-193
# T.E.(Information Technology)
# DATABASE MANAGEMENT SYSTEMS
# (2012 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, 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) What is database constraints? Explain the types of database constraints with example. **[6]**

b) What is DDL? Explain different DDL commands with example. **[4]**

OR

***Q2)*** a) What is E-R model? Draw an E-R diagram for a hospital management system with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. **[6]**

b) Consider the following database **[4]**

Student (RollNo, Name, Address)
Subject (Sub_code, Sub_name)
Marks (Roll_no, Sub_code, Marks)
Write following queries in SQL.

i) Find average marks of each student along with the name of student
ii) Find how many students have less than 40 marks(fail) in the subject DBMS

***Q3)*** a) Why database join operations are required? Discuss types of outer join operations with example. **[6]**

b) What is schedule? Explain types of schedules with suitable example. **[4]**

OR

***Q4)*** a) What is normalization? Explain 1NF, 2NF, 3NF and BCNF with example. **[5]**

b) Explain select and project operations used in RDBMS with example. **[5]**

***P.T.O.***

***Q5)*** a) What is NO SQL database? Explain the CRUD operations of MongoDB with suitable example. **[6]**

b) Why a fragmentation is useful concept in distributed database design? Explain the types of fragmentation with example. **[6]**

c) List down all crash recovery methods. Explain the log based recovery method with example. **[6]**

OR

***Q6)*** a) Explain 2-tier and 3-tier database architectures with figure. **[6]**

b) What is deadlock? Explain how deadlock detection and prevention is done. **[6]**

c) Explain client- server database architectures with diagram. **[6]**

***Q7)*** a) What is XML? Explain documents, elements, nested/sub elements, attributes, namespace, DTD and schema in XML with examples. **[8]**

b) Explain JSON data types with object and ARRAY. **[8]**

OR

***Q8)*** a) What is Hadoop? Explain HBase data model and HBase region. **[8]**

b) What is concurrency control? Explain concurrency control techniques. **[8]**

***Q9)*** a) What is OLTP & OLAP? Explain different OLAP operations. **[8]**

b) What is KDD process? Explain KDD process in data mining. **[8]**

OR

***Q10)***a) Write short note on: **[8]**

i) Mobile databases.

ii) Machine learning for big Data.

b) What is Data Warehouse? Explain Schemas in Data Warehouse. **[8]**

Total No. of Questions : 10]

SEAT No. :

**P1667**

[Total No. of Pages : 2

# [5460]-194
# T.E.(Information Technology) (Semester - I)
# SOFTWARE ENGINEERING
# (2012 Pattern)

*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 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 is Software? What are the characteristics of Software? **[5]**

b) What are the elements of Prototyping process model? What are the advantages and disadvantages of prototyping process model? **[5]**

OR

***Q2)*** a) What are different process models? Explain Generic process model. **[5]**

b) Explain Rapid application development model with the help of diagram. **[5]**

***Q3)*** a) What are the principles of Agile development process with example. **[5]**

b) Discuss XP values and XP process in detail. **[5]**

OR

***Q4)*** a) Define Refactoring and Pair-Programming? Mention their advantages. **[5]**

b) Explain SCRUM process flow. **[5]**

***Q5)*** a) What are design strategies? Explain in detail. **[8]**

b) Explain data centred and layered architectures with neat diagrams. **[8]**

OR

***Q6)*** a) In context of software design explain the following term in brief: **[8]**

i) Modularity

ii) Functional independence

b) Explain Client server architecture in detail? **[8]**

***P.T.O.***

***Q7)*** a) Explain Seeheim model of human-computer dialog management. **[8]**

b) Write short note on. **[8]**

i) Technology evolution.

ii) Collaborative development.

OR

***Q8)*** a) Explain different types of users and their requirements. **[8]**

b) Explain in detail following: **[8]**

i) Hick's Law

ii) Metaphors

***Q9)*** a) What are the functions of software configuration management repository? How it works? **[8]**

b) Write short note on Software Configuration Management Process. **[10]**

OR

***Q10)***a) With neat diagram explain components of CASE. **[9]**

b) What is the goal of Cleanroom testing? Discuss in brief the Statistical use Testing and Certification process involved in Cleanroom Testing. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1668**

[Total No. of Pages : 2

# [5460]-195
# T.E.(Information Technology)
# WEB ENGINEERING & TECHNOLOGY
# (2012 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 and 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) Differentiate between Web Engineering and Software Engineering. **[5]**

b) Explain various phases in website Development. **[5]**

OR

***Q2)*** a) Explain in detail web security audit process. **[5]**

b) What are the signs of good and bad web design? **[5]**

***Q3)*** a) Explain with suitable example HTML tags used to create Frames. **[5]**

b) What is hyperlink? Explain tags to create links. **[5]**

OR

***Q4)*** a) Explain box model of CSS. **[5]**

b) Explain Image Map with example. **[5]**

***Q5)*** a) Differentiate between Java and Java Script. **[8]**

b) Explain control and loop structures in PHP. **[8]**

OR

***Q6)*** a) Explain MySQL functions in PHP. **[8]**

b) State and explain use of string functions of PHP. **[8]**

***P.T.O.***

***Q7)*** a) Explain J2EE multi-layer architecture. **[8]**

b) Describe doGet() and doPost() with respect to servlet. **[8]**

OR

***Q8)*** a) Write a note on web personalization. **[8]**

b) Explain with suitable use of XML for data files. **[8]**

***Q9)*** a) Write a short note on WordPress. **[9]**

b) Compare CMS development tools Drupal and Joomla. **[9]**

OR

***Q10)***a) Write a short note on website deployment. **[9]**

b) Write a short note on AJAX. **[9]**

Total No. of Questions : 10]

SEAT No. :

**P1669**

[Total No. of Pages : 3

# [5460]-196

## T.E.(Information Technology)

## DESIGN AND ANALYSIS OF ALGORITHMS

## (2012 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 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.***

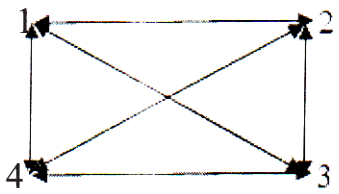
***Q1)*** a) Give the significance of analysis of algorithms. Also compare a priori analysis and a posteriori analysis of algorithms. **[6]**

b) Analyze the time complexity of Strassen's matrix multiplication using divide and conquer strategy. **[4]**

OR

***Q2)*** a) Prove by contradiction that "there exists two irrational numbers x and y such that $x^y$ is rational." **[4]**

b) Find the solution of the following travelling sales person problem using Dynamic approach. **[6]**




$$\begin{pmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$$

***Q3)*** a) Write and explain greedy method control abstraction for Subset paradigm. **[4]**

b) What is dynamic programming? Is this the optimization technique? Give reasons. What are its drawbacks? Explain memory functions. **[6]**

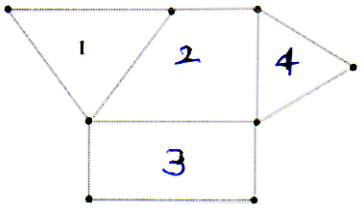
***P.T.O.***

OR

***Q4)*** a) Write and explain Warshall's algorithm to fine transitive closure of a graph. Give time complexity for the same. **[6]**

b) Compare Divide and Conquer strategy and Greedy strategy. **[4]**

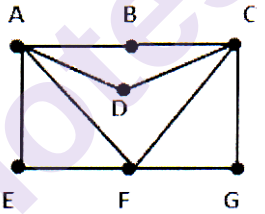
***Q5)*** a) What is a graph coloring problem? Define a chromatic number of a graph. Find the chromatic number of a following map and draw necessary state space tree. **[8]**




b) Solve the 4-Queen's problem. Draw the state space tree for the same. **[8]**

OR

***Q6)*** a) Find Hamiltonian cycles starting from A in given graph. Draw state space tree for the same. **[8]**




b) State and explain the principle of backtracking. Explain the constraints used in backtracking with an example. **[8]**

***Q7)*** a) Solve the following instance of 0/1 knapsack problem by LC branch and bound approach: n=4; M=18, P(l:4)={1 1,11,12,18}, W(l:4)={3,4,6,9}. **[10]**

b) What is LC search? How does it help in finding a solution for branch and bound algorithm? **[8]**

OR

***Q8)*** Write short notes on: **[18]**

a) TSP by Branch and bound strategy

b) Bounding Function

c) Various searching techniques in branch and bound

***Q9)*** a) Give detail proof for clique problem is NP-complete. **[8]**

b) What is the significance of parallel computing? Explain different fixed connection machines for parallel computing. **[8]**

OR

***Q10)***a) Write non-deterministic algorithm for sorting of elements of an array. What is its complexity? **[8]**

b) Explain the following terms in brief: **[8]**

i) PRAM

ii) EREW PRAM

iii) CRCW PRAM

iv) Speedup of the parallel algorithm

Total No. of Questions : 10]

SEAT No. :

**P1670**

[Total No. of Pages : 3

# [5460]-197
# T.E. (Information Technology)
# SYSTEMS PROGRAMMING
# (2012 Pattern) (Semester-II)

*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) ***Your answers will be valued as whole.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) Explain how a single pass assembler works for the following example

```
        START 300
        READ A
LOOP    MOVER AREG,A
        SUB AREG, ='1'
        BC GT, LOOP
        STOP
A       DS 1
        END
```

Explain the terms forward reference and backpatching with respect to the example given. **[6]**

b) Compare Compile and Go Loader with Absolute Loader. **[4]**

OR

***Q2)*** a) Convert the given Regular expression to its equivalent DFA: **[6]**

((a+ba)*(b+Є))+b*

b) With examples explain the functions of START, END, LTORG, ORIGIN and EQU. **[4]**

***Q3)*** a) Explain first three phases of a compiler for the given statement: **[6]**

(X–Y)* Y^Z^P/A

b) Give the flowchart for pass II of DLL scheme. **[4]**

***P.T.O.***

OR

***Q4)*** a) Give the various data structures in the design of pass-1 and pass-2 of a Two-pass direct linking loader for the given example. **[6]**

| | | Rel. Addr. |
|---|---|---|
| PGA | START | 0 |
| | ENTRY PGA1 | 10 |
| | EXTRN PGB | 20 |
| | DC A (PGA), A(PGB+4) | 30 |
| PGA1 | DC A (PGA1-PGA) | 34 |
| | END | |
| PGB | START | 0 |
| | ENTRY PGB1 | 5 |
| | EXTRN PGA | 10 |
| PGB1 | DC A (PGB1) | 14 |
| PGB2 | DC A (PGB+4), A(PGB1-PGB) | 18 |
| PGB3 | DC A (PGB-PGA-16) | 22 |
| | END | |

b) Compare single pass and two pass assembler. **[4]**

***Q5)*** a) With a neat figure explain classification of parsers. **[8]**

b) Find FIRST and FOLLOW of non terminals in the given grammar: **[4]**

$S \rightarrow (L)/a$

$L \rightarrow L,S/S$

c) Remove ambiguity and make the give grammar left recursion free **[6]**

$S \rightarrow S+S/SS/(S)/S*S/a$

OR

***Q6)*** a) Compare SLR and CLR parsing methods. **[4]**

b) Design LALR parser for the given grammar. Also show the moves by the parser for input string"ab". **[8]**

$S \rightarrow AA$

$A \rightarrow aA/b$

c) Using the table given, design operator precedence parser for the given expression id*id+id **[6]**

| | + | - | * | / | ^ | id | ( | ) | S |
|---|---|---|---|---|---|---|---|---|---|
| + | > | > | < | < | < | < | < | > | > |
| - | > | > | < | < | < | < | < | > | > |
| * | > | > | > | > | < | < | < | > | > |
| / | > | > | > | > | < | < | < | > | > |
| ^ | > | > | > | > | < | < | < | > | > |
| id | > | > | > | > | > | | | > | > |
| ( | < | < | < | < | < | < | < | | |
| ) | > | > | > | > | > | | | > | > |
| S | < | < | < | < | < | < | < | | |

***Q7)*** a) Define and explain annotated parse tree for the given grammar. **[8]**

D→ TL

T→ int/float

L→ L,id/id

Annotate the tree for float id1, id2, id3

b) Explain the need of Intermediate code generation in compiler.

Generate quadruple and triple for the given expression: a=b+c*d. **[8]**

OR

***Q8)*** a) Draw the Dependency graph of Type expression of Q.7.a) and list down the synthesized and inherited attributes with definition. **[8]**

b) Write the method of generating intermediate code for the expression (a<b) and (c>d) **[8]**

***Q9)*** a) Discuss with suitable example machine dependent code optimization. **[8]**

b) Explain different intermediate code generation techniques for the given expression. **[8]**

a+a*(b-c)+(b–c)*d

OR

***Q10)***a) Obtain the TAC for the following code **[8]**

for (i=1; i<=10; i++)

X[i][2*j-1]=Y[i][2*j-1]

b) Discuss code generation issues. **[4]**

c) Write a short note on activation record. **[4]**

Total No. of Questions : 10]

SEAT No. :

**P1671**

[Total No. of Pages : 2

# [5460]-198
# T.E.(Information Technology)
# OPERATING SYSTEM
# (2012 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, Q9 or Q10.***
2) ***Neat diagrams indicated full marks.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) Describe with the help of a neat diagram the interaction of OS with the help of hardware architecture. **[6]**

b) Explain the concepts of virtual machines with its implementation and benefits. Also explain in brief, example of virtual machine. **[4]**

OR

***Q2)*** a) Describe the flow control during a system call with the help of a neat diagram. **[6]**

b) List & Explain booting process of Android OS. **[4]**

***Q3)*** a) Write a short note on : critical section and mutual exclusion. **[6]**

b) With the help of neat diagram explain the concept context switching. **[4]**

OR

***Q4)*** a) Describe in detail the difference between short-term, medium-term and long-term schedulers with the help of a neat diagram. **[6]**

b) What are the 4 conditions to produce deadlock? **[4]**

***Q5)*** a) Explain the following terms in brief: **[8]**

i) Working set model
ii) Thrashing
iii) Lazy swapper.

b) Describe how address translation takes place with the help of neat diagrams in: **[8]**

i) Paging
ii) Segmentation

***P.T.O.***

OR

***Q6)*** Given the following page reference string:l, 2, 3, 2, 5, 4, 3, 4, 5, 3, 7, 6, 1, 6, 5, 4, 5, 3, 2, 4, 3,4, 5,1 Number of page frames are 4. Show the page trace and calculate the number of page frames for the following page replacement policies i) LRU ii) Optimal iii) FIFO Also explain Belady's anomaly. **[16]**

***Q7)*** a) Assume a disk with 400 tracks and the disk request queue has random request in it as follows 53,59,42,21,310,350,380,184. Find the no of tracks travers and average week length if i) FIFO ii) SSTF is used and initially heads is as track no 100. **[8]**

b) Explain different file organization techniques. **[8]**

OR

***Q8)*** a) A disk drive has 200 cylinders, numbered 0-199. The drive is currently serving the request at cylinder 68. The queue of pending requests in FIFO order is: 84, 153, 32, 128, 10, 133, 61, 69. Starting from the current head position, what is the total distance that the disk arms moves to satisfy all the pending requests for the following disk scheduling algorithms: i) FCFS ii) C-SCAN iii) SCAN iv) SSTF. **[10]**

b) Why I/O buffering is necessary? State and explain different I/O buffering techniques. **[6]**

***Q9)*** Write characteristics of following. **[18]**

a) Android OS

b) Embedded Linux,

c) Ubuntu EDGE OS

d) Service Oriented OS,

OR

***Q10)***a) Write a steps for kernel compilation with necessary commands. **[10]**

b) Write a pseudo code for simple kernel module and explain procedure of inserting a new module in existing kernel with all necessary steps. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1672

[Total No. of Pages : 2

# [5460]-199
# T.E. (Information Technology)
# MULTIMEDIA TECHNOLOGIES
# (2012 Pattern) (Semester-II)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

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

***Q1)*** a) State the objectives and characteristics of Multimedia systems. **[5]**

b) What is multimedia authoring? Explain any one of the authoring tools in detail. **[5]**

OR

***Q2)*** a) What is multimedia? Explain the applications of Multimedia related to e-learning and education. **[5]**

b) State and explain LZW algorithm.Write proper pseudo code. **[5]**

***Q3)*** a) Explain Shannon-Fano image compression algorithm with the help of suitable example. **[5]**

b) What are different Image File Formats? Explain JPEG image file format in detail. **[5]**

OR

***Q4)*** a) What are various audio compression techniques? Explain DM in brief. **[5]**

b) Write a short note on characteristic of sound wave Amplitude, Frequency, Waveform, Speed. **[5]**

***Q5)*** a) What is digitization of video? Explain process of digitization of video with neat sketch. **[8]**

b) What is a need of video file formats?Explain MPEG file format briefly. **[8]**

***P.T.O.***

OR

***Q6)*** a) What is multimedia streaming? Explain RTP and RTSP Protocols in detail. **[8]**

b) State various multimedia supported video formats in Android. Explain any one in detail. **[8]**

***Q7)*** a) State and explain any 8 principles of animation. **[8]**

b) What is Animation? Explain different technique used to create Animation. **[8]**

OR

***Q8)*** a) What are the usages of animation? Explain following techniques of animation. **[8]**

i) Rendering

ii) Onion Skinning

b) Write main features of OpenGL. What are various geometric primitives supported by OpenGL? Explain the use of each primitive. **[8]**

***Q9)*** a) What is virtual reality? How does multimedia techniques are used to implement virtual reality. **[6]**

b) Explain any two virtual reality devices. **[6]**

c) What are the various categories of nodes in VRML? Explain in brief. **[6]**

OR

***Q10)***a) Explain GStreamer based Multimedia Framework. **[6]**

b) Write short note on multimedia synchronization in distributed environment. **[6]**

c) Differentiate between Virtual reality and Augmented reality with suitable example. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1673

[Total No. of Pages : 2

# [5460]-200
# T.E.(Information Technology)
# INFORMATION TECHNOLOGY PROJECT MANAGEMENT
# (2012 Pattern) (Semester-II)

*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 diagram must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

***Q1)*** a) Define Management & Explain functions of Management in Detail? **[5]**

b) Explain Proposals and contract in detail? **[5]**

OR

***Q2)*** a) Explain the fourteen principles of management stated by Henry Fayol? **[5]**

b) Define Strategy? Explain Mintzberg's 5 Ps of strategy? **[5]**

***Q3)*** a) Write a short note on Performance Reporting? **[5]**

b) Describe various Steps of Product development Process? **[5]**

OR

***Q4)*** a) Define Decision making and discuss steps and activities in decision making? **[5]**

b) Explain Maslow's need hierarchy theory of Motivation? **[5]**

***Q5)*** a) Explain various software tools for Project management and explain its purpose? **[8]**

b) Explain various activities of Risk management with detail? **[8]**

OR

***Q6)*** a) What are Common Sources of Risk in Information Technology Projects Explain in detail? **[8]**

b) What is the necessity of software documentation and explain types of Documentation? **[8]**

***P.T.O.***

***Q7)*** a) Differentiate between Quality assurance and Quality Control? **[8]**

b) Explain ISO 9000 in IT Projects in detail? **[8]**

OR

***Q8)*** a) Explain Various Objectives of Quality Control? **[6]**

b) Write a short note on : (any two) **[10]**

i) Six Sigma

ii) Benchmarking

iii) CMM I

***Q9)*** a) Explain various Objectives and Components of SCM? **[6]**

b) Explain ERP implementation Life Cycle? **[6]**

c) Explain the concept of IP patent and Copyright concern with IT project management? **[6]**

OR

***Q10)***a) List out advantages and disadvantages of ERP System? **[6]**

b) Define Supply chain management & Explain with example? **[6]**

c) What is Customer Relationship management & what is its importance in project management? **[6]**

Total No. of Questions : 10]

SEAT No. :

P1674

[Total No. of Pages : 3

# [5460]-201

## T.E. (Chemical Engineering)

## CHEMICAL ENGINEERING MATHEMATICS

## (2012 Pattern)

*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)*** Find the drag coefficient C for a mass m = 73.5 kg to have a velocity of 32.8 m/s after falling for a time t = 10 sec. The acceleration due to gravity is 9.8 m/s$^2$.

The Newtons second law of equation for velocity is given by $\frac{gm}{C}\left[1-e^{-\left(\frac{c}{m}\right)t}\right]$

Use Newton - Raphson method. **[10]**

OR

***Q2)*** a) State the graphical interpretation of False position method. **[5]**

b) During a certain process the specific heat capacity of system is given by C = (0.4 + 0.004 T) kJ/kg °C. Find heat transferred when temperature changes from 25°C to 125°C, the mass of the gas is 3 kg. Use the Trapezoidal rule with number of strips equal to 3. **[5]**

***Q3)*** a) State and explain drawbacks of elimination method. **[5]**

b) Using bisection method find the root of equation $x^3 - 1.8x^2 - 10x + 17 = 0$ that lies between the interval (1, 2) at the end of 3 iterations. **[5]**

OR

***Q4)*** The Table below gives the temperature T(°C) and length *l*(mm) of heated rod. If $l = a_0T + a_1$, find the best values of $a_0$ and $a_1$. **[10]**

| T | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|
| *l* | 800.3 | 800.4 | 800.6 | 800.7 | 800.9 | 801.0 |

***P.T.O.***

***Q5)*** a) Discuss errors induced by the Eulers method. **[8]**

b) Using Runge Kutta method, solve

For x = 0.2 correct upto 4 decimal places. Initial conditions are $x = 0, y = 1$. **[8]**

OR

***Q6)*** Use Runge-Kutta method of fourth order to obtain the numerical solution of $\frac{dy}{dx} = x^2 + y^2$ y(0) = 0. Estimate y(0.2) y(0.4) **[16]**

***Q7)*** Solve $\frac{\partial^2 u}{\partial t^2} = 100 \frac{\partial^2 u}{\partial x}$

At t = 0 and u = 4x for 0 < x < 3

At x = 0 and x = 3, u = 1 for all values at t

Take h = 1 and k = 0.1, find the values of u at t = 0.3 and x = 0 to 3. **[16]**

OR

***Q8)*** Solve the following equation

$$\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

At t = 0, u = sin 2x, 0 < x < 0.5

At x = 0 and x = 0.5, u = 1 for all values of t

Take h = 1 and k = 0.2, find values of u at t = 0.05 and x = 0 to 0.5 **[16]**

***Q9)*** a) What are the applications of optimization. **[9]**

b) Explain scanning and bracketing procedure for optimization of unconstrained functions of one dimensional search. **[9]**

OR

***Q10)*** A company is manufacturing two types of products A and B. Production is limited to 80 units of product A and 60 units of product B due to limited supply of raw material. Production of each of these products requires 5 units and 6 units of electronics components respectively. The electronic components are supplied by another manufacturer and the supply is limited to 600 units per day. The company has 160 employees i.e. the labour supply amounts to 160 man- days. The production of one unit of product A required 1 man-day of labour and one unit of product B requires 2 man-days of labour. Each unit of these products is sold in the market at a profit of Rs. 50/- and Rs 80/- respectively. Determine how many units of each product the company should produce to maximize profit. **[18]**

Total No. of Questions : 10]

SEAT No. :

P1675

[Total No. of Pages : 3

# [5460]-202

## T.E. (Chemical) (Semester - I)

## MASS TRANSFER - I

## (2012 Pattern)

*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) ***Assume suitable data, if necessary.***

***Q1)*** a) Ammonia gas (A) is diffusing through a uniform tube 0.10 m long containing Nitrogen gas (B) at 101320 Pa pressure & 298 K. At point one PA1 = 10130 Pa & at point two PA2 = 5070 Pa. The diffusivity DAB = 0.000023 $m^2$/sec. Calculate the flux at steady state.

(R = 8.314 KPa $m^3$/Kmol K) **[6]**

b) State & explain Maxwell's law of Diffusion? **[4]**

OR

***Q2)*** a) Explain Diffusion mass transfer Operation? Differentiate between Molecular & Eddy Diffusion? **[5]**

b) Explain Choice of Solvent for Absorption. **[5]**

***Q3)*** a) In an Oxygen-Nitrogen mixture at 10 atm & 25 °C the concentration of oxygen at two places of 0.2 cm apart are 10 & 20 volume % respectively. Calculate the rate of diffusion of oxygen expressed as gm/$cm^2$.hr for the case of unicomponent diffusion (Nitrogen is non diffusing). Value of diffusivity is 0.181 $cm^2$/sec.? **[6]**

b) Explain Wetted-Wall Column? **[4]**

OR

***Q4)*** a) What are the different theories of Mass-Transfer? Explain any one? **[5]**

b) Explain Absorption & Stripping? What is the significance of minimum liquid to gas ratio for Absorption? **[5]**

***P.T.O.***

***Q5)*** a) Define following terms. **[10]**

i) Absolute Humidity

ii) Percentage Humidity

iii) Percentage relative Humidity

iv) Dew point temperature

v) Humid Heat.

b) Air entering a dryer has a temperature (DBT) of 60 °C & a dew point of 26.7 °C. Using the Humidity chart, determine the actual humidity H, percentage humidity, humid heat & the Humid volume? **[6]**

OR

***Q6)*** a) Explain the Phase diagram for water & Pshychrometric Chart? **[8]**

b) Explain Adiabatic Saturation temperature? Derive Lewis Relation? **[8]**

***Q7)*** a) What are the different Gas-Liquid contacting device? Explain. **[8]**

b) Explain Tray tower Vs Packet towers? **[8]**

OR

***Q8)*** a) Explain Flooding & Loading Conditions? **[8]**

b) What are the characteristics that tower packing should offer? Give the classification of packing's used in Packed column? **[8]**

***Q9)*** a) A porous dry solid was dried under constant drying conditions in a batch dryer. It took 5 hrs to reduce the moisture from 30% 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 36% to 6% under the same drying conditions? **[10]**

b) Explain Rate of Drying Curve in detail? **[8]**

OR

***Q10)***a) 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 300 kg & the drying surface is 1 $m^2$/8 kg dry weight. Determine the time for drying. **[12]**

| X kg moisture/kg dry solid | 0.35 | 0.25 | 0.20 | 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 |

b) Explain mechanism of moisture movement within the solid during drying. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1676

[Total No. of Pages : 2

# [5460]-203

## T.E. (Chemical) (Semester - I)

## INDUSTRIAL ORGANISATION AND MANAGEMENT

## (2012 Pattern) (New)

*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) ***Assume suitable data, if necessary.***
4) ***Attempt Q1 OR Q2, Q3 OR Q4, Q5 OR Q6, Q7 OR Q8, Q9 OR Q10.***

***Q1)*** a) Explain Joint Stock Company with advantages. **[6]**

b) Write a note on Merit Rating. **[4]**

OR

***Q2)*** What is Management? Explain in detail various functions of management. **[10]**

***Q3)*** a) Define Tender and its types. **[4]**

b) Explain Trade Unions in Chemical Industries. **[6]**

OR

***Q4)*** Explain various functions of Purchase Manager. **[10]**

***Q5)*** a) Write an explanatory note on Marketing Mix. **[8]**

b) Write an explanatory note on Advertising. **[8]**

OR

***Q6)*** a) Explain in detail Marketing Mix. **[8]**

b) Explain any two Pricing Strategies in detail. **[8]**

***P.T.O.***

***Q7)*** a) Write notes on : **[8]**

i) Antidumping Duty

ii) ISO

b) Explain in detail Total Quality Management of a process industry. **[8]**

OR

***Q8)*** a) Explain Quality Circle. **[8]**

b) Explain in detail various factors affecting International Trade. **[8]**

***Q9)*** Write short notes on : **[18]**

a) Patent and Patent Rights

b) FERA and FEMA

c) Monopolies Restrictive Trade Practices (MRTP)

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 Flow Chart and Flow Diagram. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1677

[Total No. of Pages : 2

# [5460]-204

## T.E. (Chemical)

## CHEMICAL PROCESS TECHNOLOGY

## (2012 Pattern)

*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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** Describe the manufacture of Nitric Acid by ammonia oxidation process. Also enlist the major engineering problems involved in this process. **[10]**

OR

***Q2)*** Explain the production of sulfur from pyrites (Finnish process). Also enlist the major engineering problems involved in this process. **[10]**

***Q3)*** Explain the purification of alumina from bauxite by Bayer process. Also explain the electrolytic Aluminium smelting cell with reactions involved. **[10]**

OR

***Q4)*** a) Differentiate between Sulfite and Sulfate Pulp process. **[5]**

b) Draw the block diagram and explain the process in brief (ANY ONE)**[5]**

i) Ammonium Nitrate

ii) Ammonium Phosphate

iii) Ammonium Sulfate

***Q5)*** Explain the process of coking of coal with neat diagram. Also enlist the major engineering problems involved in this process. **[10]**

OR

***Q6)*** Explain the process for the production of soap and glycerin from fatty acids. **[10]**

***P.T.O.***

***Q7)*** a) Explain the production of producer gas with major engineering problems involved in it. **[10]**

b) Draw and explain the refinery operation - isomerization for n - paraffin feed. **[10]**

OR

***Q8)*** a) Write a note on reforming process with neat diagram. **[10]**

b) Explain the production of natural gas and LPG treatment process. **[10]**

***Q9)*** a) Draw and explain the production of chloromethanes. **[10]**

b) Explain the production of ethylene dichloride by the reaction of ethylene and chlorine. **[10]**

OR

***Q10)***a) Explain the production of acetone by catalytic dehydrogenation of isopropanol. **[10]**

b) Explain the production of phthalic anhydride by air oxidation of naphthalene or ortho-xylene. **[10]**

Total No. of Questions : 10]

SEAT No. :

P1678

[Total No. of Pages : 3

# [5460]-205

## T.E. (Chemical)

## CHEMICAL ENGINEERING THERMODYNAMICS - II

## (2012 Pattern)

*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 property changes with mixing. **[5]**

b) An azeotrope is formed between ethanol and hexane at 33.2% by mole of ethanol, with a boiling point of 331.9 K and 101.3 kPa. The vapour pressures are 44.25 kPa for ethanol and 72.24 kPa for hexane. Determine the van Laar constants and write the expressions for the van Laar equations for the two components. **[5]**

OR

***Q2)*** a) At a given pressure and temperature the volumetric data for a liquid mixture of components 1 and 2 is given by $V = 109.4 \times 10^{-6} - 16.8 \times 10^{-6} x_1 - 2.64 \times 10^{-6} x^2_1$, where $x_1$ is the mole fraction of component 1 and V is the molar volume in $m^3$/mol. Find the expressions for partial molar volumes of both the components in terms of $x_1$. **[5]**

b) Describe briefly the three methods for estimating fugacity of pure gases. **[5]**

***Q3)*** a) Define excess property. **[2]**

b) The compressibility factor of oxygen at 200K varies with pressure as given below. **[8]**

Evaluate the fugacity of oxygen at 200 K and 100 bar.

| P, bar | 1.0 | 4.0 | 7.0 | 10.0 | 40.0 | 70.0 | 100.0 |
|---|---|---|---|---|---|---|---|
| Z | 0.99701 | 0.98796 | 0.97880 | 0.96956 | 0.8734 | 0.7764 | 0.6871 |

***P.T.O.***

OR

***Q4)*** a) Give the van Laar equations and explain all the terms. **[2]**

b) The binary system of component (1) and component (2) conforms to Raoult's law.

Using the vapor pressure data given plot the T-x, y diagram. **[8]**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TK | 311.45 | 315 | 319 | 323 | 327 | 331 | 335.33 |
| $P_1^S$kPa | 53.32 | 61.09 | 70.91 | 81.97 | 94.36 | 108.2 | 124.95 |
| $P_2^S$kPa | 21.25 | 24.61 | 28.90 | 33.79 | 39.35 | 45.62 | 53.32 |

***Q5)*** a) Why is it important to test consistency of VLE data? Describe the method of slope of $ln\ \gamma$ curves and the mid-point method. **[10]**

b) Give the criteria for phase equilibrium. **[8]**

OR

***Q6)*** a) Using the criterion for phase equilibrium show that the change in entropy during phase change can be calculated from the latent heat of phase change and the absolute temperature as $\Delta S = \Delta H/T$. **[6]**

b) The activity coefficient for component 1 in a binary mixture is given by the expression ln $\gamma_1 = ax_2^2 + bx_2^3 + cx_2^4$ where a, b and c are concentration independent constants. Derive an equation for ln $\gamma_2$ in terms of $x_1$. **[6]**

c) State and explain Duhem's theorem. **[6]**

***Q7)*** a) Explain the significance of the curve of Gibbs free energy versus extent of reaction. **[8]**

b) A gas mixture contains 2 moles ammonia, 6 moles hydrogen and 2 moles ammonia initially. The reaction taking place is $N_2 + 3H_2 \rightarrow 2NH_3$. Derive expressions for the mole fractions of various components and explain how the conversion of limiting reactant is related to the extent of reaction. **[8]**

OR

***Q8)*** a) If the standard Gibbs free energy change of a reaction is known how can one calculate he reaction equilibrium constant. **[6]**

b) Calculate the equilibrium constant for the reaction $N_2 + 3H_2 \rightarrow 2NH_3$ if the free energy of formation of ammonia is — 16,500 J/mol. **[5]**

c) Give the criteria for feasibility of a reaction. **[5]**

***Q9)*** a) Describe the effect of pressure on equilibrium constant. **[6]**

b) A gas mixture containing 25% CO, 55% $H_2$ and 20% inerts is to be used for methanol synthesis according to the reaction $CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$. The gas mixture leaving the reactor is in equilibrium at 300 bar and 625 K. Assume that the equilibrium mixture forms an ideal solution and $K_f$ and $K_\phi$ are $4.9 \times 10^{-9}$ and 0.35 respectively. What is the percentage conversion of CO? **[10]**

OR

***Q10)***a) What is the effect of the presence of inerts on reaction equilibrium constant. **[6]**

b) One mole of steam undergoes the water gas shift reaction at 1100 K and 1 bar. $CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$. The equilibrium constant for the reaction K = 1. Assuming ideal behavior calculate the fractional dissociation of steam when CO is supplied in 100% excess and only 50% of theoretical requirement. **[10]**

Total No. of Questions : 10]

SEAT No. :

P1679

[Total No. of Pages : 2

# [5460]-206

## T.E. (Chemical Engineering)

## CHEMICAL REACTION ENGINEERING - I

## (2012 Pattern)

*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) Define the term Rate of Reaction and what are the variables affect the rate of reaction. **[6]**

b) What are single and multiple reactions? **[4]**

OR

***Q2)*** a) Give the basis on which chemical reactions and reactors are classified with suitable examples. **[6]**

b) Define molecularity and order of reaction. **[4]**

***Q3)*** a) Differentiate constant volume and variable volume methods of analysis of reactor. **[6]**

b) Distinguish between homogeneous and heterogeneous reactions. **[4]**

OR

***Q4)*** Derive the performance equation for ideal Batch reactor. **[10]**

***Q5)*** a) Explain contacting patterns for various combinations of high and low concentration of reactants in non-continuous and continuous flow operations. **[10]**

b) Write advantage and Disadvantages of a batch reactor. **[6]**

***P.T.O.***

OR

***Q6)*** a) Write note on the product distribution in Quantitative and Qualitative methods. **[10]**

b) Explain in detail Instantaneous yield and Overall yield for multiple reactions. **[6]**

***Q7)*** a) Discuss optimum temperature progression needed for optimum reactor performance. **[8]**

b) Explain E, F and C curve and find the relationship between them. **[8]**

OR

***Q8)*** a) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. **[8]**

b) Discuss Micro and Macro Mixing of fluids. **[8]**

***Q9)*** Write short notes :

a) Segregation model **[5]**

b) Models for non-ideal reactions **[5]**

c) Dispersion model **[4]**

d) Tanks in series model **[4]**

OR

***Q10)***Explain in detail effect of temperature on rate of reaction by following theories.

a) Arrhenius law **[5]**

b) Thermodynamics Approach **[5]**

c) Collision Theory **[4]**

d) Transition state theory. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1680

[Total No. of Pages : 2

# [5460]-207

## T.E. (Chemical) (End-Semester)

## TRANSPORT PHENOMENA

## (2012 Pattern)

*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 table is allowed.***
4) ***Assume suitable data, if necessary.***

***Q1)*** Derive the expression of momentum flux and velocity distribution for flow of fluid through an annulus in upward direction. **[10]**

OR

***Q2)*** Derive the expression of heat flux and temperature distribution for nuclear heat source surrounded by aluminum cladding. **[10]**

***Q3)*** Derive the expression of volumetric flow rate for flow of Bingham fluid through the tube. **[10]**

OR

***Q4)*** a) Explain procedure to solve mass transfer problem. **[5]**

b) Explain significance of Brinkman number. **[5]**

***Q5)*** Derive Euler's equation of motion for rectangular coordinate system. **[18]**

OR

***Q6)*** a) Use Navier Stoke's equation of motion to derive velocity distribution for laminar flow of fluid through pipeline. **[12]**

b) Use dimensionless form of equation of motion and explain when the two Systems are said to be mathematically similar? **[6]**

***P.T.O.***

***Q7)*** Use macroscopic mass momentum and energy balance equations and derive expressions of pressure rise and friction loss occurring for sudden enlargement. **[16]**

OR

***Q8)*** a) What pressure gradient is required to cause N, N-diethylamine to flow in a horizontal smooth tube of inside diameter 3 cm at a rate of 1.1 lit/s. Density of diethylamine is 935 kg/$m^3$ and viscosity is 1.95 cp. Assume friction factor f = 0.0063. **[8]**

b) Derive Blasius equation. **[8]**

***Q9)*** a) Discuss transfer coefficients at high transfer rates by penetration theory. **[8]**

b) Discuss transfer coefficients at high transfer rates by film theory. **[8]**

OR

***Q10)***a) Explain Chiton-Colburn analogy. **[8]**

b) Explain Martinnelli's analogy. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1681

[Total No. of Pages : 3

# [5460]-208

## T.E. (Chemical Engineering) (End-Semester)

## CHEMICAL ENGINEERING DESIGN - I

## (2012 Pattern)

*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 are the various types of storage vessels? **[5]**

b) Explain the procedure for the design of saddle support with necessary equations. **[5]**

OR

***Q2)*** a) With neat sketch explain bracket support with required design calculations. **[5]**

b) What are the various types of roofs used for storage vessels? **[5]**

***Q3)*** A tall vertical vessel 1.5 m in diameter and 13 m in height is to be provided support. Weight of the vessel with all its attachment is 80000 kg. Diameter of the skirt is 2.2 m. wind pressure acting over the vessel is 100 kg/m$^3$, K = 0.7, seismic coefficient C = 0.08. Permissible tensile stress of skirt material= 960 kg/cm$^2$. Permissible compressive stress is 1/3 of yield stress of material. Yield stress of material= 2400 kg/cm$^2$. Estimate the thickness of skirt support. **[10]**

OR

***Q4)*** a) What is temperature correction factor? How is it calculated? Why is it used in design heat exchanger? **[6]**

b) Discuss briefly on shell and tube side heat transfer coefficients in a shell and tube heat exchanger. **[4]**

***P.T.O.***

*Q5)* a) Explain various methods of feeding for multiple effect evaporators. **[6]**

b) Gas oil at 200 deg C is to be cooled to 40 deg C. The oil flow rate is 22500 kg/h. Cooling water is available at 30 deg C and the temperature rise is to be limited to 20 deg C. The pressure drop allowance for each stream is 100kN/$m^2$. Design a suitable heat exchanger for this duty. **[10]**

Physical properties of water :

| Temperature, deg C | 30 | 40 | 50 |
|---|---|---|---|
| $C_p$, KJ/kg deg C | 4.18 | 4.18 | 4.18 |
| k, kW/m deg C | $618 \times 10^{-6}$ | $631 \times 10^{-6}$ | $643 \times 10^{-6}$ |
| $\mu$, mN/$m^2$s | $797 \times 10^{-6}$ | $671 \times 10^{-6}$ | $544 \times 10^{-6}$ |
| $\rho$, kg/$m^3$ | 995.2 | 992.8 | 990.1 |

Physical properties of oil :

| Temperature, deg C | 200 | 120 | 40 |
|---|---|---|---|
| $C_p$, KJ/kg deg C | 2.59 | 2.28 | 1.97 |
| k, kW/m deg C | 0.13 | 0.125 | 0.12 |
| $\mu$, mN/$m^2$s | 0.06 | 0.17 | 0.28 |
| $\rho$, kg/$m^3$ | 830 | 850 | 870 |

OR

*Q6)* a) In case of reboilers how the heat transfer coefficient is calculated for Pool boiling. Explain all the equations involved in the calculations. **[8]**

b) Explain the design methods for mixed vapor condensers and how the true temperature difference is evaluated in such cases? **[8]**

*Q7)* a) Describe any three types of agitators giving their range of rpm, functioning and application. **[8]**

b) A triple effect evaporator is fed with 5kg/s of a liquor containing 15% solids. The concentration in the last effect, which operates at 13.5 kN/$m^2$, is 60 % solids. The steam fed at 388 K to the first effect, determine the temperature distribution and the area of heating surface required in each effect? The feed temperature is 294 K and the specific heat capacity of all liquors is 4.18 kJ/kg K. If the unit is run as a backward feed system, the coefficients are 2.3, 2.0 and 1.6 kW/$m^2$K respectively. Determine the new temperatures, the heat economy and the heating surface required under these conditions. **[10]**

OR

***Q8)*** a) Explain criteria for jacket selection in a reactor. **[6]**

b) Toluene is continuously nitrated to mono nitro toluene in a cast iron vessel, 1m diameter fitted with propeller agitator 0.3 m diameter, rotating at 2.5 Hz. The temperature is maintained at 310K by circulating 0.5 kg/s cooling water through a stainless steel coil 25 mm OD and 22 mm ID wound in the form of a helix, 0.8 m in diameter. The reacting material is having the same physical properties as 75 % sulphuric acid. If the mean water temperature is 290 K, what is the overall heat transfer coefficient for desired heat transfer? **[12]**

Physical Properties :

| | Water | Sulphuric acid |
|---|---|---|
| $C_p$ (J/kgK) | 4180 | 1880 |
| Viscosity (nNs/$m^2$) | 1.08 | 6.5 |
| Density (kg/$m^3$) | 998 | 1666 |

Viscosity at the surface = 8.6 mNs/$m^2$

***Q9)*** a) Write short note on any two - **[6]**

i) Settling chamber

ii) Impingement separator

iii) Cyclone separator

b) Make a preliminary design for a separator to separate a mixture of steam and water. Steam flowrate= 2000 kg/hr, water flowrate = 1000 kg/hr. operating pressure = 4 bar. Physical properties at 4 bar pressure: saturation temperature: 143.6 °C, liquid density = 926.4 kg/$m^3$, vapor density = 2.16 kg/$m^3$. **[10]**

OR

***Q10)***a) Write about knockout drum, role of demister pad and reflux drum. **[8]**

b) Design a decanter to separate a light oil from water. Oil is the dispersed phase. Oil flowrate is 1000 kg/hr. density of oil is 900 kg/hr, viscosity of oil is 3 mNs/$m^2$. Water flowrate is 5000 kg/hr, ρw= 100 kg/$m^3$, μw= 1mNs/$m^2$. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1682

[Total No. of Pages : 3

# [5460]-209
# T.E. (Chemical Engineering)
# MASS TRANSFER - II
# (2012 Pattern)

*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) A mixture of 40% hexane and 60% octane by mole is flash distilled. If 45% of the feed is vapourized find the composition of distillate and residue. The equilibrium data: **[6]**

| | | | | | | |
|---|---|---|---|---|---|---|
| x | 0 | 0.045 | 0.192 | 0.4 | 0.69 | 1 |
| y | 0 | 0.178 | 0.538 | 0.78 | 0.932 | 1 |

b) Derive the Fenske equation. **[4]**

OR

***Q2)*** a) A saturated liquid mixture containing 60 mole % benzene and 40 mole % toluene is to be separated continuously in to a distillate product containing 90 mole % benzene and the bottom product containing 5 mole % benzene. The fractional distillation column will operate at 1 atm. The reflux ratio is 2. How many theoretical plates must be the columns have if the feed is introduced in to the eighth plate? Equilibrium data : **[8]**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0 | 0.02 | 0.07 | 0.13 | 0.21 | 0.29 | 0.37 | 0.41 | 0.58 | 0.8 | 1.0 |
| y | 0 | 0.04 | 0.16 | 0.26 | 0.39 | 0.49 | 0.59 | 0.63 | 0.77 | 0.9 | 1.0 |

b) What is partial condenser? **[2]**

***Q3)*** a) Carbon disulphide is used to extract iodine from its saturated aqueous solution. The distribution of iodine between Carbon disulphide and water is given by K = Y/X (g Iodine / L of $CS_2$)/(g of Iodine / L of water) = 588.2. How many stages are required to reduce the concentration of iodine in its saturated aqueous solution, containing 0.3 g of Iodine per 1 L of water, to 0.012 g Iodine per L of water? Water and $CS_2$ are immiscible. **[5]**

***P.T.O.***

b) Describe the working principle of spray extraction column. **[5]**

OR

***Q4)*** a) A mixture of benzene and toluene containing 55 mole % benzene is distilled to give 95 mole% benzene and a bottom product containing 7 mole % benzene. The feed is liquid at bubble point and a total condenser is used. Find the number of plates required at total reflux. The equilibrium data: **[5]**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.37 | 0.51 | 0.62 | 0.71 | 0.78 | 0.85 | 0.91 | 0.95 | 1.0 |

b) Explain the selection criteria for solvent in a liquid-liquid extraction process. **[5]**

***Q5)*** 350 kg per hour of halibut liver is to be extracted in a counter current cascade with ether to recover oil. The ether which has been partially purified contains 2% oil. The fresh liver contains 20% oil and are to be extracted to a composition 10% oil (on solvent free basis) 250 kg of solvent is to be used. **[16]**

a) What % of oil entering with the liver is recovered in the extract?

b) How many equilibrium stages are required?

**Data :**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **kg oil/ kg solution** | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 |
| **kg solution/ kg exhausted liver** | 0.288 | 0.368 | 0.44 | 0.51 | 0.6 | 0.71 | 0.87 |

OR

***Q6)*** a) Explain how the conditions of constant and variable underflow arise and represent them graphically. **[8]**

b) Describe the construction and the functioning of a Bollman Extractor. **[8]**

***Q7)*** a) Equilibrium water adsorbed by a silica gel in contact with moist air is given by Y = 0.03 X, where Y = kg water / kg dry air and X = kg water adsorbed / kg silica gel. 0.5 kg silica gel containing 5% moisture on dry basis is placed in a collapsible vessel in which there is 10 $m^3$ of moist air. The partial pressure of water vapour is 25 mmHg. The total pressure and temperature are 760 mmHg and 298 K respectively. Calculate the quantity of water adsorbed. **[9]**

b) Explain schematically and graphically crosscurrent adsorbers. Write their material balance equations. **[9]**

OR

***Q8)*** a) 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 0.86. Calculate the minimum quantity of the fresh carbon per kg solution for a continuous countercurrent process when the solid fed is solute free. 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 color | 9.6 | 8.6 | 6.3 | 4.3 | 1.7 | 0.7 |

b) Explain in detail pressure swing adsorption. **[8]**

***Q9)*** a) Describe the various driving forces in membranes and give an example of each type of operation. **[8]**

b) Explain the terms rejection, permeability, membrane fouling, cake resistance. **[8]**

OR

***Q10)***a) Explain composite membrane and the function of each part. **[6]**

b) A solution of 500 kg of $Na_2SO_4$ and 2500 kg of water is cooled from 333 K to 283 K in a mild steel agitated vessel weighing 750 kg. At 283 K the solubility of $Na_2SO_4$ is 8.9 kg per 100 kg of water. The salt crystallizes as $Na_2SO_4$ $10H_2O$. If 3% of the original water is lost by evaporation calculate the heat that must be removed while cooling. Also find the yield of hydrated crystals. Data: Heat capacity of solution = 3.6 kJ/kg K, Heat capacity of mild steel = 0.5 kJ/kg K, heat of crystallization = 78.5 MJ/kmol, latent heat of vaporization of water = 2395 kJ/kg. **[10]**

Total No. of Questions : 10]

SEAT No. :

P1683

[Total No. of Pages : 2

# [5460]-210

## T.E. (Chemical) (End-Semester)

## PROCESS INSTRUMENTATION & CONTROL

## (2012 Pattern)

*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) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***

***Q1)*** Explain static and dynamic characteristics of measuring instruments. **[10]**

OR

***Q2)*** Explain intermediate elements of instruments. **[10]**

***Q3)*** Explain classification of temperature measuring instrument & Explain RTD in details. **[10]**

OR

***Q4)*** What are different types of pressure measuring devices? Explain U Tube manometer. **[10]**

***Q5)*** a) Explain classification of level measuring instruments. **[8]**

b) Explain variable area flow meter in detail. **[8]**

OR

***Q6)*** Write short note on : **[16]**

a) Orifice meter

b) Flow nozzels

***P.T.O.***

***Q7)*** a) Explain with diagram, construction & working of HPLC. **[10]**

b) Explain atomic absorption spectroscopy. **[6]**

OR

***Q8)*** Write short on : **[16]**

a) UV absorption Spectroscopy

b) Gas chromatography

***Q9)*** a) What is first order system? Derive Thermometer transfer function. **[12]**

b) Explain on-off control. **[6]**

OR

***Q10)***a) Explain modes of control action. **[8]**

b) Derive the transfer function of liquid level system. **[10]**