Total No. of Questions : 12]

SEAT No. :

P1684

[Total No. of Pages : 3

[5460]-501

T.E. (Civil)

HYDROLOGY AND WATER RESOURCE ENGINEERING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10, Q.No.11 or 12.***
2) ***Assume suitable data if necessary.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Estimate the total volume of rainfall water received in m^3 over a basin of 4444 hectare for following data : **[4]**

Station	1	2	3	4	5
Polygon area (ha)	518	777	906	1495	748
Observed rainfall (mm)	267	198	142	114	81

b) Explain Area-velocity method of discharge measurement. **[3]**

OR

Q2) a) Explain construction and application of DAD curves with sketch. **[3]**

b) The rates of rainfall for successive 20 minutes period of a 140 minutes duration storms are 2.5, 2.5, 10.0, 7.5, 1.25 and 5.0 cm/hr. Taking the value of 'ϕ' index as 3.2 cm/hr, estimate the net Run-off (surface). Also determine 'W'- index. **[4]**

Q3) a) Explain various methods of assessment of canal revenue. State constraints of each. **[3]**

b) Determine reservoir capacity for command area of 40,000 hectares, canal losses = 10%, and reservoir losses = 10%. **[4]**

P.T.O.

Crop	Base period (days)	Duty ha/cumecs	Intensity of irrigation (%)
Sugar cane	360	1700	20
Cotton	180	1500	10
Wheat	120	1800	20
Rice	120	700	15
Vegetables	120	700	15

OR

Q4) a) After how many days you will supply water to soil in order to ensure sufficient irrigation of given crop, if field capacity of the soil = 30% permanent wilting point = 12%, density of soil = 1.25 gm/cc, effective depth of root zone = 60 cm and daily consumptive use of water for crop = 12.5 cm. Assume that readily available moisture is 80% of the available water. **[3]**

b) State principal Indian crops and explain importance of crop rotation. **[4]**

Q5) a) A 20 cm well penetrates 30m below static water level (GWT). After long period of pumping at a rate 1800 rpm, the drawdown in the observation wells are 12m and 36m from the pumped well are 1.2m and 0.5m respectively. **[4]**

Determine :

i) transmissibility of the aquifer.

ii) drawdown in the pumped well assuming R = 300 m.

b) Explain the perched water table. **[2]**

OR

Q6) a) Write explanatory note - Validity of Darcy's law. **[2]**

b) Derive the Dupit's equation for unconfined aquifers. State assumptions. **[4]**

Q7) a) The ordinate of 4-hour unit hydrograph in particular basin are given below. Determine the ordinate of the S-hydrograph and also the ordinate of 6-hour unit hydrograph. **[8]**

Time (Hrs)	0	2	4	6	8	10	12	14	16	18	20	22	24
4-hour unit Hydrograph ordinate (cumecs)	0	25	100	160	190	170	110	70	30	20	6	1.5	0

b) What are different methods of estimation of flood. Explain any one. **[8]**

OR

Q8) a) Define 'Recurrence internal' and 'frequency' as applied to annual floods. Explain Gumbel's method. **[8]**

b) What is "S" curve hydrograph? Explain its component and construction with a sketch. **[8]**

Q9) a) Explain flow mass curve and explain the step by step procedure to determine the reservoir capacity and surplus water. **[8]**

b) What are different looses which take place from reservoir. Also write methods to control it. **[8]**

OR

Q10) a) Explain Fixation of reservoir capacity using elevation capacity curve and dependable yield. **[8]**

b) What is Flood routing? State different methods. Explain any one in detail. **[8]**

Q11) a) Explain rotational water supply system. **[6]**

b) Describe the role of auto weather station in water management. **[6]**

c) What are causes of becoming land alkaline and saline. Suggest remedies. **[6]**

OR

Q12) a) Explain water logging - process, causes and curative measures. **[6]**

b) What is PIM? Why is it needed in India. **[6]**

c) Compare 'Warabandi' with cooperative water distribution system. **[6]**

Total No. of Questions : 12]

SEAT No. :

P1685

[Total No. of Pages : 3

[5460]-502

T.E. (Civil)

INFRASTRUCTURE ENGINEERING & CONSTRUCTION TECHNIQUE

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer any one from questions 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***
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 need of mechanization in construction industry with demerits of mechanization? **[6]**

b) Explain with neat sketch coning of wheel. **[5]**

OR

Q2) a) Explain in brief the role of transportation in infrastructure engineering. **[6]**

b) Define following terms: Turnout, Stock rails, Switch. **[5]**

Q3) a) With an aid of a neat sketch, explain points and crossings. **[5]**

b) Explain in brief the dredging systems and what is suction method of dredging? **[6]**

OR

Q4) a) Explain with neat diagrams dewatering systems used in construction. **[5]**

b) Define permanent way and state its components & explain any two in brief. **[6]**

P.T.O.

Q5) a) State the various methods of tunneling in Soft ground. Explain Needle Beam Method with neat sketch. **[6]**

b) Write a note on Micro Tunneling. **[6]**

OR

Q6) a) Give the names of types and methods of Tunnel Ventilation. Explain any one in detail. **[6]**

b) Explain the Tunnel Boring Machine (TBM) Technique in detail. **[6]**

Q7) a) With labeled sketch, Define the following terms. **[6]**

i) Shaft

ii) Addit

iii) Portal

iv) Pilot Tunnel

b) List out the various components of Port. Explain any two in detail. **[6]**

OR

Q8) a) Define the term Breakwater. Explain necessity in detail. **[6]**

b) Write a short note on Wet Dock. **[6]**

Q9) a) Discuss the site selection criteria for harbors. **[6]**

b) Define the term Port. Bring out the difference between Port and Harbor in detail. **[6]**

OR

Q10) a) Define the following terms (any four) **[6]**

i) Fenders

ii) Dolphins

iii) Quay

iv) Bulkhead

v) Wharves

vi) Jetty

b) Explain the Preventive Maintenance of Equipment. **[6]**

Q11) a) What is Depreciation? Explain any one method of Depreciation. **[6]**

b) Write a short note on : Operating Cost of Equipment. **[6]**

OR

Q12) a) Discuss in brief various factors affecting selection of equipment for a project. **[6]**

b) Write a short note on : **[6]**

i) Economic life of Equipment.

ii) Dumpers.

✷ ✷ ✷

Total No. of Questions : 10]

SEAT No. :

P1686

[Total No. of Pages : 3

[5460]-503
T.E. (Civil)
STRUCTURAL DESIGN - I
(2015 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Take Fe 410 grade of steel.***
5) ***Take ultimate stress in bolt, f_{ub} = 400 N/mm^2.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator IS: 800-2007 and steel table allowed.***
8) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) Explain classification of sections by using moment curvature graph and bending stress diagram. **[4]**

b) Determine design tensile strength of 2-ISA 125 × 95 × 10 @ 16.5 kg/m in which longer leg connected back to back to the gusset plate of thickness 12 mm by 3 number of M20 black bolts. **[6]**

OR

Q2) a) Differentiate working stress method and limit state method of design. **[4]**

b) Check the adequacy of an ISA 90 × 60 × 6 @ 6.8 kg/m to carry factored axial tension of 200 kN. Assume angle is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts and effective length of member is 1.8 m. **[6]**

Q3) a) A 5 m long is effectively held in position at both ends and restrained against rotation at one end. If 300 × 20 mm cover plates are connected on both sides of an ISHB350 @ 67.4 kg/m. Calculate design compressive strength of the column. **[5]**

b) Define a beam-column member and give examples with suitable sketches. **[5]**

P.T.O.

OR

Q4) Design the slab base for a column ISMB 350 @ 66.1 kg/m supporting a factored axial compression of 1200 kN. Consider grade of concrete as M20. **[10]**

Q5) Calculate the safe uniformly distributed load over a laterally unsupported beam ISMB 400 @ 61.6 kg/m for an effective length of 5m. **[16]**

OR

Q6) a) Explain web buckling and web crippling developed in beams. **[6]**

b) Design a laterally unsupported beam of effective span 4 m subjected to 100 kN/m uniformly distributed load including self weight on entire span. **[10]**

Q7) a) Design a welded connection for the factored beam end reaction 100 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of the column section ISHB 200 @ 37.3 kg/m. **[7]**

b) Design a bolted seat connection for the factored beam end reaction 120 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of the column section ISHB 200 @ 37.3 kg/m. **[10]**

OR

Q8) A simply supported welded plate girder of an effective span of 30 m subjected to factored uniformly distributed load 60 kN/m througout the span including the self weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa. Design cross section of plate girder, stiffeners and connections. Draw sectional plan and elevation. **[17]**

Q9) Determine the maximum wheel load, shear force and bending moment for the gantry girder as per the following data. Design the section and check for moment capacity of the section.

Weight of crane girder: 150 kN, crane capacity: 180 kN, weight of crab and motor: 50 kN, span of crane girder: 15 m, minimum hook approach: 1.2 m, centre to centre distance between gantry column: 5m, Weight of rail: 0.25 kN/m. **[17]**

OR

Q10) A truss shown in **Fig. 10** is used for an industrial building situated at Pune is covered with GI sheets. Determine the panel point dead, live, and wind load. Design the members $L_0\ L_1$, $U_1\ L_0$ and $L_1\ U_1$. Assuming P_z = 1000 kN/m^2 F_y = 250 MPa. Draw the design sketches. **[17]**

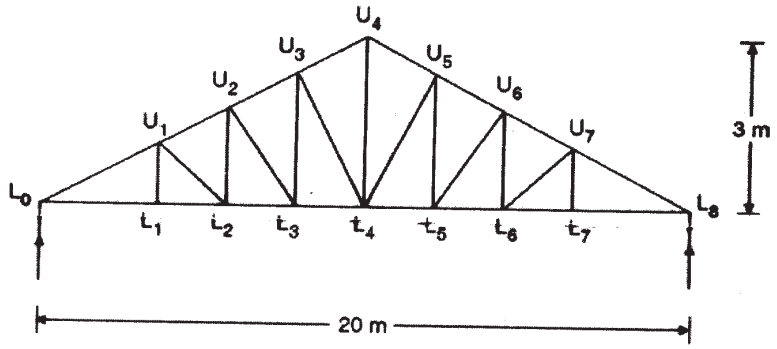


Fig. 10

Total No. of Questions : 8]

SEAT No. :

P1687

[Total No. of Pages : 3

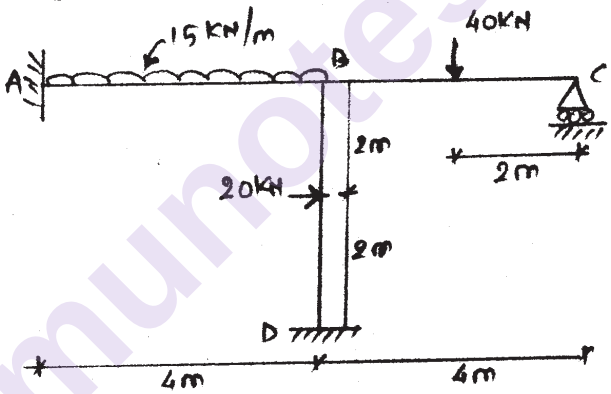
[5460]-504
T.E. (Civil)
STRUCTURAL ANALYSIS - II
(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

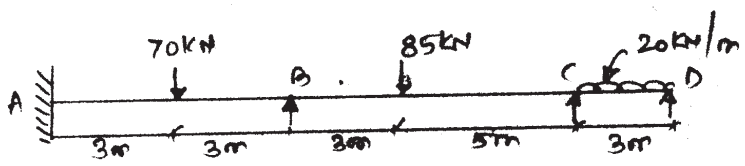
Instructions to the candidates:

1) ***Answer questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***If necessary answer suitable data & indicate clearly.***
4) ***Use of electronic calculator is allowed.***

Q1) a) Analyse the frame shown in fig. by slope deflection method. Draw BMD. Take EI = const. **[10]**



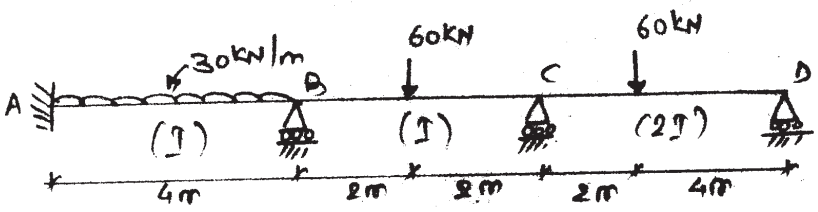
b) Analyse the continuous beam shown in fig. using flexibility method & draw the BMD. **[10]**



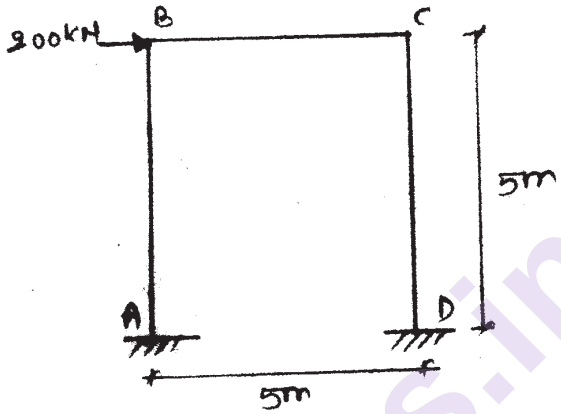
OR.

P.T.O.

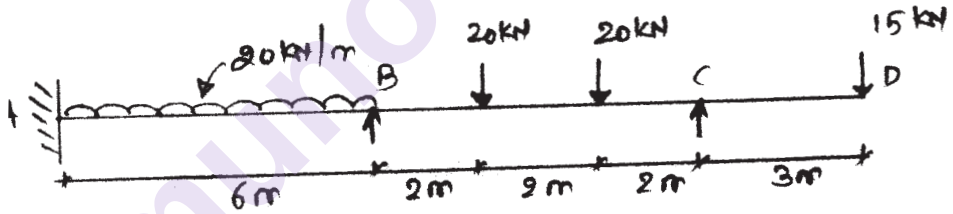
Q2) a) Analyse the continuous beam shown in fig. by slope deflection method. **[10]**



b) Analyse the frame shown in fig. by moment distribution method. Draw BMD. **[10]**

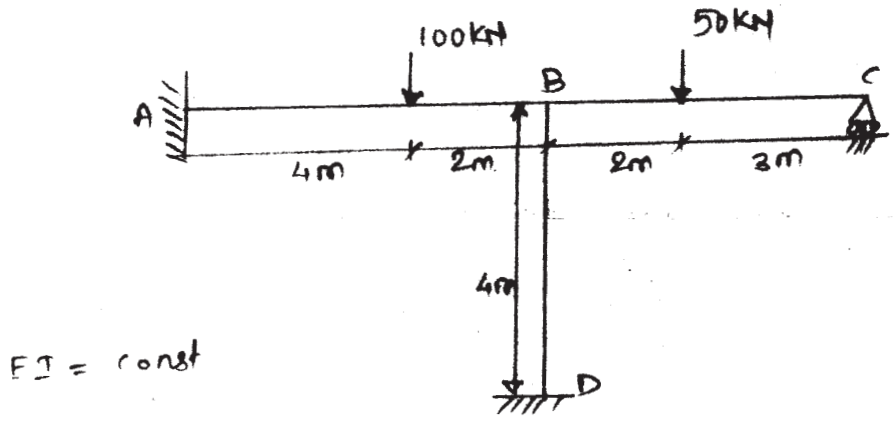


Q3) Analyse the continuous beam by stiffness matrix method. Draw BMD. **[16]**

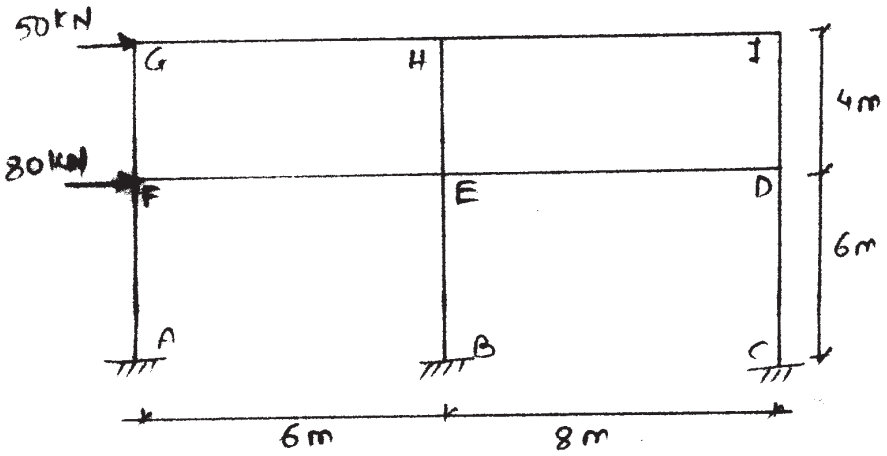


OR

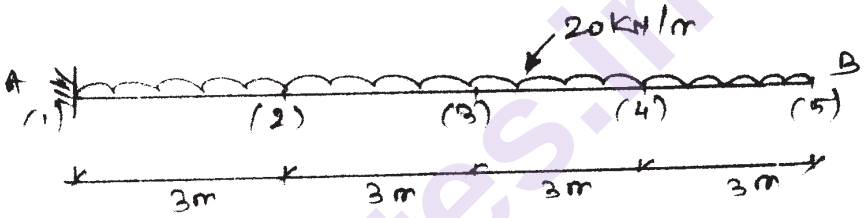
Q4) Analyse the beam shown in fig. by stiffness matrix method. Draw BMD. **[16]**



Q5) a) Determine the approximate values of moment, shear & axial forces of the frame loaded & supported as shown in fig. using cantilever method. **[10]**



b) Using finite difference method find nodal displacement for cantilever as shown in fig. **[8]**



OR

Q6) a) Analyse the frame given in Q.5(a) by portal method. Draw BMD. **[10]**

b) Determine maximum deflection for cantilever beam of 2m span carrying 100 kN load at free end. Take 4 nodes. **[8]**

Q7) a) Explain constant strain triangle & linear strain triangle. **[8]**

b) Explain convergence criteria of FEM. **[8]**

OR

Q8) a) Using La Grange function find shape function for four noded rectangular element. **[8]**

b) Discuss Axisymmetric & Isoparametric elements. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1688

[Total No. of Pages : 4

[5460]-505
T.E. (Civil)
FLUID MECHANICS - II
(2015 Pattern) (Semester - I)

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 non programmable electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***

Q1) a) Distinguish between Bluff body and Streamlined body. **[2]**

b) A standard cricket ball of diameter 7.13 cm is bowled at speed of 101 km/hr by fast bowler. Determine the drag force on the ball by taking the following values for C_D and fluid properties.

For a sphere: $C_D = 0.5$ for $10^4 < Re \leq 3\times10^5$ and $C_D = 0.2$ $Re > 3\times10^5$

Density of air = 1.21 Kg/m^3 and Dynamic viscosity of air = 1.81×10^{-5} N.s/m^2. **[6]**

OR

Q2) a) Explain in brief unsteady flow with suitable practical examples of it. **[2]**

b) In a pipe of 600 mm diameter and 3000 m length, provided with a valve at its end, water is flowing with a velocity of 2.1 m/s. Assuming velocity of pressure wave C = 1500 m/s. Find:

i) The rise in pressure if the valve is closed in 20 seconds, and

ii) The rise in pressure if the valve is closed in 2.5 seconds.

Assume the pipe to be rigid one and take bulk modulus of water K = 2 GN/m^2. **[6]**

Q3) Explain in brief the various types of flow in channels. **[6]**

P.T.O.

OR

Q4) Explain in brief with neat sketches the following terms: **[6]**

a) Depth Discharge Diagram.

b) Specific Energy Curve.

Q5) Derive the conditions for the most economical trapezoidal channel section. **[6]**

OR

Q6) A horizontal rectangular channel 4 wide carries a discharge of 15.50 m^3/s. **[6]**

a) Determine whether a jump may occur at an initial depth of 0.5m or not.

b) If a jump occurs, determine the sequent depth to this initial depth.

c) Also determine the energy loss in the jump.

Q7) a) A jet of water having velocity of 45 m/s impinges without shock on series of vanes moving at 15 m/s, the direction of motion of vanes being inclined at 20° to that of jet. The relative velocity at outlet is 0.9 of that at inlet and absolute velocity of the water at exit is to be normal to the motion of the vanes.

Find : **[9]**

i) Vane angles at entrance and exit

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

iii) The hydraulic efficiency.

b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m. works against a total head of 40m. The velocity of flow through the impeller is constant and equal to 2.5m/s. The vanes are set back at an angle of 40° outlet.

If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, Determine: **[9]**

i) Vane angle at inlet

ii) Work done by the impeller on water per second, and

iii) Manometric efficiency.

OR

Q8) a) Explain the principle and working of a centrifugal pump with neat sketch. **[6]**

b) What do you mean by manometric efficiency, mechanical efficiency and overall efficiency of centrifugal pump? **[6]**

c) Derive expression for the "work done by the jet" in case of flat plate inclined and moving in the direction of jet. **[6]**

Q9) a) Obtain an expression with reference to hydraulic turbine for unit speed, unit power and unit discharge. **[8]**

b) A Pelton wheel has mean bucket speed of 10 meters per second with jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The bucket deflect the jet through an angle of 160°.

Calculate the power given by the water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98. **[8]**

OR

Q10) a) What is Cavitation? How it can be avoided in case of a hydraulic turbine? **[4]**

b) What is draft tube? What are the functions of draft tube? **[4]**

c) A turbine is to operate under head of 26 m at 210 r.p.m. The discharge is 9.5 m^3/s. If the efficiency is 90%, determine **[8]**

i) Specific speed of the machine

ii) Power generated and

iii) Type of turbine.

Q11) a) Derive the following form of GVF equation with usual notations. Also state the assumptions made for it. **[8]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - F_r^2}$$

b) Describe with neat sketches "Classification of Channel Bed Slopes". **[8]**

OR

Q12) a) What do you mean by Non-uniform flow? Explain its types with neat sketch along with suitable example. **[4]**

b) A rectangular channel carries a discharge of 3 $m^3/s/m$. It is laid at a slope of 0.0001. If at section in this channel the depth is 1.6 m, how far (upstream or downstream) from the section will the depth be 1.9 m? Take Manning's n as 0.015 and width of rectangular channel as 10m. Use the Step method (Consider the depth of flow 'y' with interval of 0.1m). **[12]**

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Total No. of Questions : 10]

SEAT No. :

P1689

[Total No. of Pages : 4

[5460]-506
T.E. (Civil)
ADVANCED SURVEYING
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Define: **[5]**

i) Well conditioned triangle
ii) Strength of a figure
iii) Accuracy of triangulation
iv) Geodetic Surveying
v) Indivisibility of stations

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) 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) Discuss in brief the various data sources to build GIS for civil engineering applications such as watershed development. **[5]**

P.T.O.

OR

Q4) a) Define remote sensing. State importance of digital image processing. **[5]**

b) What is mean by three point problem? How it solve by analytical method? **[5]**

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]**

162º20'00''	162º21'20''	162º21'40''
162º20'40''	162º19'40''	162º21'20''

Calculate :

i) the most probable error of single observation

ii) the most probable error of mean

iii) 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 = 48º 18'22''	3
Angle B = 76º 32'47.2''	1
Angle C = 55º 08'53.8''	3

Q7) a) Write a stepwise procedure of determine air base distance using mirror stereoscope. **[5]**

b) Write short note on : Crab and Drift. **[5]**

c) The scale of aerial photograph is 1: 12000. The size of aerial photograph is 250 mm × 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 : **[5]**

i) Air base distance

ii) Relief displacement

iii) Oblique photograph

iv) Principal point

v) Mosaic

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 × 250 mm) require to cover an area of 20 km × 16 km if the longitude overlap is 60% and the side overlap is 30%. Scale of photograph is 1 cm: 150m. **[6]**

Q9) a) Two triangulation stations A and B are 3200.65 m apart. Find the difference of elevation of two stations for the following data : **[8]**

Angle of depression at B to A	= 2°18'16"
Height of signal at A	= 4.23 m
Height of Instrument at B	= 1.24 m
Coefficient of refraction at B	= 0.07
R sin 1"	= 30.88 m
R.L. of B	= 242.6 m

b) Describe in brief how setting out of a tunnel with surface setting out and transferring the alignment underground is carried out at site. **[8]**

OR

Q10) a) Two triangulation stations A and B are 2800 m apart. Find the reduce level of station B for the following data : **[8]**

Angle of elevation at A to B	= 1°28'32"
Height of signal at A	= 2.46 m
Height of Instrument at B	= 1.38 m
Coefficient of refraction at B	= 0.07
radius of earth is	= 6372 km
R.L. of A	= 125 m

b) Describe the procedure for setting out a bridge, explain with a sketch. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1690

[Total No. of Pages : 4

[5460]-507

T.E. Civil

PROJECT MANAGEMENT AND ENGG. ECONOMICS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Write a short note on : **[2.5 + 2.5]**

i) Management by objective

ii) Gantt bar chart and its limitations

b) Draw network diag. for the data as follows **[5]**

i) Act.A and B are starting activity

ii) Act.C and D succeeds Act.A

iii) Act.B and D precedes Act E

iv) Act F follows Act. C and D

v) Act. E and F are terminal Activities

OR

Q2) a) Write a short note on : **[2.5 + 2.5]**

i) Work break down structures

ii) Precedence network analysis

b) Construct network diag. for the data as follows **[5]**

i) Event 1 is first and event 5 is last

ii) Event 2 follows event 1

P.T.O.

iii) Event 3 and 4 are successor of event 2

iv) Event 3 restrains occurrence of event 4

v) Event 5 succedes event 1 and 4

Q3) a) Differentiate between CPM and PERT method with suitable example. **[4 + 1]**

b) How do you inspect quality of material like Cement and mud brick on your site? **[2.5 + 2.5]**

OR

Q4) a) Define Inventory and list out step by step process to conduct ABC analysis. **[1 + 4]**

b) What safety precautions would you take to avoid accidents on tunneling site? Explain safety programme undertaken. **[3 + 2]**

Q5) a) Explain resource allocation methods and their significance in manpower planning. **[2 + 3]**

b) What is updating of network diag.? Explain its necessity. **[2 + 3]**

c) The activities and required duration of small work are shown in table underneath. Review of work was taken after 7 days and the following conditions exist. Draw updated network diag. and what will be change in project duration? **[8]**

i) Act. 1-2 and 2-3 delayed drastically and requires 7 and 8 more day's resp.

ii) Act. 1-3 and Act 1-4 completes as per original plan

iii) Due to arrival of new machine Act. 3-5 will take 3 days to complete.

iv) Act. 4-5 yet to start and time required for completion is still appears to be accurate.

Activity	1-2	1-3	1-4	2-3	3-5	4-5
Duration, Days	3	4	7	2	6	8

OR

Q6) a) Comment on Project Management Software's and their applications in housing projects. **[1 + 4]**

b) What do you mean by EVA? Explain any one method in detail. **[5]**

c) Following table shows the cost duration data for a small construction project. Carry out step by step crashing and how much you save by crashing the network. Indirect cost is Rs. 300 week. **[8]**

Activity		1-2	2-3	2-4	3-5	4-5	5-6
Normal	Cost	4000	2000	5500	200	2200	4000
	Duration (Weeks)	3	6	5	7	4	8
Crash	Cost	4200	4800	6400	1200	2600	4200
	Duration (Weeks)	1	2	2	3	2	4

Q7) a) "Construction sector is one of the big sector which influences on economic health of country,". Comment. **[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. 1,500 in 2 years at the rate of 10% p.a. **[2 + 4]**

c) Explain Demand and Supply curve and factors affecting on it. **[2 + 2]**

OR

Q8) a) Define cost, price and value with the help of suitable example. **[2 + 2 + 2]**

b) Explain law of diminishing marginal utility and law of substitution with help of suitable example. **[3 + 3]**

c) Mrs. Mayuri brought a refrigerator for Rs. 20,000; she paid tax of Rs. 2,000 and Rs. 200 for transport. If she sold it to a customer for Rs. 22,500, 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]**

b) Write a short note on : **[3 + 3]**

i) ARR method

ii) IRR method

c) Explain Payback period method with formula and suitable example. **[4]**

OR

Q10) a) Compare the project by NPV and B/C ratio method and state its feasibility if project cost is Rs. 2,50,000 and it has net cash flow of Rs. 70,000 for a period 5 years. Firm expect returns 11% per annum. **[6]**

b) Write a short note on : **[3 + 3]**

i) Role PMC.

ii) Break even analysis.

c) Explain Detailed Project Report (DPR). **[4[**

Total No. of Questions : 12]

SEAT No. :

P1691

[Total No. of Pages : 3

[5460]-508
T.E. (Civil)
FOUNDATION ENGINEERING
(2015 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, Q.9 or Q.10, and Q.11 or Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

SECTION - I

Q1) Explain 'Electrical Resistivity Method' with respect to i) Principle ii) Procedure and iii) Limitations. **[6]**

OR

Q2) Differentiate between 'Standard Penetration Test' and 'Dynamic Cone Penetration Test'. **[6]**

Q3) Enlist the assumptions in Terzaghi's bearing capacity analysis and write the equations to calculate ultimate bearing capacity of i) strip footing ii) rectangular footing iii) circular footing. **[7]**

OR

Q4) Two plate load tests with square plates were conducted. Following loads were obtained for 30 mm settlement. i) For plate with width 300 mm, the load was 38.2 kN. ii) For plate with width 600 mm, the load was 118.5 kN. Determine the width of square footing which would carry a load of 1500 kN for a settlement of 30 mm. **[7]**

P.T.O.

Q5) Define pre-consolidated soil. Comment on over consolidation ratio of this soil. What are the causes of pre-consolidation of soil? **[7]**

OR

Q6) Determine the consolidation settlement of a clay layer 2.0 m thick at a depth of 10 m below the ground level, if water table is lowered from ground level to 1.0 m depth. The clay layer underlays the sand layer. The soil properties are as below. **[7]**

Clay – w = 35%, w_L = 45%, γ_b = 9.5 kN/m^3, G = 2.7

Sand – γ_b = 10 kN/m^3, γ_{moist} = 17.5 kN/m^3, G = 2.65

SECTION - II

Q7) a) What is negative friction? Enlist the measures to reduce it. **[5]**

b) Enlist the advantages and disadvantages of drilled piers. **[6]**

c) How the capacity of single pile is calculated by static method. **[6]**

OR

Q8) a) A pile group consists of 12 piles in 3 columns and 4 rows. Calculate the efficiency of the pile group by Feld's rule. **[5]**

b) Enlist the advantages and disadvantages of pneumatic caissons over open caissons. **[6]**

c) Explain the method to calculate the consolidation settlement of pile group in clay assuming all piles as friction piles. **[6]**

Q9) a) State and explain any five methods to anchorage sheet pile. **[5]**

b) Enlist any three types of cofferdams and draw their sketches. **[6]**

c) Draw a neat sketch of double under reamed pile and name various components. **[6]**

OR

Q10) a) Write a note on 'Cellular cofferdam'. What are it's advantages? **[5]**

b) Explain 'stone column technique' of ground improvement. **[6]**

c) Explain the design principles to be followed during the construction of foundation on black cotton soil. **[6]**

Q11) a) Write a note on 'liquefaction hazard mitigation'. **[5]**

b) Explain general principles of earthquake resistant design. **[5]**

c) What are the advantages of geosynthetics over conventional materials? **[6]**

OR

Q12) a) Write a note on 'Intensity of Earthquake'. **[5]**

b) State any five functional requirements of geosynthetics. **[5]**

c) Enlist the types of geosynthetics and explain any two in detail. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1692

[Total No. of Pages : 6

[5460]-509
T.E. (Civil Engineering)
STRUCTURAL DESIGN - II
(2015 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.7or Q.8, Q.9or Q.10 and 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 not be given full credit.***
6) ***Assume suitable data, if necessary.***

Q1) a) Why LSM is more preferable than WSM. **[3]**

b) Explain Ultimate load theory. **[3]**

OR

Q2) Explain the terms bond stress and development length. Calculate development length for 20 mm diameter bar in compression and tension by both methods (WSM and LSM). Use M 20 concrete and Fe 500 steel. **[6]**

Q3) A Calculate the moment of resistance by LSM for flanged beam section detailed as below (T- Beam) **[8]**

i) Width of rib = 300 mm

ii) Effective flange width = 1300 mm

iii) Thickness of flange = 120mm

iv) Effective depth = 475 mm

v) Tension steel = 2- #20 through plus 2- #12 curtail at mid span.

vi) Use M20 grade of concrete and Fe 500 grade of steel.

P.T.O.

OR

Q4) A rectangular beam section, 230mm wide and effective depth 425 mm is reinforced with 3 bars of 20 mm 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 500 grade of steel. **[8]**

Q5) Design-a cantilever slab for effective span of 1.5m subjected to floor finish of 1.5 kN/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 × 7.5 m. 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 Fe 500 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 = 3.8 m, BC = 4.5 m 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 20 % redistribution of moments by considering proper load case. Design beam for flexure and shear. Draw the reinforcement details.
Material- Concrete of grade M20, Fe 500 reinforcement. **[16]**

OR

Q8) Design a continuous beam ABCD for flexure only using IS Code coefficients. AB=BC=CD=3.8 m. The beam supports 110 mm slab on both sides. The beam carries dead load of 16 kN/m (including its self-weight) and live load of 14 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 5.5 m, size 300 mm × 550 mm with effective cover 40 mm is subjected to following actions:

I. Factored BM = l25kN.m

II. Factored SF = 60 kN

III. Factored Torsional Moment = 55 kN

Design the beam for flexure and shear using M 25 & Fe 500 grade materials. **[16]**

OR

Q10) Design an axially loaded short column to carry a working load of 850 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 for flexure and one way shear. Take SBC = 210 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 Fe4l5 to carry a working load of 800 KN. Working moments of 120 kN-m about major axis bisecting the depth of column and 75 kN-m about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.8 m and 3.5 m. 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

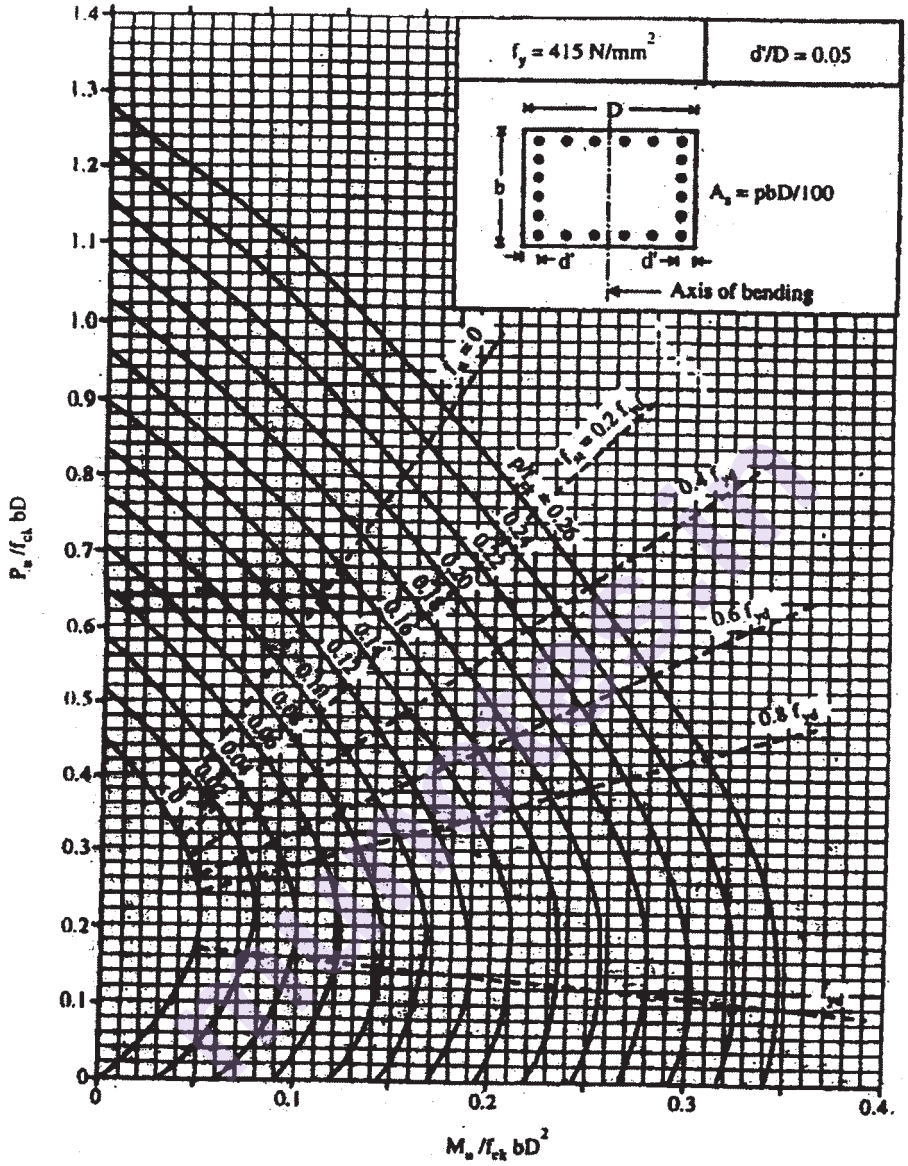


Chart 5

Chart 6 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

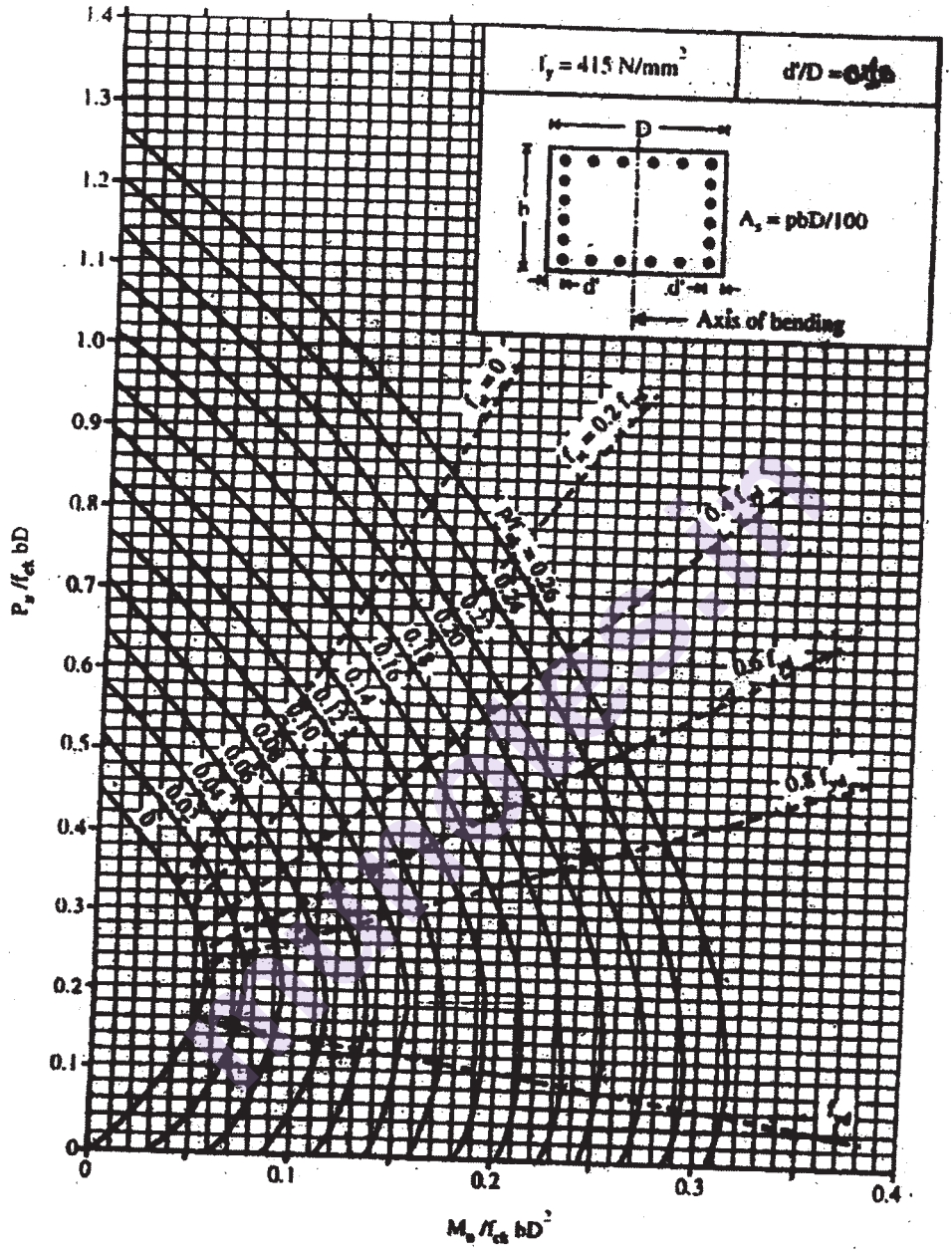
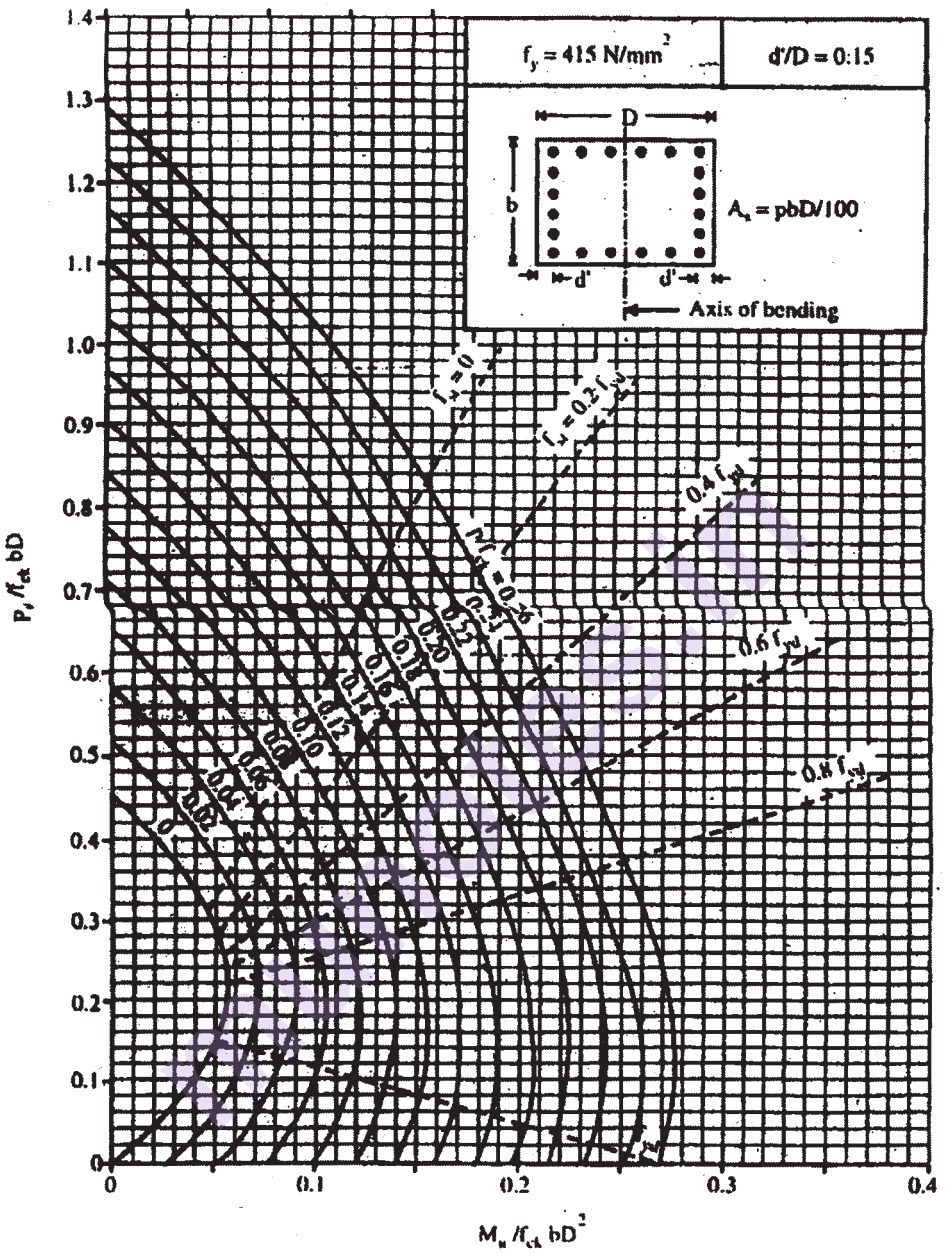


Chart 6

Chart 7 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides



Total No. of Questions : 10]

SEAT No. :

P1693

[Total No. of Pages : 3

[5460]-510
T.E. (Civil Engg.)
ENVIRONMENTAL ENGINEERING - I
(2015 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 diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) A sample of air is analyzed at 25°c and 760 mm of Hg pressure. Find the concentration of following pollutant in ppm: **[6]**

i) SO_2=l50 µg/m^3

ii) NO_2= 85 µg/m^3

iii) CO =7.85 µg/m^3.

b) Discuss classification and effects of solid waste. **[4]**

OR

Q2) a) Why water supply scheme is necessary? Explain various phases involved in water supply scheme. **[6]**

b) Write in tabular form the titrant, indicator and colour change at the end point for determination of alkalinity, hardness and chloride in laboratory.**[4]**

Q3) a) Explain in detail fire demand with various formulae used for calculating water quantity for firefighting purpose. **[6]**

b) What do you mean by MPN? Explain in detail. **[4]**

OR

P.T.O.

Q4) a) Prove that theoretically, the surface loading and not the depth of water is a measure of effective removal of particles in a sedimentation tank. **[6]**

b) How is quality of water decided? Enlist important tests that are carried out in laboratory under each category. **[4]**

Q5) a) Mention the factors on which the dose of coagulant depends? Explain how the optimum coagulant dose is determined? **[8]**

b) Draw a neat sketch of under drainage system and discuss design criteria for the design of under drainage system. **[8]**

OR

Q6) a) The population of a town is one lakh and the average per capita demand is 135 lpcd. Design the coagulation cum sedimentation tank for the waterworks, supplying water to the town. The maximum demand may be taken as l.5 times the average demand. Assume detention time 5 hours & 30 minutes for settling. Also assume that flow rate as 900 liter/hrs/m^2 of plan area. **[8]**

b) Draw a neat sketch of pressure filter and explain its working. **[8]**

Q7) a) Explain with neat sketch electro dialysis process for treatment of saline water. **[6]**

b) Water analysis shows the following results:
Free CO_2 = 3 ppm, alkalinity = 65 mg/1, non-carbonate hardness = 90 mg/1, total magnesium= 10 mg/1. Assume that it is possible to remove all but 30 mg/1 of carbonate hardness with lime and that the finished water is to have total hardness of 80 ppm. Determine the amount of chemicals required per million liter of water. **[10]**

OR

Q8) a) Write in tabular form the advantages and disadvantages of Clark process and Base Exchange process. **[8]**

b) Explain freezing and solar evaporation methods for desalination of water. **[8]**

Q9) a) What are the requirements of good distribution system? Explain any one distribution system with a neat sketch. **[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]**

OR

Q10) a) What is balancing storage? Explain various methods to calculate balancing storage. **[9]**

b) The design demand of a town is four million liter per day. Water is pumped into an elevated service reservoir from 5 am to 1 pm. The supply to the town is from 5 am to 10 am and 5 pm to 10 pm at uniform rate. Design the balance capacity of the reservoir by analytical method. **[9]**

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Total No. of Questions : 10]

SEAT No. :

P1694

[Total No. of Pages : 4

[5460]-511
T.E. (Mechanical Engg.)
DESIGN OF MACHINE ELEMENTS - I
(2015 Pattern)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer five questions from the following.***
2) ***Draw neat labelled 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) Draw neat sketches of three types of levers depending upon the position of effort point, load point and the fulcrum. Mention the applications of each. **[4]**

b) Two rods made of plain carbon steel are to be connected by means of cotter joint. Each rod diameter is 55 mm and the cotter is made from a steel plate of 20 mm thickness. Calculate the dimensions of socket end if the permissible tensile & permissible compressive stresses are 65MPa and 130 MPa respectively. The permissible shear stress is 32 MPa. The factor of safety for the joint is 3. **[6]**

OR

Q2) a) A rigid coupling is used to transmit 25kW power at 815 rpm. There are six bolts and the pitch circle of the bolts is 135 mm. The bolts are made of plain carbon steel of yield strength of 400 MPa and the factor of safety is 2.5. Assuming that bolts are finger tight and reamed in ground holes evaluate the diameter of bolts. **[6]**

b) Considering the torque transmitting capacity, arrange the following keys in chronological order ranging from low torque transmission to high torque transmission. The keys are Sunk, hollow saddle and flat saddle keys. State the reason for chronological arrangement. **[4]**

P.T.O.

Q3) a) Draw neat labelled sketches for stress-time relationships for mathematical models of i) Alternating stresses ii) Repeated stresses iii) Reversed stresses. Explain the notations used. **[4]**

b) A solid machine shaft 50mm in diameter transmits a torsional moment of 1200 N-m. A square key is used whose one side is equal to $l/4^{th}$ the shaft diameter and length is 1.5 times the shaft diameter. Evaluate the key dimensions and check the key for its induced shear and crushing stresses. Obtain the factor of safety for key in shear and crushing when yield stresses in shearing and crushing are $350N/mm^2$ and $425\ N/mm^2$ respectively. **[6]**

OR

Q4) A forged steel bar; 45mm diameter is subjected to a reversed bending stress of $300N/mm^2$. The ultimate tensile strength of the steel material is 600MPa. Calculate the life of bar for a reliability of 90%. Use surface finish factor as 0.45, temperature factor as 0.25. **[10]**

Q5) a) Enlist any four applications of ball bearing screw. **[4]**

b) The lead Screw of lathe has single start I.S.O metric trapezoidal threads of 50mm nominal diameter and 6 mm Pitch. The screw is required to exert an axial force of 2kN in order to drive the tool carriage during turning operation. The thrust is carried out on a collar of 100 mm outer diameter and 60 mm inner diameter. The values of coefficient of friction at thread surface and collar surface is 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate **[12]**

i) Power required to drive the lead screw

ii) Efficiency of Screw

OR

Q6) a) What is the fundamental difference between the force acting on square and trapezoidal threads, explain with neat sketch? For trapezoidal threads, what will be the effective coefficient of friction? **[4]**

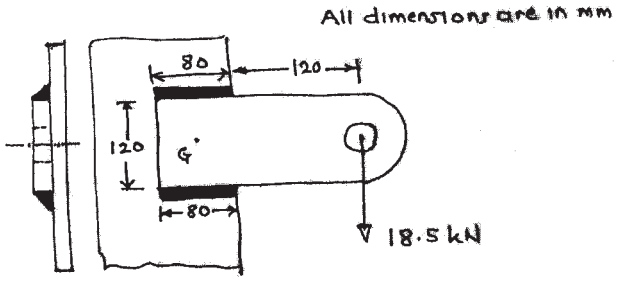
b) The nominal diameter of triple threaded screw is 60 mm while the pitch is 8mm. The screw is used to raise a load of 15 kN. It is used with collar having outer diameter 100 mm and inner diameter 65 mm. The coefficient of friction at thread surface & collar surface is 0.15. Assuming uniform Pressure theory for collar friction determine **[12]**

i) Torque required to lift the load

ii) Torque required to lower the load

iii) Force required lifting the load if it is applied at a radius of 600mm

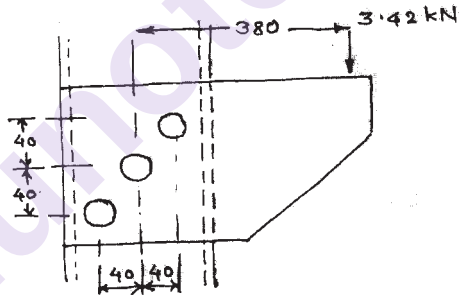
Q7) a) A welded connection as shown in figure is subjected to an eccentric force of 18.5 kN. Determine the size of the weld, if the permissible shear stress in the weld is limited to 90 MPa. Assume static condition. **[12]**



b) For a gear box assembly, a steel eye bolt is provided for lifting and transportation on shop floor. The bolted joint is subjected to tensile force P. Derive an equation for height of nut in this bolted assembly if 'd' is nominal diameter, 'd_c' is core diameter of bolt and 'h' is height of nut. **[6]**

OR

Q8) a) A steel plate subjected to a force of 3.42 kN and fixed to a channel by means of three identical bolts as shown in the figure. The bolts are made of plain carbon steel having yield strength of 450 MPa. If the factor of safety is 2.5, calculate the size of bolts. **[12]**



b) A shaft of circular cross-section is welded to the plate by means of circumferential fillet weld. The shaft is subjected to the torsional moment 'M_t' which induces the torsional shear stresses in the weld. Derive an expression for torsional shear stresses induced in the circumferential weld. Assume shaft diameter as 'd'. **[6]**

Q9) a) Name and draw the neat labelled sketch of suspension spring used trucks. **[4]**

b) It is required to design a helical compression spring for the valve mechanism. The axial force acting on the spring is 300 N when the valve is open and 150 N when the valve is closed. The length of the spring is

30 mm when the valve is open and 35 mm when the valve is closed. The spring index is 6. The spring is made of cold-drawn steel wire with ultimate tensile strength of 1400 N/mm^2. The permissible shear stress for spring wire should be taken as 30% of the ultimate tensile strength. The modulus of rigidity is 81370 N/mm^2. Design the spring and calculate:

i) Wire diameter
ii) Mean coil diameter
iii) Number of active coils
iv) Total number of coils
v) Free length of the spring and
vi) Pitch of the coil

Assume that total clearance is 15% of the deflection under the maximum load. **[12]**

OR

Q10) a) A helical compression spring is used to absorb the shocks. The initial compression of the spring is 30 mm and it is further compressed by 50 mm while absorbing the shock. The spring is to absorb 250 J of energy during the process. The spring index can be taken 6. The spring is made of cold drawn steel wire with ultimate tensile strength of 1100 N/mm^2. The permissible shear stress for the spring wire should be taken as 50 % of the ultimate tensile strength. The modulus of rigidity is 81370 N/mm^2. Design the spring and calculate: **[12]**

i) Wire diameter
ii) Mean coil diameter
iii) Number of active coils
iv) Total number of coils
v) Free length of spring; and
vi) Pitch of the coils

Assume that the total clearance is 15% of the deflection under the maximum load.

b) What is surge in springs? Enlist methods to avoid surge in springs. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1695

[Total No. of Pages : 4

[5460]-512
T.E. (Mech./Auto./Mech.-Sandwich)
HEAT TRANSFER
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10.***
2) ***Assume suitable data whenever necessary.***
3) ***Use of non-programmable pocket calculator is allowed.***
4) ***Draw neat diagram whenever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) Write down the three dimensional heat conduction equations only with standard notation in Cylindrical and Spherical coordinates. **[4]**

b) The roof of an electrically heated home is 6 m long, 8 m wide and 0.25 m thick and is made of a flat layer of concrete whose thermal conductivity is k = 0.8 W/m-K. The temperature of the inner and the outer surface of the roof on one night are measured to be 15°C and 4°C, respectively for a period of 10 hours. Determine **[6]**

i) The rate of heat loss through the roof that night and

ii) The cost of the heat lost to the home owner if the cost of electricity is ₹ 8.63/ kWh.

OR

Q2) a) What are the different types of insulators. **[4]**

b) A 2 m long and 0.3 cm diameter electric wire extends across a room at 15 °C. Heat is generated in the wire as a result of resistance heating and surface temperature of wire is measured to be 152 °C in steady operation. Also the voltage drop and electric current through the wire are measured to be 60 V and 1.5 A, respectively. Disregarding any heat transfer by radiation, determine the convection heat transfer coefficient for heat transfer between the outer surface of the wire and the air in the room. **[6]**

P.T.O.

Q3) a) Plane wall exposed to convection environment on its sides, with heat generation, write down boundary conditions. **[2]**

b) A 15 mm diameter mild steel sphere (k = 42 W/m °C) is exposed to cooling air flow at 20 °C resulting in the convective coefficient h = 120 W/m^2 °C. Determine the following-

i) Time required for cooling the sphere from 550°C to 90°C.

ii) Instantaneous heat transfer rate 2 min. after the start of cooling

iii) Total energy transferred from the sphere during the first 2 min.

For mild steel take: Density = 7850 kg/m^3, Specific Heat = 475 J/kg °C, Thermal Diffusivity = 0.045 m^2/h **[8]**

OR

Q4) a) What is a time constant? **[2]**

b) A centrifugal pump which circulates hot liquid metal at 500 °C is driven by electric motor; the motor is coupled to the pump impeller by horizontal steel shaft 25 mm in diameter. The temperature of the motor is limited to maximum value 60 °C with ambient air 25 °C. What length of the shaft should be specified between motor and the pump? The thermal conductivity of shaft material is 35 W/mK and convective film coefficient between steel shaft and air is 15.7 W/m^{2}K. Consider the steel shaft as fin with insulated end. **[8]**

Q5) a) Explain in detail the velocity boundary layer and thermal boundary layer. **[6]**

b) Air at 2 bar and 200 °C is heated as it flows through a tube with a diameter of 25.4 mm at a velocity of 10 m/s. Calculate the heat transfer per unit length of the tube, if a constant heat flux condition is maintained at the wall and the wall temperature is 20 °C above the air temperature, all along the length of the tube. How much would the bulk temperature increase over 3 m length of the tube?

Properties of Air at temperature at 200 °C:

ρ = 1.493 kg/m^3

C_p = 1.025 kJ/kg.K, k_f = 0.0386 W/m.K,

μ = 2.57× 10^{-5} Ns/m^2, Pr = 0.681

Use the co relation **Ave. Nu = 0.023.Re$^{0.8}$. Pr$^{0.4}$** **[10]**

OR

Q6) a) What are the differences between natural and force convection? Give examples. **[6]**

b) A nuclear reactor with its core constructed of parallel vertical plates 2.2 m high and 1.4 m wide has been designed on free convection heating of liquid bismuth. The maximum temperature of the plate surface is limited to 960 °C while the lowest allowable temperature of bismuth is 340 °C. Calculate the maximum possible heat dissipation from both sides of each plate.

For the convection coefficient, the approximate co relation is,

$\mathbf{Nu = 0.13\ (Gr.\ Pr)^{0.333}}$

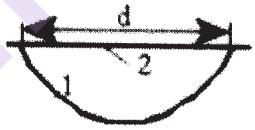
Where, different parameters are evaluated at the mean film temperature with standard notation.

$\rho = 10^4$ kg/m^3, $\mu = 3.12$ kg/m-h, $C_p = 150.7$ J/kg.K, $k = 13.02$ W/m.K, **[10]**

Q7) a) What is a solid angle? Explain with diagram. **[6]**

b) Define Kirchhoff's law and prove that when the black body is thermally equilibrium with the surrounding its emissivity is equal to absorptivity. **[4]**

c) Find the shape factor with respect to itself in given figure below. Assume surface 1 is a hemispherical cavity. **[6]**



OR

Q8) a) Define gray body? **[2]**

b) What are properties of view factor? **[6]**

c) Two large parallel planes with emissivity 0.6 are at 900 K and 300 K. A radiation shield with side polished and having emissivity of 0.05, while emissivity of other side is 0.4 is proposed to be used. Which side of the shield to face the hotter plane, if the temperature of the shield is kept to be minimum? Justify your answer. **[8]**

Q9) a) For counter flow heat exchanger prove that,

$LMTD = (\Delta T_1 - \Delta T_2) / \ln (\Delta T_1 / \Delta T_2)$

With standard notation. **[8]**

b) In a shell and tube heat Exchanger, tubes are 4 m long, 3,1 cm O.D. and 2.7 cm I.D. Water is heated from 22 ºC to 45 ºC by condensing steam at 100 ºC on the outsides of the tubes. Water flow rate through the tubes is 10 kg/s. Heat transfer coefficient on steam side is 5500 W/m^2K and water side is 850 W/m^2K. Neglect material resistance as well as fouling resistance, don't consider the correction factor. Find the number of tubes. **[10]**

OR

Q10) a) Explain in detail the pool boiling curve. **[6]**

b) Differentiate between film wise and drop wise condensation **[4]**

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

i) Heat Pipe.

ii) Electronic Cooling system.

Total No. of Questions : 10]

SEAT No. :

P1696

[Total No. of Pages : 3

[5460]-513

T.E. (Mechanical & Automobile Engg.)

THEORY OF MACHINES - II

(2015 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, Q7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Use of electronic non programmable calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) State and prove the law of gearing. **[4]**

b) Two spiral Gear A and B have 45 and 15 teeth at spiral angles 20° and 50° respectively. Both wheels are of same hand. A is 15cm in diameter. Find the distance between shaft and the angle between shafts. If the teeth are 20° involute form and coefficient of friction 0.08, find the efficiency of gear. **[6]**

OR

Q2) a) Derive the relation for virtual number of teeth of helical gear. **[4]**

b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gear in involute with 20° pressure angle, 12mm module and addendum 10mm. **[6]**

- Find the Length of Path of Contact
- Arc of Contact
- Contact ratio

Q3) a) An Epicyclic gear train consists of Sun wheel S, a Stationary internal Gear E and identical wheels P carried on a Star shaped planet carries C. The sizes of different tooth wheels are such that the planet carries C-rotates at $1/5^{th}$ of speed of Sun wheel S. The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100 N-m determine **[8]**

i) Number of teeth on different wheels of train.

ii) Torque necessary to keep the internal gear stationary.

P.T.O.

b) Define for spur gear **[2]**

i) Pressure angle

ii) Module

OR

Q4) a) An epicyclic gear train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is wheel B, which drives wheel D through an idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolved clockwise at 200 rpm about the axis of A and D. If the wheels B and D have 25 and 40 teeth respectively. Find **[8]**

i) The no. teeth on C.

ii) Speed and sense of rotation of C. Also sketch the arrangement.

b) Define following terms : **[2]**

i) Helix angle

ii) Normal circular pitch

Q5) a) What is a Cam jump phenomenon? How cam jump can be minimizing? **[4]**

b) Draw the profile for the disc cam having offset 15 mm to the right side of centre of the cam shaft. The base circle Diameter is 75 mm and the Diameter of roller is 10 mm. The follower is move outward a distance with S.H.M. in 140° of the cam rotation to dwell for 40° of cam rotation to move inward with 150° of cam rotation with Uniform acceleration and retardation. Calculate the Maximum velocity and acceleration of the follower during outstroke if the cam shaft rotates at 90 r.p.m. Assume total lift of follower is 40mm. **[12]**

OR

Q6) a) Construct cam profile for knife edge follower with offset to right by 15 mm. Minimum radius of the cam = 30 mm, Stroke of the follower = 24 mm, Angle of rise = 90°, Dwell after rise = 60°, Angle of return =120°, Dwell after return for the rest of period. Follower to move outwords with uniform velocity and return back with SHM. The cam is to rotate in clockwise direction. **[10]**

b) Derive the expression for displacement, velocity and acceleration for 3-4-5 Polynomial D-R-D cam. **[6]**

Q7) a) Explain with the help of neat sketch Precision position and structural error. **[6]**

b) Determine the Chebyshev spacing for function $y = x^{1.3}$ for the range $0 \leq \times \leq 3$ where three precision points are required. For these precision points, determine $\theta_1, \theta_2, \theta_3$ & ϕ_1, ϕ_2, ϕ_3 if $\Delta\theta = 40^\circ$ & $\Delta\phi = 90^\circ$. **[10]**

OR

Q8) a) Find the three precision points in the interval of 40° to 120° by using graphical method of Chebyshev spacing. **[6]**

b) Design a four bar mechanism with input link L_2, coupler link L_3 & output link L_4. Angles θ & ϕ for 3 successive positions are given below. **[10]**

Position	1	2	3
θ	40°	55°	70°
ϕ	50°	60°	75°

If grounded link L_1 = 30mm using Frudenstein's equation, find out lengths of other links to satisfy given positional conditions.

Q9) a) The turbine rotor of a ship is of mass 3500kg. It has a radius of gyration of 0.45m & a speed of 3000 rpm, clockwise when looking from stern. Determine the gyroscopic couple & its effect upon the ship. **[10]**

i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36km/h.

ii) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds & total angular displacement between two extreme positions of pitching is 120°.

b) Explain with the neat sketch continuous & infinite variable transmission. **[8]**

OR

Q10) a) The propeller of aero weighs 500N & has radius of gyration of 0.8m. The propeller shaft rotates at 2000 rpm, clockwise, as view from tail end. The plane turns left, making a U-turn, i.e, through 180°, of 120 m radius, at a speed of 360km/h, determine the gyroscopic couple and its effect on aircraft. Also find the reactions on bearings if the distance between two bearings of the propeller is 0.75m. **[10]**

b) Explain PIV chain drive & also write any four advantages of stepless drives. **[8]**

Total No. of Questions : 9]

SEAT No. :

P1697

[Total No. of Pages : 3

[5460]-514

T.E. (Mechanical Engg.)

METROLOGY AND QUALITY CONTROL

(2015 Pattern)

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.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of calculator is allowed.***
5) ***Figure to right indicate full marks.***

Q1) a) Differentiate between Precision & Accuracy with suitable examples. **[5]**

b) Determine the tolerance on hole and shaft for a precision running fit designated by 40H7g6. 40 mm lies in the diameter step of 30-50 mm. $i = 0.45 (D)^{1/3} + 0.001 D$ microns. Fundamental deviation of g shaft $= -2.5D^{0.34}$ State the actual maximum and minimum size of both hole and shaft. IT7 = 16i, IT6 = 10i. **[5]**

OR

Q2) a) Explain any one method of assessing the surface finish. **[5]**

b) Explain tool makers microscope & their application. **[5]**

Q3) a) Explain laser interferometer & its application. **[5]**

b) Write short note on machine vision system. **[5]**

OR

Q4) a) State & explain Taylor's principle of gauge design with example. **[5]**

b) Explain method of measuring effective diameter using two wires with neat sketch. **[5]**

P.T.O.

Q5) a) Explain Jurans triology approach with diagram. **[8]**

b) State seven new quality tools. Explain any three in detail. **[8]**

OR

Q6) a) What is cost of quality? Explain Cost of failure, Cost of appraisal & Cost of prevention. **[8]**

b) What is initial planning for quality? Explain in details. **[8]**

Q7) a) What are advantages of sampling inspection over 100% inspection? Explain the difference between Single sampling & Double sampling plan. **[8]**

b) Following is the record for successive lots of part being produced by plastic molding press. As each lot is come off the line a random sample of 150 pieces were inspected (results are expressed to the nearest 0.1%).Calculate $\bar{p}$, Control limits & plot control chart and comment. **[8]**

Lot no.	Sample size	No. of defectives
1	150	4
2	150	8
3	150	2
4	150	4
5	150	4
6	150	6
7	150	10
8	150	4
9	150	6
10	150	8

OR

Q8) a) Write short note on OC curve & its characteristics. **[8]**

b) Explain single sampling plan with flow chart. For the given data calculate sample size and AOQ for single sampling plan. **[8]**

i) Probability of acceptance for 0.3% defectives in a lot is 0.558

ii) Lot size N = 10000 units

iii) np' = 1.5

iv) Acceptance number c = 1

v) Defectives found in the sample are not to be replaced.

Q9) Write short note on (Any three) : **[18]**

a) 5S

b) Zero defects

c) FMECA

d) TS-16949

e) Quality Audit.

Total No. of Questions : 10]

SEAT No. :

P3650

[Total No. of Pages : 4

[5460]-515

T.E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING

(2015 Pattern)

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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain importance of refrigeration in dairy industry. **[5]**

b) What is the selection criteria for environment friendly refrigerants? Explain with suitable example. **[5]**

OR

Q2) a) What are the LCCP components? Discuss the methodology for calculating LCCP. **[6]**

b) Explain the design features of an air conditioning system for hospitals. **[4]**

Q3) a) Compare use of individual expansion vs multiple expansion valve. **[4]**

b) Explain Recovery, Recycle and Recharge of refrigerant. **[6]**

OR

Q4) a) 100 TR refrigerant system used for cold storage with ammonia as refrigerant. Evaporation temperature is –20°C and condensing temperature is 30°C. Find theoretical COP of refrigeration system and power input if there is 10°C subcooling and 5°C superheat. **[5]**

b) Explain Linde-Hampson cycle with neat diagram. **[5]**

Q5) a) Explain procedure of heat load calculation. **[8]**

b) Write note on: i) IAQ ii) ASHRAE Comfort chart **[8]**

OR

P.T.O.

Q6) a) Explain: SHF, RSHF, ESHF and EHSF. **[8]**

b) 100 cmm air stream at 30°C DBT and 24°C WBT is passed over cooling coil. If coil capacity is 50kW, **[8]**

i) Find air properties at coil exit and moisture removal rate if coil ADP = 15°C

ii) If coil capacity reduced by 20%, Find air properties at coil exit & moisture removal rate, if coil ADP is same.

Q7) a) With neat schematic explain variable refrigerant flow system. Explain its pros and cons over VAV system. **[8]**

b) Discuss various types of refrigerant condensers. What is their selection criteria? **[8]**

OR

Q8) a) Draw neat diagram of TXV and explain its working. **[6]**

b) Draw the neat diagram of flooded evaporator. Explain its working stating advantages and limitations. Compare it with DX type evaporator. **[10]**

Q9) a) Explain friction and dynamic pressure losses in ducting. **[6]**

b) A circular duct of 400 mm is selected to carry air at a velocity 440 m/min. If duct is replaced by rectangular duct of aspect ratio 1.5, find the size of rectangular duct for equal friction when: **[6]**

i) Velocity in two ducts is same

ii) Discharge in two ducts is same

If f = 0.015, find the pressure loss per 100 m length of duct.

Take density of air = 1.15 kg/m^2.

c) Explain working of humidity sensor. **[6]**

OR

Q10)a) With neat diagram explain working of AHU. **[6]**

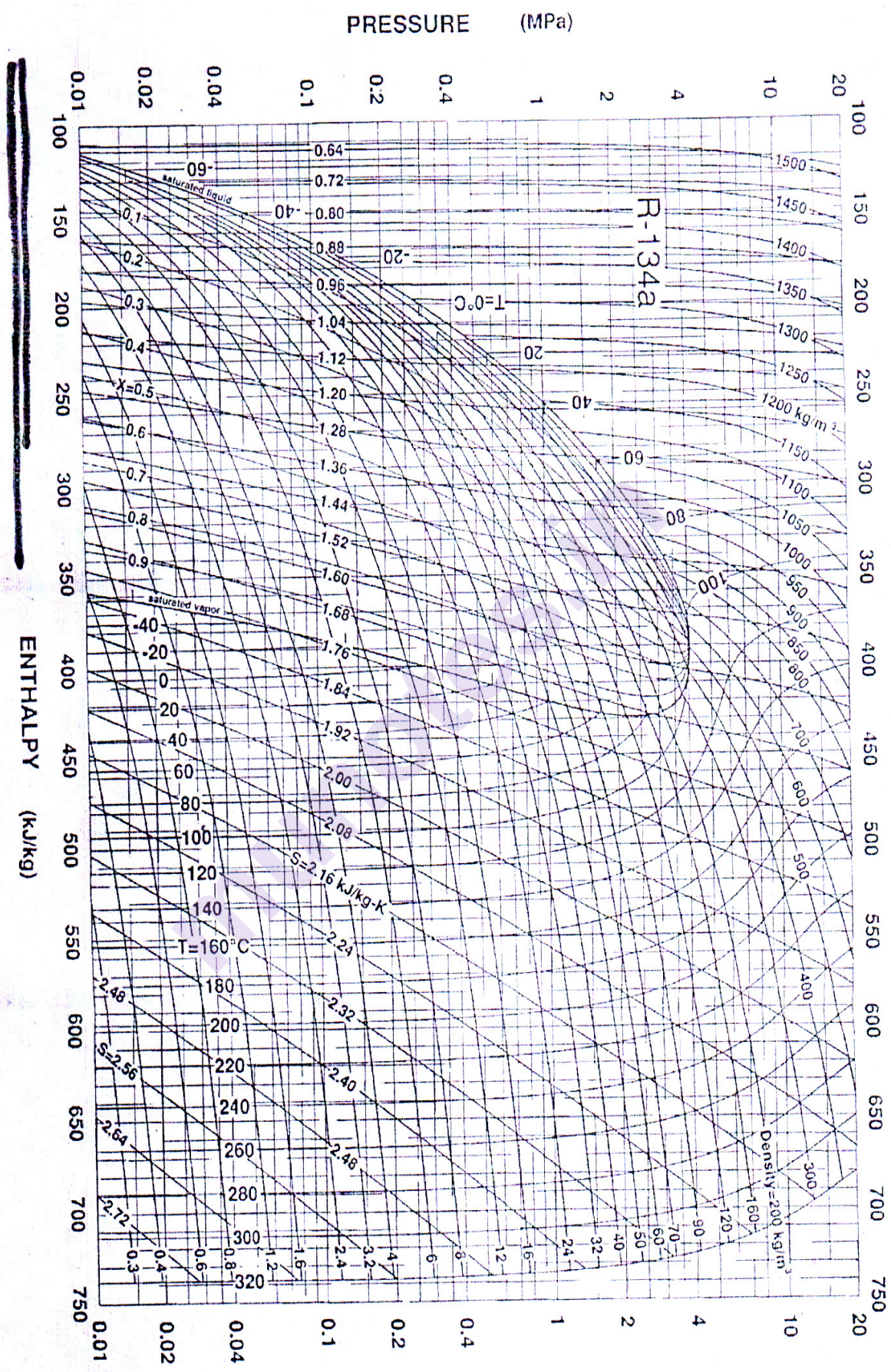
b) Explain static regain method of duct design. **[6]**

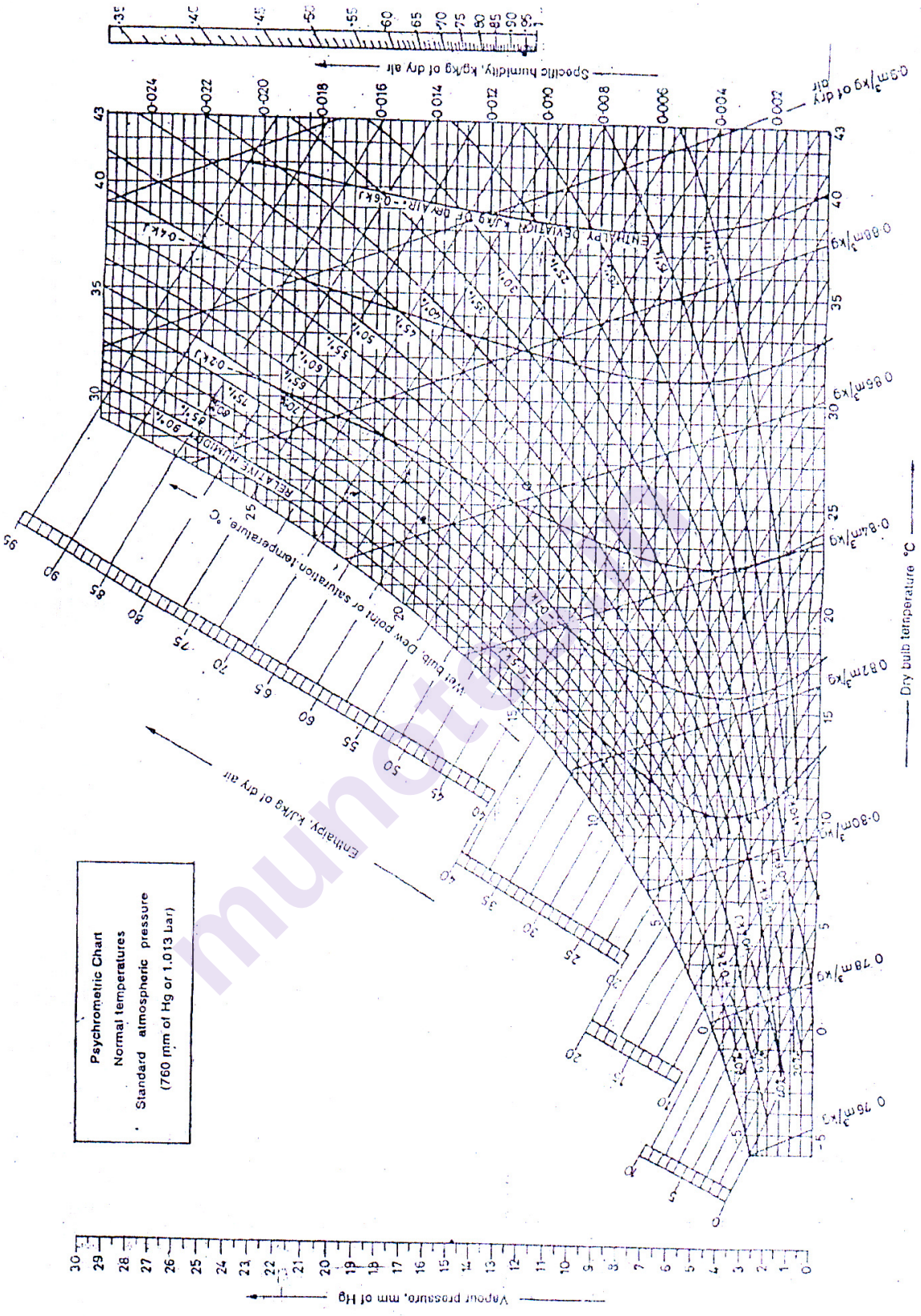
c) Explain design consideration of duct system with respect to the followings. **[6]**

i) Duct Insulation

ii) Duct System Leakage

iii) System and Duct Noise


PRESSURE (MPa)
ENTHALPY (kJ/kg)
R-134a
saturated liquid
saturated vapor
X=0.5
T=0°C
T=160°C
S=2.16 kJ/kg-K
S=2.56
Density=200 kg/m³
1200 kg/m³


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

Total No. of Questions : 12]

SEAT No. :

P1698

[Total No. of Pages : 3

[5460]-516

T.E. (Mechanical/Automobile)

NUMERICAL METHODS & OPTIMIZATION

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8, Q9 or Q10 and Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Explain the convergence and divergence of Successive Iterative method with graphical representation. **[6]**

OR

Q2) Solve by Bisection method $3x = \cos x + 1$ correct up to three decimal places.

Q3) Solve the following equation by Gauss Elimination method, with partial pivoting. **[6]**

$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

OR

Q4) Solve the following simultaneous equations using Tridiagonal Matrix Algorithm (TDMA).

$5x_1 - x_2 = 5.5$

$-x_1 + 5x_2 - x_3 = 5$

$-x_2 + 5x_3 - x_4 = 11.5$

$-x_4 + 5x_4 = 16.5$

P.T.O.

Q5) Solve the following problem of LPP. **[8]**

Maximize $Z = 2X_1 + X_2$

Subject to, $X_1 + 2X_2 \leq 10$

$X_1 - X_2 \leq 2$

$X_1 + X_2 \leq 6$

$X_1 - 2X_2 \leq 1$

$X_1, X_2 \geq 0$

OR

Q6) Write a short note on Simulated Annealing with flowchart and applications in detail.

Q7) a) Solve the second order differential equation $y'' = xy'^2 - y^2$ for $x = 0.2$ correct to 4 decimal places. Initial conditions are $x = 0$, $y = 1$, $y' = 0$, by Runge Kutta 2nd order. **[10]**

b) Draw flow chart for Eulers Method for given no of iterations. **[8]**

OR

Q8) a) Solve the $u_t = u_{xx}$ subjected to $u(0, t) = u(1, t) = 0$ $u(x, 0) = \sin\pi x, 0 \leq x \leq 1$, using Bender Smichdt method taking $h = 1$ **[10]**

b) Draw flow chart for Solution of Ordinary Differential Equation by Runge Kutta 4th order. **[8]**

Q9) a) An experimental data on life time 't' of a cutting tool at a different cutting speeds 'v' is given below : **[8]**

Speed v	325	375	450	475	500
Life t	75	30	10	7	5

Fit the curve of the form $v = at^b$

b) From the tabulated values of x and y given below prepare forward difference table. Find the polynomial passing through the points and Estimate the value of y when $x = 1.5$. **[8]**

x	0	2	4	6
y	5	29	125	341

OR

Q10) a) Fit a straight line passing through the points : **[8]**

X	1	2	5	7
Y	1	12	117	317

b) Draw the flowchart for $y = ax^b$ **[8]**

Q11) a) Find double integration of $f(x) = x + y + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Use Trapezoidal rule. **[8]**

b) The velocity of car running on a straight road at the interval of 2 minutes is given below : **[8]**

Time (min)	0	2	4	6	8	10	12
Velocity (Km/hr)	0	22	30	27	18	7	0

Find the distance covered by the car using Simpson's 1/3rd rule.

OR

Q12) a) Draw combine flow chart for Simpson's 3/8th rule & Simpson's 1/3rd rule. **[8]**

b) Evaluate $I = \int_0^{0.8} [\log_e(x+1) + \sin 2x]\,dx$ by using Gauss quadrate two point formula. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1699

[Total No. of Pages : 5

[5460]-517

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS - II

(2015 Pattern)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Five questions from following.***
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 permitted.***
6) ***Assume suitable data if necessary.***

Q1) a) Derive beam strength equation for straight bevel Gear. **[4]**

b) Design a pair of spur gear with 20° full-depth involute teeth based on Lewis Equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is to be connected to 5.29 kW, 1450 rpm motor. The service factor 1.75. The pinion as well as gear is made of plain carbon steel 40C8 (S_{ut} = 600 N/mm^2). The factor of safety as 1.5. The module 3 mm and face width 40 mm, the gears are heat treated to a surface hardness 400 BHN. Determine Beam strength, Wear strength, and maximum static load that the gear can transmit. **[6]**

Use following data :

i) Lewis form factor, $Y = 0.484 - \frac{2.87}{Z}$

ii) Velocity factor $C_V = \frac{3}{3+V}$

iii) Number of teeth on pinion: 20

iv) Number of teeth on gear: 41

OR

Q2) a) A helical gear pair with 20° full depth involute tooth profile consist of 18 teeth pinion meshing with 36 teeth gear. The pinion and gear is made of steel with ultimate tensile strength 600 N/mm^2, the module is 5 mm while the face width is 10 × module while helix angle 23°. The surface hardness of pinion & gear is 280 BHN. **[4]**

Calculate :

i) Beam strength

ii) Wear strength

Use following Data :

- Factor of safety – 2
- Pinion speed – 1440 rpm
- Lewis form factor – Y = 0.484 – 2.87/Z
- Velocity factor – $V = \frac{5.6}{5.6 + \sqrt{V}}$

b) Explain: Gear tooth failures and their remedies. **[6]**

Q3) a) Draw the free body diagram for components of tooth forces when pinion rotates in clockwise direction when seen from left. Assume pinion having right hand teeth and is below the gear. **[4]**

b) With neat sketch explain designation of rolling contact bearing. **[6]**

OR

Q4) a) Differentiate beween straight bevel with hypoid bevel gear. **[4]**

b) A cylindrical roller bearing is subjected to a radial load of 5000N. The expected life of bearing with 90% reliability is 15000 hrs. The application factor is 1.5. If shaft rotates at 1440 rpm calculate dynamic rating of bearing. Assume radial load factor unity. **[6]**

Q5) a) Write short note on thermal considerations in worm gear. **[4]**

b) A pair of worm and worm wheel is designated as 1/30/10/10. Input speed of worm is 1200 rpm. The worm is made of centrifugally cast phosphor

bronze and worm is made of case harden carbon steel 14 C6. Determine input power rating based on **[12]**

i) Beam strength

ii) Wear strength

Assume following data.

Table - I

Worm	**Worm wheel**
Speed factor strength 0.25 at 1200 rpm	Speed factor strength - 0.48 at 40 rpm
Bending Stress factor - 28.2	Bending Stress factor - 7
Speed factor for Wear - 0.112	Speed factor for Wear - 0.26
Surface stress factor - 4.93	Surface stress factor - 1.55
Zone factor - 1.143	

OR

Q6) a) Explain why in design of worm gear, worm gear governs the design. Also explain single enveloping & double enveloping worm gear with sketch. **[7]**

b) A pair of worm gear designated as 2/52/10/4 transmit 10 kW power at 720 rpm supplied to worm shaft. The coefficient of friction is 0.04 and pressure angle is 20°. Assume worm is above the worm gear and rotates clockwise direction when viewed from left. If worm is left hand, determine and show by neat sketch also calculate component of tooth forces acting on worm and worm gear and efficiency of worm gear. **[9]**

Q7) a) Three V-belts are to be used to transmit a power from an electric motor running at 2800 rpm to a machine at 700 rpm. The centre distance between input and output shaft is 800 mm. The sheave groove angle is 38° and the coefficient of friction between the belt and sheave is 0.5. The density of belt material is 1100 kg/m^3 and allowable tensile stress for the belt material is 1.75 N/mm^2. If the cross sectional area of each belt is 600 mm^2, determine **[12]**

i) The Pulley pitch diameter

ii) Maximum power the belt can transmit

iii) The required initial tension in each belt

b) Explain the procedure for the selection of flat belt from manufacturer's catalogue. **[4]**

OR

Q8) a) Discuss stresses in wire rope. **[4]**

b) In chain drives the sprocket has odd number of teeth and chain has even number of links. Why? **[4]**

c) A fan running at 750 rpm is driven by an electric motor running at 1500 rpm through the 8mm × 225mm flat leather belt. The centre distance is 1400 mm. The coefficient of friction between the belt and pulley is 0.35 and belt mass is 950 kg per cubic meter. If the allowable tensile stress for the belt material is 2 N/mm^2 determine **[8]**

i) The tensions in belt

ii) Maximum power transmitting capacity of the belt

Q9) a) With neat sketch show the radial & axial pressure distribution in hydrodynamic journal bearing. **[6]**

b) State assumptions made in Petroffs equation. Derive Petroff's equation. **[8]**

c) Compare Hydrodynamic Bearing with Hydrostatic bearing. **[4]**

OR

Q10) a) Following data is given for 360° hydrodynamic bearing : **[10]**

- Radial load = 3 kN.
- Journal diameter = 50 mm
- Bearing length = 50 mm
- Journal speed = 1490 rpm
- Radial clearance = 50 microns
- Viscosity of lubricant = 23.4375cP

Calculate Minimum oil film thickness, coefficient of friction, power lost in friction and flow rate.

I/d	ho/c	ε	S	(r/c)f	Q/ren_sl	Qs/Q	P_{max}/P
1.0	0.2	0.8	0.0446	1.70	4.62	0.842	3.195
	0.4	0.6	0.121	3.22	4.33	0.680	2.409
	0.6	0.4	0.264	5.79	3.99	0.497	2.066
	0.8	0.2	0.631	12.8	3.59	0.280	1.890

b) Explain the significance of following variables in connection with hydrodynamic bearing : **[8]**

i) I/d ratio

ii) Unit bearing pressure

iii) Radial clearance

iv) Minimum oil film thickness

Total No. of Questions : 10]

SEAT No. :

P1700

[Total No. of Pages : 4

[5460]-518
T.E. (Mech.)
TURBO MACHINES
(2015 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) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Use of steam table is permitted.***
5) ***Assume data whenever necessary.***
6) ***Due credit will be given to neat figures wherever necessary.***

Q1) a) A jet has a direct impact on a series of flat plate vanes mounted over the periphery of a large wheel. Determine the force of impact and the work done per second. **[4]**

b) A pelton wheel has to develop 13250 kW under a net head of 800 m at a speed of 600 rpm. The coefficient of velocity for the jet is 0.97. The peripheral velocity is $0.46\sqrt{2gH.}$ The diameter of the jet is not to exceed one sixteenth the wheel diameter. Find the discharge, the wheel diameter, the jet diameter and the number of jets required. Assume the overall efficiency to be 85%. **[6]**

OR

Q2) a) What are surge tanks? What is the role of surge tank in hydro electric power plant? **[4]**

b) A jet of water discharges 140N per second at 40 m/s in the direction making 30° to the direction of a series of curved vanes moving at 17.50 m/s. If the outlet angle of the vane is 20°, determine : **[6]**

i) The inlet vane angle of the vanes so that there is no shock at entry.

ii) The direction of flow at outlet

iii) The work done per second

P.T.O.

Q3) a) A turbine was originally installed at the tail water level. If it is now proposed to place it above the tail water level without any decrease in head on the turbine, how this can be achieved? **[4]**

b) Find the main dimensions and blade angles for an inward flow reaction turbine to the following data:

Velocity of flow through runner is constant; Speed = 950 rpm; Head on the turbine = 105 m; Output = 800kW; Guide blade angle at inlet = 18°; Inner diameter = 0.6 Outer diameter; Hydraulic efficiency = 88%; Overall efficiency = 80%; Breadth at inlet = 0.10 times the inlet diameter; 6 % of the circumferential area of the runner is blocked by vane thickness; the turbine discharges radially at outlet. **[6]**

OR

Q4) a) What do you mean by characteristic curves of a turbine? Why these are important? **[4]**

b) A propeller turbine runner has an external diameter of 5 m and the diameter at hub is 2 m. The turbine has to develop a shaft power of 29430 kW under a head of 25 m at a speed of 160 rpm. If the hydraulic efficiency is 95% and the overall efficiency is 85%, determine the runner vane angles at inlet and outlet at mean diameter and at extreme edge of the runner. Assume that the turbine discharges without whirl at outlet. **[6]**

Q5) a) Explain the pressure compounded impulse turbine showing pressure and velocity variations along the axis of the turbine. **[6]**

b) In a single stage steam turbine saturated steam at 10 bar (absolute) is supplied through a convergent divergent steam nozzle. The nozzle angle is 20° and the mean blade speed is 400 m/s. The steam pressure leaving the nozzle is 1 bar (absolute). Find:

i) The best blade angles if the blades are equiangular

ii) The maximum power developed by the turbine if a number of nozzles used are 5 and the area at the throat of each nozzle is 0.6 cm^2.

Assume nozzle efficiency 88%, blade friction coefficient of 0.87 and index of expansion n = 1.4. Solve using graphical method. **[10]**

OR

Q6) a) Enumerate the energy losses in steam turbine. **[6]**

b) A 50% reaction turbine (with symmetrical velocity triangles) is running at 400 rpm has the exit angle of blades as 20° and the velocity of the steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is 1.381 m^3/kg. Calculate for the stage : **[10]**

i) A suitable blade height, assuming the rotor mean diameter 12 times the blade height.

ii) The diagram work.

Q7) a) Define maximum suction lift. State the expression to calculate it. What factors affect its values? **[6]**

b) The effective inlet and outlet radial area of flow of a centrifugal pump are respectively 645 cm^2 and 580 cm^2, the water entering with the radial velocity of 5.50 m/s. The impeller vanes are set back at an angle of 45° to the tangent at outlet. The outer peripheral velocity is 27.50 m/s and manometric efficiency is 80%. Assuming the losses of head due to friction are i) between suction flange and impeller inlet = 3.05 m ii) Through impeller = 4.80 m iii) between guide vanes and delivery flange = 1.52 m and that at the outlet velocity from the guides is two-fifths of the inlet velocity to them. Find 1) The loss of head due to friction in guides vanes. 2) The guide vane efficiency. **[12]**

OR

Q8) a) What is cavitation? Explain the phenomenon of cavitation. State some methods of eliminating or reducing cavitation. **[6]**

b) Show that the rise in the pressure in the impeller of a centrifugal pump is given by $\frac{1}{2g}\left[Vf_1^2 + u_2^2 - Vf_2^2 \cos ec^2\phi\right]$

A centrifugal pump has an impeller if internal diameter 125 mm and exit diameter 250 mm and rotates at 1800 rpm. The absolute velocity of water at inlet is radial and the vanes are bent back at an angle of 30° to the tangent at discharge. The breadth of the impeller at inlet and outlet are 12.5 mm and 6.25 mm respectively. Determine the rise in pressure head as water passes through the impeller neglecting losses. The discharge of the pump is 8.5 lit/sec. **[12]**

Q9) a) Describe axia1 flow compressor with velocity diagrams. **[6]**

b) A centrifugal compressor running at 10000 rpm delivers 660 m^3/min of free air. The air is compressed from 1 bar and 20°C to a pressure ratio of 4 with an isentropic efficiency of 82%. Blades are radial at outlet of the impeller and the flow velocity of 62 m/s may be assumed throughout constant. The outer radius of the impeller is twice the inner and the slip factor may be assumed as 0.9. The blade area coefficient is 0.9 at inlet.

Calculate : **[10]**

i) Final Temperature of the air

ii) Theoretical power

iii) Impeller diameter at inlet and outlet

iv) Impeller blade angle at inlet

v) Diffuser blade angle at inlet

OR

Q10) a) Explain the phenomena of stalling of the blades. **[6]**

b) Following data pertains to a centrifugal compressor:

Total pressure ratio	= 3.6:1
Diameter of inlet eye of compressor impeller	=35cm
Axial velocity at inlet	= 140 m/s
Mass flow	= 12kg/s
The velocity in the delivery duct	= 120 m/s
The tip speed of impeller	= 460 m/s
Speed of the impeller	= 16000 rpm
Total head isentropic efficiency	= 80%
Pressure coefficient	= 0.73
Ambient conditions	=1.0132 bar and 15°C

Calculate: **[10]**

i) The static pressure and temperature at inlet and outlet of the compressor.

ii) The static pressure ratio.

Total No. of Questions : 10]

SEAT No. :

P1701

[Total No. of Pages : 4

[5460]-519

T.E. (Mechanical/Mechanical Sandwich)

MECHATRONICS

(2015 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) Write six exclusive points of comparison between serial and parallel communication. **[6]**

b) List and define any four static characteristics for accessing the measurement performance of a capacitive proximity sensor. **[4]**

OR

Q2) a) A 4-bit DAC has a V_{ref} of 0-12V. For a binary input of 1100, find the equivalent analog output voltage given by the DAC. **[6]**

b) Using a suitable diagram, explain the working of an electromagnetic type flow sensor. **[4]**

Q3) a) Using a suitable diagram explain the application of Mechatronics in an industrial shop floor. **[8]**

b) Discuss, in brief, the operating principle of the strain gauge type force sensor. **[2]**

OR

P.T.O.

Q4) a) Reduce the block diagram in Figure 1 and determine the transfer function: Y(s)/R(s). **[8]**

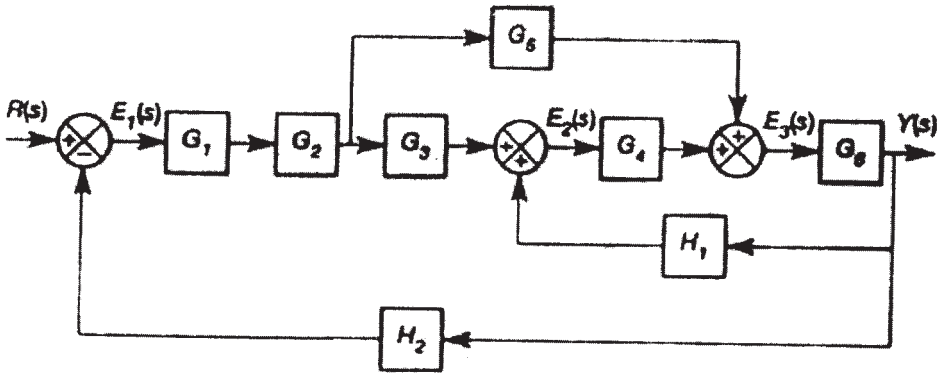


Figure 1

b) Discuss, in brief, the operating principle of the servo motor. **[2]**

Q5) a) A traffic light controller is supposed to execute following sequence of operations. **[10]**

Draw a ladder diagram for implementation of the said sequence.

Step 1: Turn Green ON for 35 seconds,
Step 2: Turn Yellow ON for 5 seconds,
Step 3: Turn Red ON for 40 seconds,
Step 4: Repeat the sequence i.e. Step 1-Step 2-Step 3.

b) Using suitable example, explain the working of the following in a PLC. **[6]**

i) Latching
ii) Counter

OR

Q6) a) A solenoid valve is used to control both the extension as well as the retraction stroke of a double-acting cylinder. Draw a ladder diagram to execute the following operation: **[10]**

i) The solenoid valve should extend the piston of the cylinder.
ii) Once extended, the piston should be held in that position for 5 seconds.
iii) After the 5 second hold is complete, the piston should retract
iv) After complete retraction of the piston, the operation should stop.

b) List and discuss, in brief, any six specifications of a PLC. **[6]**

Q7) a) For the translational mechanical system in Figure 2, determine the transfer function between output Z and input u. Also, determine the location of poles from the transfer function. **[10]**

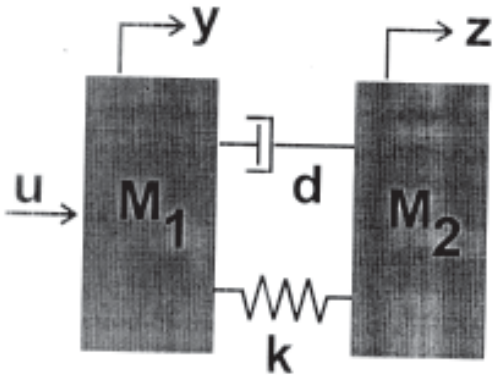


Figure 2

b) Using Routh Hurwitz criterion, determine the range of K that would confirm closed loop stability of system given by Eq. (1). **[6]**

$$s^4 + 3s^3 + 3s^2 + 2s + k = 0 \qquad (1)$$

OR

Q8) a) For the system in Figure 3, assume m = mass = 2 kg, k = stiffness = 4 N/m and c = damping = 0.3 Ns/m. Also, f(t) = force input in N and y(t) = displacement output in m. **[10]**

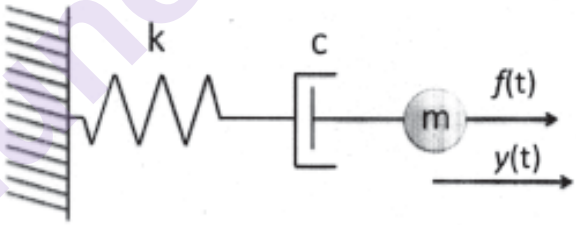


Figure 3

For this system:

i) Derive the transfer function: $y(s)/f(s)$.

ii) Identify the location of the Poles and Zeros and

iii) Comment on the absolute stability of the system.

b) Define the following terms and discuss, in detail, their significance with respect to closed loop stability of a system. **[6]**

i) Gain Margin

ii) Phase Margin

Q9) a) A proportional controller is used to control temperature within 50°C to 130°C with a set point of 73.5°C. The set point is maintained with 50% controller output. The offset error is corresponding to load change which causes 55% controller output. If the proportional gain is 2 find the % controller output if the temperature is 61°C. **[10]**

b) The open loop response of a second order system is slow and oscillatory. Discuss, in detail, the step by step procedure for manual tuning of a PID controller so that closed loop response of this second order system resembles that of a critically damped system, which is capable of accurately tracking a reference unit step input. **[8]**

OR

Q10) a) Using a suitable block diagram explain the working of PID control in Parallel form. Also, list two industrial applications where in such control could be used. **[10]**

b) Discuss the significance of the terms Q and R in an LQR type control. Also, discuss, in brief, the advantages and disadvantages of the LQR type control. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1702

[Total No. of Pages : 3

[5460]-520
T.E. (Mechanical)
MANUFACTURING PROCESS - II
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Figures to right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain different types of chips in metal cutting operation with neat sketches. **[6]**

b) The tool life of cutting tool obtain was 40 min and 25 min at cutting speed of 80 m/min and 100 m/min respectively. Determine the tool life 40 m/min and 120 m/min. **[6]**

OR

Q2) a) Index 69 divisions by using compound indexing methods. **[6]**

b) Explain radial drilling machine with neat sketch. **[6]**

Q3) a) Explain loading, glazing, truing and dressing in grinding operation. **[4]**

b) Calculate machining time required to produce 10 holes on 40 mm plate with following data. Cutting speed: 25 m/min, feed: 0.1 mm/rev, Drill Diameter : 30 mm, overrun: 15 mm. **[4]**

OR

Q4) a) Write short notes on honing process. **[4]**

b) Draw and explain broach tool geometry. **[4]**

P.T.O.

Q5) a) What is EDM? Explain EDM process with its advantages, limitations and applications. **[8]**

b) Explain USM process with its advantages, limitations and applications.. **[8]**

OR

Q6) a) Draw a Schematic diagram of 'Laser Beam Machining' and explain its working principle and process parameters. **[8]**

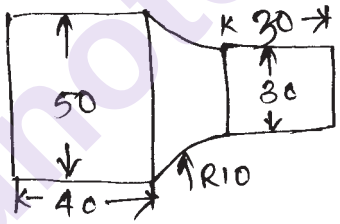
b) Write short note on micromachining. **[4]**

c) Compare process parameter of AJM and ECM. **[4]**

Q7) a) Explain DNC machines with neat sketch. State its advantages and limitations. **[5]**

b) Explain with neat sketch open and closed loop system. **[4]**

c) Write a part program for component shown in fig. Assume that spindle speed of 400 rpm and feed is 0.3 mm/rev. **[7]**



OR

Q8) a) Explain automatic pallet changer with neat sketch. State its advantages, disadvantages and applications. **[6]**

b) Explain the advantages and limitations of numerical control of machine tool. **[6]**

c) Explain the following codes : **[4]**

G04, M04, G28, G17.

Q9) a) Explain box type of jig with neat sketch. **[6]**

b) Explain concept of Poka yoke in jig and fixture. **[4]**

c) Design and draw drilling jig for drilling the ϕ10 mm holes in the component shown in fig. (a). **[8]**

OR

Q10) a) List various types of clamping devices used in jig and fixtures. Explain any one in detail. **[5]**

b) List different types of drill bushes. Explain any one with neat sketch. **[5]**

c) Design and draw milling fixture for milling slot of 10 mm wide, 5 mm deep and 25 mm in length for the component shown in fig. (a). **[8]**

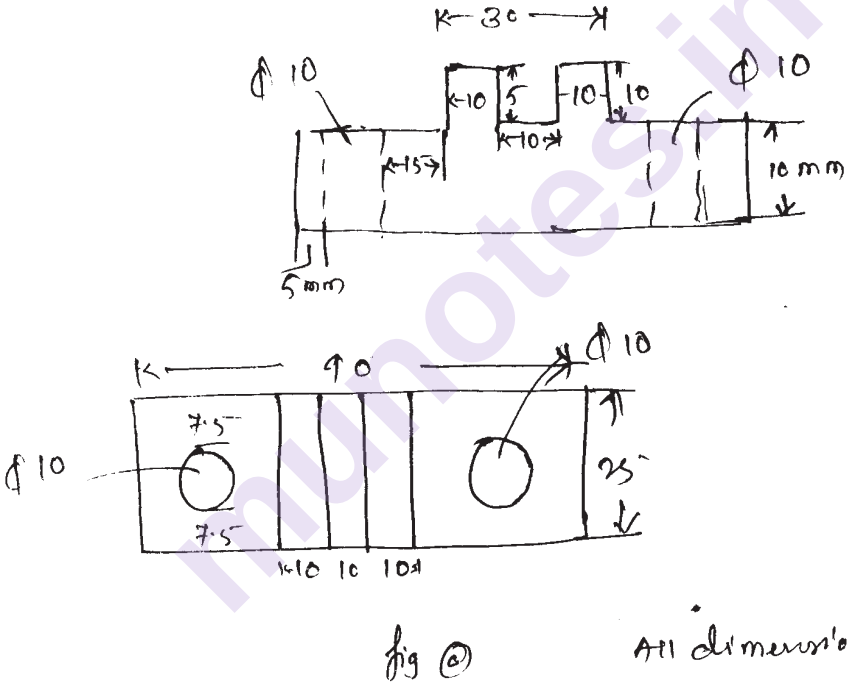


fig (a) All dimensions are in mm

Total No. of Questions : 12]

SEAT No. :

P1703

[Total No. of Pages : 3

[5460]-521

T.E. (Mechanical Sandwich)

NUMERICAL METHODS & OPTIMIZATION

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8, Q9or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data whenever necessary.***

Q1) Find the real root of the equation, $e^x \cos(x) - 1.2 = 0$ by the Newton Raphson Method correct to three decimal places. Take initial value of x as 0.5. **[6]**

OR

Q2) If $u = 3v^7 - 6v$, find the percentage of error in u and $v = 1$, if error in v is 0.05. **[6]**

Q3) Solve the following system of equation using Gauss Elimination Method. **[6]**

$2x - 3y + z = -1$, $x + 4y + 5z = 25$, $9x - 4y + z = 2$.

OR

Q4) Solve by Jacobi's iteration method, the equations are : **[6]**

$20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$.

Q5) a) Write a note on Genetic Algorithm. **[3]**

b) Determine the maximum value of root of equation $f(x) = 2\sin(x) - (x^2/10)$ by Newton's method. Take initial guess as 2.5 and do 4 iterations. **[5]**

OR

P.T.O.

Q6) Maximize, $Z = 3x_1 - x_2$ **[8]**

Subject to, $2x_1 + x_2 \leq 2$

$x_1 + 3x_2 \geq 3$

$x_2 \leq 4$

$x_1, x_2 \geq 0$

Solve by Simplex Method.

Q7) a) Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$, taking $\Delta x = 1$ upto $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x^2 (5–x)$. **[12]**

b) Draw the flowchart for Euler's Method. **[6]**

OR

Q8) a) Solve the equation $f(x, y) = –10 (x^2 + y^2 + 10)$ satisfying $\Delta^2 u = 0$ over the square with sides $x = 0 = y$, $x = 3 = y$ with $u = 0$ on all boundary and mesh length is 1. **[10]**

b) Given $\frac{dy}{dx} = 1 + y^2$ where $y = 0$ at $x = 0$. Find $y(0.2)$, $y(0.4)$ using Runge Kutta 4th order formula. **[8]**

Q9) a) The velocity 'V' of a body during the time 't' is given in a following table. Find the velocity at $t = 1.15$ using forward interpolation method. **[8]**

t	1.1	1.2	1.3	1.4
V	47.7	52.1	56.4	60.8

b) Determine the values of a and b so that the equation $Q = ah^b$ best fits the following data by the method of least squares : **[8]**

h	25	20	12	9	7	5
Q	0.22	0.2	0.15	0.13	0.12	0.1

OR

Q10) a) Use method of least squares to fit the parabolic equation of the form $v = a + bT + cT^2$ for the data. **[8]**

T	1	2	3	4	5	6	7
V	–5	–2	5	16	31	50	73

b) Draw the flowchart for Lagrange's Interpolation Method. **[8]**

Q11) a) Solve by Trapezoidal rule, $\int_0^1 \int_0^1 x^2 y^2 dx\, dy$ taking step length in x and y as 0.25. **[10]**

b) Draw the flowchart for integration by $3/8^{th}$ Simpson rule. **[6]**

OR

Q12) a) The data listed in the table gives measurements of heat flux 'q' at the surface of solar collector. Estimate the total heat absorbed by a 2×10^5 cm^2 collector panel during 14hr period. The panel has an absorption efficiency $\epsilon = 42\%$. The total heat absorbed is given by, **[10]**

$$H = \epsilon \int_0^t qA\, dt$$ where A is area, q is heat flux and t is time.

t (hr)	0	1	2	3	4	6	8	11	14
q cal/cm^2.hr	0.05	1.72	5.23	6.38	7.89	8.05	8.03	5.85	0.24

Use Simpson's $1/3^{rd}$ Rule.

b) Draw the flowchart for integration by Gauss Quadrature 3 point formula. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1704

[Total No. of Pages : 3

[5460]-522

T.E. (Mechanical Sandwich)

APPLIED COMPUTER AIDED ENGINEERING

(2015 Pattern)

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 Line is Drawn with vertices A(4,4), B(15,10) has undergone following transformations in sequence; **[10]**

a) Rotation through angle 45° anticlockwise

b) Scaling by 1.5 units

c) Reflection about X axis

Find Concatenated matrix and new coordinates of triangle

OR

Q2) a) Explain The Concept of Rotational Mapping. **[4]**

b) What is Feature based Modelling? Explain steps in feature based modelling and commonly used feature operation in CAD. **[6]**

Q3) a) Explain Parametric and Non parametric Representation of Curves. **[6]**

b) Compare Programmable and Flexible Automation System. **[4]**

OR

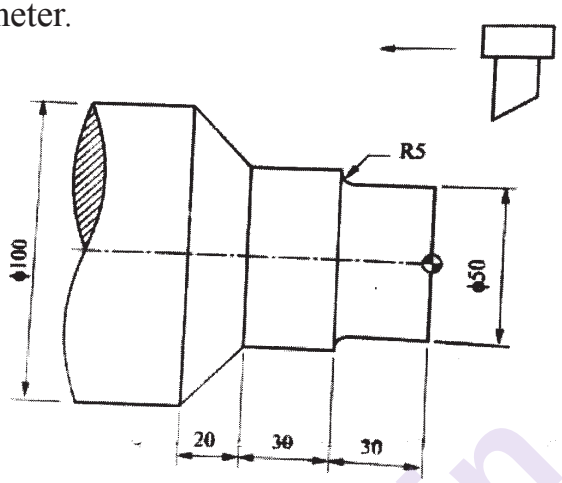
Q4) a) Compare solid modeling with wireframe modeling. **[4]**

b) Explain Basic Anatomy of Robot. **[6]**

P.T.O.

Q5) a) What are the features of CNC Machine Compared to NC Machines. **[6]**

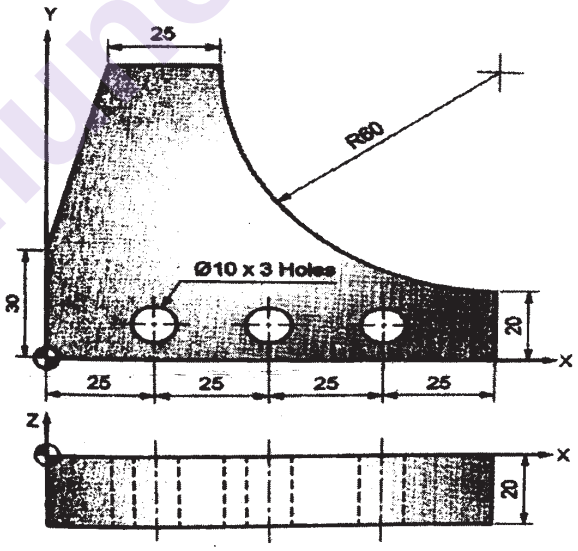
b) Write a manual part program for finishing of forged component as shown in figure. Assume the speed and feed on the turning center are 200 rpm and 0.35mm/rev. Assume 1mm material is to be removed radially from external diameter. **[10]**



OR

Q6) a) Explain Fixed Zero and Floating Zero For CNC Machines. **[4]**

b) Write CNC Part Program to Manufacture the Component as shown in Figure. Use Peck Drill Canned Cycle for Drilling operation. Take Thickness of Plate 20 mm. Assume Feed 100 mm/min and spindle speed 500 RPM. **[12]**



Q7) a) Explain Selective Laser Sintering (SLS) process and enlist its advantages, limitations. **[8]**

b) What is Stereo lithography (SLA) Process? Explain working of SLA. List its advantages and limitations. **[8]**

OR

Q8) a) What is Rapid Tooling? Explain Classification of Rapid Tooling. **[4]**

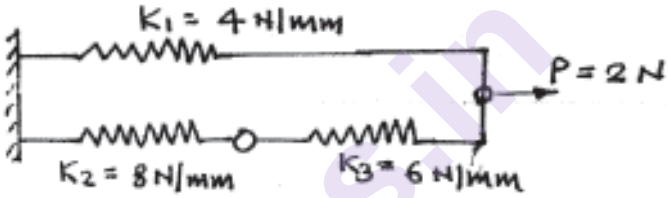
b) Explain Prototype properties of different Rapid Prototyping Processes. **[4]**

c) Explain Laminated Object Manufacturing (LOM) process. Enlist its advantages and limitations. **[8]**

Q9) a) Explain Plane Stress and Plane Strain with suitable example. **[6]**

b) Explain the significance of the shape functions for 1D two node element. **[4]**

c) Find Nodal Displacement and reaction for the cluster of springs as shown in figure. **[8]**



OR

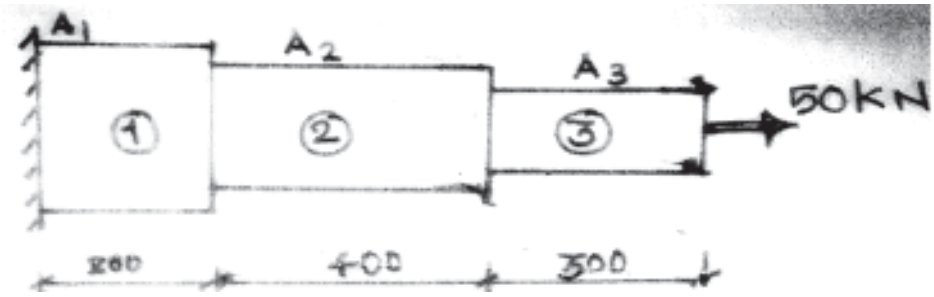
Q10) a) Derive an elemental stiffness Matrix for two noded 1D bar element. **[6]**

b) A steeped bar, shown in figure, is subjected to an axial pull of 50 kN. If the material of bar is uniform and has modulus of elasticity of 200 GPa, Areas of sections are A_1= 300mm^2, A_2= 200mm^2 and A_3 = 90mm^2 determine: **[12]**

i) Nodal displacements

ii) Stresses in each element

iii) Reaction force at support



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Total No. of Questions : 10]

SEAT No. :

P1705

[Total No. of Pages : 3

[5460]-523

T.E. (Mechanical - Sandwich)

MACHINE DESIGN

(2015 Pattern) (Semester - I)

Time : 3 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) Explain the following : **[4]**

i) Factor of Safety

ii) Service Factor

b) Derive an expression for bending stress in the knuckle pin of a knuckle joint with a neat sketch. **[6]**

OR

Q2) a) Draw the following diagrams and write their equations. **[4]**

i) Goodman Diagram

ii) Soderberg Diagram

b) What is stress concentration? What are the causes of stress concentration? Explain with sketch any two methods to reduce it. **[6]**

Q3) a) Explain self-locking screw. What is the condition for self-locking? **[4]**

b) SQ. 50* 10 threads are used to lift a load of l0 kN. The mean radius of friction collar is 30 mm and axial length of nut is 40mm. Coefficient of screw friction and collar friction is 0.12. **[6]**

P.T.O.

Calculate

i) Force required at the handle of length 500mm

ii) Efficiency of mechanism

iii) Bearing pressure

OR

Q4) A shaft is supported by two bearings placed 1m apart. A 600 mm diameter pulley mounted at a distance of 300 mm to the right of left hand bearing and it drives a pulley placed directly below it with a maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and it is driven horizontally by an electric motor. The angle of contact for both the pulleys is 180° and coefficient of belt friction is 0.25. Determine shaft diameter if allowable shear stress is 42 MPa and $k_b = 1.5$, $k_t = 1.5$. Use ASME Code. **[10]**

Q5) a) For bevel gears, define the following : **[6]**

i) Cone distance;

ii) Pitch angle;

iii) Back cone distance; and

iv) Crown height

b) What are the various forces acting on worm and worm gears? Explain in brief. **[6]**

c) Define formative or virtual number of teeth on a helical gear. Derive the expression used to obtain its value. **[4]**

OR

Q6) a) Explain the force analysis of helical gear. **[4]**

b) The P.C.D of spur pinion and gear are 100mm and 300mm respectively. The pinion is made of plain carbon steel 40C8 (Sut = 600N/mm^2) while gear is made of Gr. C.I FG300.The pinion receives 5Kw power at 500 rpm through its shaft. The service factor and factor of safety is 1.5 each.The face width of gear is ten times of module. If velocity factor accounts the dynamic load, calculate the module and the number of teeth on pinion and gear. Specify the surface hardness for a gear pair.(Km = 1, 20° full depth involute system). **[12]**

Q7) a) Explain the procedure to select the rolling contact bearing from manufacturer's catalogue. **[6]**

b) A ball bearing subjected to a radial load of 5 kN, is expected to have a life of 8000 hours at 1450 rpm with a reliability of 99%. Calculate the dynamic load capacity of the bearing, so that it can be selected from manufacturer's catalogue based on reliability of 90%. **[10]**

OR

Q8) a) Derive the Petroff's equation for sliding contact bearing. **[6]**

b) A ball bearing operates on work cycle consisting of three parts: a radial load of 3000N at 720 rpm for 30% of the cycle, a radial load of 7000N at 1440pm for 40% of the cycle and radial load of 5000N at 900rpm for remaining part of the cycle. The dynamic capacity of the bearing is 30700N. **[10]**

Calculate:

i) The rating life of bearing in hours.

ii) The average speed of rotation;

iii) The life of bearing with 95% reliability

Q9) a) It is stated that the speed at which a belt should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt at that speed. Prove the statement. **[6]**

b) Explain the different types of stresses induced in the wire ropes. **[6]**

c) Explain the polygon effect in case of chain drives. **[6]**

OR

Q10) a) Explain the procedure to select the V- belt from manufacturer's catalogue. **[6]**

b) Two parallel shafts whose centre lines are 4.8 m apart, are connected by an open flat belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 kg/m length. The coefficient of friction between the belt and the pulley is 0.3.Taking centrifugal tension into account, calculate the power transmitted, when the smaller pulley rotates at 400 rpm. **[12]**

Total No. of Questions : 10]

SEAT No. :

P1706

[Total No. of Pages : 3

[5460]-524

T.E. (Mechanical Sandwich)

MATERIALS AND MANUFACTURING ENGINEERING

(2015 Pattern)

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.***
5) ***No separate drawing sheet will be provided.***

Q1) a) Classify *polymers.* Discuss factors affecting on properties of *polymers.* **[4]**

b) What is composite material? Classify composites. What unique properties they have over conventional material? **[6]**

OR

Q2) a) Discuss the technological advantages of nano and Bio materials. **[4]**

b) Explain different methods for prevention of corrosion. **[6]**

Q3) a) What is corrosion? Classify and explain different types of corrosion. **[4]**

b) Compare and contrast the nature of protection given to the steel by **[6]**
   i) Cadmium coating
   ii) Zinc coating
   iii) Tin coating

OR

Q4) a) Differentiate between : Electrochemical series and Galvanic series. **[4]**

b) What do you understand by : **[6]**
   i) Smart Materials
   ii) Shape memory alloys

P.T.O.

Q5) a) Sketch the following types of broaches and state their specific use **[8]**

i) Progressive cut broach

ii) Rectangular broach

iii) Key-way broach

iv) Round hole broach

b) Name various methods of manufacturing of threads and explain any one out of them. **[8]**

OR

Q6) a) Draw a neat sketch of an internal pull type broach and indicate the various terms relating to its teeth. Describe these terms in brief. **[8]**

b) Compare the gear shaping and gear hopping process of gear making. **[8]**

Q7) a) Explain with suitable sketches the relative movement of work, grinding wheel and table in different types of surface grinding. **[8]**

b) Explain following super finishing processes: **[8]**

i) Abrasive flow machining

ii) Magneto-rheological finishing

OR

Q8) a) Explain following terms with respect to grinding : **[8]**

Loading, Glazing, Dressing and Truing.

b) Explain lapping, honing, buffing and burnishing process in brief. **[8]**

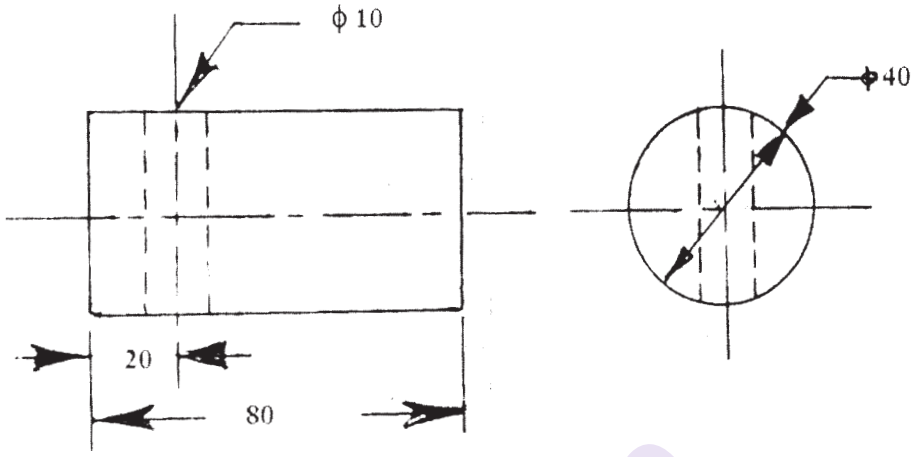
Q9) a) Define jigs & fixture? State advantages of jig & fixture. **[6]**

b) What is six point location principle? Explain it with the help of neat sketch. **[6]**

c) Explain with neat sketch any two types of quick acting clamps. **[6]**

OR

Q10) a) Draw a jig to drill a hole of size $10^{\pm 0.1}$ mm at a distance of $20^{\pm 0.2}$ mm in a component as shown in figure below. All other dimensions are to be maintained with a tolerance of ± 0.5 mm. **[14]**



b) What is function of a locating pin? Draw any three types of locating pins. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1707

[Total No. of Pages : 2

[5460]-525

T.E. (Mechanical - Sandwich)

INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT (Self Study - II)

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Define Industrial Engineering. Explain the role of Industrial Engineering department in Modern Industry. **[5]**

b) What are the principles of good management? Explain. **[5]**

OR

Q2) a) Describe the contribution of FW Taylor in the Industrial Engineering and Scientific Management. **[5]**

b) What are the types of Organization? Explain organization structure of Modern Automobile Manufacturing Industry. **[5]**

Q3) a) What factors are important for the selection of site to start new industry? Explain them in brief. **[5]**

b) Describe the objectives and functions of material handling system. **[5]**

OR

Q4) a) What is meant by Industrial Safety? Describe the safety rules to be implemented while working in industry. **[5]**

b) What are various types of plant layout? Describe the principles of good plant layout. **[5]**

P.T.O.

Q5) a) Explain the role of Production Planning and Control Department in industry. **[8]**

b) Describe importance of Inventory control and explain what is meant by ABC analysis. **[8]**

OR

Q6) a) Derive the equation for EOQ? What are the assumptions made for it? Explain. **[8]**

b) Describe various steps involved in Method study. **[8]**

Q7) a) What types of charts are used in method study? Explain multiple activity chart with suitable example. **[8]**

b) What is standard time? How time standard is determined in work measurement? Explain. **[8]**

OR

Q8) a) What is the difference between work study and time study. **[8]**

b) What are the steps involved in process planning? Explain assembly planning process with suitable example. **[8]**

Q9) a) Explain the concept and meaning of technology. Describe evolution and growth in technology. **[9]**

b) What are the steps in product development process? Explain with suitable example. **[9]**

OR

Q10) Write short note on the following (Any three) : **[18]**

a) Group Technology.

b) Impact of technology on society.

c) Role of Research and Development department.

d) PERT/CPM.

Total No. of Questions : 10]

SEAT No. :

P1708

[Total No. of Pages : 3

[5460]-531

T.E. (Automobile Engineering)

DESIGN OF MACHINE ELEMENTS

(2015 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer any five questions.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *A figure to the right indicates full marks.*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a) What are the factors to be considered while designing a machine element? **[6]**

b) Differentiate between transmission shaft and machine shaft. **[4]**

OR

Q2) a) Explain the design procedure of lever. **[6]**

b) How do you classify keys? **[4]**

Q3) a) Differentiate between rigid and flexible coupling. **[2]**

b) A machine slide weighing 3 KN is elevated by a double start acme threaded screw at the rate of 0.84 m/min. If the coefficient of friction is 0.12, calculate the power to drive the slide. The end of the screw carries a thrust collar of 32 mm inside diameter and 58 mm outside diameter. Pitch of the screw thread is 7 mm and outside diameter is 44 mm. Take coefficient of friction for collar as 0.09 and allowable shear stress as 44.125 Mpa. Is it strong enough to sustain the load? **[8]**

OR

P.T.O.

Q4) a) Prove that square key is strong in shear and crushing. **[2]**

b) The lead screw of a lathe has single start ISO trapezoidal threads of 30 mm diameter and 6 mm pitch. It drives a tool carriage and exerts an axial load of 1.5 KN on a collar of 30 mm inside diameter and 50 mm outside diameter. If the lead screw rotates 40 rpm, find the power required to drive the screw and efficiency. Take the coefficient of friction for power screw as 0.14 and for collar as 0.09. **[8]**

Q5) a) Write a short note on S-N diagram. **[6]**

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

OR

Q6) a) 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 0.5m/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]**

b) Derive Soderberg equation. **[10]**

Q7) a) Derive Lewis equation for beam strength. **[6]**

b) A spur gear set to transmit 20 KW at 900 rpm of pinion. The transmission ratio is 7/3:1. Take 20° FDI, Z_1=18, σ_d = l40 Mpa for pinion and σ_d = 55 Mpa for gear. The diameter of the pinion is 105 mm. Design number of teeth, module, face width for strength only.

$Y = \pi(0.154 - 0.912/Z)$, $C_V = 3.05/3.05+V$ **[12]**

OR

Q8) a) Explain about herringbone gears with sketch. **[6]**

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

Q9) Two shafts are right angles to each other are connected by 20° full depth involute teeth bevel gears. The velocity ratio is 3:1. The pinion transmits 37.5 KW at 750 rpm. Assume number of teeth on pinion is 20. Design the gear set. Take $\sigma_d = 233.4$ Mpa, BHN = 200 for pinion and $\sigma_d = 172.6$ Mpa, BHN = 150 for gear. Form factor $Y = \pi (0.154 - 0.912/Ze)$, CV = 6.1/6.1 + V. **[16]**

OR

Q10) A worm gear drive is to connect two shafts to transmit 10 KW. The transmission ratio is 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take $\sigma_d = 207$ Mpa, for worm and $\sigma_d = 82.4$ Mpa, for worm wheel. Form factor $Y = \pi (0.154\text{-}0.912/Z)$. **[16]**

Total No. of Questions : 10]

SEAT No. :

P1709

[Total No. of Pages : 2

[5460]-532

T.E. (Automobile Engineering)

AUTOMOTIVE ELECTRICAL AND ELECTRONICS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain Wiring Harness. **[5]**

b) Explain Electromagnetic Interference and Electromagnetic Compatibility with examples. **[5]**

OR

Q2) a) Write a short note on recharging of the battery. **[5]**

b) Explain working of spark plug. **[5]**

Q3) a) Enlist the troubles of the ignition system which are likely to be encountered while running the vehicle and their remedies. **[5]**

b) Write a short note on battery tests. **[5]**

OR

Q4) a) Explain Electronic Ignition System. **[5]**

b) Explain Advanced Front Lighting system. **[5]**

Q5) a) Classify sensors used in automobile. Explain working of any one of them with neat figure. **[10]**

b) Explain working of Knock Sensor with neat figure. **[8]**

P.T.O.

OR

Q6) a) Enlist the types of exhaust gas oxygen sensors. Explain any one of them. **[8]**

b) Enlist the types of actuators used in engine. Explain working of any one motorized engine actuator. **[10]**

Q7) a) Explain Throttle body injection and Multipoint Fuel Injection in detail. **[12]**

b) Enlist the components of fuel system. **[4]**

OR

Q8) a) Explain all Injection Strategies or Techniques used in SI Engine with neat figures. **[8]**

b) Explain cold and warm start system. **[8]**

Q9) a) Explain Driver state monitoring system in detail with layout. **[8]**

b) Explain Lane departure warning system in brief. **[8]**

OR

Q10) a) What is meant by adaptive cruise control? Explain in detail. **[8]**

b) Explain smart parking assist system with neat figures. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1710

[Total No. of Pages : 3

[5460]-533

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2015 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 Whipping stresses in detail. **[4]**

b) The following data is given for a four stroke diesel engine. **[6]**

Cylinder bore 250mm, maximum gas pressure 4MPA, bearing pressure at small end of connecting rod 15MPA, length of piston pin in bush of small end 0.45D, ratio of inner to outer diameter of piston pin 0.6, mean diameter of piston boss = 1.4 × outer dia of piston pin, Allowable bending stress for piston pin 84 N/mm^2.

Calculate :

i) Outer diameter of the piston pin

ii) Inner diameter of the piston pin

iii) Mean diameter of the piston boss

iv) Check the design for bending stress.

OR

Q2) a) What is buckling of connecting rod? **[4]**

b) Enlist any three engine components with its function and material. **[6]**

P.T.O.

Q3) a) Explain why I section is used for connecting rod? **[2]**

b) Design an exhaust valve for a horizontal diesel engine using following data. **[8]**

Cylinder bore 150 mm, length of stroke 275 mm, engine speed 500 rpm, maximum gas pressure 3.5 MPa. seat angle 45°

Calculate :

i) diameter of valve port
ii) diameter of valve head
iii) thickness of valve head
iv) diameter of valve stem and
v) maximum lift of valve

OR

Q4) a) Write design considerations for connecting rod. **[2]**

b) What are the types of radiator? Explain any one in detail. **[8]**

Q5) a) Derive an expression for principal stresses in rotating disc. **[4]**

b) A rimmed flywheel made of gray cast iron FG200 (δ = 7100 Kg/m^3) is required to keep down fluctuations in speed from 200 to 220 rpm. The cyclic fluctuations in energy are 30000 N-m, while the maximum torque during the cycle is 75000 N-m. The outside diameter of flywheel should not exceed 2m. It can be assumed that there are 6 spokes and the rim contributes 90% of the required inertia. The cross section of the rim is rectangular and the ratio of width to thickness is 2. Determine the diameter of the rim. Assuming suitable cross section for spokes, calculate the stresses in the rim and the spokes using Timoshenko's Expression. **[12]**

OR

Q6) a) The torque developed by an engine is given by following equation: **[8]**

$T = 14250 + 2200\sin 2\theta - 1800\cos 2\theta$

Where T is the torque in N-m and θ is the crank angle from the inner dead center position. The resisting torque of machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150 rpm. A solid circular steel disc is used as flywheel. The mass density of the steel is 7822 kg/m^3. Calculate the radius of the flywheel.

b) What is the function of flywheel? What are the types of flywheel? Write down materials used for flywheel. **[8]**

Q7) a) A single row deep grove ball bearing is subjected to radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm the expected life L_{10th} of the bearing is 20000h. The minimum acceptable diameter of the shaft is 75mm. Select the suitable bearing for this application. **[8]**

b) Explain the Hydrodynamic theory of lubrication. **[8]**

OR

Q8) a) What are the types and objectives of lubricants used for bearings? **[8]**

b) Differentiate between sliding contact bearing and rolling contact bearings. **[8]**

Q9) a) Explain selection of engine type on the basis of Stroke and Bore and Number of cylinders. **[9]**

b) Select an IC engine for a car which can carry 4 people with maximum speed of 120 km/h producing minimum emission. **[9]**

OR

Q10) Write short note on : **[18]**

a) Mechanical fuel pump testing.

b) Cylinder power balance.

c) Oscilloscope engine analyzers.

Total No. of Questions : 10]

SEAT No. :

P1711

[Total No. of Pages : 2

[5460]-534

T.E. (Automobile Engg.)

AUTOMOTIVE TRANSMISSION

(2015 Pattern) (Semester - II)

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) Classify Automobile. **[5]**

b) Write a short note on semi forward and fully forward chassis. **[5]**

OR.

Q2) a) What is the function of a clutch? Discuss various factors affecting the torque transmission in a clutch. **[5]**

b) Write a short note on Friction Lining Materials. **[5]**

Q3) a) What is the necessity of a gear box at all in the automobile when the vehicle speed can be varied by means of an accelerator? **[5]**

b) Write a short note on Propeller shaft. **[5]**

OR

Q4) a) Explain Universal joint. Why two universal joints are used on a propeller shaft. Justify. **[5]**

b) Explain Gear shift mechanism. **[5]**

Q5) a) Sketch general arrangement of a live rear axle. Identify and explain various loads that it has to withstand. **[10]**

b) Explain different types of final drives with figures. **[8]**

P.T.O.

OR

Q6) a) Explain the necessity of differential in an automobile in detail. **[8]**

b) Explain Differential lock with neat figures. **[10]**

Q7) a) Explain Fluid flywheel with its characteristics. **[8]**

b) Explain Wilson epicyclic gear box. **[8]**

OR

Q8) a) Explain construction and working of torque converter. **[8]**

b) Explain simple epicyclic gear train. **[8]**

Q9) a) Write a short note on Hydramatic transmission. **[8]**

b) Explain Fully automatic transmission. **[8]**

OR

Q10) a) Write a short note on semi-automatic transmission. **[8]**

b) Explain Continuous Variable Transmission. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1712

[Total No. of Pages : 2

[5460]-535

T.E. (Automobile Engineering)

AUTOMOTIVE AERODYNAMICS & BODY ENGINEERING

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Discuss flow field around car. **[4]**

b) Explain the Aerodynamic drag & its types. **[6]**

OR

Q2) a) How performance of vehicle is affected by forces and moments of fluid flow? **[6]**

b) What are application CFD in Vehicle aerodynamics? **[4]**

Q3) a) Write a short note on improvement of windshield and A-pillar to increase aerodynamic performance vehicle. **[6]**

b) Write a short note on Fundamentals of wind tunnel technique. **[4]**

OR

Q4) a) Write a short note on Mechanism of generation and transmission of wind noise. **[6]**

b) Calculate aerodynamic drag of car running with 85 km/hr with frontal projected area 3.0 m^2. Coefficient of drag for car is 0.32 and density of air is 1.23 kg/m^3. **[4]**

P.T.O.

Q5) a) Discuss the methods for improving visibility of vehicle. **[8]**

b) Sketch and explain in details any 4 types of bus body. **[8]**

OR

Q6) a) Explain Integral types of Chassis Frame. **[8]**

b) Explain with a neat sketch single decker Bus body. **[8]**

Q7) Explain the following with neat sketch. **[16]**

a) Flat platform
b) Tipper body
c) Tanker body
d) Fixed side

OR

Q8) a) Explain driver seat design in relation to control. **[8]**

b) Write any three energy absorbing systems used in vehicles in brief. **[8]**

Q9) a) Explain Symmetric & Asymmetric Vertical Load in Car in sketch. **[10]**

b) Define Ergonomics & anthropometry for vehicle. **[8]**

OR

Q10) a) Explain importance of Bumper in Automobile. **[8]**

b) Explain different types of seats and seat belts used in Automobiles. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1713

[Total No. of Pages : 3

[5460]-541

T.E. (Electronics Engineering)

POWER ELECTRONICS AND APPLICATIONS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Draw and explain N-channel EMOSFET. Also draw drain and transfer characteristics. **[8]**

b) Draw and explain V-I characteristics of SCR. define IL, IH, VBO, VBR. **[6]**

c) Compare MOSFET and IGBT. **[6]**

OR.

Q2) a) What are heat sinks? Explain any one method of cooling technique with its need in high power industries. **[8]**

b) Draw and explain single phase semi converter for RL Load. **[6]**

c) Define triggering circuits. What are the different types triggering methods explain any one in details. **[6]**

Q3) a) Draw and explain single phase full bridge voltage source inverter for R load. Derive the expression for RMS output voltage. **[8]**

b) Explain various methods of voltage control in three phase inverters. **[4]**

c) Write a short note on PWM inverter. **[6]**

OR

P.T.O.

Q4) a) A single phase full bridge inverter is operated from 48V battery and supplying power to a pure resistive load of 2.4 ohms determine **[8]**

i) the rms output voltage at fundamental frequency V_{01}

ii) the output power P_{01}

iii) the average peak currents of each transistor

iv) the THD

b) Draw and explain three phase inverter with the help of waveform for 180° conduction mode for R load. **[6]**

c) Draw and explain single phase AC voltage controller for R load. **[4]**

Q5) a) Explain in details the operation of step down chopper. Derive the expression for average output voltage. **[8]**

b) Explain flyback converter (SMPS) with circuit diagram, waveforms and operational analysis. **[8]**

OR

Q6) a) What is a chopper? Explain with circuit diagram and waveforms, working of 2 quadrant step down chopper. **[6]**

b) Draw and explain Buck- Boost converter in details. **[6]**

c) The buck regulator has an input voltage of V_S = l2V. The required average output voltage is V_a = 5V at R = 500 ohms and the peak to peak output ripple voltage is 20 mv. The switching frequency is 25 kHz. If the peak to peak ripple current of inductor is limited to 0.8A, determine **[4]**

i) the duty cycle

ii) the filter inductance L

iii) the filter capacitor C and

iv) the critical value of L and C.

Q7) a) Explain the operation of electronic ballast with the help of block diagram. Also state its advantages. **[6]**

b) Explain performance parameters of battery. **[5]**

c) Draw and explain battery charger. **[5]**

OR

Q8) a) Draw and explain online UPS with neat diagram. **[6]**

b) Draw and explain bipolar HVDC transmission system. Also state its advantages. **[5]**

c) Explain application of power electronics in induction heating. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P1714

[Total No. of Pages : 2

[5460]-542
T.E. (Electronics)
INSTRUMENTATION SYSTEMS
(2015 Pattern) (Semester - I)

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) *Figures to the right side indicate full marks.*

Q1) a) Write in your own words the term related to an instrumentation system. **[8]**

i) Linearity

ii) Repetability

iii) Sensitivity

iv) Accuracy

b) How you can interface RTD with microcontroller? Explain it with neat diagram? **[6]**

c) Sketch construction diagram of : **[6]**

i) Vortex shedding

ii) Electromagnetic Flow Meter

OR

Q2) a) Define Sensor & Transducer? Give the classification of Transducer with suitable example. **[8]**

b) With the help of neat diagram explain working of : **[6]**

i) LM75

ii) Acoustics sensors

c) Which are the head type flow meters? Explain any one in detail. **[6]**

P.T.O.

Q3) a) Design a system for detection of a motion using ultrasonic sensor? **[8]**

b) Explain working principle of : **[8]**

i) Piezoelectric accelerometer

ii) Capacitive accelerometers

OR

Q4) a) Extend your views on how Photo diodes and photo transistor can be used as light & radiation detectors? **[8]**

b) With neat diagram explain absolute & Incremental encoder. **[8]**

Q5) a) What are magneto-resistive elements (MRE), with neat diagram explain any on sensor working on Haff effect principle? **[8]**

b) What is micromaching? Explain Bulk micromachining. **[6]**

c) With neat diagram explain Hot wire anemometer. **[4]**

OR

Q6) a) Explain magneto-transistors, piezoelectric (PZT) sensors. **[8]**

b) With example explain process of surface micromachining. **[6]**

c) Discuss applications of SMART sensors. **[4]**

Q7) a) Design and explain any hydraulic system with use of direction control valve? **[6]**

b) Explain Construction and working of Stepper motor. **[6]**

c) Explain in brief working principle of spool valve. **[4]**

OR

Q8) a) Draw pneumatic schematic symbols used in process control system. **[6]**

b) Explain detailed working of Rolling diaphragm cylinder. **[6]**

c) Write a short note on any one type of Directional control valves. **[4]**

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Total No. of Questions : 10]

SEAT No. :

P1715

[Total No. of Pages : 2

[5460]-543

T.E. (Electronics)

ELECTROMAGNETIC AND WAVE PROPAGATION

(2015 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 electronic packet calculator and Smitch chart is allowed.***

Q1) a) State and explain Coulomb's Law of force. **[4]**

b) The spherical region $0 < r < 10$ cm. Contains a uniform volume charge density $\rho_v = 4\mu c/m^3$. Find total charge for $0 < r < 10$ cm and flux density $\overline{D}$ just outside the region. **[6]**

OR

Q2) a) State and explain Gauss's law. **[4]**

b) A point charge of 5 nC is located at origin. If V = 2V at (0, 6, 8). **[6]**
Find :

i) Potential at A (–3, 2, 6)

ii) Potential at B (1, 5, 7)

iii) Potential difference V_{AB}

Q3) a) Derive boundary condition for electric field at an interface between conductor and free space. **[6]**

b) State and explain Biot-Savart's law. **[4]**

OR

Q4) a) State and explain Ampere's circuit law. **[4]**

b) A circular loop located on $x^2 + y^2 = 9$, $z = 0$ carries a direct current of 10A along $\overline{a\phi}$. Determine $\overline{H}$ at (0, 0, 4) and (0, 0, –4) **[6]**

P.T.O.

Q5) a) Explain the term Displacement current. **[4]**

b) Given $\overline{H} = H_M e^{j(wt+\beta z)} \overline{ax}$ Alm in the free space. **[6]**

Find $\overline{E}$

c) Write Maxwell's equation in both differential and integral form. **[8]**

OR

Q6) a) State and explain Faraday's law. **[6]**

b) A parallel plate capacitor with plate area of $5cm^2$ and plate separation of 3 mm has a voltage $50\sin 10^3 t$ volts applied across the plates. Calculate the displacement current, assuming $\in = 2\in_o$. **[6]**

c) In the free space, $\overline{E} = 20\cos(wt - 50x)\ \overline{ay}$ V/M, Calculate : **[6]**

i) $\overline{J}_d$

ii) $\overline{H}$

Q7) a) Derive the expression for wave equation in free space. **[8]**

b) A plane wave propagating in free space has a peak electric field of 750 mV/m. Find the average power through a square area of 12 cm on a side perpendicular to the direction of propagation. **[8]**

OR

Q8) a) What is Polarization? Explain linear, circular and Elliptical polarization with Mathematical expression. **[10]**

b) State and explain Poynting theorem. **[6]**

Q9) a) Explain the different types of wave propagation in detail. **[8]**

b) Explain the fundamental equation for the free space propagation. **[8]**

OR

Q10) a) Explain the different characteristics of Wireless channel. **[8]**

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

i) Virtual Height

ii) MUF

iii) Skip distance

iv) Multi-hop propagation

Total No. of Questions : 8]

SEAT No. :

P1716

[Total No. of Pages : 2

[5460]-544

T.E. (Electronics)

MICROCONTROLLERS AND APPLICATIONS

(2015 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.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Compare CISC and RISC processor. **[4]**

b) Explain assembler, Compiler, Debugger, Emulator. **[8]**

c) Draw interfacing diagram to interface relay with 8051 microcontroller. Write assembly language program to turn on/off relay. **[8]**

OR

Q2) a) Draw and explain interrupt structure of 8051 microcontroller. **[8]**

b) Draw interfacing diagram to interface LED's to port 1 of 8051 microcontroller, write assembly language program for blinking LED's. **[8]**

c) Draw interfacing diagram to interface buzzer with 8051. Write assembly language program to turn on/off buzzer. **[4]**

Q3) a) State features of PIC18FXXX microcontroller. Explain status register of PIC18FXXX microcontroller. **[8]**

b) Explain following instructions with example. **[8]**

i) MOVLW

ii) ADDLW

iii) CLRF

iv) DECF

OR

P.T.O.

Q4) a) Explain BOD and power down mode of PIC18FXXX microcontroller. **[8]**

b) With neat block diagram explain TIMER0 in 8 bit mode. Explain Prescaling of PIC timer. **[8]**

Q5) a) Draw and explain interrupt structure of PIC18FXXX microcontroller. **[8]**

b) Draw interfacing diagram of DC motor control using PWM with PIC18FXXX microcontroller. Explain how the speed of the DC motor is controlled by PWM. **[8]**

OR

Q6) a) Explain capture and compare mode of PIC18FXXX microcontroller in detail. **[8]**

b) Draw interfacing of 4 × 4 matrix keypad with PIC18FXXX microcontroller. Write embedded C program to detect and display key pressed. **[8]**

Q7) a) Explain SPI serial communication protocol in detail. Compare 12C with SPI. **[10]**

b) Explain MSSP structure with SPI mode. **[8]**

OR

Q8) a) Draw interfacing diagram of RTC using 12C with PIC18FXXX microcontroller. Draw flow chart to display date and time. **[8]**

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

i) UART

ii) RS 232

Total No. of Questions : 10]

SEAT No. :

P1717

[Total No. of Pages : 3

[5460]-545
T.E. (Electronics Engineering)
DATA COMMUNICATION
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer the Q.1 OR Q.2 and Q.3 OR Q.4 and Q.5 OR Q.6 and Q.7 OR Q.8 and Q.9 OR Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain in detail ARQ Stop and Wait & Selective repeat ARQ. **[6]**

b) Write a short note on OSI model. **[4]**

OR

Q2) a) What are the properties of analog and digital signal? **[4]**

b) The Generator matrix of a particular (6, 3) block code is given below. Find all code vectors of this code. **[6]**

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

Q3) a) An information source produces a sequence of independent symbols having the following probabilities. S1 = 1/3, S2 = 1/27, S3 = 1/3, S4 = 1/9, S5 = 1/9, S6 = 1/27, S7 = 1/27. Construct binary, Ternary code using Huffman encoding procedure and find its efficiency. **[6]**

b) Prove that $H(X, Y) = H(X/Y) + H(Y)$ **[4]**

$H(X,Y) = H(Y/X) + H(X)$

P.T.O.

OR

Q4) a) Apply Shannon Fano coding procedure to find the coding efficiency for the following Message ensemble. **[6]**

X1 = 1/4, X2 = 1/8, X3 = 1/16, X4 = 1/16, X5 = 1/16, X6 = 1/4, X7 = 1/16, X8 = 1/8

Take M = 2

b) Explain various data transmission modes with suitable example. **[4]**

Q5) a) Explain Adaptive Delta Modulation in detail with the help on transmitter and receiver. **[8]**

b) Draw the waveforms for the bit sequence 10111001 **[8]**

i) RZ Unipolar

ii) NRZ polar

iii) AMI

iv) Split phase Manchester

OR

Q6) a) Write a short note on Quantization Noise and Non Uniform Quantization. **[8]**

b) A DM system is operating at 3 times the Nyquist rate for a signal with a 3 KHz Bandwidth. The quantizing step size is 250 mV. **[8]**

i) Determine the maximum amplitude of a 1 KHz input sinusoid for which the delta Modulator does not show slope overload.

ii) Determine the post filtered output of SNR.

Q7) a) Explain QPSK with its Transmitter and Receiver. **[8]**

b) Explain M-ary PSK in detail with the help of Transmitter and Receiver. **[8]**

OR

Q8) a) Compare QPSK, M-ary PSK, M-ary FSK and ASK. **[8]**

b) Explain with the help of neat block diagram 16 bit QAM transmitter and receiver. **[8]**

Q9) a) Compare FDMA, CDMA, TDMA. **[9]**

b) With the help of block diagram, explain the FH-SS transmitter and receiver. **[9]**

OR

Q10) a) With the help of mathematical expressions and block diagram explain DS-SS system. **[9]**

b) Write a Short note on : **[9]**

i) Pure ALOHA.

ii) Slotted ALOHA.

iii) CSMA.

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Total No. of Questions : 10]

SEAT No. :

P1718

[Total No. of Pages : 3

[5460]-546
T.E. (Electronics Engineering)
DSP AND APPLICATIONS
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) What is multi-rate signal processing? Draw block diagram of interpolator. With neat waveforms explain interpolator. Which filter is used in interpolator and why? **[6]**

b) Compute 4-point DFT of sequence x(n) = {1, 0, –1, 2}. **[4]**

OR

Q2) a) State following properties of DFT. **[4]**

i) Periodicity

ii) Symmetry

b) Draw signal flow graph of 8-point radix 2 DIT FFT algorithm. **[6]**

Q3) a) Obtain inverse Z transform of $X(Z) = \dfrac{3Z^{-1}}{1-\frac{1}{4}Z^{-1}-\frac{1}{8}Z^{-2}}$

Comment on ROC, if system is stable. **[6]**

b) Explain advantages of DSP over analog signal processing. **[4]**

OR

P.T.O.

Q4) a) State and write mathematical expression for any Five properties of Z transform. **[5]**

b) Compute circular convolution for sequences given below using DFT - IDFT method **[5]**

X1 (n) = {1, 3, 5, 7} and X2 (n) = {6, 4, 2, 0}

Q5) a) The system function of the analog filter is given as **[10]**

$$Ha(s) = \frac{S + 0.1}{(S + 0.1)^2 + 9}$$

Obtain the system function of the IIR digital filter by using impulse invariance method.

b) Explain the steps used for designing an IIR filter using bilinear transformation method (BLT). What is wrapping effect? How is it taken care of in BLT? **[8]**

OR

Q6) a) Obtain direct form I and II realization of a system described by **[8]**

$3y\,(n) - 2y\,(n-1) + y\,(n-2) = 4x\,(n) - 3x\,(n-1) + 2x\,(n-2)$.

b) Compare FIR filter with IIR filter. **[6]**

c) Write short note on Finite word length effect in IIR filter. **[4]**

Q7) a) Design linear phase FIR low pass filter with cut of frequency of 1 rad/sec and filter length is 7 using rectangular window. **[10]**

b) Explain Gibbs phenomenon. **[6]**

OR

Q8) a) Design a low pass digital filter with cut off frequency $\omega_c = \pi / 2$ using frequency sampling technique for N = 17. **[10]**

b) Compare various windows for design of FIR filter. **[6]**

Q9) a) Write notes on : **[8]**

i) Multiply and Accumulate unit.

ii) Pipelining.

b) State and explain four important features of DSP processors. **[8]**

OR

Q10) a) With the help of block diagram explain architecture of TMS30C28XX processor. **[8]**

b) Explain how DSP is useful in Interference cancellation in ECG. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1719

[Total No. of Pages : 2

[5460]-547

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS

(2015 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 and Q9 or Q10.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain Exception/interrupts of ARM 7. **[6]**

b) Explain different instruction format of MSP 430 Microcontroller. **[4]**

OR

Q2) a) Interface LED's to port P1.0 to P 1.7 of MSP 430 microcontroller and write a embedded C program to blink LED's. **[6]**

b) Explain DMA Transfer Modes of MSP 430 microcontroller. **[4]**

Q3) a) Explain block diagram of Analog to Digital conversion (ADC 10) of MSP 430 microcontroller. **[6]**

b) Explain the low power modes of MSP 430 microcontroller. Compare Active mode and Standby mode. **[4]**

OR

Q4) a) Explain the following instruction of ARM 7. **[6]**

i) MLA R0, R1, R2, R3

ii) MVN R1, #22

iii) BIC R1, R2, R3

b) What are the different modes of Operation in Arm 7? **[4]**

P.T.O.

Q5) a) Explain PLL 0 and PLL 1 of LPC 2148. Explain the PLLCON and PLLCFG registers of PLL. **[8]**

b) List the features of timer of LPC 2148. Explain the functions of following w.r.t. timer of LPC 2148. **[8]**

i) Match Register
ii) Capture Register
iii) Timer Counter register
iv) Timer Control register

OR

Q6) a) Draw diagram to interface 16 x 2 LCD display to LPC 2148. Explain control signal of LCD. Write embedded C program to display message "UNIVERSITY" on second line. **[8]**

b) List features of GPIO in LPC 2148. Explain various registers of GPIO of LPC 2148 by giving example for each. **[8]**

Q7) a) List the features of on chip DAC of LPC 2148. Write embedded C program to generate saw tooth, triangular and square wave using DAC of LPC 2148. **[8]**

b) Draw & Explain Interfacing of GPS to LPC2148. Write the algorithm and flow chart for initializing and reading data from GPS. **[8]**

OR

Q8) a) List Features of UART 0 of LPC 2148. Interface PC with LPC 2148 using UART. Write embedded C program to transmit character "A" to PC. **[8]**

b) List the features of on chip ADC of LPC 2148. Write an Embedded C program for on chip ADC. **[8]**

Q9) a) Describe the need of operating system in developing complex applications in embedded system design. Explain desired features of operating system & hardware support from processor. **[6]**

b) What are the features of ARM Cortex processors? **[6]**

c) Explain different software layers with respect to CMSIS standard. **[6]**

OR

Q10) a) Draw and explain blcok diagram of ARM Cortex M_3. **[6]**

b) Compare ARM Cortex M_3 with ARM 7 TDMI. **[6]**

c) List the features of ARM Cortex A, R, M series. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1720

[Total No. of Pages : 2

[5460]-548

T.E. (Electronics)

BUSINESS MANAGEMENT AND ORGANIZATION

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Give the distinctive features of new public sector policy. **[8]**

b) Write short note on globalization **[8]**

c) Explain the benefits of e-commerce to consumer **[4]**

OR.

Q2) a) Enumerate the advantages of Joint Stock Company. **[7]**

b) What are the advantages of Multinational Company? **[7]**

c) List feature relative merits and demerits of Sole Proprietorship. **[6]**

Q3) a) Explain SEZ rules and Approval mechanism and administrative Setup of SEZ. **[8]**

b) What does it mean "license a patent" and why is it done? **[8]**

OR

Q4) a) Describe the components in the four phases model of creativity. **[8]**

b) List the popular services offered across various BPOs and KPOs. **[8]**

Q5) a) Explain nature and functions of management. **[10]**

b) Explain contribution of Henri Fayol in the evolution of Management thought. **[8]**

P.T.O.

OR

Q6) a) Define forms of organization –Line, line staff and committee. **[10]**

b) Discuss the FW Taylor principles in management in detail **[8]**

Q7) a) Explain the levels of decision making in Business Management. **[8]**

b) What is International Management? Explain in detail. **[8]**

OR

Q8) a) Write short note on : **[10]**

i) Total Quality Management.

ii) Stress Management.

b) Explain the benefits of Strategic Management. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1721

[Total No. of Pages : 2

[5460]-549
T.E. (Electronics)
FUNDAMENTALS OF HDL
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explore the advantages of HDL language. **[4]**

b) With examples explain the types of wait statements in HDL. Also explain with examples Assert and report statement. **[8]**

c) Explain with diagram SRAM and Antifuse techniques. **[8]**

OR.

Q2) a) Differentiate between simulation and synthesis. **[4]**

b) Write VHDL structural code for a 3-bit Ripple carry adder using Full adders. **[8]**

c) Draw and explain: **[8]**

i) Logic Cell
ii) CLB
iii) Slice
iv) Programmable switch matrix

Q3) a) Write Verilog code for an N-Bit Ripple-carry adder using Task. **[6]**

b) What is Subprogram? Describe VHDL subprograms with syntax. **[6]**

c) Compare functions with procedures in VHDL. **[4]**

P.T.O.

OR

Q4) a) Write Verilog function for half adder to have a full adder. Use function call in main module. **[6]**

b) Write VHDL procedure to implement single bit Full adder. **[6]**

c) Explain Verilog Tasks with syntax. **[4]**

Q5) a) What are the salient features of Verilog? Explore in detail. **[5]**

b) Explain in detail Verilog Module with an example. **[5]**

c) What are "nets" in Verilog? List out different types of Net declarations. **[6]**

OR

Q6) a) List the differences between "Wire" and "Reg". **[5]**

b) Write short note on compiler directives used in Verilog. **[5]**

c) Using arithmetic operators, write verilog program to perform addition, multiplication, subtraction and division of two one bit numbers. **[6]**

Q7) a) Explain Verilog structural design elements and also list out Verilog built-in gates. **[8]**

b) Write Verilog behavioral module for full adder. **[6]**

c) Differentiate between "always" and "initial" block. **[4]**

OR

Q8) a) Write Verilog structural description for a 2 to 4 Decoder with three-state output. **[5]**

b) Explain Verilog dataflow design elements. **[5]**

c) Write switch level Verilog code for a two input CMOS NAND gate. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1722

[Total No. of Pages : 3

[5460]-550
T.E. (Electronics)
PLC AND APPLICATIONS
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Compare Digital Gate logic vs Relay logic. **[6]**

b) What is PLC Ladder logic? Draw a ladder program for; A selection committee comprises four members including the chairman. In order for a candidate to be selected, he or she has to have the support of at least two members. The chairman however can push any candidate through. If each member is provided with a switch design a logic that will ring a bell when a candidate is selected. **[6]**

c) List timer and counters used in PLC programing. **[8]**
Draw a ladder diagram using timer function for a two motor system having a following conditions,

i) The start switch starts motor 1 and after 10 seconds motor 2 starts.

ii) The stop switch stops motor 1 and after 15 seconds motor 2 will stops.

OR

Q2) a) Define PLC. Explain its History, Basic structure & Components. **[6]**

b) Develop a ladder diagram to fulfil the following conditions, **[6]**

i) When the start switch is ON the motor is ON.

ii) When the stop switch is ON the motor is OFF.

iii) When the motor is ON the green light is ON.

iv) When the motor is OFF the red light is ON.

P.T.O.

c) Design ladder logic for a system using comparisons instructions, **[8]** Motor 1 starts as soon as the PLC starts. After 10 seconds, Motor 1 goes OFF and Motor 2 starts. After 5 seconds Motor 2 goes OFF and Motor 3 starts. After another 10 seconds Motor 2 restarts and after 5 seconds it stops and Motor 1 starts and cycle is repeated.

Q3) a) List the parameters need to be check while PLC installation. Write in your own words how do you protect PLC from Electrical noise and Voltage variation & Surge? **[8]**

b) What do you mean by Program Editing & Commissioning of PLC? List general steps followed when commissioning a PLC system? **[8]**

OR

Q4) a) Extend your view on Troubleshooting of a PLC system for following sections, **[8]**

i) Processor module

ii) Input & Output malfunctions

b) Which are the preventive maintenance tasks should be carried for PLC systems? **[8]**

Q5) a) Explain with block diagram SCADA system. **[8]**

b) What is RTU? Explain its functions. **[6]**

c) Discuss PID Control system in brief. **[4]**

OR

Q6) a) What is HMI? Explain Interfacing technique of PLC with HMI. **[8]**

b) Illustrate MTU operating interfaces & applications. **[6]**

c) What is structure of control systems? **[4]**

Q7) a) List the types of communication interface. Explain Serial communication with its advantages. **[6]**

b) Explain working of Modbus and Fieldbus. **[6]**

c) Which types of networking channels used in PLC? Discuss any one in brief. **[4]**

OR

Q8) a) What is CAN? Explain working principle of it in detail. **[6]**

b) List advantages of standard industrial network. **[6]**

c) Write the characteristics of Profibus-DP. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P1723

[Total No. of Pages : 2

[5460]-551
T.E. (E & TC)
DIGITAL COMMUNICATION
(2015 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Derive Mathematical expression for Signal to noise ratio in PCM System. **[8]**

b) Compare PCM and DM systems. **[6]**

c) What is a strictly stationary process? Explain. **[6]**

OR.

Q2) a) What is bit synchronization? Explain Early –late and early gate method? **[8]**

b) A binary channel with 64 kbps bit rate is available for PCM Voice transmission find **[8]**

i) Number of quantization levels
ii) Number of bits per sample
iii) Sampling frequency, the voice signal is band limited to 3.4 kHz.

c) What are the properties of line codes. **[4]**

Q3) a) Explain Maximum likelihood ratio test. (LRT) **[4]**

b) Derive the expression of SNR and Probability of error for Matched Filter in presence of AWGN noise channel. **[8]**

c) Define Gaussian process state its properties. **[4]**

OR

P.T.O.

Q4) a) Explain geometrical representation of signal and Gram-Schimitt Procedure. **[4]**

b) Derive expression of SNR for Integrator and Dump circuit. **[8]**

c) State the various properties of Match filter. **[4]**

Q5) a) Find the probability of error for coherent FSK when amplitude of I/P at coherent optimal receiver is 10mv and frequency 10 MHz, the signal corrupted with white noise of PSD 10^{-9} W/Hz , the data rate is 100 kbps. [erfc(1.01) = 0.1531, erfc(1.11)=0.1164, erfc(1.22) = 0.0844, erfc(1.33) = 0.0599]. **[8]**

b) Explain QPSK generation with neat diagram and waveform. **[4]**

c) Compare the performance of modulation schemes, BPSK, BFSK, QPSK, DPSK, M-ary PSK, M-ary FSK w.r.t. **[6]**

i) BW
ii) PSD
iii) Probability of Error
iv) Application Bit rate

OR

Q6) a) Derive the expression of Probability of error for BPSK receiver in presence of AWGN noise channel. **[8]**

b) Explain coherent binary FSK signal generation **[4]**

c) Explain M-ary PSK transmitter and receiver. **[6]**

Q7) a) What is PN sequence? Explain its properties with 4-stage Shift register. **[6]**

b) What are the advantages of FHSS. **[4]**

c) Explain the concept of spread spectrum in advanced digital communication system. **[6]**

OR

Q8) a) Explain the concept of Processing gain, Probability of error and Concept of jamming. **[6]**

b) Explain Fast and Slow frequency hopping techniques. **[6]**

c) Derive PSD for DSSS system and enlist its disadvantages. **[4]**

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Total No. of Questions : 10]

SEAT No. :

P2963

[Total No. of Pages : 3

[5460]-552
T.E. (E & TC) (End Semester)
DIGITAL SIGNAL PROCESSING
DSP (Digital Signal Processing)
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagram must be drawn whenever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data if necessary.***

Q1) a) Show the mapping between analog frequencies and digital frequencies. **[4]**

b) Explain the concept of Eigen values and Eigen vector, Find the Eigen values of given matrix A as given below: **[6]**

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$$

OR

Q2) a) Explain the cyclic property of twiddle factor for 8 point DFT. **[4]**

b) Find linear convolution using overlap save method of the following sequences: **[6]**

$x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ and $h(n) = \{1, 2, 3\}$

Q3) a) Explain how ROC is important to determine the causality and stability of LTI discrete time system. **[4]**

b) Draw signal flow graph of radix-2 DIF FFT algorithm for N=4. **[6]**

OR

P.T.O.

Q4) a) State and prove the convolution property of Z transform. **[6]**

b) Show relation between Fourier Transform and Z-Transform. **[4]**

Q5) a) Comparison between Impulse invariance and bilinear transformation method. What is prewarping? **[9]**

b) A Digital filter has frequency specification as:

Pass band Frequency = $\omega_p = 0.2\pi$ **[9]**

Stop band Frequency = $\omega_s = 0.3\pi$

What are the corresponding specifications for pass band and stop band frequencies in analog domain if,

i) Impulse invariance technique is used for designing.

ii) BLT method is used for Designing.

OR

Q6) a) Obtain direct form I and Direct form II realization of a LTI system described difference equation as given below: **[9]**

$3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3(n-1) + 2x(n-2)$

b) Give the properties and characteristics of chebyshev and Butterworth filter, Give salient features of Low Pass Butterworth Filter. **[9]**

Q7) a) What is Gibbs Phenomenon? Explain Importance of windowing functions to design FIR filter in details. **[8]**

b) Distinguish between IIR and FIR filter, Why ideal filter cannot be realized practically? **[8]**

OR

Q8) a) Design an FIR filter with Hamming window for desired impulse response given below: **[8]**

$$H_d(w) = e^{-3jw}; -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$

$$= 0 : \frac{\pi}{4} \le w \le \pi$$

b) Explain finite word length effect in Digital FIR filter. What do You understand by linear phase response? **[8]**

Q9) a) Explain different types audio crossover systems? Why digital crossover is preferred? **[8]**

b) Explain compact disc recording system with the help of block schematic. **[8]**

OR

Q10) Write short notes : (Any Two) **[16]**

a) Vibration analysis for Defective Gear Teeth.

b) Voice Coders (Vocoders)

c) Speech noise Reduction

d) Explain how DSP is very useful to suppress the interference in ECG.

Total No. of Questions : 10]

SEAT No. :

P1724

[Total No. of Pages : 3

[5460] - 553
T.E. (E & Tc)
ELECTROMAGNETICS
(2015 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.***
5) ***Use of Non - programmable calculator and Smith Chart is allowed.***

Q1) a) State and prove Gauss Theorem. **[5]**

b) A 5nc point charge is located at A (2, –1, 3) in free space. Find Electric Field Intensity at origin. **[5]**

OR

Q2) a) State the relation between Electrostatic potential & Electric field intensity. **[5]**

b) If $D = 5x / 2\ \hat{a}x\ c/m$ Evaluate both sides of divergence theorem for volume of cube 1m to an edge centered at origin & edges parallel to the axis. **[5]**

Q3) a) Derive the boundary condition at an interface between conductor and free space. **[6]**

b) State and prove Biot Savarts law. **[4]**

OR

Q4) a) An infinite long straight filament carrying current 3 A is placed along z - axis. Calculate magnetic field intensity at p(1, 2, 1) **[5]**

b) State and explain stockes theorem. **[5]**

P.T.O.

Q5) a) Write Maxwell's equations in point & integral form for time varying field & free space. **[8]**

b) Define conduction current & conduction current density? Derive current continuity equation. **[10]**

OR

Q6) a) State and prove Poynting theorem. **[8]**

b) The Electric field intensity $\bar{E}=250\sin 10t$ v/m for afield propagating in a medium whose $\sigma = 5.0$ s/m & $\in_r = 1.0$ Calculate Jd, Jc and frequency at which Jc = Jd. **[10]**

Q7) a) Explain various primary and secondary parameters of Transmission line. **[6]**

b) A transmission line has following primary constants : **[10]**
R = 11 Ω/Km, G = 0.8 mho/Km, L = 0.00367 H/Km, C = 8.35 nf/Km. At a single of 1 KHz.

Calculate :

i) Characteristic impedance

ii) Attenuation constant

iii) Phase constant

iv) Wavelength

v) Velocity

OR

Q8) a) What is distortion less line? Derive the expression for characteristic impendence and propagation constant for distortion less line. **[6]**

b) A lossless 100 Ω transmission line is terminated in an impedance 50 + j60 Ω **[10]**

Calculate

i) VSWR

ii) Reflection coefficient.

iii) Impedance of 0.35 Ω from load using smith chart.

Q9) a) Derive from Maxwell's equations the wave equation in vector form for Electric Field Intensity in free space. **[8]**

b) Find skin depth at frequency of 1.6 MHz in aluminum whose $\sigma = 38.2 \times 10^{-3}$ s/m & new $\mu_r = 1.0$. Also find propagation constant and wave velocity propagating in that medium ($\alpha = \beta = 1/\delta$) **[8]**

OR

Q10) a) Define depth of penetration. Derive expression for depth of penetration for a good conductor. **[8]**

b) A 10 GHz plane wave travelling in free space as an amplitude Ex = 10 V/m. Find V, λ, β, η and amplitude & direction of H. **[8]**

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Total No. of Questions : 08]

SEAT No. :

P1725

[Total No. of Pages : 2

[5460] - 554
T.E. (E & TC) (Semester - I)
MICROCONTROLLERS
(2015 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 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Write a program for Transmission of SPPU continuously at baud rate of 9600. **[6]**

b) Draw and explain block schematic of logic analyzer. **[7]**

c) Draw an interfacing diagram of stepper motor and write an ALP to rotate 90° clock wise and then anti - clock wise with highest delay generated by timer 1, mode 1. **[7]**

OR

Q2) a) Draw and explain programming model of 8051 in detail. **[6]**

b) Draw an interfacing diagram of multiplexed 7 segment display and write an ALP to display 99 with step delay of 1 msec (Timer 0, Mode 1) **[7]**

c) Design a DAS to interface LED, Switches, relay and buzzer, write an ALP for satisfying the following conditions. **[7]**

i) S1 pressed – Relay ON, LED ON, Buzzer off;

ii) S2 Pressed ---- Relay On, LED ON, Buzzer ON;

iii) S3 pressed ----- Relay off, LED off, Buzzer off

P.T.O.

Q3) a) Draw and explain functional diagram of Timer 1 of PIC. Also differentiate between operating functions of timer 0, 1 and 2 of PIC. **[8]**

b) Draw and explain the functional diagram of RESET in PIC. **[8]**

OR

Q4) a) State features of PIC 18, draw and explain the flag structure of PIC in detail. **[8]**

b) Write a C18 program to generate square wave of 50 Hz continuously using Timer 0, 16 bit and no prescaler. XTAL = 10 MHz. **[8]**

Q5) a) Draw a neat interfacing diagram to display 'SPPU' on 4^{th} position in line one and 'UNIVERSITY' at 5^{th} position on second line, write an embedded C program. **[8]**

b) Draw and explain the Compare mode of CCR module. **[8]**

OR

Q6) a) Write a program for 2.5 KHz and 75% duty cycle PWM generation with N = 4, XTAL = 10 MHz. **[8]**

b) Draw an interfacing diagram of LED connected to Port B of PICI8F and write program embedded C program for Ring Counter. **[8]**

Q7) a) Explain the I2C mode of MSSP structure used for serial communication. **[8]**

b) Explain the use of BRGH register for calculation of Baud rates. Draw and explain UART transmitter block diagram. **[10]**

OR

Q8) a) Draw an interfacing diagram to PIC - ADC for measuring temperature of room and display on LCD, indicate over temperature by LED, buzzer and relay connected to port, Write an C program for testing. **[8]**

b) State features of RTC and draw an interfacing diagram with PIC 18FXXXX, write an initialization program. **[10]**

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Total No. of Questions : 08]

SEAT No. :

P1726

[Total No. of Pages : 3

[5460] - 555
T.E. (E & TC)
MECHATRONICS
(2015 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.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Write a short note on servomechanism. **[6]**

b) If the spring transducer deflects 0.075 m when a force of 15 kN is applied, find the input force for a displacement of 0.1 m. **[4]**

c) With the help of a suitable diagram explain the working principle of unbalanced vane pump. **[5]**

d) Describe the working of epicyclical gear train with the help of neat diagram. **[5]**

OR

Q2) a) A potentiometer which is used to measure the rotational position of a shaft has 850 turns of wire. The input range is from –160° to + 160°. The output range is from 0 to 12V. Determine **[6]**

i) Span of potentiometer

ii) Sensitivity

iii) Average resolution in volts

b) Explain the working of absolute encoder with a neat diagram. **[6]**

c) Determine the force needed to a piston of 2 cm radius in order to result a force of 6000 N at the working piston of radius 6 cm. Calculate the hydraulic pressure in bar. **[4]**

d) Define the following terms with respect to hydraulic pump : **[4]**

i) Volumetric efficiency

ii) Power efficiency

P.T.O.

Q3) a) Explain the working of dynamic compressor with a neat sketch. **[6]**

b) Demonstrate the working of non-relieving pressure regulator. **[6]**

c) What is the difference between free air and standard air? **[4]**

OR

Q4) a) With a suitable diagram explain how double acting piston compressor delivers air twice than single acting piston compressor. **[8]**

b) A pneumatic cylinder is required to move a 750N load 150mm in 0.5s. What is the output power? **[4]**

c) List two advantages and two drawbacks of pneumatic system over hydraulic system. **[4]**

Q5) a) Explain the following specifications of stepper motor. **[4]**

i) Phase

ii) Step angle

b) With a suitable sketch, explain the working of single acting cylinder. **[8]**

c) Explain the construction & working of bidirectional flow control valve. Draw its symbol. **[6]**

OR

Q6) a) Determine the input pulse rate if the stepper motor has 10° per step and rotating at 300 rpm. **[4]**

b) Explain the construction & working of 5/2 - way pilot operated valve. Draw its symbol. **[8]**

c) How relay is used as an electromechanical switch? Explain with suitable sketch. **[6]**

Q7) a) A train is subjected to lateral forces when it passes horizontal curves. This causes severe discomfort to the passengers. Devise a solution to tackle this problem. **[8]**

b) Design an antilock brake system to prevent the wheels of motor vehicle from locking while braking. **[8]**

OR

Q8) a) List six points of comparison between NC, CNC and conventional system. **[12]**

b) Explain the need of following sensors in engine management system. **[4]**

i) Knock sensor

ii) Mass airflow sensor.

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Total No. of Questions : 8]

SEAT No. :

P1727

[Total No. of Pages : 3

[5460] - 556
T.E. (E & TC)
POWER ELECTRONICS
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***

2) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

3) ***Assume suitable data, if necessary.***

Q1) a) Explain the gate drive circuit requirements for MOSFET & draw the sample drive circuit. **[6]**

b) Explain effect of source impedance on the performance of 1Φ full converter. Derive the expression for average output voltage? **[6]**

c) In a single phase full converter with highly inductive load is feed from 120 V RMS ac mains & fired at $\alpha = 45$ deg., Calculate **[8]**

i) Average Load voltage.

ii) RMS Load Voltage.

iii) Power factor.

OR

Q2) a) In a full AC to DC converter, explain the rectification mode & line commutated inverter mode of operation with relevant waveforms. **[7]**

b) Explain single pulse PWM & Sinusoidal PWM control technique for 1 ϕ inverter. **[7]**

c) Explain the following parameters in relation to ac to dc converters, **[6]**

i) Displacement factor

ii) Harmonic factor.

iii) Power factor

P.T.O.

Q3) a) Explain the principle of step up chopper feeding R - L load, with neat diagrams and waveforms of load voltage, load current, voltage across switch & current through switch. Derive the expression of output voltage. **[8]**

b) Explain the operation of Flyback type SMPS and discuss advantages & limitations. **[8]**

OR

Q4) a) Explain 4 quadrant operation of chopper for DC motor as a load. **[8]**

b) Draw & explain the operation of single phase AC voltage controller using SCR or IGBT with necessary waveforms. Derive the expression of RMS voltage at output. **[8]**

Q5) a) Draw the neat diagram of ZCS resonant converter. Explain the operation through waveforms? **[8]**

b) In a MOSFET operating in a circuit with V_{DS} = 25V & I_D = 1A, the thermal resistance θ_{jc} = 1°C/W, Maximum junction temperature is 125°C, and ambient temperature is 25°C, the thermal grease is used between heat sink and device case reduces the θ_{cs} = 0.3°C/W, find the appropriate heat sink. **[8]**

OR

Q6) a) Draw the neat diagram of ZVS resonant converter. Explain the operation through waveforms? **[8]**

b) Explain dv/dt, di/dt and snubber circuit protection. **[8]**

Q7) a) A UPS is driving a load of 200 W with lagging pf of 0.82. The efficiency of the inverter is 85% & the battery voltage is 12 V, Find **[6]**

i) KVA Rating of inverter

ii) AH rating of battery

b) Draw and explain the fan regulator using Triac & Diac with waveforms at various circuit points? **[6]**

c) What are the methods of speed control of DC motor? Explain the how the speed of the separately excited dc motor can be controlled by DC drive system? **[6]**

OR

Q8) a) What is stepper motor drive? Explain with necessary sequence generation, how it works? **[8]**

b) Draw & explain torque speed characteristics of DC drive and explain the constant power & constant speed operation of DC motor? **[10]**

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Total No. of Questions : 08]

SEAT No. :

P1728

[Total No. of Pages : 2

[5460] - 557
T.E. (E & TC)
Information Theory, Coding & Communication Networks
(2015 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 and 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) A DMS channel has following symbols and their probabilities. Apply Huffman coding technique to generate a code with minimum variance. Calculate code efficiency. **[8]**

S_0	S_1	S_2	S_3	S_4	S_5	S_6
0.125	0.0625	0.25	0.0625	0.125	0.125	0.25

b) Draw syndrome calculator for (7, 4) cyclic decoder and obtain syndrome for received codeword [1001001] **[6]**

c) Define channel capacity. State channel coding theorem. What are parity bits? **[6]**

OR

Q2) a) Apply L.Z. algorithm to find the code for following bit stream : 1110100110001011010. Recover original sequence for code word 01000.**[6]**

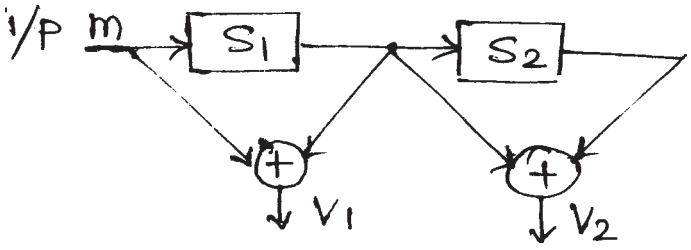
b) Obtain codewords for (6,3) LBC which has generator matrix of G = [100101; 010011; 001110]. Find all possible codewords. obtain corrected codeword, if received codeword is r = [001110]. **[8]**

c) For cyclic code with generator polynomial $g(x) = x^3 + x^2 + 1$, obtain the codewords for [1011], [1010] & [1100]. **[6]**

P.T.O.

Q3) a) Design a BCH code with block length n = 15 and error correcting capacity $t_c = 1,2$ **[9]**

b) For the convolutional encoder shown below, decode the encoded sequence [1011111101] using viterbi algorithm. **[9]**



OR

Q4) a) Write short notes on sequential decoding and viterbi decoding. **[8]**

b) For binary BCH (15, 5) triple error correcting code with generator polynomial, **[10]**

$$g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$$

Find out the error locations if the received polynomial is $r(x) = x^5 + x^3$.

Q5) a) Draw OSI model and explain functions of each layer. **[8]**

b) Explain network design issues. **[8]**

OR

Q6) a) Compare OSI and TCP/IP models. **[8]**

b) What is addressing? Explain different types of addressing. **[8]**

Q7) a) What is error control & flow control? Explain stop & wait ARQ protocol. **[8]**

b) Explain HDLC protocol & its frame structure. **[8]**

OR

Q8) a) Explain different transfer modes of HDLC. **[8]**

b) What is framing? Explain different types of framing methods. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1729

[Total No. of Pages : 2

[5460] - 558
T.E. (E & Tc)
BUSINESS MANAGEMENT
(2015 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.***
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) Draw and explain the flowchart of Planning in the management? **[8]**

b) Enumerate Juran's 10 steps of Quality Improvement. **[6]**

c) Write a note on Cost - Benefit analysis? **[6]**

OR

Q2) a) What do you understand by quality of design, conformance and performance. Explain in detail. **[8]**

b) A gear manufacturing Company sells gears at a selling price of Rs. 250 per unit. The company has fixed cost commitment at Rs. 20 Lacs and variable cost of Rs. 125 per unit. Calculate : **[6]**

Break Even Sales Quantity.

Break Even Sales

Contribution

Margin of Safety if actual production quantity of 60,000 Units.

c) Compare between F.W. Taylor's and Henry Fayol's theory of management. **[6]**

P.T.O.

Q3) a) Explain functions of HR management? **[8]**

b) Explain systematic approach to training? **[8]**

OR

Q4) a) Explain Human Resource Information System? **[8]**

b) Define Recruitment and Selection strategies? Also write the difference between them? **[8]**

Q5) a) What is Entrepreneurship? Explain the characteristics of Entrepreneurship. **[8]**

b) What are the government policies and incentives for business? **[8]**

OR

Q6) a) Explain two important documents for formation of Joint Stock Company? **[8]**

b) Discuss the different sources of Finance. **[8]**

Q7) a) What is Marketing? Briefly state the need for working. Enumerate the function of Management? **[10]**

b) Explain Modern marketing system? **[8]**

OR

Q8) a) Write note on : **[10]**

i) Supply Chain Management.

ii) Customer Relationship Management.

b) Explain Blogging and Micro Blogging Event Management. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1730

[Total No. of Pages : 2

[5460] - 559
T.E. (E & Tc)
ADVANCED PROCESSOR
(2015 Pattern)

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 with schematic the ARM based embedded device in detail **[6]**

b) Explain with neat diagram relation between CCLK and PCLK with the help of VPB/APB divider. Find the configuration of VPB divider to achieve PCLK = 30MHz for FOSC = 12 MHz. **[7]**

c) Draw an interfacing diagram of LED with LPC 2148 port1 and write a C program to display hex counter **[7]**

OR

Q2) a) Draw the structure of CPSR and explain the functions of each bit **[6]**

b) Draw and explain the system memory MAP of LPC 2148 **[7]**

c) Draw an interfacing diagram for GLCD with data pins from port 0 and control pins from port1 of LPC 2148 and write an embedded C program to display "square wave" starting at x = y = 10. **[7]**

Q3) a) Draw the interfacing diagram of SD card with LPC 2148. Explain the step to switch From SD bus mode to SPI bus mode **[8]**

b) Draw an Interfacing diagram of GSM module with LPC2148 and Write an initialization program to send a message. **[8]**

P.T.O.

OR

Q4) a) What is role of Vref in ADC and DAC ? Write a C program for generation of Triangular wave using on-chip DAC in LPC2148. **[8]**

b) Draw the interfacing diagram of EEPROM using 12C bus with LPC 2148. Explain the steps to read/write from/to 12C EEPROM. **[8]**

Q5) a) Explain the use of Hardware FFT processor with block schematic **[8]**

b) Explain the concept of Pairing General purpose register files of TMS320C67X processor with example **[8]**

OR

Q6) a) Explain in detail Selection Criteria of DSP.Compare the versions of fixed point digital signal processors **[8]**

b) Draw and explain Data paths ofTMS320C67X processor. **[8]**

Q7) a) Explain the operation of basic Fetch packet format in details **[8]**

b) Enlist on chip peripheral ofTMS320C67X processor? Explain with block diagram of Timers. **[10]**

OR

Q8) a) Explain the functions of following instructions in detail **[8]**

i) MVKLH .S1 or .S2;

ii) LDBU .D1 or .D2;

iii) SADD .L1 or .L2;

iv) MPYU .M1 or .M2

b) Draw and explain the internal memory architecture of TMS320C67X processor **[10]**

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Total No. of Questions : 8]

SEAT No. : ____

P1731

[Total No. of Pages : 4

[5460] - 560
T.E. (E & TC)
SYSTEM PROGRAMMING & OPERATING SYSTEM
(2015 Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Write difference between MACRO and FUNCTION with one example. **[7]**

b) Enlist the different loading schemes and explain in brief compile and go loader. **[7]**

c) Consider the following process where the arrival and burst time as shown below calculate average waiting time and turnaround time using FCFS algorithm **[6]**

	Burst time	Arrival time
P1	6	0
P2	4	4
P3	3	2

OR

Q2) a) In the analysis of a source program explain the significance and main functions of Lexical Analysis, Syntax Analysis and Semantic Analysis. **[7]**

b) Explain the significance and main functions of Loader in System software. **[7]**

c) Consider the following process where the arrival and burst time as shown below. If the quantum slice time is 2 calculate average waiting time and turnaround time using Round Robin algorithm. **[6]**

	Burst time	Arrival time
P1	05	0
P2	04	2
P3	07	4
P4	06	6

P.T.O.

Q3) a) What is mutual exclusion? Hence explain concept of Deadlock. **[6]**

b) What is producer Consumer problem? Explain how to solve it using semaphore. **[6]**

c) Find out the safe sequence for the execution of the following processes using bankers algorithm. **[6]**

Maximum resources R1 = 15, R2 = 8.

	Allocation Matrix			Maximum Required	
	R1	R2		R1	R2
P1	2	1	P1	5	6
P2	3	2	P2	8	5
P3	3	0	P3	4	8

OR

Q4) a) Define Deadlock, explain the conditions under which deadlock occur? **[6]**

b) Explain the following terms under IPC. **[6]**

i) Shared Memory

ii) Message passing

c) Find out the safe sequence for the execution of the following processes using bankers algorithm. **[6]**

Maximum resources R1 = 4, R2 = 4

	Allocation Matrix			Maximum Required	
	R1	R2		R1	R2
P1	1	0	P1	1	1
P2	1	1	P2	2	3
P3	1	2	P3	2	2

Q5) a) Differentiate between paging and segmentation. **[6]**

b) A computer has 4 page frames. Following table shows Time of loading, Time of last Access and R and M bits. Answer the following **[6]**

Page	Loaded	Last Reference	R	M
0	126	280	1	0
1	230	265	0	1
2	140	270	0	0
3	110	285	1	1

i) Which page will NRU replace.

ii) Which page will FIFO replace.

iii) Which page will LRU replace.

c) Consider the following page reference string
9,1,3,1,3,6,4,6,8,4,8,7,1,2
Number of page frames = 4
Calculate page fault and Hit ratio using LRU page replacement algorithm. **[4]**

OR

Q6) a) Consider the following page reference string

A,B,C,D,A,B,E,A,B,C,D,E

Calculate page fault with FIFO page replacement algorithm, when frame size 4. **[6]**

b) Explain demand paging and its advantages, also explain hardware support required to implement demand paging. **[6]**

c) Write a note on virtual memory. **[4]**

Q7) a) Write a note on **[6]**

i) Directory structure in OS

ii) File management system in OS

b) Explain DMA concept in detail. **[6]**

c) Calculate average seek length with the help of FCFS disk scheduling algorithm for the following track sequence **[4]**
90, 58, 55, 39, 18, 150

Current location of head is 55

OR

Q8) a) Write a short note on RAID disc. **[6]**

b) Enlist the various file operations. Explain access rights in file sharing. **[6]**

c) Explain file attributes. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1732

[Total No. of Pages : 3

[5460] - 561
T.E. (Electrical)
ADVANCED MICROCONTROLLER AND ITS APPLICATIONS
(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***

2) ***Figures to the right indicate full marks.***

Q1) a) Write an assembly language program for PIC 18 microcontroller to clear the contents of location 0 × 200 and 0 × 300 in internal data memory. **[6]**

b) Draw the status register for the PIC microcontroller and explain the function of Digit Carry flag. **[4]**

OR

Q2) a) Explain the following instructions. **[6]**

i) MOVF 0 x 04,0,1

ii) MOVFF fs, fd

iii) BSF PORTD, 0

b) Write a program in C language to configure bits RD0 and RB0 as input bits. **[4]**

Q3) a) Explain any three addressing modes used in PIC 18 microcontroller. **[6]**

b) Write an assembly language program for PIC 18 microcontroller to add 3 decimal numbers 1, 2, 3 and store the result in a location 0 x 040 in internal data memory. **[4]**

OR

P.T.O.

Q4) a) Draw T0CON register and explain function of individual bits of T0CON register. **[6]**

b) Find timer clock frequency and timer period for a PIC18 microcontroller with a crystal frequency of 16 MHz. Assume a pre scalar of 64 is used. **[4]**

Q5) a) Write a program in C language to configure CCP module of PIC18 microcontroller in PWM mode to generate a digital waveform with 40% duty cycle and 10 kHz frequency assuming PIC 18 microcontroller is running with 32 MHz crystal frequency. Use a pre scalar of 4 for timer2. **[8]**

b) Draw CCP1CON and list the steps involved in programming PIC microcontroller in Compare mode. **[8]**

OR

Q6) a) Explain how time period and duty cycle is set for generation of a waveform using PWM mode in CCP module in PIC 18 microcontroller. **[8]**

b) Draw CCP1CON and list the steps involved in programming PIC microcontroller in capture mode. **[8]**

Q7) a) Draw an interfacing diagram of LCD (16 × 2) with PIC18 microcontroller and explain the functions of various pins of LCD. **[8]**

b) Explain the interrupt structure of PIC18 microcontroller. **[9]**

OR

Q8) a) Write a neat diagram and flowchart explain AC voltage measurement using PIC microcontroller. **[8]**

b) Write a program in C language for PIC 18 microcontroller to transfer a letter 'T' serially and continuously at a baud rate of 9600. Use BRGH = 0. Assume crystal frequency = 10 MHz. **[9]**

Q9) a) With the help of interfacing diagram and flowchart explain how PIC 18 microcontroller can be used to measure temperature using LM35 sensor. **[8]**

b) Explain with a neat diagram, interfacing of DAC 0808 with PIC microcontroller and wirte a program in C language for generation of Square waveform using DAC interfaced with PIC microcontroller through Port B. Use suitable delay. Assume the crystal frequency to be 10 MHz. **[9]**

OR

Q10) a) 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

b) With the help of a neat interfacing diagrams explain interfacing of an electromagnetic relay and an Optoisolator with a PIC18 microcontroller. **[9]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P1733

[Total No. of Pages : 3

[5460] - 562
T.E. (Electrical)
ELECTRICAL MACHINES - II
(2015 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.***
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 neat diagram explain slip test to determine direct & quadrature axis reactance. **[6]**

b) What is hunting in synchronous motor. Explain how it can be reduced. **[6]**

c) A 1200 kVA 3300 V 50 Hz star connected alternator has effective armature resistance of 0.25 Ω per phase. A field current of 40 A produces a short circuit current of 200 A and an open circuit emf of 1100 V line to line. Calculate the voltage regulation at full load. **[8]**

i) 0.8 pf lag

ii) 0.8 pf lead

OR

Q2) a) A 3 phase 8 pole 750 rpm star connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is shorted by 2 slots. Calculate the induced emf between the lines if flux per pole is 0.06 weber. **[6]**

b) With neat diagram explain bright lamp method of synchronization of 3 phase alternators. **[6]**

c) Justify - 'Three phase synchronous motor is not self starting'. Explain any one method of starting 3 phase synchronous motor. **[8]**

P.T.O.

Q3) a) Explain with neat diagram following speed control methods in 3 ϕ I.M. **[8]**

i) Rotor resistance control

ii) V/F method

b) Explain with neat diagram construction & working of variable reluctance stepper motor. **[8]**

OR

Q4) a) With suitable diagram explain construction & working of linear induction motor. **[8]**

b) Write short note on - 3 phase Induction Generator. **[8]**

Q5) a) What are the problems experienced by dc series motor operated on a.c. supply. What are the modifications necessary to improve the performance of motor. **[8]**

b) Draw the circle diagram of plain A.C. series motor. Describe how to find out motor Input, motor output and speed scale. **[8]**

OR

Q6) a) Compare the performance of universal motor on A.C. and D.C supply. Draw torque vs. armature current and speed vs. torque characteristics on a.c. & d.c. operation. **[8]**

b) With neat diagram explain working of **[8]**

i) Inductually compensated a.c series motor.

ii) Conductually compensated a.c series motor

Q7) a) With neat diagram, explain construction & working of permanent capacitor induction motor. Draw its phaser diagram. **[10]**

b) With suitable diagram explain no load test and blocked rotor test on single phase induction motor. How equivalent circuit parameters are obtained from these tests. **[8]**

OR

Q8) a) A 230 V, 1 HP, 2 pole single phase Induction motor has following parameters -

$$R_1 = 2.2\ \Omega,\ X_1 = 3\ \Omega,\ R_2' = 3.8\Omega,\ X_2' = 2.1\Omega,\ X_m = 86\Omega$$

Calculate current, Input power, power factor & efficiency when operating at slip, s = 6% **[10]**

b) With neat diagram, explain construction & working of split phase induction motor. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1734

[Total No. of Pages : 3

[5460] - 563
T.E. (Electrical)
POWER ELECTRONICS
(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) *Answer any one question from 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) What is communication of SCR? Explain class C communication of SCR. **[5]**

b) Explain the working of type D chopper with appropriate waveforms to demonstrate its operation in first and fourth quadrants. Indicate the range of duty cycle for which it operates in first and fourth quadrants. **[5]**

OR

Q2) a) Derive expression for average output voltage and rms output voltage of a single phase fully controlled bridge converter feeding RL load. (assume continuous conduction) **[5]**

b) Draw and explain output and transfer characteristics of IGBT. **[5]**

Q3) a) Describe working of single phase of dual converter with output voltage waveform. **[5]**

b) Explain working of SCR. Define latching current & holding current as applicable to an SCR. Show these currents on its static V-I Characteristics. **[5]**

OR

P.T.O.

Q4) a) Explain with neat circuit diagram operation of UJT triggering circuit of Thyristor. **[5]**

b) For a type A chopper, DC source voltage Vs = 230 V, load resistance R = 10 Ω. Take a voltage drop of 2V across chopper when it is on. For duty cycle of 0.4, calculate : **[5]**

i) Average and rms values of output voltage.

ii) Chopper efficiency

Q5) a) Explain working of three phase fully controlled converter with RL load & firing angle of 60° Draw output voltage waveforms & obtain expression for phase voltage & Line voltage. **[8]**

b) With neat diagram explain four mode operation of a TRIAC. **[8]**

OR

Q6) a) Explain operation of two stage ac voltage regulator with out put waveforms for RL load. **[8]**

b) A 3 phase full converter, fed from three phase, 400 V, 50 Hz source is connected to load R = 10Ω , E = 350 V and large inductance so that the output current is ripple free. Calculate the power delivered to load and input power factor for $\alpha = 30°$ **[8]**

Q7) a) For single pulse width modulation with quasi square wave show that output voltage can be expressed as $V0=\sum_{n=1,3,5,....}^{\infty} \frac{4Vs}{n\pi} \sin\frac{n\pi}{2} \sin nd \sin nwt$. Where Vs is source voltage and pulse width is 2d. **[8]**

b) Explain with neat circuit diagram working of single phase full bridge voltage source inverter connected to R, RL, RLC load and draw output voltage and current waveforms. **[8]**

OR

Q8) a) Explain Multiple pulse modulation with necessary waveforms. Why multiple pulse modulation is better than single pulse modulation? **[8]**

b) Compare current source inverter and voltage source inverter. **[8]**

Q9) a) Draw neat diagram of three level Flying capacitor converter and explain its principal of operation. Comment on voltage balancing of capacitors. **[10]**

b) List different harmonic elimination techniques used in inverter. Explain any one method in detail. **[8]**

OR

Q10) a) Explain working of three phase six step voltage source inverter in 120° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **[10]**

b) Write short note on cascaded multilevel converter. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P3697

[Total No. of Pages : 2

[5460]-564
T.E. (Electrical)
ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(2015 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) Derive Kelvins law and state its Limitations. **[7]**

b) List out any three symbols of equipment used in substations with their specifications. **[3]**

OR

Q2) a) A Single phase ac distributor AB 500 mt. long is fed from point A and is loaded as: **[6]**

i) 100A at 0.707 lag power factor at C at distance of 300 mt. from Point A.

ii) 200A at 0.8 lag power factor at 500 mt. from Point A.

The power factors at both load points are referred to voltage at point 'C'.

The Total Impedance of Distributor per km is (0.2 + j0.1) Ω. Calculate total voltage drop in distributor and its Magnitude.

b) Explain Single bus bar system with suitable diagram. **[4]**

Q3) a) Explain Breakdown maintenance of transformers. **[6]**

b) Explain Steps involved in design of substation earthing grid as per IEEE standard 80 – 2000. **[4]**

OR

Q4) a) Explain necessity of earthing in substations. **[4]**

b) Explain following Terms. **[6]**

i) Polarization Index

ii) Role of thermography in electrical field

P.T.O.

Q5) a) What is dissolved gas analysis? List out gases generally found in transformer oil. **[6]**

b) List out fault location methods for locating the cable fault and explain any one with diagram **[6]**

c) Explain motor current signature analysis for induction motor. **[6]**

OR

Q6) a) Write short note on following: **[9]**

i) Degree of polymerization

ii) Failure mode of Transformer

iii) Causes of cable failure

b) Draw and explain block diagram of filteration and reconditioning of transformer oil. **[9]**

Q7) Write short note on following: **[16]**

a) Cable Sizing

b) Price Catalogue

c) Labour Rate

d) Schedule of rate

OR

Q8) a) Explain the procedure of installation of underground LT service line. **[8]**

b) State and explain general factors to be considered in estimation of HT and LT Lines. **[8]**

Q9) a) Explain following terms: **[8]**

i) Danger arising as a result of faulty equipments

ii) Contents of first aid box

b) Sate Indian electricity rules of Central Electricity Authority (CEA). **[8]**

OR

Q10)a) Classify hazardous areas and how they can be prevented. **[8]**

b) Write any eight objectives of electrical safety. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1735

[Total No. of Pages : 4

[5460] - 565
T.E. (Electrical)
POWER SYSTEM - II
(2015 Pattern) (Semester - II)

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) ***Use of calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Prove that complex power $S = \bar{V} \times \bar{I}^*$. **[5]**

b) What are the factors affecting corona? Elaborate the methods to reduce corona loss. **[5]**

OR

Q2) State true or false with justification :

a) If 50% line capacitive series line compensation is connected in a transmission line, power transfer capability is reduced by 50% than uncompensated line. **[2.5]**

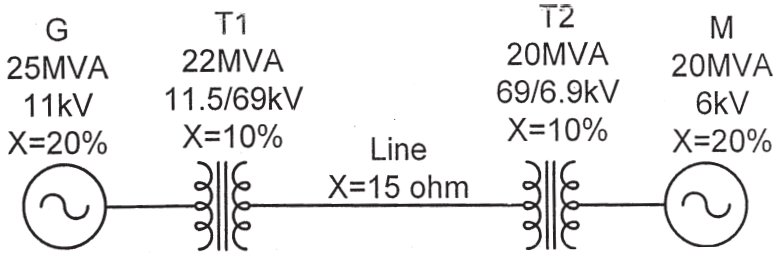
b) When HV transmission line is unloaded, the voltage regulation is negative. **[2.5]**

c) Increase in the spacing between the conductor, increases the corona loss in EHV AC transmission line. **[2.5]**

d) The per unit impedance on HV side of transformer is less than LV side of transformer. **[2.5]**

P.T.O.

Q3) a) Take base MVA = 25 MVA and base kV = 69kV on transmission network and draw per unit diagram to these base values. **[7]**



b) What are the advantages of EHV AC transmission system? **[3]**

OR

Q4) a) Derive the active and reactive power equation for receiving end using generalized transmission line constant. **[7]**

b) Give the classification of buses with known and unknown variables in load flow analysis. **[3]**

Q5) a) A three phase 11kV, 5MVA, generator has a direct axis steady state reactance of 20%. It is connected to a 3MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV side is connected to a transmission line having 30 ohm reactance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current supplied by generator assuming no load prior to the fault. Take base of 11 kV, 5 MVA on generator. **[9]**

b) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. **[8]**

OR

Q6) a) The generating station at Koyna power plant is rated at 11 kV with short circuit capacity of 1000 MVA. The generating station at Radhanagar is also rated at 11 kV with short circuit capacity of 670 MVA. If these two generating stations are connected with interconnector of reactance $j0.4\Omega$, calculate possible short circuit MVA at each station. Take 1000 MVA as base (Hint : Short circuit MVA = Base MVA /reactance in pu, Take base MVA = 1000 MVA and base kV = 11kV) **[9]**

b) In case of three phase fault at the terminal of an unloaded alternator, prove that $x''_d < x'_d < x_d$ and $I''_f > I'_f > I_f$ with mathematical relation and diagram. (where I_f is fault current) **[8]**

Q7) a) A 50 MVA, 11 kV, three phase synchronous generator was subjected to different types of faults without fault impedance. The generator neutral is solidly grounded. Find the per unit values of three phase sequence reactance of the generator if the fault currents are as follows : **[9]**

LG fault = 4200 A, LL fault = 2600 A, LLL fault = 2000 A.

b) Prove that apparent power in three phase circuit is given by **[8]**

$$S_{abc} = 3V_{a0}I_{a0}^{*} + 3V_{a1}I_{a1}^{*} + 3V_{a2}I_{a2}^{*}$$

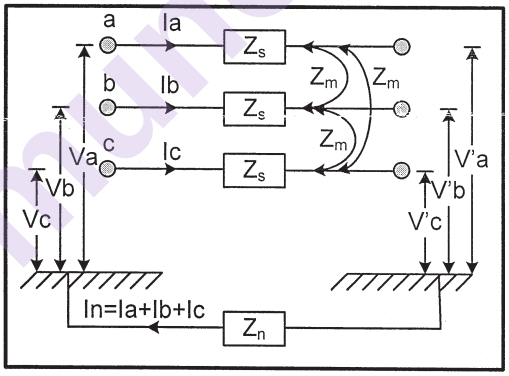
OR

Q8) a) Three 6.6 *kV*, 10 MVA, 3 - phase synchronous generators are connected to a common bus bar. Each machine has $x_1 = 20\%$, $x_2 = 15\%$, $x_0 = 6\%$. If LG fault is occurred on the common bus bar, determine the fault current when **[9]**

i) If all generator neutrals are solidly grounded.

ii) If one of the generator neutral is solidly grounded and others are isolated.

b) An unsymmetrical loaded transmission line is given in following figure. Show that $Z_0 = Z_s + 2Z_m + 3Z_n$ and $Z_1 = Z_2 = Z_s - Z_m$. **[8]**



Q9) a) Compare HVDC and EHVAC transmission system based on following points with due justification. **[8]**

i) Stability

ii) Power transfer capability

iii) Right of way

iv) Short circuit fault level

b) Explain constant current control in HVDC transmission system with characteristic and DC current equation. **[8]**

OR

Q10) a) What are different types of HVDC link? With neat diagram, elaborate each type in details. **[8]**

b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1736

[Total No. of Pages : 3

[5460] - 566
T.E. (Electrical) (Semester - II)
CONTROL SYSTEM - I
(2015 Pattern)

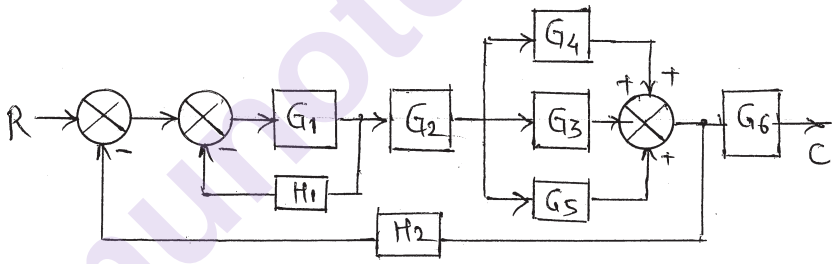
Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer any one question from each pair of questions : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Derive an expression for Force - voltage analogy in Translational and Rotational systems using simple R - L - C series circuit. **[8]**

b) Draw signal flow graph and obtain the transfer function using Mason's Gain Formula for the block diagram shown below : **[8]**



c) A unity feedback system having open loop transfer function. **[4]**

$$G(s) = \frac{100}{s(s+10)}$$

determine :

i) Error constants kp, kv and ka.

ii) Steady state error for unit step input.

OR

P.T.O.

Q2) a) Derive an expression for Rise time (Tr) and Settling time (Ts) for second order under damped system for unit step input. **[8]**

b) Sketch the root locus and comment on the stability for a unity feedback system with open loop transfer function. **[8]**

$$G(s)H(s) = \frac{K}{S(S+1+j)(S+1-j)}$$

c) For a system with $F(s) = s^4 + 22s^3 + 10s^2 + s + k$. Use Routh's criterion to obtain the marginal value of k and the frequency of oscillations of that value of k. **[4]**

Q3) a) Compare frequency domain specifications and time domain specifications of control system. **[8]**

b) The specifications of standard second order unity feedback control system are that the maximum overshoot must not exceed 30% and rise time must be less than 0.2 second. Find the limiting values of resonant peak Mr and Bandwidth. **[8]**

OR

Q4) a) Derive an expression for resonant frequency (ωr) for standard second order system. **[8]**

b) Sketch the Polar plot and determine gain margin for a unity feedback system having open loop transfer function. **[8]**

$$G(s) = \frac{1}{s(s+1)(2s+1)}$$

Q5) a) State and explain Nyquist stability criterion. **[6]**

b) The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{10}{s(1+0.5s)(1+0.1s)}$$

Draw Bode plot and determine GM, PM, gain cross over frequency and phase cross over frequency. Comment on stability of the system. **[12]**

OR

Q6) a) Define the terms : Cut - off frequency (ωc), Resonance Peak Frequency (Mp), Resonant Frequency (ωr) **[6]**

b) Draw Bode plot for a system having **[12]**

$$G(s)H(s) = \frac{100}{s(s+1)(s+2)}$$

Comment on stability of the system.

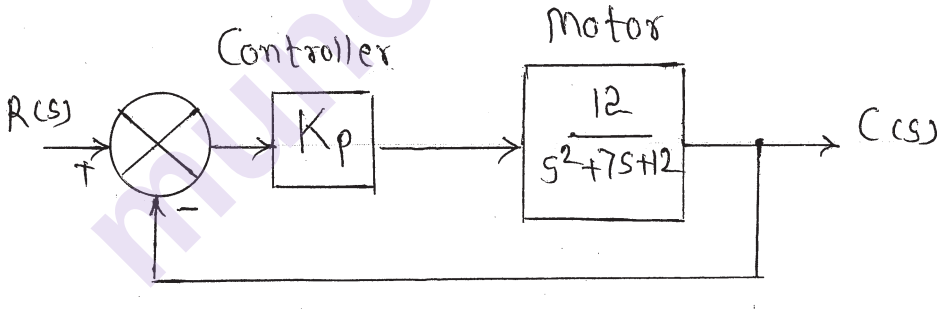
Q7) a) Draw block diagram and discuss PD controller. **[8]**

b) Write short note on Synchros. **[8]**

OR

Q8) a) Differentiate between phase Lead and phase Lag compensation. **[8]**

b) The system given below is so design to have damping ratio 0.707. Determine the required value of Kp for given damping ratio. **[8]**



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Total No. of Questions : 8]

SEAT No. :

P1737

[Total No. of Pages : 3

[5460] - 567
T.E. (Electrical)
UTILIZATION OF ELECTRICAL ENERGY
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Assume suitable data, if necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier Charts, electronics pocket calculator is and steam table is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) a) Calculate the efficiency of a high frequency induction furnace which takes 15 minutes to melt 2 kg of Aluminium. The input to the furance being 5 kW and initial temperature 15°C, Specific heat of Aluminium is 0.88 kJ/kg°C, melting point of Aluminium is 660°C, latent heat of fusion of Aluminium is 32 kJ/kg, 1 kJ = 2.78×10^{-4} kWh. **[8]**

b) Write a brief description of vapour compression refrigeration cycle with a neat diagram. **[6]**

c) Write a short note on street lighting with principle. **[6]**

OR

Q2) a) Explain Ajax Wyatt furnace with neat diagram. **[6]**

b) Explain Factors governing electro - deposition. **[6]**

c) A filament lamp of 500 W is suspended at a height of 5 meter above working plane and gives uniform illumination over an area of 8 m diameter. Assume reflector efficiency as 60%. Determine the illumination on the working plane. Lamp efficiency is 0.9 watt per candle power. **[8]**

Q3) a) Explain advantages of electric traction. **[8]**

b) Draw block diagram of electric locomotive and describe function of various equipments and accessories. **[8]**

P.T.O.

OR

Q4) a) Explain advantages and disadvantages of Steam engine drive. **[8]**

b) Explain composite system of track electrification. **[8]**

Q5) a) Obtain equation of maximum speed with trapezoidal speed time curve with sketch. **[8]**

b) An electric train has quadrilateral speed time curve having uniform acceleration from rest at 2 km/hr for 30 sec, coasting for 50 sec, breaking period of 20 sec. The train is moving up gradient of 1%, tractive resistance is 40 N/tonne rotational inertia effect 10% of dead weight, duration of station stop is 15 sec and overall efficiency of transmission gear and motor as 75%. Calculate schedule speed and specific energy consumption of run. **[8]**

OR

Q6) a) A train is required to run between two stations 1.6 km apart at an average speed of 40 kmph. The run is to be made a simplified quadrilateral speed time curve. If the maximum speed is 64 kmph, acceleration is 2 kmphps, coasting is 0.16 kmphps, breaking retardation is 3.3 kmphps. Determine the acceleration time, costing time and breaking time. **[8]**

b) Define with unit **[8]**

i) Tractive Effort

ii) Schedule speed

iii) Average speed

iv) Coefficient of adhesion

Q7) a) Explain suitability of following motors for traction purpose : **[9]**

i) DC series motor

ii) AC series motor

iii) Linear Induction Motor

b) Obtain efficiency for Series parallel starting of two motors. **[9]**

OR

Q8) a) Explain following transition methods with neat diagram. **[9]**

i) Open Transition

ii) Shunt Transition

iii) Bridge Transition

b) A 2340 tonne train including loco proceeds down a gradient of 1 in 80 for 5 minutes during which its speed gets reduced from 60 kmph to 36 kmph by application of regenerative breaking. Find the energy returned to the lines if the tractive resistance is 5 kg/tonne, rotational inertia 10% and overall efficiency of the motor during regeneration is 70%. **[9]**

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Total No. of Questions : 08]

SEAT No. :

P1738

[Total No. of Pages : 3

[5460] - 568
T.E. (Electrical)
DESIGN OF ELECTRICAL MACHINES
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain the mechanical forces developed under short circuit condition in a transformer and the measures to overcome them. **[6]**

b) Explain Specifications of three phase transformers as per IS 2026. **[4]**

c) Determine the dimensions of core and yoke for a 200 KVA, 50 Hz, single phase core type transformer. A cruciform core is used with distance between the adjacent limbs equal to 1.6 times the width of the core laminations. Assume voltage per turn 14V, flux density = 1.1 wb/m^2, window space factor = 0.32, current density = 3 A/mm^2. The net iron area is $0.56d^2$, width of largest stamping = 0.85d. Also calculate the overall width and height of the frame. **[10]**

OR

Q2) a) Derive the condition for optimum design of transformer for minimum loss or maximum efficiency. **[6]**

b) Explain the different Modes of heat dissipation. **[4]**

c) A 6600 V, 60 Hz, single phase transformer has a core of sheet steel. The net iron cross sectional area = 22.6×10^{-3} m^2. The mean length is 2.23m. There are four lap joints and each joint takes $\frac{1}{4}^{th}$ time as much reactive mmf as it is required per metre of the core. The flux density is 1.1 Wb/m^2. Find the number of turns on the 6600 V winding and no load current. Assume the peak factor as = 2.149, mmf/m = 232 A/m, specific loss = 1.76 W/Kg and density of plates = 7.5×10^3 kg/m^3 **[10]**

P.T.O.

Q3) a) Define specific electrical and magnetic loadings. Explain the factors to be considered for the choice of specific electrical and magnetic loading. **[8]**

b) Derive the Output equation for three phase induction motor with usual notations. **[8]**

OR

Q4) a) Explain any two types of AC windings. **[8]**

b) Explain the various factors in detail which play a major role while deciding the number of stator slots. **[8]**

Q5) a) Explain the various factors that are to be considered while deciding the length of air gap. **[8]**

b) Find the main dimensions of a three phase 10 Kw, 400 V, 50 Hz, 4 pole squirrel cage induction motor having efficiency = 0.85, power factor = 0.86, Bav = 0.4 Wb/m^2, Specific electric loading = 20000 A/m, winding factor = 0.955. Take the rotor peripheral speed as 20 m/sec. **[8]**

OR

Q6) a) What is Unbalanced Magnetic Pull (UMP) and what are the practical aspects of it? **[8]**

b) A 11 KW, three phase, 50 Hz, 6 pole, 220 V, Star connected Induction motor has 54 stator slots each containing 9 conductors. The number of rotor bars is 64. Find the bar current, end ring current, area of bar section, area of end ring section. Assume that efficiency = 0.86, power factor = 0.85, rotor mmf is 85% of stator mmf and current density in the bar and end ring is 5 A/mm^2. **[8]**

Q7) a) Explain the different types of leakage flux in an induction motor. **[6]**

b) Explain the calculation of MMF in case of an induction motor. **[6]**

c) A 25 KW, 1500 rpm, three phase, 50 Hz, 4 pole, 415 V, delta connected induction motor has flux equal to 20 mwb and area is 500 cm^2. The length of air gap is 0.6 mm. The gap contraction factor is 1.533 and mmf for iron parts is 25% of mmf for air gap. Find the magnetizing current. Assume the stator winding factor as 0.955. **[6]**

OR

Q8) a) Explain the short time and continuous rating of electrical machine. **[6]**

b) Explain the effect of ducts on the calculation of magnetizing current. **[6]**

c) A 75 KW, 3300 V, 50 Hz, 8 pole, three phase, star connected Induction motor has magnetizing current equal to 35% of full load current. Find the stator turns per phase if the mmf required for flux density at 60° from the interpolar axis is 500 A. Assume the stator winding factor as 0.955. efficiency = 0.94, power factor = 0.86. **[6]**

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Total No. of Questions : 11]

SEAT No. : ____

P1739

[Total No. of Pages : 3

[5460] - 569
T.E. (Electrical)
ENERGY AUDIT AND MANAGEMENT
(2015 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) What are the high lights of Energy Conservation Act 2001. **[6]**

OR

Q2) What is energy security? Explain energy security of nation. **[6]**

Q3) What is the energy management strategy? How it is useful? **[7]**

OR

Q4) With suitable example explain energy policy. Give standard format of the same. **[7]**

Q5) Explain steps in implementation of demand side management with suitable example. **[7]**

OR

Q6) Explain benefits and short comings of supply side management. **[7]**

P.T.O.

Q7) a) What are different types of audits? What is the importance of data in energy audit? Explain simple steps in data analysis is the importance of energy audit? Explain steps involved in detailed energy audit? **[10]**

b) What is least square method? Explain it in detailed. **[8]**

OR

Q8) a) The specific energy consumption of a process is varies linearly with expression of line is given by E = 0.4*P + 210. The monthly production is tabulated in the following table. Using following data calculate energy savings by using CuSum technique. Also draw CuSum graph. **[9]**

Month	Production	Actual Energy Consumption (kWh)
Apr. 17	400	450
May 17	450	510
June 17	430	530
July 17	389	490
Aug. 17	440	560
Sept. 7	471	620
Oct. 17	520	650
Nov. 17	540	670
Dec. 17	580	675

b) What are the requirements of monitoring systems? Explain role of different instruments in energy audit. **[9]**

Q9) Attempt any two of the following : **[16]**

a) Discuss energy conservation measures used in pumping systems.

b) Discuss the measures identified during energy audit for energy savings in coal fired boiler and auxiliary systems.

c) Compare standard motor with energy efficient motor on the basis of design, performance, operation, auxiliary etc.

Q10) a) During audit it is decided to replace 400 W sodium vapour lamp with two, 40 W LED lamps in street lights. The lamps are operational for 3500 hours. The cost of replacement of single LED fitting is Rs. 250. Total number of old fittings are approximately 10000. Calculate economic feasibility of project by calculating payback period. Comment on the conservation measure. Take cost of electricity is Rs. 5/kWh. **[8]**

b) Discuss with merits and demerits life cycle cost method. Is it superior than other methods? Justify. **[8]**

OR

Q11) a) Calculate Internal rate of return for following cash flows capital investment of Rs. 500000 and cash inflows for five years are Rs. 75000, Rs. 125000, Rs. 140000, Rs. 160000 and Rs. 100000. The available discounting rates are 10%, 14% and 18%. **[10]**

b) What is Time value of money? Explain its importance in financial appraisal. **[6]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1740

[Total No. of Pages : 2

[5460] - 570
T.E. (Electrical) (Semester - I)
Industrial and Technology Management
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Ans. 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) Define the term management. Explain any Five functions of management. **[6]**

b) Explain the Concept of Industrial Management. Explain scope and any two applications of industrial management. **[7]**

c) Write a short note on Six Sigma tool, how Six Sigma DMAIC can be used in industrial manufacturing to improve product quality ? **[7]**

OR

Q2) a) State law of demand and law of supply. Explain methods of demand Forecasting in detail. **[6]**

b) Enlist the classification of various technologies. Explain how technology is managed at various levels. **[7]**

c) What is meaning of Kaizen. How 5S is used in implementation of Kaizen **[7]**

Q3) a) Explain the concept of Perfect Competition and Monopolistic competition. **[8]**

b) What is cost? Explain any three methods of costing in detail. **[8]**

OR

P.T.O.

Q4) a) Explain the terms - **[8]**

i) Price

ii) Capital

iii) Debit and Credit

iv) Books of Account

b) Write short Note on Online Marketing. Enlist its four Benefits. **[8]**

Q5) a) Define Motivation. With neat diagram showing various needs, Explain Maslow's Hierarchy of Needs theory in detail. **[8]**

b) Define and explain the concept of recruitment. What are the steps of Selection process? **[9]**

OR

Q6) a) What is Group Dynamics? Explain the stages of group dynamics in detail. **[8]**

b) Enlist the theories of work Motivation. Explain Herzberg's Two factor Theory in detail **[9]**

Q7) a) What is meant by Patent? Explain Criteria for securing Patents. **[4]**

b) Explain the concept of entrepreneurship? What are the qualities of an entrepreneur? **[4]**

c) Explain any three limitations of Rational Decision Making? Explain the concept of Decision making under Uncertainty, Certainty and risk. **[9]**

OR

Q8) a) Write short note on Copyright **[4]**

b) Write short note on Trademark **[4]**

c) Explain the "Government policies and Incentives" for Small Business Development. **[9]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1741

[Total No. of Pages : 2

[5460] - 571
T.E. (Instrumentation and Control)
Embedded System Design
(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) Hundred ASCII characters are stored in the internal data memory of 8051. Write a program to count the number of times ASCII character 'b' appears in it. Store this count in register R5. **[10]**

OR

Q2) a) Draw a memory map of internal RAM of 8051 with addresses and explain it. **[6]**

b) Explain the use of pins XTAL1 and XTAL2 of 8051. What role do they play in generating the timing? **[4]**

Q3) a) List and explain, giving examples of each, the addressing modes of 8051.**[5]**

b) With a neat diagram, explain the interfacing of 3 × 3 matrix keyboard to 8051 **[5]**

OR

Q4) With a neat diagram, explain the interfacing of ADC to 8051. **[10]**

Q5) Draw an interfacing diagram to interface a stepper motor to the 8051. Also write a program to run the motor continuously with a sequence of clockwise direction for 5 rotations followed by 5 rotations in anticlockwise direction.**[16]**

P.T.O.

OR

Q6) Design a traffic light controller and elaborate your answer with the following points :

a) Block diagram. **[5]**

b) Circuit diagram. **[5]**

c) Flowchart **[6]**

Q7) a) Explain the Watchdog Timer Control Register (WDTCR) in AT Mega 8535 AVR microcontroller. **[8]**

b) List the important architectural features related to peripherals of the AVR microcontroller. **[8]**

OR

Q8) a) Explain the addressing modes of AVR microcontrollers giving examples from the instruction set. **[8]**

b) Ten unsigned eight bit numbers are stored from 80h onwards in the internal SRAM of AVR microcontroller. Write a program to add these numbers and store the result at 61h (Lower byte) and 62 h (Higher byte)**[8]**

Q9) a) The following is the UART control register of AVR microcontroller. Explain the bits of this register. **[8]**

RXCIE	TXCIE	UDRIE	RXEN	TXEN	CHR9	RXB8	TXB8

b) What is the function of timers in microcontrollers? The following is the Timer Interrupt flag register of AVR microcontroller. Explain the bits of this register. **[10]**

OCF2	TOV2	ICF1	OCF1A	OCF1B	TOV1	OCF0	TOV0

OR

Q10) List and explain the features of ADC of AVR microcontroller. What is the necessity of prescalar in ADC? With a neat diagram, explain the prescalar block of ADC of AVR microcontroller. **[18]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1742

[Total No. of Pages : 2

[5460] - 572
T.E. (Instrumentation & Control) (Semester - I)
INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Give the advantages of Instrumental methods over the Classical methods with suitable examples. **[5]**

b) List out the IR Sources and Detectors. **[5]**

OR

Q2) a) What is Plasma? List out the types of plasma. **[5]**

b) Give the specifications of Flame Photometer. **[5]**

Q3) a) Give the advantages of double beam filter photometer over the single beam Filter photometer. **[5]**

b) Define Spectrophotometer. List out the various types of Spectrophotometer. **[5]**

OR

Q4) a) State the Laws of Photometry. List the applications of 'Laws of Photometry'. **[5]**

b) Compare Atomic Absorption spectroscopy Vs Atomic Emission Spectroscopy. **[5]**

P.T.O.

Q5) a) Explain Fourier Transform Nuclear Magnetic Resonance Spectrometer (FTNMR) with respect to following points : **[8]**

i) Chemical shift
ii) Principle
iii) Working
iv) Construction

b) List out different Gas analyzers. Explain with neat sketch working construction of any one type of gas analyzer. **[8]**

OR

Q6) a) What is Phosphorescence? Explain the working of Phosphorimeter. **[8]**

b) What is Raman effect? Draw and explain the block diagram of Raman Spectrometer. Give the applications of Raman spectroscopy. **[8]**

Q7) a) Explain the Principle of Mass Spectrometer. Justify Mass spectroscopy is a Qualitative or Quantitative method of analysis. **[9]**

b) Distinguish between Gas chromatography and High performance liquid chromatography. **[9]**

OR

Q8) a) Define chromatography. Name the types of chromatography. List out which gases used as a carrier gas and explain in detail role of carrier gas in Gas chromatography. **[9]**

b) Explain the working principle of Mass Spectroscopy. Draw and explain block diagram of the components in mass spectrometer. **[9]**

Q9) a) Explain the Instrumentation for X - ray spectrometry. **[8]**

b) Explain Auger emission spectroscopy with respect to following points : **[8]**

i) Principle
ii) Diagram
iii) Applications

OR

Q10) a) List out the various Radiation detectors. Explain with neat sketch Ionization Chamber. And list out the applications of Ionization chamber. **[8]**

b) Draw and explain X - ray diffractometer. What is Bragg's law? **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1743

[Total No. of Pages : 3

[5460] - 573
T.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2015 Pattern) (Semester - I)

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) Draw the symbols and give applications of **[5]**

i) Limit switch.

ii) Pressure Switch

iii) Selector Switch

iv) DIP Switch

v) Temperature switch

b) List the advantages gained by the use of contactors instead of manually operated control equipments. **[5]**

OR

Q2) a) Why is arc suppression needed in contactors? **[5]**

b) Explain opto - isolation as it applies to a solid state relay. **[5]**

Q3) a) Explain the purpose of motor protection. **[5]**

b) Describe the jogging operation of a motor. **[5]**

OR

P.T.O.

Q4) a) With the help of electric wiring diagram, explain Direct - On - Line starter for 3 phase induction motor. **[5]**

b) Explain the reversing of 3 phase induction motor using push buttons. **[5]**

Q5) a) Compare pneumatics systems with electrical systems. **[5]**

b) Draw symbols of special double acting cylinders and give their application. **[5]**

c) Draw using standard symbols pneumatic circuit for reciprocating of double acting cylinder. **[6]**

OR

Q6) a) Draw and explain pneumatic time delay valve. **[5]**

b) Draw and explain the principle of venturi in Oil Lubricator. **[5]**

c) Draw using standard symbols pneumatic circuit for sequential operation of two pneumatic cylinders. **[6]**

Q7) a) Draw and explain hydraulic power pack (hydraulic supply) **[8]**

b) Draw and explain using standard symbols hydraulic circuit for meter - in - circuit. **[8]**

OR

Q8) a) List different types of hydraulic pumps and explain any one type in detail **[8]**

b) Draw and explain using standard symbols hydraulic circuit for sequencing of cylinders using hydraulic sequencing valve. **[8]**

Q9) a) Explain the need of circuit breakers, list different types of circuit breakers and explain the operating principle of any one type of circuit breaker. **[8]**

b) Explain with neat diagram, how synchros are used as error detector. **[10]**

OR

Q10) a) List different types of fuses and explain the terms Fusing current, Current rating of fuse element and Fusing Factor **[8]**

b) Explain Hazardous Area Classification as per NEC standards and briefly describe protection methods. **[10]**

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Total No. of Questions : 10]

SEAT No. : ____

P1744

[Total No. of Pages : 3

[5460] - 574
T.E. (Instrumentation)
CONTROL SYSTEM DESIGN
(2015 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a phase lead compensator if the open loop transfer function is given by

$$G(s)H(s) = \frac{k}{(s(s+5))}$$

If % overshoot required is 25%, steady state error ≤ 0.25 rad., peak time $t_p = 1.71$ sec. **[10]**

OR

Q2) a) Derive transfer function for lead network. **[6]**

b) Differentiate lead and lag network. **[4]**

Q3) Apply Bode plot method to design a lag compensator for unity feedback system having. $G(s) = \frac{k}{(s(s+1)(s+5))}$ such that P.M. $\approx 40°$ G.M. at least 20 dB and ess = 0.2 rad for unit ramp input. **[10]**

OR

P.T.O.

Q4) Find tuning constants of P, Pi, and PID controller for following process **[10]**

$$G(s)=\frac{(10e^{-4s})}{(8s+1)}$$

Q5) a) Design a controller if the process open loop transfer function is given by $G(s)=\frac{1}{(5s+1)}$ and desired close loop behaviour is given by $G(s)=\frac{1}{(9s+1)}$. **[8]**

b) Design a PID controller if open loop transfer function is given by $G(s)=\frac{5}{(s(s+1)(s+3))}$ so that P.M. Is 40° at ω = 4 rad/sec. **[8]**

OR

Q6) a) Design a PID controller for a open loop transfer function $G(s)=\frac{4}{(s(s+5)(s+6))}$ so that K_v = 20 sec^{-1} and PM = 30° at ω = 3 rad/sec. **[8]**

b) Design a controller if the process open loop transfer function is given by $G(s)=\frac{1}{(10s+1)}$ and desired close loop behaviour is given by $G(s)=\frac{1}{(15s+1)}$. **[8]**

Q7) a) Derive the equation for solution of state space equation. **[8]**

b) Check whether following system is controllable and observable or not. **[8]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -4 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 4\end{bmatrix}u \quad y=\begin{bmatrix}1 & 1 & 5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+15u$$

OR

Q8) a) Find the state transition matrix if $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -20 & -29 & -10 \end{bmatrix}$ using Similarity theorem. **[12]**

b) State properties of state transition matrix. **[4]**

Q9) Determine feedback gain matrix so that poles of given system should placed to **[18]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 5 & 7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 6u$$

so that desired poles can be placed at –1,–4, –5

OR

Q10) Design a full state observer for a system given so that desired poles are –2, –7, –5 **[18]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -18 & -27 & -10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} u$$

$$y = \begin{bmatrix} 4 & 2 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 6u$$

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1745

[Total No. of Pages : 2

[5460] - 575
T.E. (Instrumentation and Control Engineering)
Industrial Organization and Management
(2015 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, 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) Draw neat Ishikawa diagram and explain. **[5]**

b) Explain business merging and takeover? **[5]**

OR

Q2) a) Explain briefly - Environmental norms : ISO 14000. **[5]**

b) Give the importance of SWOT analysis. **[5]**

Q3) a) Explain the various levels of management. **[5]**

b) Write a note on value addition activities. **[5]**

OR

Q4) a) Derive the equation for EOQ. **[5]**

b) Explain Inspection objectives and qualities of inspector. **[5]**

Q5) Write short notes on - **[18]**

a) Motivation as a development tool.

b) Leadership skills and its styles.

P.T.O.

OR

Q6) a) What is manpower planning? Give its need, general procedure and sources of manpower. **[10]**

b) Write a note on role summary. **[8]**

Q7) a) What are functions of function of money market and capital Market? **[8]**

b) Write a note on capital budgeting and any two methods. **[8]**

OR

Q8) a) What are the objectives and functions of financial management? **[8]**

b) Write a note on Capital structure, its types and need of working capital. **[8]**

Q9) Write notes on : **[16]**

a) Business ethics and its need.

b) ERP - Enterprise Resource Planning.

OR

Q10) a) Explain the importance of management information system with the help of example. **[8]**

b) Write a note on e - business and strategies? **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1746

[Total No. of Pages : 3

[5460] - 576
T.E. (Instrumentation & Control Engineering)
DIGITAL SIGNAL PROCESSING
(2015 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator / Log table is allowed.***

Q1) a) Determine the cross - correlation of the following sequences. **[6]**

$$x(n) = \{\underset{\uparrow}{2},1,3,1\} \text{ and } y(n) = \{\underset{\uparrow}{1},4,2,7\}$$

b) Compare between continuous time system and discrete time system. **[4]**

OR

Q2) a) Determine energy and power of the signal $x(n) = \left(\frac{1}{2}\right)^n u(n)$. **[6]**

b) Enlist the application of digital signal processing. **[4]**

Q3) a) Determine the impulse response of the system described by **[4]**

$$H(z) = \frac{z(z-0.5)}{(z-0.8)(z-1)}$$

b) The discrete - time system is described by the following difference equation. **[6]**

$$y(n) = y(n-1) - 0.6\,y(n-2) + x(n) + x(n-1)$$

Determine

i) Transfer Function.

ii) Sketch the pole - zero plot.

P.T.O.

OR

Q4) a) Prove the following properties of the Discrete Time Fourier Series. **[4]**

i) Linearity

ii) Frequency Shifting

b) Determine the Linear convolution of the sequences using DTFT. **[6]**

$$x_1(n) = x_2(n) = \{1, \underset{\uparrow}{1}, 1\}$$

Q5) a) Compute the 8 - point DFT of the sequence $x(n) = \{1,1,1,1,0,0,0,0\}$ using radix - 2 decimation in frequency (DIF) FFT algorithm. **[12]**

b) Compute the 4 - point DFT of the sequence $x(n) = \cos(n\pi)$ for $0 \le n \le 3$, using twiddle factor matrix. **[6]**

OR

Q6) a) Compute the circular convolution between the following sequences using DFT - IDFT method $x_1(n) = \{\underset{\uparrow}{1}, 2, 2\}$ and $x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$. **[12]**

b) Explain the following concept in FFT Algorithm. **[6]**

i) Bit reversal technique.

ii) In - place computation.

Q7) a) Transform the analog filter transfer function $H_a(s) = \dfrac{4s + 7}{s^2 + 5s + 4}$ into a digital filter $H(z)$ using impulse - invariant method at $F_s = 2Hz$. **[6]**

b) Design a Chebyshev analog filter with a maximum pass - band attenuation of 2.5 dB at $\Omega_p = 20$ *rad* / sec and a minimum stop - band attenuation of 30 dB at $\Omega_s = 50$ *rad* / sec. **[10]**

OR

Q8) a) For the given specifications of LPF : $\Omega_p = 1$, $\Omega_s = 2.33$, $A_p = 0.5$ dB and $A_S = 22$dB compute the filter order for Chebyshev and Butterworth analog filter. **[6]**

b) Design an IIR low - pass Butterworth filter using bilinear transformation for the following specifications : **[10]**

$$passband : 0.8 \le |H(e^{j\omega})| \le 1 \quad for\ |\omega| \le 0.2\pi$$

$$stopband : |H(e^{j\omega})| \le 0.2 \quad for\ 0.6\pi \le |\omega| \le \pi$$

Assume T = 1 sec.

Q9) a) Enlist the different methods of FIR filter design, explain frequency sampling method. **[6]**

b) Design on linear - phase FIR LPF with the following desired frequency response **[10]**

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & 0 \le |\omega| \le \dfrac{\pi}{4} \\ 0 & \dfrac{\pi}{4} \le |\omega| \le \pi \end{cases}$$

use a Hamming window.

OR

Q10) a) Explain the Gibb's phenomenon in detail. **[6]**

b) Design an Idea FIR HPF of length M = 11 with a frequency response.

$$H_d(e^{j\omega}) = \begin{cases} 1 & \dfrac{3\pi}{5} \le |\omega| \le \pi \\ 0 & |\omega| \le \dfrac{3\pi}{5} \end{cases}$$

Using Fourier series method. **[10]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1747

[Total No. of Pages : 3

[5460] - 577
T.E. (Instrumentation and Control) (Semester - II)
PROCESS LOOP COMPONENTS
(2015 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, moiller charts, electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain Level control loop using standard P & ID symbols. **[6]**

b) Give application of the following **[4]**

i) Converter

ii) Square root extracter

OR

Q2) a) Draw the temperature control loop and define the following terms associated with the loop. **[8]**

i) Controlled variable

ii) Manipulated variable

iii) Load variable

b) State the features of conventional transmitter. **[2]**

Q3) a) What do you mean by tuning. Explain Ziegler - Nichols method of tuning. **[6]**

b) What is mean by offset in 'P' mode? **[4]**

OR

P.T.O.

Q4) a) Draw the response of proportional, Integral and derivate controller for step change in error. **[6]**

b) Explain with neat sketch pressure to current conveter. **[4]**

Q5) a) Explain the following w.r.t. programmable logic controller. **[8]**

i) Rung

ii) Scan time

iii) Counter

iv) Ladder diagram

b) Draw a ladder diagram for a three motor system with the following conditions **[8]**

motor 2 (M_2) can start 5 seconds after motor 1(M_1) starts; when M_2 is running, motor 3(M_3) can be started.

When M_2 is turned off, M_3 is off. When M_1 is turned off, both M_2 and M_3 stop.

c) What are the different programming languages of PLC? **[2]**

OR

Q6) a) Explain the following w.r.t. P.L.C. **[8]**

i) Timers

ii) Input module

iii) Output Module

iv) Counters

b) List out the different input and output field devices used in PLC. **[6]**

c) Compare Relay logic and PLC logic. **[4]**

Q7) a) Draw and explain the installed and inherent valve characteristics of control valve. Also draw the plug shapes for three basic characteristics. **[8]**

b) Explain the control valve accessories with neat diagarm. **[8]**

i) Positioner

ii) Reversing Relay

OR

Q8) a) Explain the following w.r.t. control valve. **[8]**

i) Spring

ii) Bonet

iii) Travel indicator

iv) Select

b) Explain the following terms w.r.t control valve. **[8]**

i) Application of O_3 way globe valve.

ii) Fail safe action with suitable example.

Q9) a) Define the control valve coefficient (C_v) Find the C_V for valve is used for flow control. The line size is 10 inches and the liquid is water. Maximum flow rate is 3,000 gpm and minimum 250 gpm. The line pressure varies between 40 and 50 Psi. The downstream piping loss is 2 psi at 3,000 gpm and the downstream pressure is 25 Psi. **[8]**

b) Write a notes on : **[8]**

i) Control valve noise

ii) High temperatue service valves

OR

Q10) a) Draw and explain cavitation and flashing. Draw pressure profile diagram. Also list techniques to reduce it. **[10]**

b) Explain the high pressure service valves. **[6]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1748

[Total No. of Pages : 3

[5460] - 578
T.E. (Instrumentation and Control) (Semester - II)
Unit Operations and Power Plant Instrumentation
(2015 Pattern)

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, Q.11 or Q.12.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Explain closed circuit grinding using flow diagram? **[6]**

OR

Q2) Explain the need of pumps and blowers in the thermal power plants? Classify various pumps available? **[6]**

Q3) Explain with appropriate diagram the working of shell and tube heat exchanger? Enlist their types? **[8]**

OR

Q4) Explain with diagram working of continuous fractionating column with rectifying and stripping sections? **[8]**

Q5) Draw and explain working of high temperature Rankine cycle with central tower solar thermal power generation plant? **[6]**

OR

Q6) Write a short note on Geothermal and Bio-fuel energy sources for power generation. **[6]**

P.T.O.

Q7) a) Explain with schematic diagram working and instrumentation used for following systems of boiler. **[5 + 5]**

i) Fluidized Bed.

ii) Steam temperature and Pressure control.

b) Write a short note on feed water treatment process used in the boiler system. **[6]**

OR

Q8) a) Explain working of drum type water tube boiler with appropriate diagram and show the main in - line instruments such as FD/ID fan, Oxygen and CO analyser? **[10]**

b) What is mean by safety interlocks? Explain Purge and loss of flame interlock in the boiler system? **[6]**

Q9) a) Classify the turbines? Explain in detail the instrumentation associated with a typical turbine in power generation plant? **[8]**

b) What is excess combustion air used for a boiler system? What is its effect on the boiler efficiency and pollution caused by plant? **[8]**

OR

Q10) a) Explain the processes start-up, shut-down for a typical thermal power plant? **[8]**

b) Write a note on calculation of boiler efficiency by input and output method? **[8]**

Q11) a) Discuss in detail the selection factors for a site to establish a new hydroelectric plant? **[8]**

b) Write a short note on **[5 + 5]**

i) Pollution monitoring and control of smoke and dust.

ii) Wind power plant.

OR

Q12) a) Explain in detail the performance achieved, site selection criterion, capital required and pollution caused of a typical Nuclear Power Plant? **[8]**

b) Write short notes on : **[5 + 5]**

i) Power plant safety

ii) Solar power plant.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1749

[Total No. of Pages : 2

[5460] - 579
T.E. (Instrumentation & Control)
INSTRUMENT AND SYSTEM DESIGN
(2015 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) ***Use of electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Suggest suitable IP enclosure for following operating condition **[6]**

i) Control panel to be install under shade.

ii) A electronic pressure gauge to be used for scuba diver.

iii) A vision sensor system to be installed in region of snow fall.

With Justification.

b) State features of XTR 110. **[4]**

OR

Q2) a) The output of a pressure sensor varies from 0mV to 100mV. It is required to convert this signal into 0 to 5V. Suggest suitable IC for this purpose and design circuit with same to have required output. **[6]**

b) Define Noise. What are various types of Noise? **[4]**

Q3) a) Explain the concept of Optoisolation. Compare IC HCNR 201 with IC MCT2E. **[6]**

b) What is ground? List various functions of ground. **[4]**

P.T.O.

OR

Q4) a) Explain NEMA Standards. **[6]**

b) What is human body model? What is it used for? **[4]**

Q5) a) Enlist the features of ICM 7217 and explain the functions of **[8]**

i) Zero.

ii) Count input

iii) Scan

iv) Up/Down

b) Design frequency multiplier (fout = 10* fin) using suitable IC. Also draw the circuit diagram. **[8]**

OR

Q6) a) 230 V 10 Amp motor is to be interfaced to micro controller. Suggest suitable IC. Draw interfacing diagram. Give its features and applications. **[8]**

b) Explain working of TCA785 with neat diagram. **[8]**

Q7) a) Write a short note on "Soldering Metals and Soldering Flux". **[8]**

b) State general component layout guideline for PCB layout. **[10]**

OR

Q8) a) Enlist various steps in PCB design. Write a short note on Types of PCBs. **[10]**

b) What are the rules followed for designing a Printing Circuit Board layout of digital circuits. **[8]**

Q9) a) Explain Weibull and Gamma distribution. **[8]**

b) Differentiate between reliability and quality. **[8]**

OR

Q10) a) Explain with suitable example cumulative distribution function. **[8]**

b) What is Hazard rate explain with suitable example. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1750

[Total No. of Pages : 2

[5460] - 580
T.E. (Instrumentation & Control Engineering) (Semester - II)
BIO-MEDICAL INSTRUMENTATION
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain different chambers of heart. **[5]**

b) Explain an electrical conduction system of heart. **[5]**

OR

Q2) a) Explain the Micro electrode? **[6]**

b) Mention the types of electrodes to record ECG signal. **[4]**

Q3) a) State the cause characteristics, duration & frequency of generated heart sounds. **[5]**

b) Explain the ultrasonic blood flow measurement along with neat diagram. **[5]**

OR

Q4) a) Explain the Direct Blood pressure measurement Techniques. **[5]**

b) Explain the thermal convection method for blood flow measurement. **[5]**

Q5) a) Explain EEG amplitude and frequency bands. **[8]**

b) Explain and draw 10 - 20 EEG electrode placement system. **[8]**

OR

P.T.O.

Q6) a) Explain neuron membrane potential. **[8]**

b) Explain with neat sketch Muscle contraction Mechanism. **[8]**

Q7) a) Draw & Explain the three main sections of human auditory system? Explain the Middle ear functioning. **[8]**

b) Explain the various errors in Vision & their method of correction with neat sketch. **[10]**

OR

Q8) a) Define a hearing Threshold. Explain the Bekesy Audiometer with neat diagram. **[10]**

b) Describe the working of Evoked Response Audiometry system with neat diagram. **[8]**

Q9) a) What is Spirogram? Draw & Explain the working of Bell and Jar Spirometer for Respiration measurements. **[8]**

b) Draw & explain the working of CO_2 Gas Analyzer. **[8]**

OR

Q10) a) What is ventilator? Explain the application of various modes of ventilator. **[8]**

b) Explain the following terms with respect to Respiration Measurements **[8]**

i) IRV

ii) VC

iii) ERV

iv) TLC

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1751

[Total No. of Pages : 3

[5460] - 581
T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Define the following terms with example - **[6]**

i) Alphabets

ii) String

iii) Regular Expression

b) Design a DFA which accepts a ternary number divisible by 4. **[6]**

c) Design FA accepting the following language over the alphabet {0, 1} **[8]**

i) Set of all strings having at least three consecutive zeros.

ii) Set of all strings that begin and end with same symbol.

OR

Q2) a) Define the following terms with example **[6]**

i) DFA

ii) NFA

iii) NFA - ε

b) Eliminate the useless symbols in the grammar below - **[6]**

$S \rightarrow aA \mid bB$

$A \rightarrow aA \mid a$

$B \rightarrow bB$

$D \rightarrow ab \mid Ea$

$E \rightarrow aC \mid d$

P.T.O.

c) Construct a DFA accepting the following languages over the alphabet {a, b} **[8]**

i) Set of all strings that begin with the substring ab.

ii) Set of all strings with at most two consecutive b's.

Q3) a) Write short notes on - **[4]**

i) Universal Turing Machine

ii) Multi - tape Turing Machine

b) Construct a Turing Machine for R = (a + b)*bb. **[6]**

c) Construct a Turing Machine to accept the language $L = \{a^n b^n a^n \mid n \geq 1\}$. **[8]**

OR

Q4) a) Write short notes on - **[4]**

i) Unsolvable problems.

ii) Applications of TM.

b) Construct a Turing Machine for R = (aba*b). **[6]**

c) Construct Turing Machine that accepts strings with equal number of 0's and 1's over Σ = {0, 1}. **[8]**

Q5) a) Prove that CFLs are closed under union, concatenation and Kleene's closure. **[6]**

b) Design PDA for the following language - **[6]**

$L = \{a^n b^{2n} \mid n > 0\}$

c) Explain the working of Bottom - up parser with example. **[4]**

OR

Q6) a) Convert the following CFG to PDA - **[6]**

$S \rightarrow aSb \mid A$

$A \rightarrow bSa \mid S \mid \varepsilon$

b) Show that CFLs are not closed under intersection and complementation. **[6]**

c) Explain acceptance by PDA - **[4]**

i) By final state

ii) By empty state

Q7) a) Explain Tractable and Intractable problem. **[6]**

b) How the Kruskal's Algorithm can be solved by using Turing machine? **[6]**

c) Explain the Satisfiability Problem with an example. **[4]**

OR

Q8) a) Prove that the Satisfiability Problem is NP - complete. **[6]**

b) What do you mean by Polynomial Time reduction? Explain with suitable example. **[6]**

c) Differentiate between P and NP classes. **[4]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1752

[Total No. of Pages : 4

[5460] - 582
T.E. (Computer Engg.)
DATABASE MANAGEMENT SYSTEM
(2015 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) Write a PL/SQL block using user defined exception for following requirements: **[5]**

The Bank_Account table records the current balance for an account, which is updated whenever, any deposits or withdrawals takes place. If the withdrawal attempted is more than the current balance held in the account. The user defined exception is raised, displaying an appropriate message.

Note : Assume table :- Bank_Account (Account_No, Balance)

b) Consider Employee database with following schema : **[5]**

Employee(Emp_Id, First_Name, Last_Name, Salary, Joining_Date, Department)

Bonus(Emp_Ref_Id, Bonus_Amount, Bonus_Date)

Designation(Emp_Ref_Id, Emp_Designation, Affected_From)

Write queries in SQL for following requirements (any 2):

i) To fetch the departments that have less than five people in it.

ii) To print the name of employees having the highest salary in each department.

iii) Write an SQL query to print details of the employee who are also Managers.

P.T.O.

OR

Q2) a) Ramesh's family owns and operates a 100-acre farm for several generations. Since the farm business is growing, Ramesh is thinking to build a database that would make easier the management of the activities in the farm. He is considering the following requirements for the database: **[5]**

i) For each livestock classification group (for example, cow, horse etc.), Ramesh keeps track of the following: identification number, classification, total number of livestock per classification group (for example, number of cows, number of horses etc.)

ii) For each crop the following information is recorded Crop identification number and classification.

iii) Ramesh has recorded the yield of each crop classification group during the last ten years. The records consist of the year, yield, sales, price of the crop and the amount of money earned.

iv) Ramesh has recorded the yield of each livestock classification group during the last ten years. The records consist of the following historical data: the year, (historical) selling price per head, number of livestock in the end of the year, number of livestock sold during one-year period, and the total amount of money earned.

Draw an E-R diagram for this application. Specify the key attribute of each entity type.

b) Explain 3NF and BCNF. Also enlist their differences. **[5]**

Q3) a) Consider the schema: **[5]**

student_fees_detail (name, total_fees_deposited, till_date)

Answer the following :

i) Write a SQL query to display the total fees deposited by students whose minimum 3 character name starts with aj.

ii) Write Database Trigger to preserve the old values of student fees details before updating in table. It is easy to create index on all attributes of any relation, why index is not created on all attributes?

b) It is easy to create index on all attributes of any relation, why it is not recommended to create index on all attributes? **[5]**

OR

Q4) a) Draw the overall Database System Structure. Explain its structure components. **[5]**

b) Explain what is meant by *repetition of information and inability to represent information*. Explain why each of these properties may indicate a bad relational database design. **[5]**

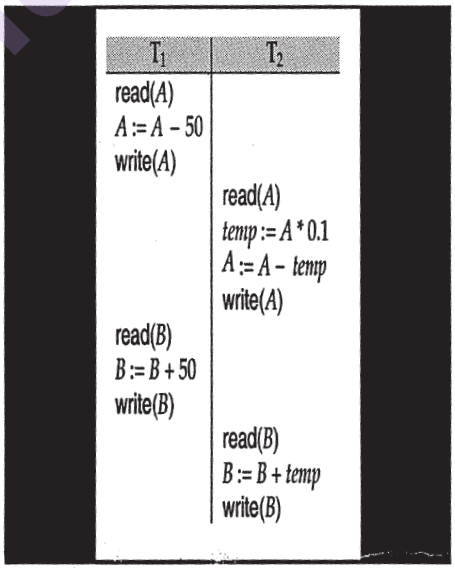
Q5) a) Explain the Concept of Conflict Serializability with example. Since every conflict-serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability? **[8]**

b) Explain the Two Phase lock Protocol and show how it ensures conflict serializability. Two Phase lock protocol does not ensure freedom from deadlock explain with necessary example. Also explain its two versions: strict two phase lock protocol and rigorous two phase lock protocol.**[9]**

OR

Q6) a) State and explain the ACID Properties. During its execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain the situations when each state transition occurs. **[8]**

b) Check whether following schedule is view serializable or not. Justify your answer. (Note:T_1 & T_2 are transactions). Also explain the concept of view equivalent schedules and conflict equivalent schedule considering the example schedule given below: **[9]**



T_1	T_2
read(A)	
$A := A - 50$	
write(A)	
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
read(B)	
$B := B + 50$	
write(B)	
	read(B)
	$B := B + temp$
	write(B)

Q7) a) Explain in details two important issues Speedup and Scaleup in Parallel Databases. Also explain which factors work against efficient parallel operation and can diminish both speedup and scaleup. **[9]**

b) Explain Data Replication and Data Fragmentation in Distributed Data Storage. Also explain the advantages of each type of distributed data storage. **[8]**

OR

Q8) a) What are different Parallel Database Architectures? Explain with their advantageous and disadvantageous. **[8]**

b) Describe Two Phase Commit(2PC) Protocol. Explain how 2PC protocol responds in different ways to various types of failures like site failure, coordinator failure and network partition. **[9]**

Q9) a) Explain the difference SQL Vs NoSQL. **[4]**

b) Enlist and explain any three NoSQL Database Models. **[6]**

c) Explain the HDFS and MapReduce in HADOOP. **[6]**

OR

Q10) a) Explain the CAP theorem referred during the development of any distributed application. **[7]**

b) BASE Transactions ensures the properties like Basically Available, Soft State, Eventual Consistency explain each property with its significance. How soft state of system is depend on Eventual consistency property? **[9]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1753

[Total No. of Pages : 2

[5460] - 583
T.E. (Computer Engineering)
Software Engineering and Project Management
(2015 Pattern)

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

Instructions to the candidates:

1) ***Attempt questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain classic life cycle paradigm for software engineering and problems encountered when it is applied. **[5]**

b) What is the importance of Agile/XP methodology for project development. **[5]**

OR

Q2) a) What are the Practitioner's myths? Discuss the reality of these myths. **[5]**

b) Explain why waterfall model of the software engineering is not an accurate reflection of software development activities. **[5]**

Q3) a) Why Requirement Elicitation is difficult? What are the problems in requirement elicitation? **[5]**

b) Explain layered architecture style with neat diagrams. **[5]**

OR

Q4) a) What do you understand by refactoring? Give the importance of refactoring in improving the quality of software. **[5]**

b) Explain the user interface design issues. **[5]**

P.T.O.

Q5) a) Explain in detail software process and project metrics. **[8]**

b) Explain COCOCMO Model for project estimation with suitable example. **[8]**

OR

Q6) a) What is a task network in project scheduling? Explain with an example. **[8]**

b) What is the need for defining a software scope? What are the categories of software engineering resources? **[8]**

Q7) a) What is Risk identification? What are the different categories of risks? **[6]**

b) What is software SCM repository? Explain the features of tool set supporting SCM repository. **[6]**

c) Explain Software Reengineering Process model in detail. **[6]**

OR

Q8) a) Explain RMMM Plan in detail. **[6]**

b) What is software configuration management? Explain the change control mechanism in software configuration management? **[6]**

c) What is forward engineering? Compare with reverse engineering. **[6]**

Q9) a) Explain equivalence partitioning and boundary value analysis techniques in detail. **[8]**

b) What do you understand by System Testing? What are the different kinds of system testing that are usually performed on large software testing. **[8]**

OR

Q10) a) Explain Defect Life Cycle in detail. **[8]**

b) Differentiate between white box testing and black box testing. **[4]**

c) What are the objectives of Black - Box Testing? **[4]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1754

[Total No. of Pages : 3

[5460] - 584
T.E. (Computer Engineering)
INFORMATION SYSTEMS AND ENGINEERING ECONOMICS
(2015 Pattern)

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.***
5) ***Use of scientific calculator is permitted.***

Q1) a) What is decision support system? How it is different from Transaction processing system? **[5]**

b) Explain the roles and responsibilities of Information system manager. **[5]**

OR

Q2) a) Discuss the role of information system in business. **[5]**

b) What are various types of firewall? Explain advantages and disadvantages of each of them. **[5]**

Q3) Explain the following terms : **[10]**

a) Supply chain management

b) ICT

c) E - Governance

d) Outsourcing

OR

P.T.O.

Q4) a) What are the controls in information security? List various types of controls. **[5]**

b) Write short note on : ERP. **[5]**

Q5) a) Explain the following : **[8]**

i) Business Economics and its scope.

ii) Engineering Economics decisions.

b) What is debt management? Explain. **[8]**

OR

Q6) a) Explain the following in detail : **[8]**

i) Rational decision making

ii) Time value of money.

b) Explain in brief "Understanding money management". Describe market interest rate in money management. **[8]**

Q7) a) What is inflation & deflation? Explain measures of inflation and inflation rate in detail. **[8]**

b) Explain the following terms : **[8]**

i) Reserve cash flow

ii) Cost cash flow

iii) Consumer price index

iv) Internal rate of returns

OR

Q8) a) Explain present - worth analysis in detail. **[8]**

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

i) Discounted cash flow method

ii) Accounting rate of return

Q9) a) Explain in detail effect of inflation in project cash flow. **[10]**

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

i) Break even analysis

ii) Positive and negative cash flows

OR

Q10) a) Elaborate on cost classification while preparing financial statement. **[10]**

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

i) Tangible and intangible assets.

ii) Depreciation

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1755

[Total No. of Pages : 3

[5460] - 585
T.E. (Computer)
COMPUTER NETWORKS
(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) What are different types of topology? Explain any one. **[4]**

b) Define FHSS and explain how it achieves bandwidth spreading. **[6]**

OR

Q2) a) Explain 802.11 Wireless frame format? **[6]**

b) For the bit sequence 10000101111 draw the waveform for **[4]**

i) Manchester Encoding

ii) Differential Manchester Encoding

Q3) a) Measurement of a slotted ALOHA channel with an infinite number of users, show that 20 percent of the slots are idle: **[4]**

i) What is the channel load?

ii) What is the throughput?

b) Explain MAC 802.3 frame format . **[6]**

OR

Q4) a) Explain the working of Cyclic Redundancy Check (CRC) using the following example (show the complete steps of division)
Data bits: 1101110110
Generator Polynomial: $x^3 + x + 1$
Write the redundant bits that will be sent along with the data bits. **[6]**

b) Compare and contrast the Go-Back-N ARQ protocol with Selective-Repeat ARQ. **[4]**

P.T.O.

Q5) a) A host was given the 192.168.2.64 /27 IP address, indicate: **[6]**

i) Netmask of the network.

ii) The network broadcast address to which the host belongs.

iii) The total number of hosts available in the network.

b) Explain Distance Vector Routing Algorithm. **[6]**

c) Write short note on Network Address Translation **[4]**

OR

Q6) a) Host A sends a UDP datagram containing 8880 bytes of user data to host B over an Ethernet LAN. Ethernet frames may carry data up to 1500 bytes (i.e. MTU = 1500 bytes). Size of UDP header is 8 bytes and size of IP header is 20 bytes. There is no option field in IP header. How may total number of IP fragments will be transmitted and what will be the contents of offset field in the last fragment? **[6]**

b) Describe in short the importance and working of ARP protocol? What is ARP cache. **[8]**

c) What is ICMP? **[2]**

Q7) a) What causes Silly Window syndrome ? How it is avoided ? Explain **[6]**

b) Differentiate between TCP and UDP protocol. **[4]**

c) Following is a dump of UDP header in Hexadecimal format. **[6]**

06 32 00 0D 00 1C E2 17

i) What is source port number?

ii) What is destination port number?

iii) What is total length of the user datagram?

iv) What is the length of the data?

v) Is packet directed from a client to server or vice versa?

vi) What is the client process?

OR

Q8) a) In a Stop-and-Wait system, the bandwidth of the line is 1 Mbps, and 1 bit takes 10 milliseconds to make a round trip. What is the bandwidth-delay product? If the system data packets are 1,000 bits in length, what is the utilization percentage of the link? **[4]**

b) What are the types of socket? Explain various socket primitives used in connection oriented client server approach. **[8]**

c) Explain state transition diagram of TCP **[4]**

Q9) a) Explain HTTP request and reply message format. **[6]**

b) Write short notes on **[8]**

i) DHCP

ii) MIME

c) Explain various FTP commands? **[4]**

OR

Q10) a) Define FTP ? Can we specify file transfer in a Web page? Explain with the help of suitable example. **[6]**

b) Explain working of IMAP. **[4]**

c) What is DNS? Explain its various resource records with one example **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1756

[Total No. of Pages : 2

[5460] - 586
T.E. (Computer) (Semester - II)
Design and Analysis of Algorithm
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer all questions.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Make suitable assumptions wherever necessary.***

Q1) a) Compare between definiteness and effectiveness of an algorithm with example. **[7]**

b) What is the application of proof techniques? Explain any one technique with example. **[7]**

c) Solve following multiplication using Divide and Conquer strategy 2135 * 4014. **[6]**

OR

Q2) a) Discuss the advantages & disadvantages of recursion. **[7]**

b) Prove by induction that $S_n = 1 + 3 + 5 + 7 + ... + 2n - 1 = n^2$ **[7]**

c) Comparison of Greedy approach and Dynamic programming. **[6]**

Q3) a) Explain best case, worst case & average case complexity of an Algorithm with one example. **[8]**

b) Explain deterministic and non - deterministic algorithm with example. **[8]**

OR

Q4) a) Explain asymptotic notations Big - O, Theta, Omega, small - o, small - omega with example of each. **[10]**

b) Whether Hamiltonian cycle problem is NP Hard problem or not? Justify. **[6]**

P.T.O.

Q5) a) What is amortized analysis? Explain amortized analysis of splay tree operations. **[9]**

b) Explain Randomized algorithm for Quick Sort. **[8]**

OR

Q6) a) Explain amortized analysis for Binomial Heap & Fibonacci Heap. **[8]**

b) What is Approximate algorithm? Explain Approximate algorithm for Vertex Cover. **[9]**

Q7) a) Write & explain Rabin - Karp string matching algorithm. **[10]**

b) Explain Distributed Breadth first search algorithm. **[7]**

OR

Q8) a) Explain multithreaded Merge sort algorithm. **[8]**

b) Write Naïve string matching algorithm. What is the time complexity of algorithm? Explain complexity of algorithm with example. **[9]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1757

[Total No. of Pages : 3

[5460] - 587
T.E. (Computer Engg.)
SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Define following terms **[5]**

i) Token

ii) Lexeme

iii) Pattern

iv) String

v) Alphabet

b) Explain advance macro facilities using suitable example. **[5]**

OR

Q2) a) Give complete design of Direct linking Loader. **[6]**

b) Explain MNT, MDT, MDTP, and ALA with respect to macro processor using example? **[4]**

Q3) a) Draw a neat flowchart of pass - I of two pass assembler and explain it. **[5]**

b) Explain "General loading scheme (using suitable diagram)" with advantages and disadvantages. **[5]**

OR

P.T.O.

Q4) a) Give complete design of Absolute Loader with suitable example. **[6]**

b) Differentiate between compiler and interpreter? **[4]**

Q5) a) Explain use of process control block and all fields in brief. **[6]**

b) Draw Gantt chart and calculate Avg. turnaround time, Avg. waiting time for the following processes using SJF non preemptive and round robin with time quantum 2. **[6]**

Processes	Arrival time	Burst Time
P1	0	6
P2	1	4
P3	4	8
P4	3	3

c) Write Banker's algorithm and explain with suitable example. **[6]**

OR

Q6) a) Explain various process states with suitable process state diagram. **[6]**

b) Consider following status of system, compute need of each process and check given state is safe or unsafe using Bankers algorithm. Also check, if P3 generates new request (0, 1, 0, 0) system is safe or unsafe and request is granted or not? **[8]**

	MAX_CLAIM					ALLOCATED			
	R1	R2	R3	R4		R1	R2	R3	R4
P1	0	0	1	2		0	0	1	2
P2	2	7	5	0		2	0	0	0
P3	6	6	5	6		0	0	3	4
P4	4	3	5	6		2	3	5	4
P5	0	6	5	2		0	3	3	2

Currently Available Resources →

R1	R2	R3	R4
2	1	0	0

c) What are necessary conditions for deadlock? Explain them with example. **[4]**

Q7) a) What is Thrashing? Explain in brief. **[4]**

b) Compare contiguous and non - contiguous memory allocation. **[3]**

c) What is virtual memory? Explain Demand paging with example. **[6]**

d) Explain segmentation using suitable example in brief. **[3]**

OR

Q8) a) What is fragmentation? Explain types of fragmentations with suitable diagram/example. **[5]**

b) Write a note of swapping. **[5]**

c) Consider given page sequence a, b, c, d, c, a, d, b, e, b, a, b, c, d and the size of the frame is 4. Show the output of LRU and Optimal policies, also count page faults. **[6]**

Q9) a) What is file system? Explain file system implementation in brief. **[4]**

b) Consider the disk access requests given as 55, 58, 39, 18, 90, 160, 150, 38, 184, where starting head position is - 100. Calculate average seek time using FCFS, SSTF, SCAN and C - SCAN disk scheduling policies and show which policy performs better. **[12]**

OR

Q10) a) Explain following terms with respect to directory structure. **[8]**

i) Two level directory structure (use suitable diagram)

ii) Tree structured directories (use suitable diagram)

b) What is I/O Buffering? Explain its type in detail. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1758

[Total No. of Pages : 2

[5460] - 588
T.E. (Computer Engineering)
Embedded System & Internet of Things
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer any three questions 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) ***Assume suitable data wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat & labelled diagram wherever necessary.***

Q1) a) Draw the whole set of ARM registers. **[5]**

b) With the help of diagram explain IOT functional blocks. **[5]**

OR

Q2) a) List and explain different components of an IOT system. **[4]**

b) Explain service specification step of IOT system design methodology, consider smart IOT - based home automation system as an example. **[6]**

Q3) a) Explain operational view specification step of IOT system design methodology, consider smart IOT - based home automation system as an example. **[6]**

b) Explain M2M (the internet of devices) pillar of IOT. **[4]**

OR

Q4) a) Justify, 'The three - layer DCM classification is more about the IOT value chain than its system architecture at runtime'. **[5]**

b) List and explain interfaces available with Raspberry Pi board. **[5]**

P.T.O.

Q5) a) Explain IEEE 802.15.4 protocols in detail. **[7]**

b) List and explain possible vulnerabilities of IOT. **[6]**

c) List and explain different misuse cases in IOT security? **[4]**

OR

Q6) a) Explain lifecycle of an IOT device. **[4]**

b) Explain ZigBee protocol in detail. **[7]**

c) Explain various possible attacks in different layers of IOT. **[6]**

Q7) a) What is Web of Things (WOT)? **[4]**

b) Draw and explain the cloud of things architecture. **[8]**

c) Explain SCADA Middleware Standards in brief. **[4]**

OR

Q8) a) Draw and explain multi - tiered cloud architecture based on middle ware. **[8]**

b) Explain RFID Middleware Standards in brief. **[4]**

c) Explain Cloud Computing as a fusion of Grid computing and SOA. **[4]**

Q9) a) Design Weather Monitoring system, what are the different components required? Draw deployment design for this system. **[7]**

b) Draw and explain the WAMP protocol interaction between peers. **[6]**

c) Write the Auto Bahn installation and setup steps. **[4]**

OR

Q10) a) List and explain various Amazon Web Services for IOT. **[7]**

b) Explain the python web application framework - Django. **[6]**

c) Briefly explain Xively Cloud for IOT. **[4]**

♦♦♦♦

Total No. of Questions : 08]

SEAT No. :

P1759

[Total No. of Pages : 2

[5460] - 589
T.E. (Computer Engineering)
SOFTWARE MODELING AND DESIGN
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Q.1 and Q.2 are compulsory. Solve Q. 3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Assume suitable data if required.***
3) ***Figure to the right indicates full marks.***

Q1) a) Explain the difference between procedural/structural and Object-Oriented paradigm of design **[5]**

b) Write a use case specification for the use case: User authentication? **[5]**

Q2) a) Draw sequence diagram for Event registration system? **[5]**

b) Why class diagram is important in static modeling? Explain different relationship used in class diagram? **[5]**

Q3) a) Explain synchronous communication pattern in Client server architecture with example? **[6]**

b) Explain Location & Platform transparency in service oriented architecture?**[6]**

c) Write short notes on **[6]**

i) web registration services

ii) Brokering & discovery services

OR

P.T.O.

Q4) a) Explain asynchronous message communication with call back pattern with suitable example? **[6]**

b) Explain important characteristic of real time software architecture? **[6]**

c) Explain dynamic view of software architecture with the help of example? **[6]**

Q5) a) Explain proxy pattern? Describe its intent, motivation, Applicability & implementation with example? **[6]**

b) Draw structure of observer pattern with suitable class diagram including subject and observer? **[6]**

c) Write short note on **[4]**

i) Port provided & required interface

ii) Real time software architecture

OR

Q6) a) Explain Behavioral Design Pattern in short? **[4]**

b) Explain factory pattern? Describe its intent, motivation & implementation with example? **[6]**

c) What is singleton pattern? Explain one example scenario where you will Singleton pattern to get applied? **[6]**

Q7) a) What is integration testing; Explain its type in details? Define Stub & Driver? **[8]**

b) What is Black box testing? Why it is called BBT? Also explain boundary value analysis? **[8]**

OR

Q8) a) Explain graph based testing with suitable example? **[6]**

b) Compare white box testing and black box testing. **[4]**

c) What is performance testing? List few tools of performance testing? **[6]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : [ ]

P1760

[Total No. of Pages : 3

[5460] - 590
T.E. (Computer Engineering)
WEB TECHNOLOGY
(2015 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) List and discuss the different design issues in web development. **[5]**

b) Explain how to call Java Script function from HTML page. **[5]**

OR

Q2) a) What are the strengths of XML technology? Also list the limitations of using XML. **[5]**

b) Write a program of your choice to demonstrate the use of DOM. **[5]**

Q3) a) Create simple JSP pages which will demonstrates use of implicit session object in JSP. **[5]**

b) Explain HttpServletRequest and HttpServletResponse with suitable examples. **[5]**

OR

Q4) a) How to create an object in Java Script? Explain with suitable examples. **[5]**

b) Write the differences between include action and include directive in JSP. **[5]**

P.T.O.

Q5) a) What is Multi dimensional arrays in PHP? Explain it with simple PHP code. **[6]**

b) List and explain different values of readystate and status property of the HTTPRequestObject. **[6]**

c) Write the differences between Client side scripting and server side scripting. **[4]**

OR

Q6) a) Explain server side include in PHP with sample code. **[6]**

b) What are the technologies used in traditional web programming? Also identify location of each technology used in this model. **[6]**

c) Find out and explain how XML and AJAX are related. **[4]**

Q7) a) What is MVC? Draw and explain MVC architecture for developing web applications. **[6]**

b) Create Simple Angular JS application to display "Hello, Input Name" using proper directive. **[6]**

c) Write various features of struts framework. **[4]**

OR

Q8) a) What are the different configuration files are require to develop any struts application? Explain each configuration file. **[6]**

b) Identify and explain data tags from struts2 which are used to manipulate data displayed on any web application page. **[6]**

c) List and explain various directives in AngularJS. **[4]**

Q9) a) Draw and explain scenerio of client accessing remote EJB. List some of the EJB clients. **[8]**

b) What are the different types of EJB? Identify and explain situations about when to use session beans. **[6]**

c) Write short note on Content Management System. **[4]**

OR

Q10) a) Write EJB code to acquire JNDI context through **[8]**

i) default JNDI properties and

ii) Seperate JNDI properties

b) What are the web services? List and discuss components of web services. **[6]**

c) Write a short note on JSF. **[4]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1761

[Total No. of Pages : 3

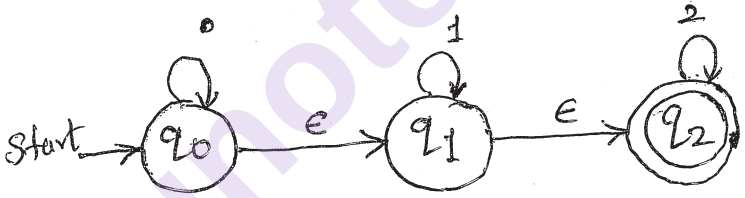
[5460] - 591
T.E. (IT)
THEORY OF COMPUTATION
(2015 Pattern)

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) Convert the NFA with ∈ moves, for the following Transition Diagram, into its equivalent DFA. **[8]**



b) State properties & limitations of FSM. **[2]**

OR

Q2) a) Find the regular expression for the language **[6]**

i) Consisting of all strings of a's & b's without any combination of double letters.

ii) over Σ = {a, b} containing at least one 'a' & at least one 'b'.

iii) Consisting of set of all strings that start with 'a' and do not have two consecutive 'b's.

b) Construct Transition Graph for the following regular expression. **[4]**

r = 1*·0·0· (0 + 1)*

P.T.O.

Q3) a) Write a context free language (CFL) for the following CFG. **[6]**

i) $S \rightarrow OSO \mid A \mid \in$

$A \rightarrow 1SO \mid \in$

ii) $S \rightarrow a\ Sc \mid A \mid \in$

$A \rightarrow aAb \mid \in$

b) Eliminate $\in$ - productions from the given Grammar consisting of following productions **[4]**

$S \rightarrow a\ S\ a \mid b\ S\ b \mid \in$

OR

Q4) a) Convert the following grammar G to GNF **[8]**

$G = \{(A_1\ A_2\ A_3), (a, b), P, A_1\}$

Where P consists of the following productions :

$A_1 \rightarrow A_2\ A_3$

$A_2 \rightarrow A_3\ A_1 \mid b$

$A_3 \rightarrow A_1\ A_2 \mid a$

b) State applications of Context - free Grammar. **[2]**

Q5) a) Define PDA. Construct PDA that accepts the following language. **[8]**

$L = \{a^n b^n / n > 0\}$

Simulate for ω = aaabb

b) Construct a PDA that accepts the following language. **[8]**

$L = \{X, aXa, bXb, aaXaa, abXba.....\}$

OR

Q6) a) Construct PM that multiplies two unary numbers write simulation for **[10]**

i) aa.a

ii) aaa.aaa

b) Give difference between PDA & PM. **[6]**

Q7) a) Design a TM that recognizes strings containing equal no. of 0's & 1's Write simulation for any two input strings. **[9]**

b) Design a TM that recognizes binary palindromes. Write simulation for any two input strings. **[9]**

OR

Q8) a) Design TM that finds the Greatest Common Divisor (GCD) of two given numbers. Find GCD of 4 & 2. **[12]**

b) Write short note on types of TM. **[6]**

Q9) a) Prove that.

PCP = {<p> |p is an instance of the Post Correspondence problem with a match}. **[10]**

b) Write short note on p - class with examples. **[6]**

OR

Q10) a) Prove that following are decidable languages. **[10]**

i) A_{NFA} = {<B, ω> | B is an NFA that accepts input string ω}

ii) A_{REX} = {<R,ω> | R is a regular expression that generates string ω}

b) Explain computational complexity with example. **[6]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1762

[Total No. of Pages : 2

[5460] - 592
T.E. (Information Technology)
DATABASE MANAGEMENT SYSTEM
(2015 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) ***Figures to the right side indicate full marks.***

Q1) a) Describe the three level architecture of DBMS. Explain how it is useful for achieving data independence. **[5]**

b) When are two schedules said to be view equivalent? **[5]**

OR

Q2) a) List the responsibilities of DBA. **[5]**

b) Describe DROP TABLE command of SQL with both the options CASCADE and RESTRICT. **[5]**

Q3) a) Write short note on : Mapping of ISA relationship of E - R diagram to tables. **[4]**

b) State and explain (any 6) Codd's norms for RDBMS. **[6]**

OR

Q4) a) What are the measures of Query cost? **[5]**

b) Why are cursors necessary in embedded SQL? **[5]**

Q5) a) Draw and explain the architecture of Parallel databases. **[6]**

b) What is a checkpoint? List the operations to be performed by the system when a checkpoint is to be taken. What does the recovery system do if there is a crash. **[10]**

P.T.O.

OR

Q6) a) Explain Query optimization with respect to SQL databases. **[8]**

b) Discuss and explain data replication and allocation issues in Distributed database system. **[8]**

Q7) a) Explain XML data model. List advantages of XML. **[8]**

b) Explain in brief the advantages of Mongo DB over RDBMS. **[8]**

OR

Q8) a) Discuss data management issues in cloud databases. **[8]**

b) What is HDFS? Draw and explain the architecture. **[8]**

Q9) a) Explain Association rules with Support and Confidence measures. **[6]**

b) Explain architecture of data mining system. **[6]**

c) Explain the conceptual models for data ware house. **[6]**

OR

Q10) a) Write a short note on : (any 3) **[12]**

i) Data processing techniques.

ii) OLAP

iii) Machine learning for business intelligence.

iv) Big data features

b) Explain KDD in detail. **[6]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1763

[Total No. of Pages : 2

[5460] - 593
T.E. (I.T.)
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve any 1 out of Q.1 or Q.2 and any 1 out of Q.3 or Q.4 and***
2) ***Solve any 1 out of Q.5 or Q.6 and any 1 out of Q.7 or Q.8 and any 1 out of Q.9 or Q.10.***
3) ***Draw neat diagrams and assume suitable data wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Elaborate how software engineering is layered technology. **[5]**

b) What are the key principles for agile requirements? **[5]**

OR

Q2) a) Explain four major sections of project management plan. **[5]**

b) What is meant by normal and exciting requirements? How requirements are validated? **[5]**

Q3) a) What are different techniques for effort estimation? **[5]**

b) Explain incremental model in detail. **[5]**

OR

Q4) a) How stakeholder identification is performed? What are the advantages of recognizing multiple viewpoints? **[6]**

b) Discuss software myths and realities in developer perspective. **[4]**

Q5) a) Explain agility and cost of change. State the Agility principles. **[8]**

b) Explain sprint planning meeting, sprint backlog, sprint execution. **[8]**

OR

P.T.O.

Q6) a) Explain with an example test driven development. **[8]**

b) Explain difference between exploratory testing versus scripted testing. **[8]**

Q7) a) Explain the need of Quality management. Draw and explain six sigma in quality management. **[10]**

b) Explain Different statistical tools used quality control. **[8]**

OR

Q8) a) Explain risk mitigation, risk monitoring, risk management. **[10]**

b) Explain the differences between 'Known risks' and 'predictable risks' with example. **[8]**

Q9) a) What is customer relationship management (CRM)? Explain benefits of CRM. **[8]**

b) What is meant by business reengineering? What are business reengineering process principles? **[8]**

OR

Q10) Write short note on **[16]**

a) CASE tools

b) Collaborative Development

c) Elements of a Configuration Management System

d) Technology Evolution

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1764

[Total No. of Pages : 3

[5460] - 594
T.E. (IT)
OPERATING SYSTEM
(2015 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, 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) Elaborate the functions of operating system. **[5]**

b) Specify the role of schedulers in operating system. **[5]**

OR

Q2) a) State command line arguments in shell with example. **[5]**

b) Differentiate between user - level and kernel - level threads. **[5]**

Q3) a) Describe in brief different IPC mechanisms. **[5]**

b) Explain following terms : **[5]**

i) Critical Section.

ii) Race Condition.

OR

Q4) a) Write a semaphore solution for readers - writers problem. **[5]**

b) Explain with an appropriate example, how resource allocation graph determines a deadlock. **[5]**

P.T.O.

Q5) a) For the following reference string.
6,5,1,2,5,3,5,4,2,3,6,3,2,1,2
Count the number of page faults that occur with 3 frames using FIFO, Optimal and LRU page replacement methods. Discuss the result. **[12]**

b) Explain segmentation with suitable daigram. **[6]**

OR

Q6) a) Free memory holes of sizes 15 K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K are to be allocated. How processes are placed using first fit, best fit and worst fit partitioning algorithm. Calculate internal and external fragmentation. **[10]**

b) Explain the concept of virtual memory with suitable diagram. **[8]**

Q7) a) A disk drive has 200 cylinders, numbered 0 - 199. The drive is currently serving the request at cylinder 63. The queue of pending requests in FIFO order is 27,129,110,186,147,41,10,64,120. Starting from the current head position what is the total distance that disk arm moves to satify all the pending requests for the following disk scheduling algorithms. **[12]**

i) FCFS

ii) C-SCAN

iii) C - LOOK

iv) SSTF

b) Explain I/O buffering mechanism. **[4]**

OR

Q8) a) Write a short note on the following **[8]**

i) Directory Structure

ii) File sharing

b) Explain free space management technique. **[8]**

Q9) a) Explain in detail Linux Booting process. **[8]**

b) List and explain different inter - process communication mechanisms in Linux operating system. **[8]**

OR

Q10) Write short note on following : **[16]**

a) Memory Management in Linux

b) Linux File system.

c) Kernel Modules

d) Process Scheduling in Linux.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : [ ]

P1765

[Total No. of Pages : 4

[5460] - 595
T.E. (IT)
HUMAN COMPUTER INTERACTION
(2015 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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Express your opinion - "A design should be User-Centric". **[5]**

b) Explain any 2 of the following HCI principles in brief. **[5]**

i) Know thy user

ii) Understand the task

iii) Reduce Memory Load

iv) Strive for Consistency

v) Prevent Errors/Reversal of Action

OR

Q2) a) Human memory plays an important role in how well people deal with an interface. Describe differences between STM and LTM. **[5]**

b) What are differences between menu-bar & a tool-bar? Many times users face problems in understanding/learning tool-bar icons. How to resolve this issue? **[5]**

Q3) a) How does making a call differs when using **[5]**

i) Cell phone

ii) Smart phone?

Consider the kinds of user, type of activity and context of use

P.T.O.

b) When systems are not designed to match the way people actually work, then users end up having to do 'work arounds'. Discuss. **[5]**

OR

Q4) a) What influence does the social environment in which you work have on your interaction with the computer? What effect does the organization (commercial or academic) to which you belong have on the interaction?**[5]**

b) There are four main translations involved in the interaction framework viz. articulation, performance, presentation and observation. **[5]**

i) The compact disk player has a button for power off. However its remote control does not have a power off button.

ii) It is difficult in a command line interface to determine the result of copying and moving files in a hierarchical file system.

iii) User is unable to figure out which switches from the bank to turn on to lit the front portion of a class room.

iv) The user is unable to know whether the voice recorder is in playing or recording state.

Specify in each of the above four cases wich of the interaction framwork translations are ineffective.

Q5) a) Explain Hill climbing approach with prototyping? **[8]**

b) What is design? What is the golden rule of design? Illustrate the process of interaction design. **[8]**

OR

Q6) a) What is a prototype? Explain different types of rapid prototyping techniques. **[8]**

b) A scenario is an idealized but detailed description of a specific instance of human-computer interaction (HCI). Scenarios specify how users carry out their tasks in a specified context. Write scenarios for purchasing an airline ticket.
Note - Generate scenarios to cover a wide range of situations, not just the most common ones. Include problem situations that will test the system concept, not just straightforward scenarios. **[8]**

Q7) a) What is the definition of usability as per ISO 9241 standard? Effective applications are both consistent within themselves and consistent with one another. Discuss this in context of Microsoft Office products. **[8]**

b) Explain Nielsen's ten heuristics. **[8]**

OR

Q8) a) The cognitive walk-through is a formalized way of imagining people's thoughts and actions when they use an interface for the first time. During a cognitive walk-through the evaluator needs to ask four questions as below **[8]**

i) Is the effect of the action the same as the user's goal at that point?

ii) Will users see that the action is available?

iii) Once users have found the correct action, will they know it is the one they need?

iv) After the action is taken, will users understand the feedback they get?

Given below is an action sequence for creating a Customized voicemail message on an iPhone:

1) Tap Voicemail.

2) Tap Greeting.

3) Tap Custom.

4) Tap Record and speak your greeting.

5) When you finish, tap Stop.

6) To listen to your greeting, tap Play.

7) To re-record, repeat steps 4 and 5.

8) Tap Save.

Imagine an iPhone interface and create a report of the cognitive walk-through for the above mentioned task in context with the review questions.

b) Explain the following terms **[8]**

i) Predictability

ii) Synthesizability

iii) Familiarity

iv) Consistency

Q9) a) KLM (key-stroke-level) model predicts expert error-free task completion time (human performance) with interactive computing systems. Total predicted time for a task is given by the equation.

$$t_{EXECUTE} = t_K + t_P + t_H + t_D + t_M + t_R$$

What does each of the above timing represent?
Develop a KLM model and predict time for the completion of the task **"Change font and style for the word "KLM" to bold, Arial"** using mouse only. **[9]**

b) Discuss applications meant for computer-mediated communication. **[9]**

OR

Q10) a) Draw a state chart diagram of a machine that dispenses bottles on inserting coins. **[9]**

b) Hierarchical task analysis (HTA) is used to describe the interactions between a user and software system. Draw and explain HTA to online bus reservation system. **[9]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1766

[Total No. of Pages : 3

[5460] - 596
T.E. (Information Technology)
COMPUTER NETWORK TECHNOLOGY
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***

2) ***Neat diagrams must be drawn wherever necessary.***

3) ***Figures to the right side indicate full marks.***

4) ***Assume suitable data if necessary.***

Q1) a) An organization is granted the block 172.16.0.0/18. Design the network and **[6]**

i) Find how many subnets?

ii) Find how many hosts per subnet?

iii) Subnet mask

iv) What are the valid subnets?

v) What's the broadcast address for last subnet?

vi) What is the range of valid hosts in last subnet?

b) What is socket? Explain various socket primitives used in client server interaction. **[4]**

OR

Q2) a) What is FTP? Which ports does it use and for what purpose? Explain any 4 commands in FTP. **[6]**

b) Compare and contrast distance vector routing with link state routing. **[4]**

P.T.O.

Q3) a) What is the purpose of Leaky bucket and token bucket algorithms? Describe working of Token bucket algorithm with reference to CBR, VBR and bursty traffic. **[6]**

b) What is MIME? Explain the MIME header with suitable example. **[4]**

OR

Q4) a) What is PING? Explain with suitable example how PING works. **[6]**

b) Explain use of different timers in TCP. **[4]**

Q5) a) Explain the following corresponding to 802.11 MAC sublayer. **[8]**

i) Reliable data delivery

ii) Access control

b) Discuss the interference handling mechanism adopted in Bluetooth. List MAC layer specifications of IEEE 802.15.1. **[8]**

OR

Q6) a) Draw the various frequency bands in the electromagnetic spectrum? Explain why high frequency X rays and Gamma rays are not normally used for wireless communication. **[8]**

b) Explain in detail about IEEE 802.16 architecture. **[8]**

Q7) a) Differentiate between Infrastructure Network and Infrastructure - less Wireless Networks. What are the MAC layer and Routing Layer Design goals? **[8]**

b) Give classification of Transport layer solutions in adhoc wireless network. Explain operation of TCP - F. **[8]**

OR

Q8) a) Explain the connection establishment and data transfer phase in the following routing protocols with suitable diagram. **[8]**

i) AODV

ii) DSDV

b) What are the elements of sensor networks? Differentiate the MAC protocol of WSN from traditional wireless MAC protocol. **[8]**

Q9) a) What are the technical building blocks of Internet of Things? List the applications IoT. Explain any one in detail. **[10]**

b) What are the design issues in wireless sensor network. **[8]**

OR

Q10) a) What are the issues and challenges in Internet of Things? **[5]**

b) State the types of satellites and their advantages and disadvantages. **[5]**

c) Write short note on any two **[8]**

i) SDN

ii) Network Function Virtualization

iii) Net Neutrality

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1767

[Total No. of Pages : 4

[5460] - 597
T.E. (IT)
SYSTEMS PROGRAMMING
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1 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) Perform Pass I and Pass II of assembler for the given assembly language program. Assume instruction length of 1 byte. **[10]**

```
        START 1500
        READ LAB
LOOP    MOVER AREG, A
        MOVER BREG, = '1'
A       EQU LOOP+5
        LOAD B
        ORIGIN A +10
        LTORG
B       MOVER CREG, = '2'
        STORE D
        MOVEM AREG, = '1'
LAB     DS 10
        STOP
        END
```

OR

P.T.O.

Q2) a) Explain overlay structure and subroutine linkage w.r.t. loaders. **[6]**

b) Define the following : **[4]**

i) Forward referenced symbol

ii) Pattern and Lexeme

iii) Macroprocessor

Q3) a) For the given 'C' code, generate the output of lexical analysis. **[6]**

```
// My first C Program
Void main ( )
{
      int i, j;
      clrscr( );
      scanf("%d  %d",&i,&j);
      while (i <= j)
      {

            i++;
            j--;
      }

printf("C Programming!");

getch( );}
```

b) Define loader and explain its functions. **[4]**

OR

Q4) a) Explain different parameter passing methods used in macroprocessors. **[5]**

b) Convert the given RE to its equivalent DFA : **[5]**

(a + b)*.a

Q5) a) For the given grammar, construct the SLR parser and parse the string (a,(a,a)) **[8]**

$S \rightarrow (L) / a$

$L \rightarrow L, S / S$

b) Explain with example the problem of left factoring of grammar in parsers. **[4]**

c) With neat diagram explain classification of parsers. **[6]**

OR

Q6) a) Consider the following grammar. **[10]**

$S \rightarrow Aa / bAc / Bc/bBa$

$A \rightarrow d$

$B \rightarrow d$

Construct CLR parser and parse for the string "bdc" and "bc".

b) Define handle. Where is the concept of handle pruning used? For the given grammar, generate the string +*aaa
And identify the handles at each stage. **[4]**

$S \rightarrow +SS/*SS/a$

c) Differentiate between SLR and LALR parsers. **[4]**

Q7) a) Define the following : **[4]**

i) Syntax Directed Definition

ii) Syntax Directed Translation

iii) Synthesized Attributes

iv) Inherited Attributes

b) For the given grammar. **[6]**

$D \rightarrow TL$

$T \rightarrow int / real$

$L \rightarrow L, id/id$

Show the annotated parse tree for the statement real x_1, x_2;

c) Define dependency graph and for the annotated tree generated in Q7b) draw the dependency graph. **[6]**

OR

Q8) a) Explain dynamic allocation strategies. **[6]**

b) Show DAG, quadruple and triple for the given expression : **[6]**

a + a*(b-c) + (b-c)*d

c) Generate three address code for **[4]**

If (a>b) then x = y + z

else p = q - r

Q9) a) i) prod = 0

ii) i = 1

iii) $t_1 = 4 * i$

iv) $t_2 = a[t_1]$

v) $t_3 = 4 * i$

vi) $t_4 = b[t_3]$

vii) $t_5 = t_2 * t_4$

viii) $t_6 = prod + t_5$

ix) $prod = t_6$

x) $t_7 = i + 1$

xi) $i = t_7$

xii) if i < = 20 goto(3)

Show the basic flow graph for the given code. Explain the rules for forming the blocks. **[4]**

b) Explain machine dependent and independent optimization techniques. **[8]**

c) Discuss machine dependent issues for code generation. **[4]**

OR

Q10) a)

i = 4	i = 4	i = 4
$t_1 = i + 1$	$t_1 = 5$	$t_1 = 5$
$t_2 = b[t_1]$	$t_2 = b[t_1]$	$t_2 = b[5]$
$a[t_1] = t_2$	$a[t_1] = t_2$	$a[5] = t_2$

Perform machine independent code optimization techniques on the given code. **[8]**

b) Discuss code generation issues. **[4]**

c) Write a note on activation record. **[4]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1768

[Total No. of Pages : 3

[5460] - 598
T.E. (IT)
DESIGN AND ANALYSIS OF ALGORITHMS
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) How do we analyze and measure the time complexity of algorithm? What are the basic components, which contribute to space complexity? In what way the asymmetry between Big - Oh notation and Big - Omega notation helpful. **[5]**

b) Write an algorithm for finding out the maximum and minimum number in an array using divide and conquer. **[5]**

OR

Q2) a) Consider the following instance of the knapsack problem : n = 3, m = 20, (p1, p2, p3) = (25, 24, 15) and (w1, w2, w3) = (18, 15, 10). Solve it using greedy approach. **[5]**

b) Write a recursive algorithm and set up a recurrence relation for finding factorial of a given number and analyze it. **[5]**

Q3) a) Write a prims algorithm to find shortest path and analyze it. **[5]**

b) Compare **[5]**

i) Divide and conquer and Dynamic programming

ii) Greedy and Dynamic programming.

OR

P.T.O.

Q4) a) Solve the TSP problem using Dynamic Programming. **[8]**

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

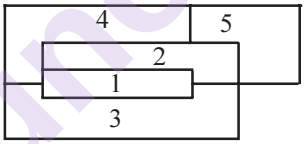
b) Define OBST? **[2]**

Q5) a) Write a recursive algorithm which shows a recursive formulation of the backtracking technique and explain it. **[8]**

b) If m = 30, Given data set w = {5, 10, 12, 13, 15, 18} find all possible subset of w that sum to m. Draw the portion of state space tree that is generated by sum of subset. Are there any differences in the computing time in given set of elements? w = {18, 15, 13, 12, 10, 5} And w = {15, 13, 5, 18, 10, 12} **[8]**

OR

Q6) a) Construct planar graph for following map. Explain how to find m - coloring of this planar graph by using m - coloring Backtracking algorithm. **[8]**



b) Write a recursive algorithm to find the Hamiltonian cycle using backtracking technique and explain it. **[8]**

Q7) Consider the travelling salesman instance defined by cost matrix. **[18]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

a) Obtain reduced matrix.

b) Obtain the portion of state space tree generated by LCBB.

OR

Q8) a) What is Branch and bound algorithmic strategy? Draw the portion of the sate space tree generated by LCBB for the following knapsack instances: N = 4, M = 15 and {p1,p2,p3,p4} = {10, 10, 12, 18}, (w1,w2,w3,w4) = (2, 4, 6, 9) **[10]**

b) What is least cost search? Explain in detail control abstraction for LC search. **[8]**

Q9) a) Explain the need and significance of parallel algorithms. Define the speedup of parallel algorithm. **[8]**

b) What do you mean by P, NP, NP - Hard and NP - Complete Problems? Give an example of each category. **[8]**

OR

Q10) a) State and explain pointer doubling concept with example. **[8]**

b) Prove that Clique problem is NP complete. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1769

[Total No. of Pages : 2

[5460] - 599
T.E. (IT)
CLOUD COMPUTING
(2015 Pattern) (Semester - II)

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.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagram 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) Define Cloud Computing. Explain different types of Cloud Computing. **[8]**

b) Explain benefits of IaaS. **[6]**

OR

Q2) a) Explain different types of Cloud Deployment Models. **[8]**

b) Explain characteristics of Cloud Computing. **[6]**

Q3) a) Write short note on following standards of application developer. **[8]**

i) Solution stack (LAMP and LAPP)

ii) Syndication (Atom and RSS)

b) State and describe any four Cloud Enabling Technologies. **[8]**

OR

Q4) a) Availability is one of the most important security measure in IoT and Cloud Computing. Explain in detail. **[8]**

b) Smart buildings is one of the major application of IoT and Cloud computing. Elaborate with suitable diagram and examples. **[8]**

P.T.O.

Q5) a) Explain significance of RFID in IoT with suitable system architecture features and advantages in detail. **[8]**

b) Write short note on Cloud implementation and application. **[6]**

OR

Q6) a) Explain various threat agents in cloud computing domain with suitable examples and diagrams. **[8]**

b) ZigBEE Technology is one of the enabling technologies for IoT. Explain in detail with suitable diagram. **[6]**

Q7) a) Write short notes on : **[8]**

i) WSN : a driving force of IoT and Cloud Computing

ii) IAM : Identity and Access Management in cloud computing

iii) Non - repudiation and DOS attacks.

iv) Significance of GPS in IoT.

b) What is Docker? Explain its Workflow in detail. **[8]**

OR

Q8) a) What is Jungle Computing? Explain why there is need of Jungle Computing? **[8]**

b) Draw architecture for Docker and explain it's components. **[8]**

Q9) Enlist and Explain benefits of using wireless network for UbiCom. **[10]**

OR

Q10) Write short note on Ubiquitous System Challenge and Outlook. **[10]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1770

[Total No. of Pages : 3

[5460] - 600
T.E. (Information Technology)
Data Science and Big Data Analytics
(2015 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, Q.9 or Q.10.***
2) ***Draw neat diagrams whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) State one example of big data and explain how all V's are applied for big data example **[4]**

b) Only 1 in 1000 people has rare disease. Given True Positive = 0.9 and False positive = 0.02.If randomly tested individual is positive, What is the probability that they have a disease. **[6]**

OR

Q2) a) How Big Data Analytics is useful for improving agriculture and life of farmers. **[4]**

b) A computer device can be either in a busy mode (state 1) processing a task, or in an idle mode (state 2), when there are no tasks to process. Being in a busy mode, it can finish a task and enter an idle mode any minute with the probability 0.2.Thus,with the probability 0.8 it stays another minute in a busy mode. Being in an idle mode, it receives a new task any minute with the probability 0.1 and enters a busy mode. Thus, it stays another minute in an idle mode with the probability 0.9. The initial state is idle. Let Xn be the state of the device after n minutes. Find the distribution of X2. **[6]**

P.T.O.

Q3) a) What are the advantages of Hadoop? Explain Hadoop Architecture and its Components with proper diagram. **[5]**

b) What is Textual ETL processing? Explain different components of textual ETL processing. **[5]**

OR

Q4) a) Explain the concept of Blocks and Heartbeat mechanism in HDFS Architecture. **[5]**

b) List and explain any five hadoop shell commands with syntax. **[5]**

Q5) a) What is need of integrating R and Hadoop? Explain the process of R and Hadoop Integration. **[9]**

b) How Missing values and categorical variables are preprocessed before building model? Explain with example. **[9]**

OR

Q6) a) Explain different types of analysis in detail with example. **[9]**

b) Explain different techniques of data visualization in detail. **[9]**

Q7) a) What is the need of data visualization? Also explain advantages of data visualization. **[8]**

b) Draw and Explain detail architecture of Text Mining and explain why it is required. **[8]**

OR

Q8) a) What do you mean by Model Planning and Model building? Explain tools for model building. **[8]**

b) Explain various Challenges in Big data visualization and explain the mechanism to overcome the challenges. **[8]**

Q9) a) What is Mobile Analytics? What is the importance of Mobile analytics? **[8]**

b) Explain the process of social media data analytics with example. **[8]**

OR

Q10) a) What are various Responsibilities of Data Scientist? Explain with Diagram. **[8]**

b) Write note on **[8]**

i) Tag Cloud

ii) Cluster-gram

iii) Motion Chart

iv) Google Chart API

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1771

[Total No. of Pages : 3

[5460] - 601
T.E. (Chemical)
CHEMICAL ENGINEERING MATHEMATICS
(2015 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***

2) ***Figures to the right, indicate full marks.***

Q1) Calculate the density of Chlorine gas at 230°C and 150 atm pressure assuming that gas follows vander walls equation of state. Critical temperature and pressure for Cl_2 gas at 417°K and 76.1 atm. Use Newton - Raphson method. **[10]**

OR

Q2) Solve the following system of equation using relaxation method Perform 4 iterations. **[10]**

$$10x_1 - 2x_2 - 2x_3 = 6$$
$$-x_1 + 10x_2 - 2x_3 = 7$$
$$-x_1 - x_2 + 10x_1 = 8$$

Q3) a) State and explain drawbacks of elimination method. **[5]**

b) Discuss the importance of Curve fitting and its applications in chemical engineering. **[5]**

OR

Q4) The velocity distribution of a fluid near a flat surface is given below.

x	0.1	0.3	0.6	0.8
y	0.72	1.81	2.73	3.47

x is the distance from the surface (mm) and v is the velocity (mm/sec). Use Langrage interpolation polynomial to obtain the velocity at x = 0.4 **[10]**

P.T.O.

Q5) a) The concentration of salt x in a homemade soap maker is given as a function of time by $\frac{dx}{dt} = 37.5 - 3.5x$.

At the initial time, t = 0 the salt concentration in the tank is 50 g/L. Using Eulers method and a step size of h = 1.5 minutes, what is the salt concentration after 3 minutes. **[8]**

b) Discuss the errors induced by Eulers method. **[8]**

OR

Q6) Solve the following differential equation using Modified Eulers method for the given boundry condition $\frac{dy}{dx} = \frac{x}{4} + yy(1) = 0.1$. Find value of y at x = 1.2 upto accuracy = 0.001. **[16]**

Q7) Evaluate the pivotal values of the equation u_u = 16 taking Δx = 1 upto t = 1.25. The boundry conditions are u(0, t) = u(5, t) = u(x, 0) and u(x, 0) = $x^2(5 - x)$. **[16]**

OR

Q8) $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition using Crank - Nicolson method.

At x = 0 and x = 3, u = 0 for all values of t.

At t = 0, u = x^2 for 0 < x < 3

Take increment in x as 1 and increment in t as 0.1. Find all values of u for t = 0 to t = 0.3 **[16]**

Q9) a) Define following terms **[9]**

i) Feasible solution.

ii) Basic solution

iii) Optimum solution

iv) Degenerate solution

b) What are the six steps of optimization. **[9]**

OR

Q10) A firm uses lathes, milling machines and grinding machines to produce two machine parts. Table represents the machining times required for each part, the machining times available on different machines and the profit on each machine part. **[18]**

Type of machine	Machine time required for the machine part (minutes)		Maximum time available per week (minutes)
	I	II	
Lathes	12	6	3000
Milling machines	4	10	2000
Grinding machines	2	3	900
Profit per unit	Rs.40	Rs. 100	

Find the number of parts I and II to be manufactured per week to maximize the profit.

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Total No. of Questions : 10]

SEAT No. :

P1772

[Total No. of Pages : 3

[5460] - 602
T.E. (Semester - I)
MASS TRANSFER - I
(2015 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the phenomena of mass transfer by molecular diffusion. Define Fick's law of diffusion. **[4]**

b) Derive the expression to calculate the flux of : **[6]**

i) Diffusion of gas 'A' through non diffusing stagnant gas 'B'.

ii) Equimolal counter diffusion of gases A and B.

OR

Q2) a) Derive the expression for Maxwell law of diffusion. **[4]**

b) Classify different mass transfer operations based on the phases in contact. Enlist different mass transfer operation in separation processes. **[6]**

Q3) a) With neat sketch explain Higbie's Penetration theory. Discuss in brief limitations of surface renewal theory and film theory. **[5]**

b) Explain Chiton Colburn Analogy, Write corresponding dimentionless groups of mass and heat transfer. **[5]**

OR

P.T.O.

Q4) Write a note on **[10]**

a) Minimum L/G ratio

b) Absorption and stripping factor

c) Choice of solvent for absorption

Q5) a) Define Wet Bulb Temp and Derive expression relating wet bulb temp with absolute humidity and psychrometric ratio. **[10]**

b) Explain Mechanism and working of Natural Cooling Tower. **[6]**

OR

Q6) a) What are the different types of Humidification and dehumidfication equipments? Explain any one in detail. **[6]**

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

i) Lewis relationship

ii) Psychrometric ratio

Q7) a) Explain Construction and Working of following equipment **[8]**

i) Spray Tower

ii) Bubble Column

b) Explain sparged vessel & mechanically agitated vessels with neat diagram. **[8]**

OR

Q8) a) Describe the following operating characteristics of sieve tray column using following points. Draw the diagram of gas flow rate Vs liquid flow rate to explain satisfactory operation of tray tower. **[10]**

i) Flooding

ii) Weeping

iii) Coning

b) Explain various Types of packing used in Packed Column. **[6]**

Q9) a) Explain following terms : **[6]**

i) Equilibrium moisture content

ii) Bound moisture content

iii) Unbound moisture content

b) Explain movement of moisture within solid based on capillary movement and unsaturated surface drying. **[6]**

c) A porous solid is dried in a batch dryer under constant drying conditions 5 hours are required to reduce the moisture content from 30% to 10%. The critical moisture content is found to be 16% and equilibrium moisture content is 2%. All moisture content are dry basis. Assume the rate of drying during the falling rate period is proportional to free moisture content. How long it will take to dry the same solids from 35 to 6%? **[6]**

OR

Q10) a) Derive the equation for Total Time required for drying. **[8]**

b) A batch of solid for which following table of data applies is to be dried from 25% to 6% moisture under conditions identicial to those for which data are tabulated. The initial weight of wet solid is 300 kg and drying surface is $1m^2/8kg$ of dry vapours. Determine the time required for drying **[10]**

x	0.35	0.25	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
n	0.3	0.3	0.3	0.266	0.239	0.208	0.180	0.150	0.097	0.07	0.025

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Total No. of Questions : 10]

SEAT No. :

P1773

[Total No. of Pages : 2

[5460] - 603
T.E. (Chemical) (Semester - I)
INDUSTRIAL ORGANISATION AND MANAGEMENT
(2015 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) ***Assume suitable data, if necessary.***
4) ***Attempt Q1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***

Q1) a) Explain essential functions of Manager in chemical industry. **[6]**

b) Write a note on Cooperative society. **[4]**

OR

Q2) Explain in detail F.W. Taylor's principles of management and his valuable contribution to scientific management. **[10]**

Q3) a) Explain in detail any two types of wages. **[4]**

b) Explain in detail trade unions in chemical industries. **[6]**

OR

Q4) Explain various functions of Stores department. **[10]**

Q5) a) Explain Penetration pricing and skimming pricing in detail. **[8]**

b) What is market research? What are different market research techniques? **[8]**

OR

P.T.O.

Q6) a) What is sales forecasting? Explain the long term and short term forecasting. **[8]**

b) Explain in detail the procedure to export a product to a foreign customer. **[8]**

Q7) a) Write an explanatory note on Marketing Mix. **[8]**

b) Explain in detail Patent and Patent rights. **[8]**

OR

Q8) a) Explain Total Quality Management of a process industry. **[8]**

b) What is ISO? Explain any three ISO standards. **[8]**

Q9) 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 Patents. **[6]**

OR

Q10) Write short notes on **[18]**

a) FERA and FEMA.

b) Monopolies Restrictive Trade Practices (MRTP)

c) Flow Chart and Flow Diagram.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1774

[Total No. of Pages : 2

[5460] - 604
T.E. (Chemical)
CHEMICAL PROCESS TECHNOLOGY
(2015 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.*
4) *Assume suitable data if necessary.*

Q1) a) Explain Production of common salt from sea water. **[5]**

b) What do you mean by PFD and major engineering problems. **[5]**

OR

Q2) Describe the process for chlorine and caustic soda production with the help of reactions. **[10]**

Q3) Explain production of Nitric acid by ammonia oxidation process. **[10]**

OR

Q4) Discuss Penicillin production by fermentation with neat flow sheet. **[10]**

Q5) a) Explain the method of detergent manufacture in detail. **[8]**

b) Discuss hydrogenation of oil in detail. **[8]**

OR

Q6) Discuss Batch Saponification process for soap production. **[16]**

P.T.O.

Q7) a) Explain water gas manufacturing process. **[6]**

b) Explain manufacturing of producer gas. **[6]**

c) Discuss in brief about fuel cell. **[6]**

OR

Q8) a) Explain Low temperature isomerization process. **[9]**

b) Write note on Catalytic reforming. **[9]**

Q9) a) Discuss manufacturing process for vinyl chloride from ethylene dichloride. **[8]**

b) Explain manufacturing of phenol. **[8]**

OR

Q10) Explain production of phthalic anhydride by wet air oxidation of naphthalene or orthoxylene. **[16]**

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Total No. of Questions : 08]

SEAT No. :

P1775

[Total No. of Pages : 2

[5460] - 605
T.E. (Chemical Engineering)
CHEMICAL ENGINEERING THERMODYNAMICS - II
(Semester - V) (2015 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.***
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 Partial Properties? Define and explain Partial Molar Volume. **[6]**

b) Note the Margule's equations and explain their application in representing empirical model of solution behavior. **[6]**

c) Describe the Phase rule for non reacting systems. **[8]**

OR

Q2) a) Obtain the relation : **[6]**

$$d(nG) = (nV)dP - (nS)dT + \sum \mu_i \, dn_i$$

b) With schematic represenation, describe Fugacity of a species i. **[6]**

c) Write on the nature of equilibrium on a tray in a distillation column and comment on microscopic changes. **[8]**

Q3) a) Draw and explain the block diagram for calculation of BUBLP. **[8]**

b) For an industrial application Solvent Extraction, *Liquid - Liquid Equilibrium* is applicable, Describe the concept. **[8]**

OR

P.T.O.

Q4) a) Show that the Gamma/Phi Rule formulation reduces to Raoult's Law when $\phi_i = \gamma_i = 1$. **[8]**

b) Draw a general isotherm for $T < T_c$ for a pure species and explain the terms. **[8]**

Q5) a) Deduce the relation : **[8]**

$$\Delta G° = - RT \text{ in } K$$

b) Consider a vessel which initially contains n_0 moles of water vapor. If decomposition occurs according to the reaction :

$$H_2O \rightarrow H_2 + ½O_2$$

Find expressions which relate the number of moles and the mole fraction of each chemical species to the reaction coordinate. **[8]**

OR

Q6) a) Describe the Multireaction Stoichiometry. **[8]**

b) Write in brief and explain two distinctive features of an equilibrium state. **[8]**

Q7) Write in details and describe the formulation and applications of Phase Rule and Duhem's Theorem for Reacting Systems. **[18]**

OR

Q8) With schematic diagram, describe construction, working and applications of *Fuel Cells.* **[18]**

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Total No. of Questions : 10]

SEAT No. :

P1776

[Total No. of Pages : 3

[5460] - 606
T.E. (Chemical)
CHEMICAL REACTION ENGINEERING - I
(2015 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) ***Assume suitable data, if necessary.***

4) ***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.***

Q1) a) Differentiate between single and multiple reactions with suitable examples. **[4]**

b) The irreversible reaction $2A + B \rightarrow A_2B$ has been studied kinetically. The rate equation is given by $r_{A2B} = 0.72[A]^2[B]/(1 + 2[A])$. Propose a suitable mechanism consistent with above rate equation. **[6]**

OR

Q2) After 8 minutes in a batch reactor, reactant (C_{A0} – 1 mol/lit) is 80% converted: after 18 minutes, conversion is 90%. Find rate equation to represent this equation. **[10]**

Q3) Explain the various methods of analyzing reaction data to find out rate of reaction. **[10]**

OR

Q4) a) Explain the differential analysis of batch reactor data in detail. **[5]**

b) Derive performance equation for batch reactor. **[5]**

P.T.O.

Q5) a) The desired liquid phase reaction. **[8]**

$$A + B \rightarrow R + T \qquad \frac{dC_R}{dt} = \frac{dC_T}{dt} = k_1 C_A^{1.5} C_B^{0.3}$$

Is accompanied by the unwanted side reaction.

$$A + B \rightarrow S + U \qquad \frac{dC_S}{dt} = \frac{dC_U}{dt} = k_2 C_A^{0.5} C_B^{1.8}$$

What contacting scheme (reactor type) would you use to carry above reaction to maximize the concentration of desired product?

b) Give quantitative treatment of product distribution and of rector size for parallel reaction. **[8]**

OR

Q6) a) Consider the parallel decomposition of A of different orders. **[10]**

$A \rightarrow R \quad r_R = 1$

$A \rightarrow S \quad r_S = 2C_A$

$A \rightarrow T \quad r_T = C_A^2$

Determine the maximum concentration of desired product obtainable in

i) Plug flow

ii) Mixed flow

For $C_{A0} = 4$

b) Define instantaneous fractional yield and overall fractional yield in detail. **[6]**

Q7) a) Explain effect of temperature, pressure and inert on equilibrium conversions (X_{AC}) for exothermic and endothermic reactions. **[6]**

b) Explain optimum temperature progression for exothermic reversible reaction. **[6]**

c) Draw and explain energy balance equation line for adiabatic operations. **[4]**

OR

Q8) a) For aqueous reaction $A \leftrightarrow R$, between the temperature range 0° to 100°C, determine the equilibrium conversion as a function of temperature in graphical form. What should be the maximum temperature so that the conversion of A achieved is 75% or higher? For $C_R^o = C_A^o = 1$ mol/liter.

$\Delta G_{298}^0 = -3375$ cal/mol; $\Delta H_{r298}^0 = -18,000$ cal/mol. **[8]**

b) Derive the relation between conversion and temperature for an adiabatic reactor using the energy balance and explain how you determine the reactor size for adiabatic operation of a plug flow and a stirred tank reactor. **[8]**

Q9) Write a note on (any three) **[18]**

a) Tank in series model.

b) C and E curve.

c) Micro and macro mixing of fluids.

d) Dispersion Model.

OR

Q10) a) From a pulse input into a vessel we obtain the following output signal. **[10]**

Time, min	1	3	5	7	9	11	13	15
Concentration (arbitraty)	0	0	10	10	10	10	0	0

We want to represent the flow through vessel with tank-in-series model. Determine the number of tanks to use.

b) A reactor with a number of dividing baffles is used to run the reaction $A \rightarrow R$ with $-r_A = 0.05\ C_A$ mol/liter. min.
A pulse tracer test gives the following output curve : **[8]**

Time min	0	10	20	30	40	50	60	70
Concentration	35	38	40	40	39	37	36	35

i) Calculate the variance of E curve.

ii) Calculate X_A assuming Plug Flow

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Total No. of Questions : 10]

SEAT No. :

P1777

[Total No. of Pages : 2

[5460] - 607
T.E. (Chemical)
TRANSPORT PHENOMENA
(2015 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 side 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 expression of momentum flux and velocity distribution for flow of two immiscible fluids in a slit which is half-half filled with both fluids. **[10]**

OR

Q2) Derive the expression of temperature distribution for viscous heat source for flow of Ostwald-de-Wade fluid in between two coaxial cylinders. **[10]**

Q3) Derive expression of volumetric flow rate for flow of an Ellis fluid through the tube. **[10]**

OR

Q4) a) Explain procedure to solve thermal energy problems. **[5]**

b) Explain mass balance equation at steady state. **[5]**

Q5) Derive Newton's second law of motion and extend it to derive Navier Stoke's equation of motion. **[18]**

OR

P.T.O.

Q6) a) Derive expression of velocity distribution and shear stress distribution for Coutte-Hatschek viscometer in which outer cylinder is rotating. **[12]**

b) Give significance of partial time, total time and substantial time derivative. **[6]**

Q7) Use macroscopic balance equations and derive expressions of pressure rise and friction loss occurring in liquid-liquid ejector. **[16]**

OR

Q8) a) Show that for turbulent flow of fluid through the tube, $f = 0.079 / R_e^{0.25}$ **[8]**

b) 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]**

Q9) a) Explain Chilton - Colburn analogy. **[8]**

b) Discuss transfer coefficients at high transfer rates by penetration theory. **[8]**

OR

Q10) a) Explain Reynold's and Prandlt analogy. **[8]**

b) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60°C. The vapor pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3}$ mol s^{-1} cm^{-2}. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1778

[Total No. of Pages : 3

[5460] - 608
T.E. (Chemical)
CHEMICAL ENGINEERING DESIGN - I
(2015 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) Write a short note on vessels for storing volatile and non - volatile liquids. **[4]**

b) Give the step by step method for designing of cylindrical tanks as per IS: 803. **[6]**

OR

Q2) a) Discuss in detail designing of skirt support considering stresses due to dead weight, wind load, seismic load. **[5]**

b) A tank is to store 24000 kg of liquid having density of 900 kg/m^3. Due to space limitations the maximum tank diameter can be 2.4 m. Calculate the height of the tank if liquid is filled up to roof to shell junction. Welded joint efficiency is 85%. The permissible stress of the material is 1020 kg/cm^2. Calculate various course thicknesses. **[5]**

Q3) 1.2 kg/sec of an organic liquid is to be cooled from 45°C to 20°C. The organic liquid is cooled by chilled water supplied from a refrigeration unit at a temperature of 5°C and can be heated upto 10°C. Use tubes of 12 mm ID and 2mm wall thickness. Length of tubes is 1.5 m. Properties of organic liquid and water are : **[10]**

	Organic liquid	Water
Specific heat, J/Kg K	2150	4180
Viscosity, Ns/m^2	0.25×10^{-3}	0.8×10^{-3}
Density, kg/m^3	716	1000
Thermal conductivity, W/mk	0.133	0.61

P.T.O.

Fouling resistance for organic liquid = 0.0002 m^2K/W

Fouling resistance for water = 0.0004 m^2K/W

Correction factor for LMTD = 0.86

Steel tubes are to be used.

Thermal conductivity of steel tube = 45 W/mK

Design a suitable heat exchanger.

OR

Q4) a) Discuss in detail mechanical design of Shell and Tube Heat Exchanger. **[7]**

b) Write a short note on LMTD and LMTD Correction factor. **[3]**

Q5) a) Give the step by step method for designing of calendria evaporator? **[8]**

b) A single effect evaporator is used to concentrate 7 kg/s of a solution from 10 to 50% solids. Steam is available at 205 KN/m^2, at temperature 394 K and evaporation takes place at 13.5 KN/m^2, at temperature 325 K. If the overall coefficient of heat transfer is 3 KW/m^2K, estimate the heating surface required and the amount of steam used if the feed to the evaporator is at 294 K and the condensate leaves the heating space at 352.7 K. The specific heats of 10 & 50 percent solutions are 3.76 & 3.14 KJ/Kg K respectively.

The total enthalpy of steam at 205 KN/m^2 = 2530 KJ/Kg.

The total enthalpy of steam at 13.5 KN/m^2 = 2594 KJ/Kg. **[10]**

OR

Q6) a) Write a short note on : **[12]**

i) Condensation inside horizontal tubes.

ii) Criteria for selection of evaporators.

iii) Convective boiling.

b) Discuss in detail type of reboilers and their selection criteria? **[6]**

Q7) a) Discuss the various types of agitators in detail and their applications. **[8]**

b) Explain the power requirement calculations for agitation systems. **[8]**

OR

Q8) a) What are reaction vessels? Explain various types of jackets used in vessels along with neat figures. **[10]**

b) Explain in detail designing of vessel shell with limpet coil. **[6]**

Q9) Write a short notes on **[16]**

a) Reflux drum

b) Decanter

c) Safety devices used in process industries

d) Entrainment separators

OR

Q10) a) What are auxiliary process vessels? Explain about Oil water separators? **[12]**

b) Write a short note on gravity settlers. **[4]**

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Total No. of Questions : 10]

SEAT No. :

P1779

[Total No. of Pages : 3

[5460] - 609
T.E. (Chemical)
MASS TRANSFER - II
(2015 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 necesssary.***

3) ***Figures to the right indicate full marks.***

4) ***Assume suitable data, if necessary.***

Q1) a) A 200 mole mixture of 35% ethanol and 65% propanol is differentially distilled. If 100 moles of the liquid is vaporized, what are the compositions of distillate and residue? The equilibrium data : **[7]**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
y	0	0.19	0.34	0.47	0.58	0.67	0.76	0.83	0.89	0.95	1

b) What is reflux? **[3]**

OR

Q2) A fractionating column is fed with a saturated feed of 40% ethanol and 60% water and is to be separated into a top product containing 80% ethanol and a bottom product containing 20% ethanol. The reflux ratio is 2.5. Determine the theoretical number of stages required, heat load of the rebolier in kJ/kmol of the bottom product and the heat load of the condenser in kJ/kmol of the top product, if the latent heat of ethanol is 90520 kJ/kmol and latent heat of water is 39720 kJ/kmol. Equilibrium data : **[10]**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.95	1.0
y	0	0.2	0.35	0.48	0.59	0.69	0.77	0.84	0.9	0.95	1.0

P.T.O.

Q3) A continuous extraction column is used to extract a solute from an aqueous stream using an organic solvent. The distribution coefficient is $y^*/x = 1$, where y and x are mass fractions of solute in the extract and raffinate respectively. The height of transfer unit based on extract phase is 1 m. Assuming water and solvent are immiscible find the height of the column required for a feed flow rate of 100 kg/h, the pure solvent flows at a rate of 100 kg/h, weight fraction of solute in feed is 0.1 and that in the raffinate phase is 0.01. **[10]**

OR

Q4) a) A mixture of benzene and toluene containing 55 mole % benzene is distilled to give 95mole% benzene and a bottom product containing 7 mole % benzene. The feed is liquid at bubble point and a total condenser is used. Find the minimum number of plated using Fenske's equation if the average reflux ratio is 2. **[5]**

b) Give the selection criteria for solvent in a liquid - liquid extraction process. **[5]**

Q5) a) Seeds containing 20% by weight of oil are to be extracted in a countercurrent plant and 87% of the oil is extracted as 46% solution in solvent. Fresh solvent is fed to the system and with every 3 kg insoluble solid 1.5 kg solution is removed. Find the number of equilibrium stages required and the amount of solvent required. **[10]**

b) Explain variable underflow with graphical representation. Why does variable underflow condition arise? **[6]**

OR

Q6) a) Give the steps for finding number of stages in N - x, y method for multistage countercurrent leaching with schematic and graphical representation. **[9]**

b) Schematically represent a single stage batch leaching unit giving all the phases and explaining all the terms. **[7]**

Q7) a) The equilibrium relation for the decolourisation operation is $Y = 0.5X^{0.5}$ where Y = gm color removed / gm of adsorbent, X = gm color in oil / 1000 gm of color free oil. 100 Kg oil containing one part of color to three part of oil is agitated with 30 Kg of adsorbent. Calculate the percentage color removed, if all 30 Kg of adsorbent is used in one stage and when two cross current stages are used with 15 kg of adsorbent in each. **[9]**

b) What is LUB? Derive relevant equations and give diagrammatic and graphical representation. **[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 0.85. Calculate the necessary dosage of the fresh carbon per 2000 kg solution for a single stage process. The data for an equilibrium isotherm is as follows: **[10]**

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

b) What parameters affect the shape of breakthrough curve? **[8]**

Q9) a) Give the classification of membranes based on driving forces applicable and particle size retained. **[8]**

b) Explain Mier's supersaturation theory. Why is supersaturation required in crystallization? **[8]**

OR

Q10) a) What is the advantage of using a vacuum crystallizer? Explain its working. **[8]**

b) 5000 kg of KCl is dissolved in water to make a saturated solution at 350 K when the solubility is 30% by weight of KCl in water. The solution is cooled to 293 K when the solubility is 25.4% by weight. Determine the amount of crystals obtained if the evaporative loss is 4% of the original water. Also determine the capacity of the vessel in which this solution is cooled if its volume is. 1.3 times the volume of the solution. Take density of solution as 1200 kg/m^3. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1780

[Total No. of Pages : 2

[5460] - 610
T.E. (Chemical) (Semester - II)
PROCESS INSTRUMENTATION AND CONTROL
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Solve Q. 1 or Q.2, Q.3 or Q. 4, Q.5 or Q. 6, Q.7 or Q. 8, Q.9 or Q. 10.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) Distinguish between self operated and power operated instrument. **[5]**

b) Evaluate the temperature at which Fahrenheit and Centigrade scales coincide **[5]**

OR

Q2) a) Explain the importance of instrumentation in process industries. **[5]**

b) Explain Seebeck effect and its application in working of a temperature measuring instruments. Name the instrument with its working diagram. **[5]**

Q3) a) Explain classification of Pressure measuring instruments. **[5]**

b) Explain with diagram, construction and working of Bourdon pressure gauge. **[5]**

OR

Q4) a) Explain with diagram, construction, working of diaphragms. **[5]**

b) What are transducers? Explain types of transducers. **[5]**

P.T.O.

Q5) a) Explain with diagram, construction and working of Rotameter with its industrial application. **[8]**

b) How level can be measured using radioactive transducers? Draw neat sketch and explain in detail. **[8]**

OR

Q6) a) Explain classification of flow measuring instruments. **[8]**

b) Write short notes on: **[8]**

i) Sight glass method

ii) Air purge method

Q7) a) Explain principle with diagram, construction and working of Gas chromatography **[8]**

b) Write short notes on: **[8]**

i) HPLC

ii) Refractometry

OR

Q8) Describe with neat diagram the following techniques of composition analysis. **[16]**

a) Mass spectroscopy

b) Ultraviolet Absorption Spectroscopy

Q9) a) With the help of block diagram explain working of feedback control system. **[9]**

b) Describe the heat exchanger automatic control system with block diagram. **[9]**

OR

Q10) a) Explain with equation, different control actions. **[9]**

b) Derive the transfer function of mercury in glass thermometer and find the dynamic behavior for step change in input. **[9]**

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