Total No. of Questions : 12]

SEAT No. :

P3890

[Total No. of Pages : 5

[4958]-101
T.E. (Civil)
STRUCTURAL ANALYSIS - II
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume any other data, if necessary.***
5) ***Answer to the two sections should be written in separate answer books.***

SECTION - I

Q1) a) Analyse the Continuous beam ABCD as shown in fig Q.1.a by Slope Deflection Method & Draw SFD & BMD. **[9]**

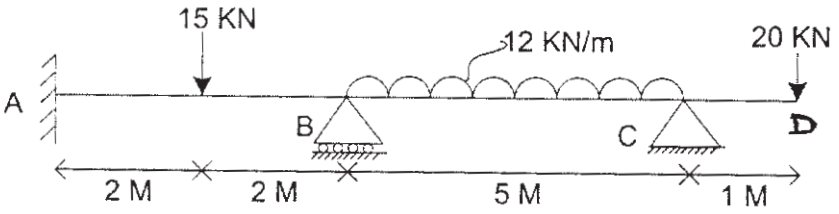


Fig. Q.1

b) Analyse the Continuous beam ABC as shown in fig.Q.1.b by Slope Deflection Method & Draw SFD & BMD. **[9]**

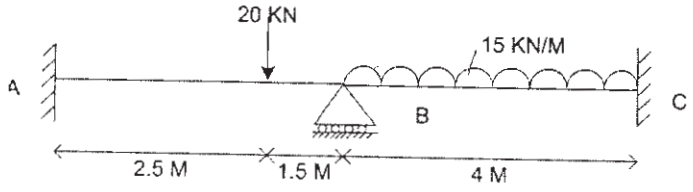


Fig Q.1.b

OR

P.T.O.

Q2) Analyse the portal frame loaded as shown in fig Q.2 by Slope Deflection Method & Also draw SFD, BMD & Elastic Curve **[18]**

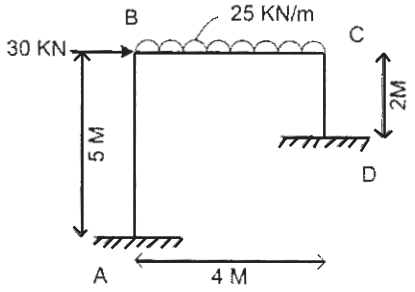


Fig. Q.2

Q3) a) Analyse the continuous beam as shown in fig.Q.3.a by using Moment Distribution Method & Plot SFD, BMD. **[8]**

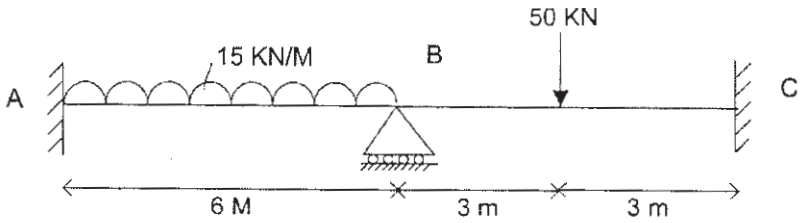


Fig. Q.3.a

b) Analyse the Continuous beam as shown in fig.Q.3.b by using Moment Distribution Method. Also Plot SFD & BMD. **[8]**

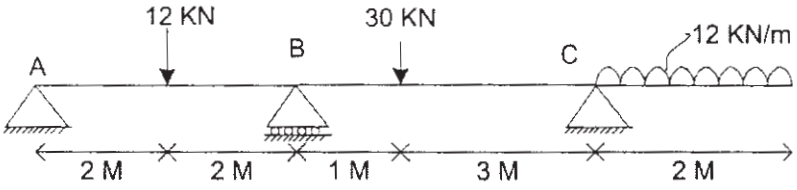


Fig. Q.3.b

OR

Q4) Analyse the portal frame loaded as shown in fig.Q.4. by using MDM.Plot SFD & BMD. **[16]**

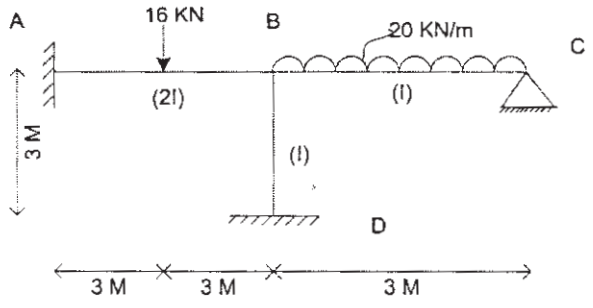


Fig. Q.4

Q5) a) A three Hinged arch is loaded & Supported as shown in Fig. Q.5.a. Determine Vertical & Horizontal reactions at supports **[8]**

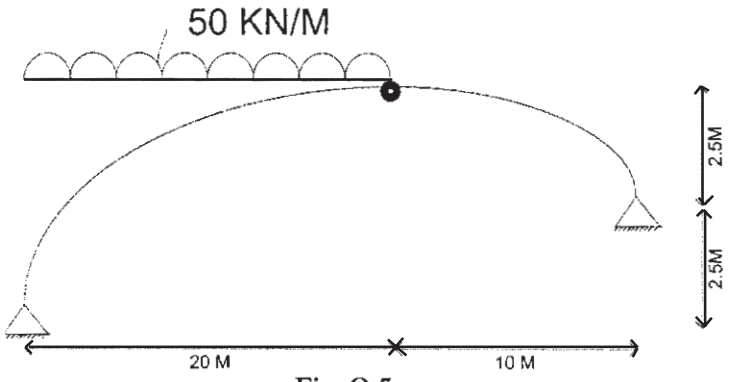


Fig. Q.5.a

b) Derive the Equation of a Horizontal thrust of Two hinged arch for Concentrated load at Crown. **[8]**

OR

Q6) a) A Three Hinged arch of span 20m is loaded & supported as shown in fig. Q.6.a Determine Normal Thrust & Radial Shear at 4m from the left support. **[8]**

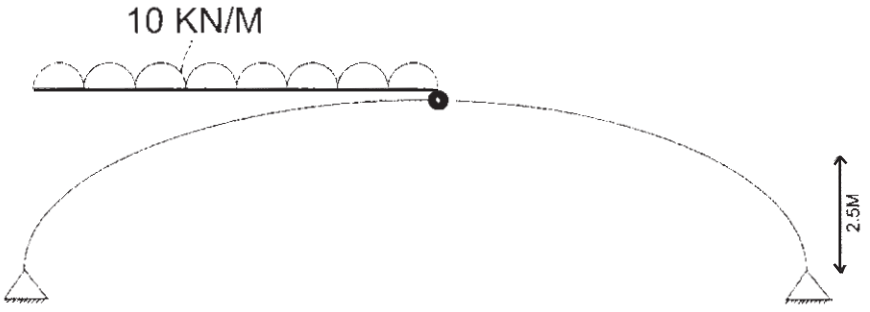


Fig. Q.6.a

b) Derive Equation for a Horizontal Thrust of Two hinged arch loaded with UDL on the Whole Span. **[8]**

SECTION - II

Q7) Analyze the frame as shown in fig.Q.7 by Flexibility Method. Draw SFD & BMD Assume EI constant **[16]**

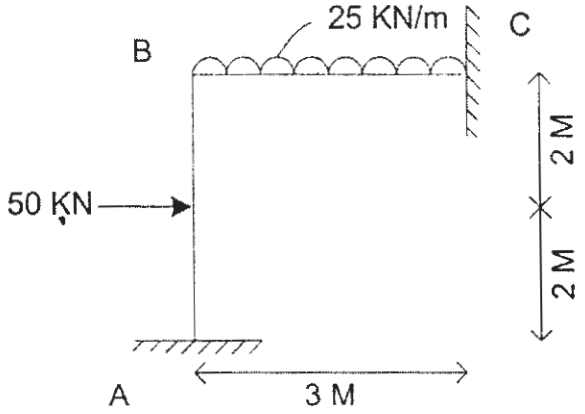


Fig. Q.7

OR

Q8) Analyze the beam as shown in fig.Q.8 by using Flexibility Method. Draw SFD & BMD. **[16]**

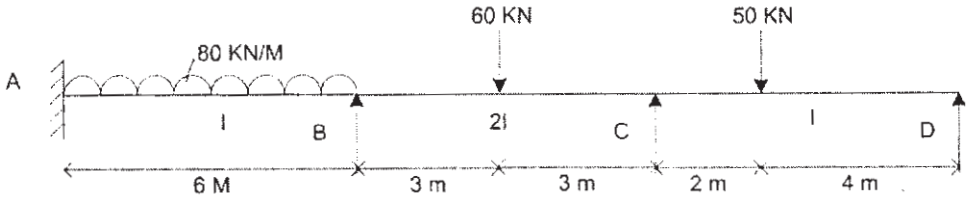


Fig Q.8

Q9) Analyze the Continuous beam as shown in fig.Q.8 by using Stiffness Method. Draw Deformation Cure, SFD & BMD. **[16]**

OR

Q10) Analyze the frame shown in fig.Q.10 by Stiffness Method & Draw BMD, SFD & Elastic Curve. **[16]**

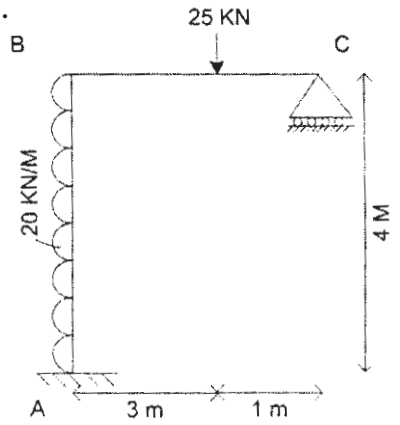


Fig Q.10

Q11)a) Determine the Deflection at the nodal points for the Beam AB loaded & Supported as Shown in Fig. Q.11.a **[6]**

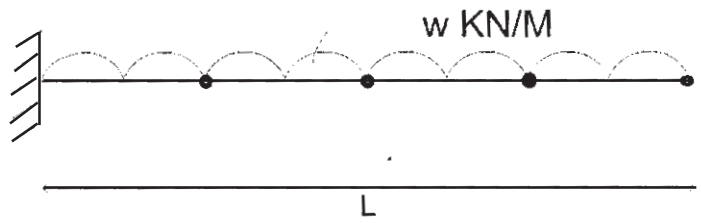


Fig Q.11. a

b) Determine the Approximate Values of Moments, Shear & Axial force in each member of frame shown in fig. 11.b Use Portal frame Method. **[12]**

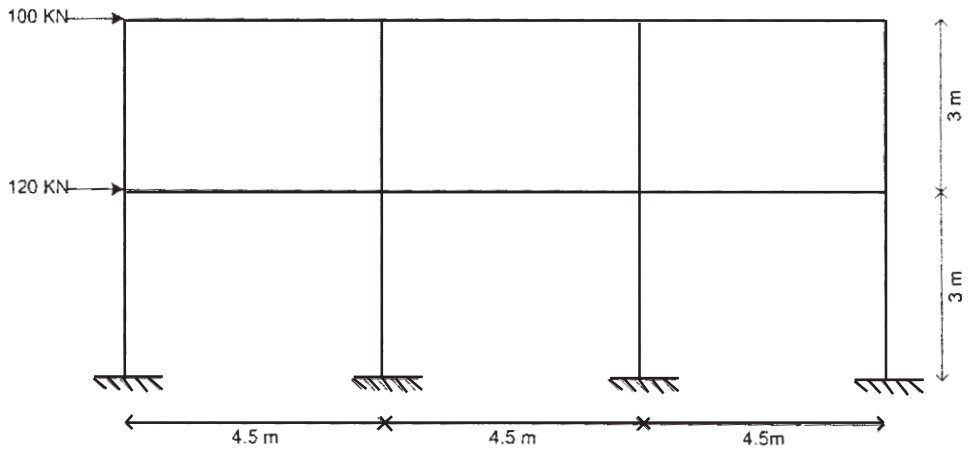


Fig. Q.11.b

OR

Q12)a) A simple Supported Beam of span 12 m is loaded with point loads 150 KN each @ quarter points using FDM. Find Deflection at centre of beam take EI = 4×10^5 KNM^2. **[6]**

b) Determine the Approximate Values of Moments, Shear & Axial force in each member of frame shown in fig.Q.11 b Use Cantilever Method.**[12]**

Total No. of Questions :12]

SEAT No. :

P2803

[Total No. of Pages :3

[4958]-102
T.E. (Civil)
ADVANCED SURVEYING
(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section II***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Differentiate between Triangulation and Traversing and Trilateration. **[8]**

b) What are the various potential error sources that affect the GPS signals?**[8]**

OR

Q2) a) Define Geodetic Surveying? What factors are to be considered while selecting a best triangulation figure or system? **[8]**

b) Explain with neat sketches, commonly used layouts of triangulation systems. **[8]**

Q3) a) Explain clearly what is meant by side equation? How would you adjust a geodetic quadrilateral without central station? **[8]**

b) Explain the following terms; **[8]**

i) True Value ii) True Error

iii) Most Probable Value iv) Residual Error

OR

Q4) a) What do you mean by weight of an observation? State the rules of assigning weight to the field observations. **[8]**

b) What is spherical excess? What are the methods of computing the sides of a spherical triangle? Explain any one method. **[8]**

P.T.O.

Q5) a) The following reciprocal observations were made from two points P & Q;

Horizontal distance between P & Q = 33128 m

Angle of Depression of Q at P = 6' 20"

Angle of Depression of P at Q = 8' 10"

Height of Signal at P = 4.87 m

Height of Signal at Q = 4.07 m

Height of Instrument at P = 1.27 m

Height of Instrument at Q = 1.34 m

Calculate **[10]**

i) The R.L. of Q, if that of P is 1248.65 m &

ii) The average co-efficient of refraction at the time of observations.

Take RSin 1" = 30.88 m.

b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground. **[8]**

OR

Q6) a) Correct the observed altitude for the height of signal, refraction and curvature, from the following data; **[10]**

Observed altitude = + 2^{o} 48 ' 39"

Height of Instrument = 1.12 m

Height of Signal = 4.87 m

Horizontal distance = 5112 m

Coefficient of Refraction = 0.07 m

RSin 1" = 30.88 m.

b) Describe in brief the location survey of a long bridge. **[8]**

SECTION - II

Q7) a) Define Relief displacement. Derive an expression for displacement due to ground relief. **[8]**

b) Define the following terms; **[8]**

i) Principal point ii) Scale

iii) Air base iv) Overlap

OR

Q8) a) Explain in detail the flight planning for an area. **[8]**

b) Differentiate between aerial photograph and Map. **[8]**

Q9) a) Explain with neat sketches the terms Spectral Signature and Atmospheric Windows. **[6]**

b) Explain what are the elements of image interpretation. **[6]**

c) Write a note on applications of remote sensing. **[6]**

OR

Q10)a) Explain with neat sketches the geo-stationary and sun-synchronous Satellites. **[6]**

b) Explain Spectral and Radiometric Resolution. **[6]**

c) What are the capabilities or functions available in G.I.S. **[6]**

Q11)a) Derive an expression for solving three point problem by analytical method. **[8]**

b) What is Index Error? How it is determined? **[8]**

OR

Q12) a) What is meant by Sounding? Discuss various methods of taking sounding. **[8]**

b) Explain the phenomenon of tides and different methods of measuring the tide level. **[8]**

X X X

Total No. of Questions :8]

SEAT No. :

P2802

[Total No. of Pages :3

[4958] - 103

T.E. (Civil)

STRUCTURAL DESIGN - I

(2008 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q. 6 and Q.7 or Q.8.***
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 are allowed.***
8) ***Use of cell phone is prohibited in the examination hall.***

SECTION - I

Q1) a) State and explain in brief advantage of steel structures. **[5]**

b) State and explain classification of cross section with bending stress diagram and classify **[10]**

i) ISHB 400 @ 77.4 kg/m.

ii) ISMC 350 @ 38.8 kg/m.

c) Determine design tensile strength of 2-ISA 90×90×10 mm connected back to back to the gusset plate of thickness 10 mm by 5 number of M20 black bolts of 4.6 grade. **[10]**

OR

P.T.O.

Q2) a) State and explain in brief disadvantage of steel structures. **[5]**

b) State and explain the advantages of welded connection. **[5]**

c) Design a double angle section to carry a factor tension of 300 kN. The end connection is to be made by using M20 bolts of class 4.6. Assuming the angles is provided on both side of gusset plate. Draw the design details. **[15]**

Q3) a) A strut 3.0 m long consist of 2-ISA 100×100×10 mm connected to each side of 10 mm thick gusset plate by fillet weld. Calculate design strength of the member. **[10]**

b) Design a built up column 10 m long to carry a factored axial load of 1200 kN. The column is restrained in position but not in direction at both the ends. Design a column by using two channels back to back and single lacing with bolted connections. **[15]**

OR

Q4) Design a gusseted base for a built up column ISHB 350 @ 67.4 kg/m with two plates 450×20 mm carrying an axial factored load of 2500 kN. The column is supported on concrete pedestal of M20 grade. Draw the design sketches.**[25]**

SECTION - II

Q5) a) Calculate the magnitude of uniformly distributed load on a laterally supported beam ISLB 400 @ 56.9 kg/m for an effective length of 4 m. **[10]**

b) A column having an effective length of 3.2 m is subjected to factored axial load of 400 kN and factored bending moment of 50 kNm. Design the Column section and check for section strength only. **[15]**

OR

Q6) a) Design a laterally supported beam of effective span 6 m for the following data: **[13]**

Maximum B M, M = 180 kNm and Maximum SF, V= 250 kN.

b) Explain with neat sketches Laterally supported beam, Laterally unsupported beam, web buckling and web crippling failure. **[12]**

Q7) A truss shown in Fig. 7 is used for an industrial building covered with A C sheet of self weight 180 N/m^2 located at Pune. Calculate the panel point dead, live and wind load. Also design the members L_0L_1, U_1L_1 and L_0U_1, assuming spacing of trusses 4 m, $k_1 = 1$, $k_2 = 1$, $k_3 = 1$, d (Cpe – Cpi) = ± 1.0. Draw the design sketches. **[25]**

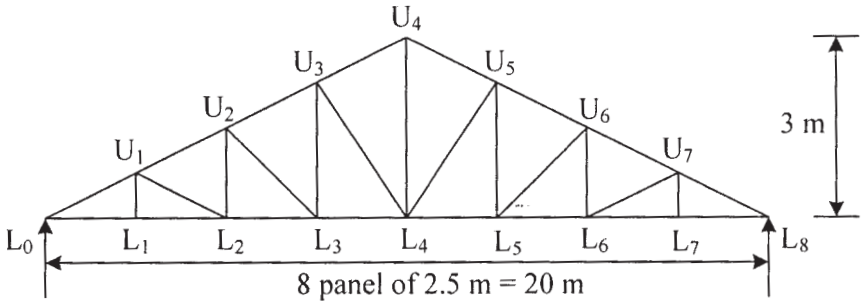


Fig. 7

OR

Q8) A simply supported welded plate girder of an effective span of 24 m subjected to uniformly distributed load 30 kN/m throughout the span excluding the self weight of plate girder. Assume compression flange laterally supported throughout the span. Design cross section of plate girder, end stiffeners and connections between flange and web plate. Draw sectional plan and elevation with connection details. **[25]**

Total No. of Questions : 12]

SEAT No. :

P2805

[Total No. of Pages : 4

[4958]-104
T.E.(Civil)
FLUID MECHANICS-II
(2008 Pattern) (301004)(Semester-I)

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

Instructions to the candidates:

1) ***Solve Q 1 or Q 2, Q 3 or Q 4 ,Q 5 or Q 6 from section-I. Solve Q 7 or Q 8, Q9 or Q 10, Q 11 or Q 12 from section -II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams 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 tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Define and discuss drag and lift phenomena. **[4]**

b) Discuss in detail about Magnus effect. **[8]**

c) An airplane having its span of 15m and chord of 2m flies with a velocity of 80m/s. Using the data given below determine the lift and drag forces involved.

Coefficient of lift = 0.85 Coefficient of drag = 0.06

Angle of attack = 6° $\rho = 0.8 kg/m^3$ **[6]**

OR

Q2) a) Define streamline body and bluff body. **[2]**

b) Discuss about water hammer in case of a pipe. **[2]**

c) With a neat sketch derive an expression for pressure growth due to gradual colsure of the valve in a pipe. **[6]**

d) An orifice is situated at the base of a hemispherical tank. Determine the time required to empty it when no flow is allowed into the tank. **[8]**

P.T.O.

Q3) a) In case of a jet striking at the center of the moving curved vane prove that for the maximum efficiency the velocity is one-third the jet velocity. **[8]**

b) A 8.0 cm dia. jet of water discharging at a rate of $0.2m^3$/sec strikes on a series of vanes tangentially. The vanes when stationary will deflect the jet through an angle of 120°. Calculate the magnitude and direction of the resultant force when the vanes are stationary. Additionally, determine the magnitude of resultant force, workdone per second on the vanes if they move in the direction of the jet at a velocity of 14m/sec. **[8]**

OR

Q4) a) Write notes on

i) Classification of centrifugal pumps **[4]**

ii) Net positive Suction Head(NPSH) **[4]**

b) The impeller of a centrifugal pump is of 25cm diameter and 5cm width at the periphery. It has blades whose tip angles incline backwards 55°from the radius. The impeller rotates at 1200rpm when it delivers a flow of $20m^3$/min. If the pump is designed to admit radially calculate

i) Direction and speed of water as it leaves the impeller

ii) Torque exerted by the impeller on water

iii) Shaft power required.

Assume mechanical efficiency=95%, hydraulic efficiency=75% **[8]**

Q5) a) With a neat sketch of hydroelectric power plant, briefly discuss all its elements. **[8]**

b) A jet of 100mm diameter when impinges on the buckets of a Pelton wheel, is deflected through an angle of 160° by the buckets. With the following data find

i) The force exerted by the jet on the buckets in tangential direction

ii) The power developed.

Head available =350m Coefficient of velocity=0.97 Speed ratio=0.48

Reduction in relative velocity while passing through buckets=15% **[8]**

OR

Q6) a) With a neat sketch write a note on draft tube considering following points

i) Its structure

ii) Its purposes

iii) Its types. **[4]**

b) Derive an expression of unit speed of turbine. **[4]**

c) In a hydroelectric generating plant, there are 4 similar turbines of total output 360MW. Each turbine is 85% efficient and runs at 120 rpm under a head of 70m. It is proposed to test the model of the above turbines in a flume where discharge is 400lit/sec under a head of 4m. Work out the scale ratio of the model. Also calculate the model speed and power results expected from the model. **[8]**

SECTION-II

Q7) a) Give the dimensions of Manning's roughness coefficient. Also state the factors affecting the roughness coefficient. **[6]**

b) What is hydraulically most efficient channel section? Derive condition for most efficient triangular section. **[6]**

c) Explain how the flow through open channel is different from that through a pipe. **[6]**

OR

Q8) a) Discuss about

i) Energy equation **[5]**

ii) Velocity distribution in open channel **[5]**

b) A 3.5m wide rectangular cannel conveys 15 cumec of water at a depth of 2.2m. Calculate

i) Specific energy

ii) Conjugate depth

iii) Critical depth

iv) Froude number.

State the type of flow. **[8]**

Q9) a) Define Froude's number. Give the flow classification based on Froude number. **[4]**

b) The width of a rectangular channel is 2.8m and carries a flow of 3 cumec discharge at a depth of 1.1m. A contraction of the channel width is proposed at a certain section. Find the smallest allowable contracted width that will not affect the u/s flow conditions. **[8]**

c) Describe about the types and uses of hydraulic jump. **[4]**

OR

Q10) a) A spillway has a width of 68m. If the tailwater depth is 4.5m and discharge over the spillway is 470cumec, determine the depth before jump, height and length of the jump. Also find the energy lost in the jump. **[8]**

b) Derive the conditions when the rectangular channel section is most economical. **[4]**

c) Define a hydraulic jump. State its engineering applications. **[4]**

Q11) a) Compare GVF and RVF. **[4]**

b) For a triangular channel with side slope 1: 1, longitudinal slope 1in 1600 and flow 0.4m^3/sec, determine whether it is mild,steep or critical channel. **[6]**

c) With neat sketches discuss water surface profiles. **[6]**

OR

Q12) a) A rectangualr channel is 6m wide and has a uniform flow depth of 1.8m.It has a bed slope of 1 in 4000. If a weir is constructed at the d/s end of the channel, water surface at a specific section is raised by 0.75m. Determine the water surface slope with respect to horizontal at this section. Assume Manning's roughness coefficient as 0.02. **[8]**

b) Write short notes on

i) Graphical integration method. **[4]**

ii) Mild slope profiles **[4]**

Total No. of Questions :12]

SEAT No. :

P2806

[Total No. of Pages :4

[4958] - 105

T.E. (Civil)

INFRASTRUCTURE ENGINEERING AND CONSTRUCTION TECHNIQUES

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Compare Railway Transportation with Road Transportation. **[6]**

b) Define track drainage. Explain the significance of track drainage. **[4]**

c) Describe the functions and requirements of rails in a railway track. **[6]**

OR

Q2) a) Explain with the help of sketches the following: **[6]**

i) Ballast cushion

ii) Shoulder ballast

iii) Crib ballast

b) What is the necessity of welding of rails. State various methods of welding. **[4]**

c) Explain the necessity of sleepers in railway track. What are the desirable qualities of good sleepers. **[6]**

P.T.O.

Q3) a) Explain with the help of a neat sketch " Negative super elevation". **[4]**

b) Define the following terms: **[6]**

i) Facing Points

ii) Trailing points

iii) Left hand turnont

c) Discuss the merits and demerits of Measure Shovel Packing. **[6]**

OR

Q4) a) Explain in brief the need of Metro railway in Urban areas. **[4]**

b) Define the following: **[6]**

i) Cant Excess

ii) Actual cant

iii) Equilibrium cant

c) Write a short note on Types of Gradients. **[6]**

Q5) a) State the merits and demerits of Tunnel Boring Machines. **[6]**

b) Distinguish between Natural and Artificial Harbor **[6]**

c) Define the following: **[6]**

i) Quay

ii) Breakwater

iii) Wharves

OR

Q6) a) What is shaft. Explain in brief necessity and merits of shafts. **[6]**

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

c) Define the following: **[6]**

i) Jetty

ii) Dolphins

iii) Buoys

SECTION - II

Q7) a) What the various advantages of Industrialized building system. **[6]**

b) Explain in brief the various types of constructions. **[4]**

c) State the various qualities of Siporex Concrete. **[6]**

OR

Q8) a) Explain in brief the following: **[6]**

i) Flat casting

ii) Gang casting

iii) Battery casting

b) What are the various points to be considered while selection of crane for any construction work. **[4]**

c) State the principle requirements of joints in any construction. **[6]**

Q9) a) State the characteristics of stationary machines and moving machines. **[6]**

b) What are dumpers? State various types of dumpers. Explain any one in brief. **[6]**

c) What do you mean by preventive maintenance? State the advantages of preventive maintenance. **[4]**

OR

Q10)a) What are the various points to be considered while selection of earth moving equipment for any project. **[4]**

b) What is depreciation? State the various methods of depreciation. Explain any one in brief. **[6]**

c) Write a short note on Dragline and its applications. **[6]**

Q11)a) What is dredging? State various dredging systems. **[6]**

b) State the advantages and disadvantages of WellPoint system of dewatering. **[6]**

c) Write a short note on Concrete Pumps. **[6]**

OR

Q12)a) Write a short note on Guniting and shotcreting. **[6]**

b) Explain in detail Tremie Method of concreting. **[6]**

c) Discuss in brief "Slip form technique" of concreting. **[6]**

Total No. of Questions :12]

SEAT No. :

P3891

[Total No. of Pages :4

[4958] - 106

T. E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGG.

(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***

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

SECTION - I

Q1) a) State the various practical applications of hydrology. **[6]**

b) State the various factors governing site selection for rain guage station. **[6]**

c) What is probable maximum precipitation? How it is estimated. **[6]**

OR

Q2) a) Explain different forms of precipitation. **[6]**

b) Explain tipping bucket type rain guage. **[6]**

c) Describe with graph 'Intensity - Duration - Frequency relationship'. **[6]**

OR

Q3) a) Calculate the value of ϕ index from the following data of storm of 8 cm precipitation that resulted in direct runoff of 4.4 cm. **[8]**

Time in hrs.	1	2	3	4	5	6
Rainfall/hour in 'cm'	0.57	0.58	1.25	3.00	1.4	1.2

P.T.O.

b) Differentiate between evaporation and evapotranspiration. Also state Dalton's law & explain terms of it. **[6]**

c) What are 'W' and 'ϕ' Indices? Explain importance. **[2]**

OR

Q4) a) Explain the dilution technique of stream flow guaging. **[6]**

b) Explain the factors affecting evaporation. What are the methods used to control it. **[6]**

c) Explain Field capacity and permanent wilting point. **[4]**

Q5) a) The table below gives ordinates of 6 hour flood hydrograph over a catchment of 250 sq.km. The constant base flow is 10 m^3/sec. Compute the ordinates of 6 hour unit hydrograph and find depth of direct run - off. **[10]**

Time in hours	0	06	12	18	24	30	36	42	48	54	60
	10	110	260	210	160	110	80	60	45	35	25

66	72
15	10

b) State different methods of estimating Runoff. **[6]**

OR

Q6) a) Explain the methods of separating base flow. Compare merits and demerits of these methods. **[6]**

b) Explain concept of synthetic hydrograph & state step by step procedure of Synder's study. **[10]**

SECTION - II

Q7) a) Find duration in days between two watering if **[10]**

i) Field capacity of soil = 30%

ii) Apparent density of soil = 1.5%

iii) Permanent wilting point = 15%

iv) Effective depth of root zone = 75 cm

v) Daily consumptive use of water for the crop = 10 mm.

b) State the salient features of national water policy. **[6]**

OR

Q8) a) Define 'Duty'. State factors affecting duty. **[8]**

b) Determine the capacity of reservoir if its culturable area is 1,00,000 hectare. Following are details of crop pattern. **[8]**

Crop	Base period (Days)	Duty (ha/cumecs)	Intensity of Irrigation (%)
Sugarcane	330	2500	40
Wheat	120	1500	20
Rice	120	1000	10

Assume reservoir loss is 10% and canal loss as 5%.

Q9) a) State any two classifications of land drainage system and explain design aspect of tile drain. **[8]**

b) State concept of participatory Irrigation management. Explain role of water user's cooperative societies in PLM. **[8]**

OR

Q10)a) Explain the concept of Global water partnership. **[8]**

b) Compare lift irrigation system with canal irrigation system. **[8]**

Q11) Write short notes on:

a) Application of R.S. in reservoir sedimentation. **[6]**

b) Use of G.I.S. in crop pattern. **[6]**

c) Warabandi. **[6]**

OR

Q12)a) State Dupit's assumption and derive the equation for discharge from unconfined aquifer under steady state conditions. **[8]**

b) What are different irrigation acts? State the main features of Maharashtra Water Resources Controlling Authority Act 2005. **[10]**

Total No. of Questions : 12]

SEAT No. :

P2807

[Total No. of Pages : 3

[4958]-107
T.E.(Civil)
FOUNDATION ENGINEERING
(2008 Course)(Semester-II)

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

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate answer - books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) How is the number and depth of exploratory holes determined? **[6]**

b) What is meant by geophysical methods of soil exploration? Explain anyone of them with neat sketch. **[6]**

c) Write a note on Standard Penetration Test. **[6]**

OR

Q2) a) What are the objectives of soil investigation? **[6]**

b) State various types of soil samplers. What is area ratio? State its significance. **[6]**

c) Discuss Pressure meter test. **[6]**

Q3) a) Explain effect of water table on bearing capacity of soil. **[6]**

b) Write a note on effect of eccentricity of loading on bearing capacity. **[6]**

c) Explain the concept of floating foundation with a neat sketch. **[4]**

OR

Q4) a) Write Terzaghi's Bearing capacity equation & explain all the terms in it. **[6]**

b) Explain Housel's perimeter shear concept. **[4]**

c) Explain with neat sketches, modes of shear failure in soil. **[6]**

P.T.O.

Q5) a) Define the following terms: **[6]**

Normal consolidation, Over consolidation & Pre consolidation pressure

b) What are the different types of foundation settlement? Explain in detail. **[6]**

c) Explain with sketches spring analogy method of consolidation process. **[4]**

OR

Q6) a) Distinguish between consolidation and elastic settlement. Explain how they are determined? **[6]**

b) Explain Terzaghi's theory of one dimensional consolidation. **[6]**

c) Draw contact pressure distribution diagram for sandy and clayey soil. **[4]**

SECTION-II

Q7) a) Enlist the methods of determining pile capacity. Explain any one method in short. **[6]**

b) Explain in detail with sketches five fold classification of piles foundation. **[6]**

c) Enlist the circumstances under which pile foundation are used. **[6]**

OR

Q8) a) Write a short note on Group capacity of pile. **[6]**

b) Explain with a sketch the concept of negative skin friction & state how you would determine the same in non-cohesive soil. **[6]**

c) State the advantages and disadvantages of piers in comparison of pile foundation. **[6]**

Q9) a) Explain Differential free swell test. **[6]**

b) What do you understand by 'Tilt' and 'Shift' of well? What are remedial measures to rectify tilt and shift? **[6]**

c) What is pier? Explain methods of installation of pier. **[4]**

OR

Q10 a) Sketch and describes the various components of well foundation, indicating functions of each component. **[6]**

b) State the characteristics of BC soil and explain the role of 'Montmorillonite'. **[6]**

c) What is Caisson? How Caissons are classified based on methods of construction? **[4]**

Q11) a) Explain with neat sketches various functions of Geotextiles. **[8]**

b) Write a detail note with sketches on Geosynthetics application in civil engineering. **[8]**

OR

Q12) Write a short note on: **[16]**

Types of earthquake, Surface rupture, Liquefaction & Reinforced earth wall

Total No. of Questions : 12]

SEAT No. :

P2808

[Total No. of Pages : 3

[4958]-108
T.E.(Civil)
ENVIRONMENTAL ENGINEERING-I
(2008 Course)(Semester-II)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8,Q.9 or Q.10,Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams 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 tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) What is the necessity of water supply scheme? Describe different phases involved in a water supply scheme. **[6]**

b) Explain factors affecting water demand. **[6]**

c) Following is the population data for a town. Water supply scheme is to be designed for this town with a design period of 30 years. Find the population at the end of the year 2040 by geometrical increase method. **[6]**

Year	1970	1980	1990	2000	2010
Population	35,000	37,500	43,500	52,000	57,500

OR

Q2) a) Write distribution forms and effects of alkalinity. **[6]**

b) Write down the Indian standards for the quality of potable water for **[6]**

i) pH ii) Colour

iii) Sulphates iv) Iron

v) Turbidity vi) Chlorides

c) Explain with a neat sketch of jack well. **[6]**

P.T.O.

Q3) a) A water treatment plant treats 250m^3/hr of water. Work out the following with respect to flocculator. **[8]**

i) Dimensions of flocculator unit.

ii) Power input.

iii) Size and number of paddles.

Assume water temperature=25°C and $\mu = 0.89 \times 10^{-3}$N.s/$m^2$.

b) Explain with a neat sketch, inlet and outlet arrangements adopted for a rectangular sedimentation tank. **[8]**

OR

Q4) a) Explain theory of sedimentation tank. Prove that theoretically, the surface loading Q/A and not the depth of water is a measure of effective removal of particles in a sedimentation tank. **[8]**

b) Explain the purpose of aeration. What are its limitations? **[8]**

Q5) a) Write comparison of slow and rapid sand filter in tabular form with reference to **[8]**

i) Economy

ii) Loss of head

iii) Rate of filtration

iv) Size of bed

v) Quantity of wash water

vi) Skilled supervision

vii) Method of cleaning and

viii) Coagulation

b) Explain break point chlorination with sketch. **[8]**

OR

Q6) a) Explain **[8]**

i) Chlorine demand

ii) Combined available chlorine

iii) Free available chlorine

iv) Residual chlorine

b) Draw a neat sketch of a rapid sand gravity filter and show various components. Explain mechanisms of rapid sand gravity filter. **[8]**

SECTION-II

Q7) a) Explain ion exchange method of water softening with sketch. **[9]**

b) Write a short note on 'adsorption' colour removal method with sketch. **[9]**

OR

Q8) a) Explain reverse osmosis and electrodialysis. **[9]**

b) Write a short note on Fluoridation and defluoridation. **[9]**

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

i) Zoning of areas ii) Dead end system

b) What are the functions of Elevated Service Reservoir? Draw a sketch of intze type tank. **[8]**

OR

Q10) a) Define rain water harvesting. Write different types of rain water harvesting system and explain any one in detail. **[8]**

b) Differentiate between Fire reserve and Break down reserve. **[8]**

Q11)a) Explain various techniques used to control noise pollution. **[8]**

b) Explain working principle of fabric filter with a neat sketch. **[8]**

OR

Q12)a) What are the effects of particulate matter on human health and materials? **[8]**

b) Define: Sound intensity level, Sound power level, Speed of sound and Sound intensity. **[8]**

Total No. of Questions :8]

SEAT No. :

P3892

[Total No. of Pages : 8

[4958]-109
T.E. (Civil Engineering)
STRUCTURAL DESIGN - II
(2008 Course) (Semester - II) (301008)

Time : 4 Hours *[Max. Marks :100]*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2 and Q.3 or Q.4 in section - I.***
2) ***Attempt Q.5 or Q.6 and Q.7 or Q.8 in section - II.***
3) ***Answer to the two sections should be written in separate books.***
4) ***Figures to the right indicate full marks.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Use of IS 456-2000 and non programmable calculator is allowed.***
7) ***Mere reproduction from IS code as answer, will not be given full credit.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A rectangular beam section, 230 mm wide and 600mm deep is reinforced with 4 bars of 25mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The clear cover is 30mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M25 grade of concrete and Fe 415 grade of steel. **[10]**

b) A reinforced concrete rectangular beam has width 230mm and total depth 600mm with clear cover of 25mm. The beam is reinforced with 3 bars with 20mm diameter at support section at tension side. Calculate the shear strength of the support section if 8mm diameter two legged stirrups are provided at spacing 200mm C/C. Use M20 grade of concrete and Fe 500 grade of steel. Use LSM. **[10]**

c) Explain with neat sketch Balanced, Under reinforced and over reinforced section as per LSM. **[5]**

OR

P.T.O.

Q2) a) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. **[5]**

b) A Calculate the moment of resistance by LSM for flanged beam section detailed as below. **[10]**

i) Width of rib = 300mm.

ii) Effective flange width = 1500mm.

iii) Thickness of flange = 140mm.

iv) Effective depth = 567mm.

v) Tension steel = 3- #20 through plus 2-#16 curtail at midspan.

vi) Use M25 grade of concrete and Fe 500 grade of steel.

c) Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in compression and tension by both methods (WSM and LSM). Use M30 concrete and Fe 500 steel. **[10]**

Q3) Design floor slabs S4 and S12 only for flexure and torsion. Refer the structural plan given in fig. 1. Consider live load = 3kN/m^2, Floor finish = 1.0 kN/m^2.

Use M25 grade of concrete and Fe 500 grade of steel. Draw neat sketches showing details of main reinforcement & torsional reinforcement in two way slab. **[25]**

OR

Q4) Design the I and II flights of a dog legged staircase as shown in figure 1 using the following data: **[25]**

i) No of risers in I flight = 9, At plinth level plinth beam is provided below first tread of width 250mm.

ii) No of risers in II flight = 9.

iii) Floor to floor height = 3.15m.

iv) Live load = 4 kN/m^2.

v) Floor finish = 1kN/m^2.

Materials: M25 Grade of concrete, Fe 500 grade of reinforcement.

Show detailed load calculations. Draw the reinforcement details in sectional elevation for both flights.

SECTION - I

Q5) A continuous R.C.C. floor beam B1-B2 (Refer Fig.1) is simply supported at end supports and continuous through column C2. Consider live load on slab 3kN/m^2 and floor finish 1.5 kN/m^2. Assume slab thickness 130mm for load calculation. Consider 230 mm thick brick wall on all exterior beams. Floor to floor height is 3.15m. Show detailed load calculations and determine support moments, maximum span moments for all beams, using 20% redistribution of moments. Draw bending moment diagram and design the beam **only for flexure**. Show the reinforcement details along the length of beam with suitable cross sections. **[25]**

Material-Concrete of grade M20, Fe 500 reinforcement.

OR

Q6) Design a continuous beam ABCD for flexure and shear using IS Code method. AB=BC=CD=4.5m. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 10 kN/m. Take material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[25]**

Q7) Design an axially loaded short column C11 as shown in Fig. 1 in ground floor for a G+2 building with following details: **[25]**

i) Floor to Floor height = 3.15 m.

ii) Height of column below plinth= 2.5 m.

iii) Live load on all slabs = 3kN/m^2.

iv) Floor Finish Load =1.0 kN/m^2.

v) Water Proofing Load on roof slab = 1.5 kN/m^2.

vi) Wall thickness = 150 mm (Internal).

vii) Slab thickness = 130 mm.

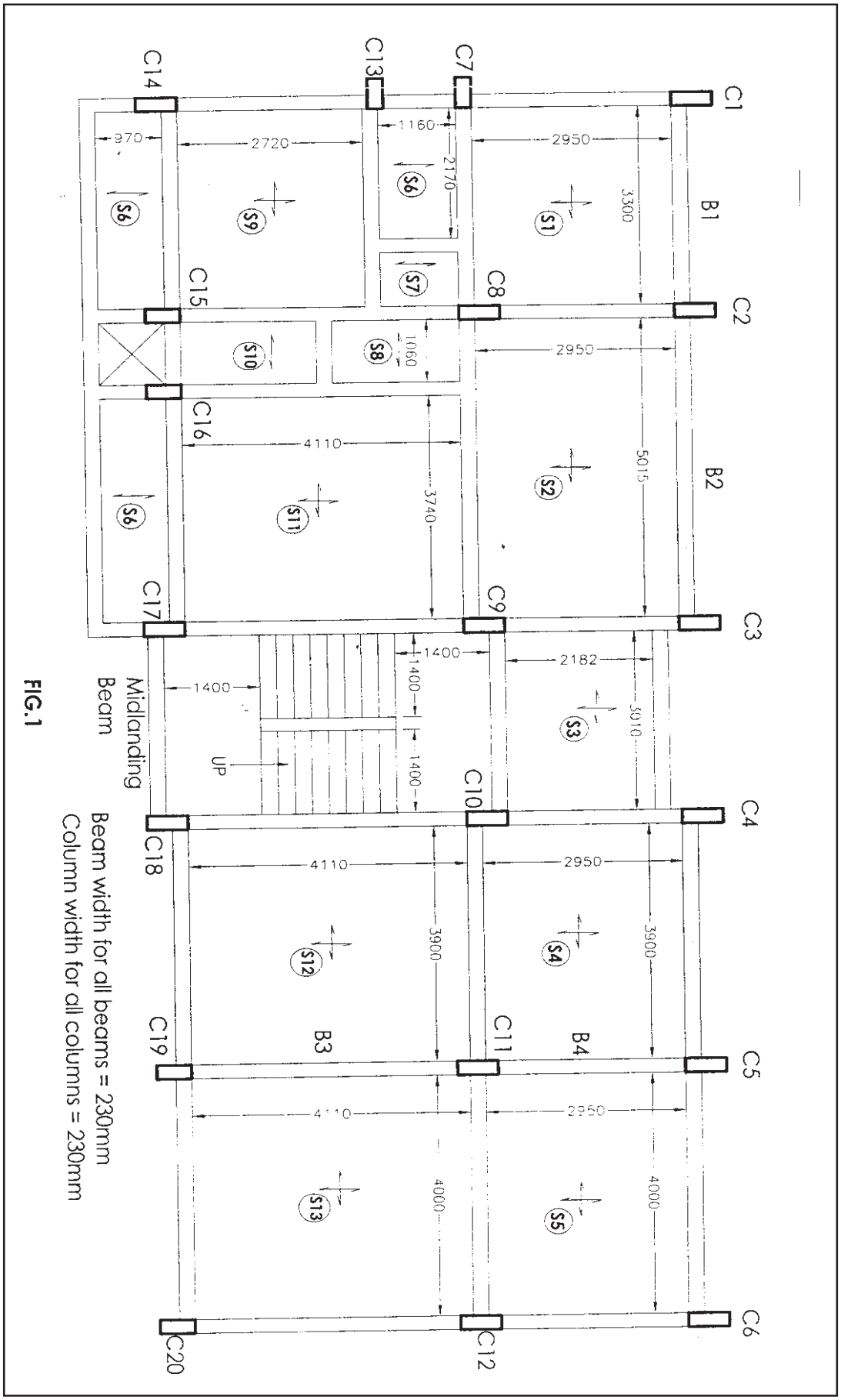
viii) Size of beams = 230x450 mm.

ix) Safe bearing capacity of soil = 200 kN/m^2. Also design isolated footing for column C11.

Material M 25 and Fe 415 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation.

OR

Q8) Design a bi-axial short column by limit state method with material M25 and Fe 415 to carry a working load of 800 kN, working moment of 100kN-m about major axis, bisecting the depth of column and 12 kN-m about minor axis, bisecting the width of column. The unsupported length of column is 3.6m. The column is fixed at one end and hinged at the other. Also design the footing for this column considering axial load and moment about major axis only. Take SBC = 300 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[25]**


C1
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S13
970
2720
1160
2170
2950
3300
1060
4110
3740
5015
1400
2182
5010
UP
3900
4000
Midlanding Beam
Beam width for all beams = 230mm
Column width for all columns = 230mm

FIG.1

Chart 5 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

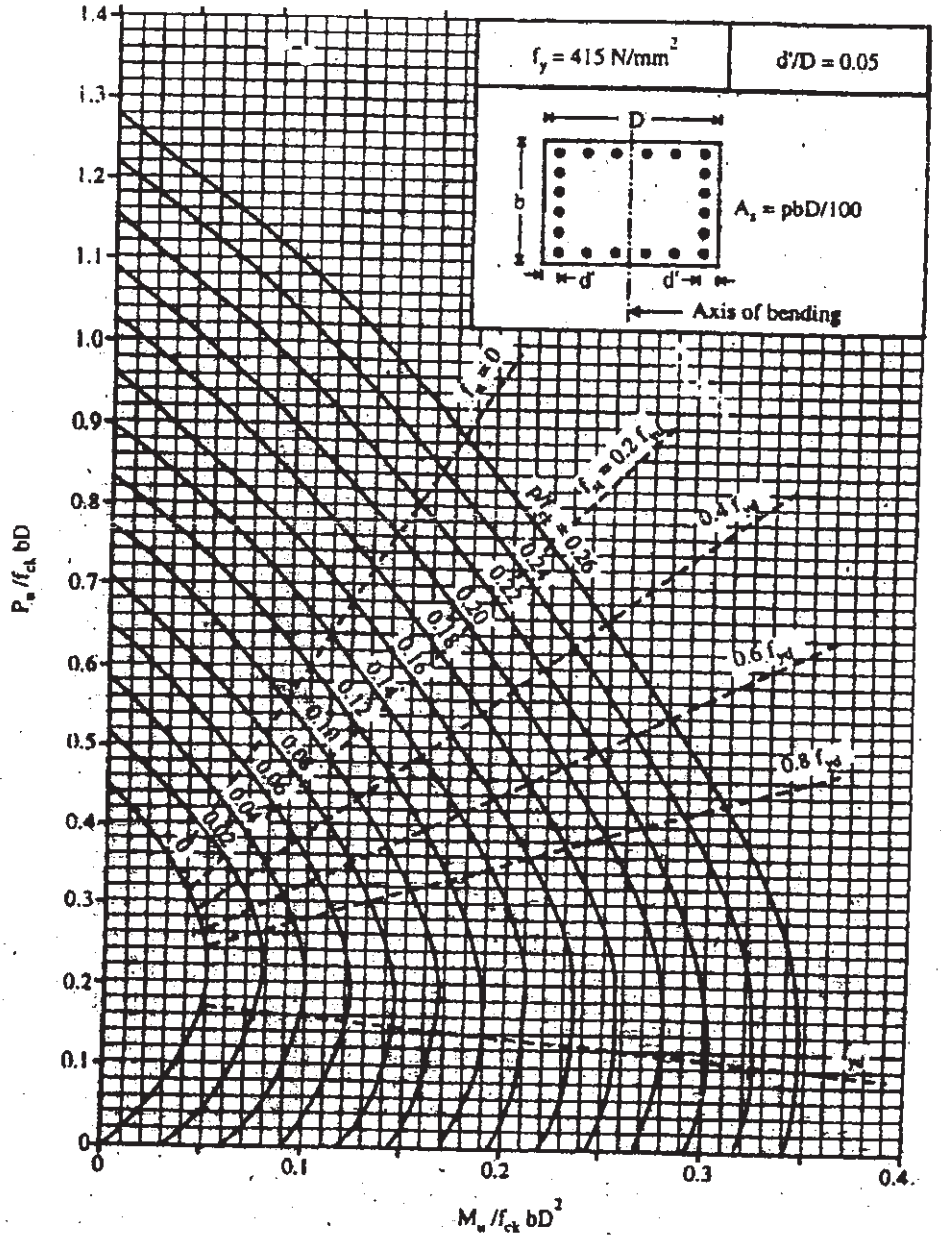


Chart - 5

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

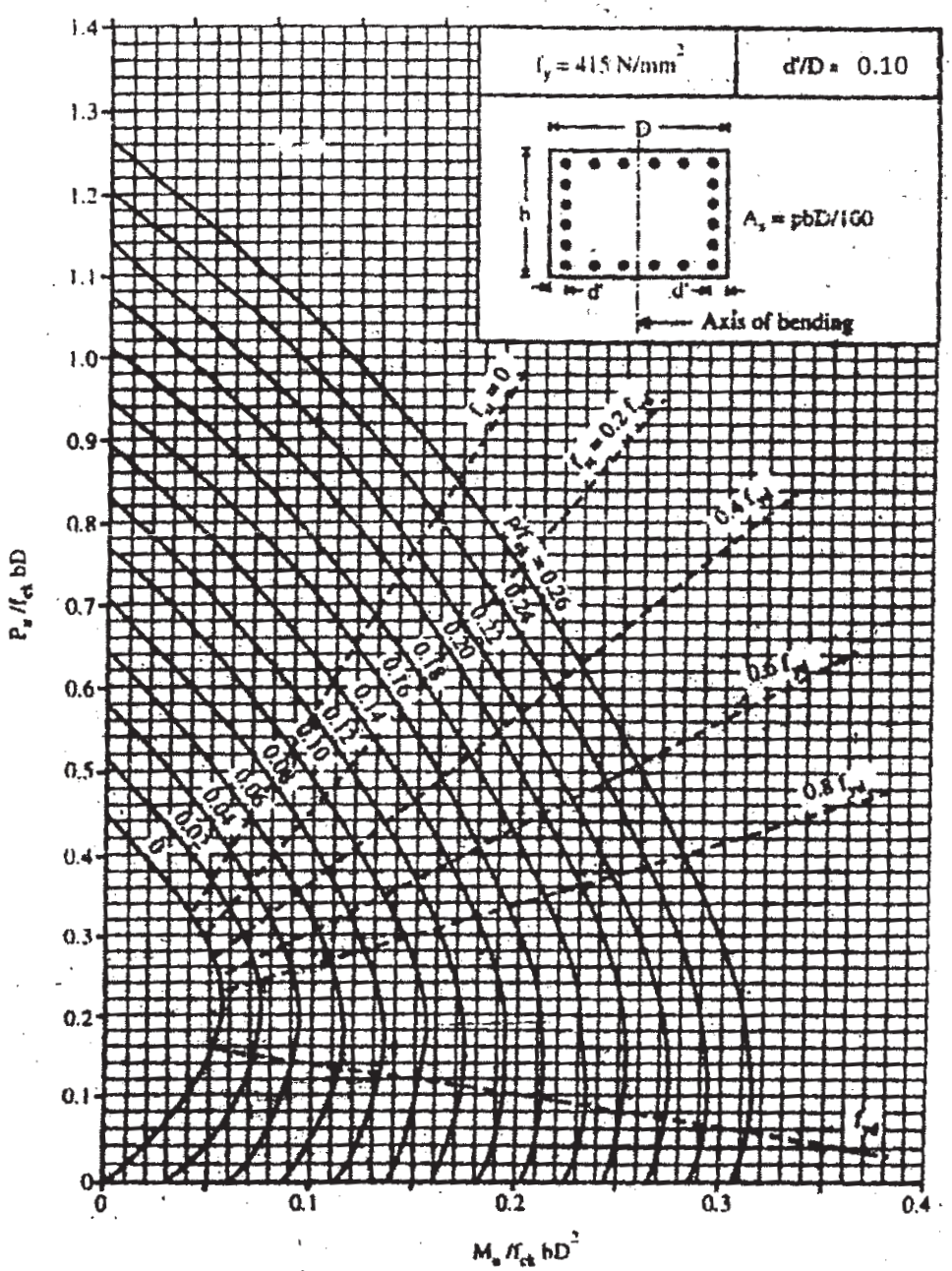
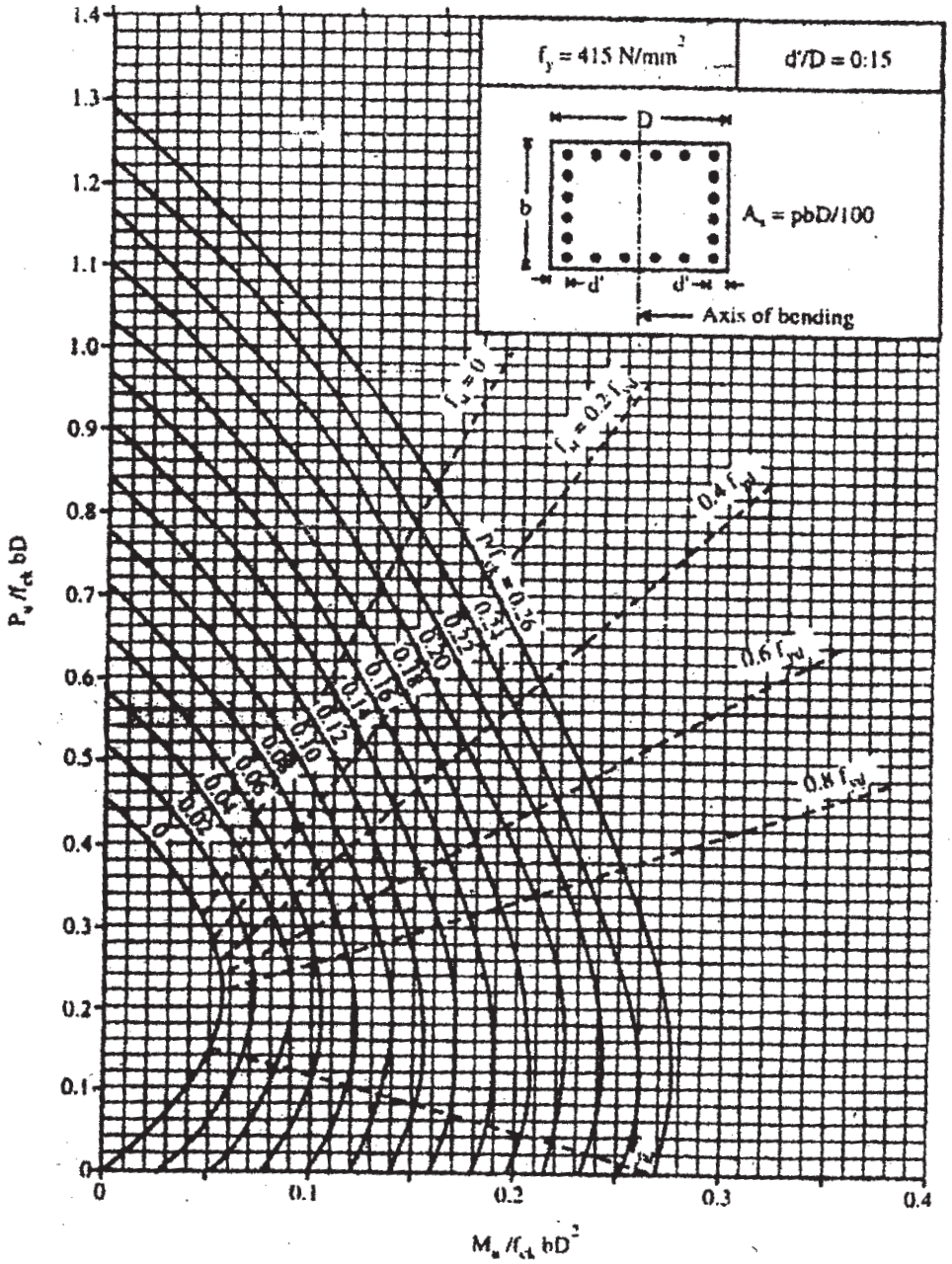


Chart 6

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



Total No. of Questions : 12]

SEAT No. :

P2791

[Total No. of Pages : 5

[4958]-110
T.E. Civil
PROJECT MANAGEMENT & ENGINEERING ECONOMICS
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6 from Section I, And Sovle Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Write a note on Project categories. **[4]**

b) What are the different types of organization structures? Explain merits and demerits of any one. **[6]**

c) Differentiate between CPM and PERT method. **[5]**

d) Define Activity, event and critical event. **[3]**

OR

Q2) Listed below are the activities of a project along their durations.

Activity	A	B	C	D	E	F	G	H	I
Immediate Predecessors	-	-	A	C	C	B	D	E,F	G,H
Duration (months)	5	2	3	4	2	4	7	6	1

a) Draw AOA network and calculate the total project duration. Highlight the critical path. **[6]**

b) Calculate EST, EFT, LST, LFT Total float, Free-float and Independent float. Write in tabular form with sample calculation. **[12]**

P.T.O.

Q3) a) Define cost slope and What do you understand by crashing of network? **[4]**

b) Following information pertains to a construction project. The Indirect cost of Project is Rs. 200/- week. Carry out step by step crashing and find out optimum Duration and cost of project. **[12]**

Activity	Normal time (weeks)	Normal cost (Rs.)	Crash time (weeks)	Crash Cost (Rs.)
1-2	4	4000	2	12000
2-3	5	3000	2	7500
2-4	7	3600	5	6000
3-4	4	5000	2	10000

OR

Q4) Following table shows the data of a small construction project. **[16]**

a) Draw the time scale version diag, manpower requirement also Histogram and EFR before leveling.

b) Carry out resource leveling if max. Limit of manpower is 8. What will be the increase in duration and EFR after leveling?

Activity	Duration (Days)	Manpower
1-2	5	4
1-3	6	3
2-3	0	0
2-4	4	5
3-4	7	8

Q5) a) What are the functions of material manager. **[4]**

b) Write a note on break even analysis. **[4]**

c) Define **[4]**

i) Safety stock

ii) Lead time

iii) EOQ

iv) Inventory

d) List out step by step procedure to conduct ABC analysis. **[4]**

OR

Q6) a) What are the assumptions made in EOQ. **[4]**

b) Segregate the items as per their annual usage and plot ABC curve **[12]**

Sr.No.	Item	Annual usage (Rs.)
1	Cement	400000
2	Sand	100000
3	Wash basin	50000
4	steel	320000
5	Aggregate (12mm)	120000
6	Aggregate (19mm)	130000
7	Nails	6000
8	Oil	5000
9	Water	12000
10	Grease	4000

SECTION - II

Q7) a) What are the aims of Safety programme and what it includes? **[6]**

b) Explain importance of site layout for any construction work? **[4]**

c) Draw a site layout for construction of bridge across the river. **[6]**

OR

Q8) a) What are the Personal protective equipments used on multistoried building Site? **[4]**

b) Define Injury frequency rate & injury severity rate and injury index. **[6]**

c) Draw a site layout of a project you have visited. **[6]**

Q9) a) Explain with sketch the Demand and supply curve. **[6]**

b) Explain with help of example 'law of diminishing marginal utility'. **[6]**

c) Explain the following terms with suitable examples **[6]**

i) Law of Substitution

ii) Elasticity of demand

OR

Q10)a) Define Cost, Price and Value with help of suitable example. **[6]**

b) Discuss the contribution of construction industry in growth of countries Economy. **[6]**

c) Explain in brief elasticity of Supply. **[6]**

Q11) Write a short note on any FOUR: **[16]**

a) Cash flow diagram.

b) Payback period

c) Annuity

d) ARR method

e) IRR method

OR

Q12)a) Write a short note on any TWO. **[8]**

i) Benefit cost ratio

ii) Break even analysis

iii) Types of Capital.

b) State the formula of NPV and B/C ratio method? Compare the project by both method and state its feasibility if project cost is Rs. 1,50,000 has net cash flow of Rs. 20,000 for a period 5 years. Firm expects returns at 10% per annum. **[8]**

Total No. of Questions :12]

SEAT No. :

P2809

[Total No. of Pages :5

[4958] - 111

T.E. (Mechanical Engineering)

MACHINE DESIGN - I

(Semester - I) (2008 Course) (302041)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer - books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrms must be drawn wherever necessary.***
5) ***Use of Electronic Pocket Calculator is allowed.***
6) ***Assume suitable data, if necessary, and mention it clearly.***

SECTION - I

Q1) A belt pulley is keyed to the shaft midway between the supporting bearings kept at 1000 mm apart. The shaft transmits 20 kW power at 400 rpm. The pulley has 400 mm diameter. The angle of wrap of belt on pulley is 180° and the belt tension acts vertically downwards. The ratio of belt tensions is 2.5. The shaft is made of steel having an ultimate tensile strength and a yield strength of 400 N/mm^2 and 240 N/mm^2 respectively. The combined shock and fatigue factors in bending and torsion are 1.5 and 1.25 respectively. The permissible angle of twist in shaft is 0.25° per meter length and the permissible lateral defection is 1 mm per meter length. Design the shaft on the basis of

a) Strength

b) Torsional rigidity

c) Lateral rigidity

Take $G = 80\times10^3$ N/mm^2 and $E = 200\times10^3$ N/mm^2 **[18]**

OR

P.T.O.

Q2) a) State different types of coupling. Explain design procedure for rigid flanged coupling. **[10]**

b) What are different types of keys? Explain design of rectangular sunk key. **[8]**

Q3) A nut from a screw-nut combination, having double start square threads of 25 mm nominal diameter and 5 mm pitch, is acted upon by an axial load of 10 kN, against the direction its linear motion. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction are 0.2 and 0.15 respectively.

The screw only rotates at 12 rpm speed while the nut only translates. Assuming uniform wear condition at collar and allowable bearing pressure of 5.77 N/mm^2, find:

a) Torque required to raise the load

b) Torque required to overcome collar friction

c) Total torque

d) Power required to rotate the screw

e) Stresses in screw body

f) Stresses in screw threads

g) Number of threads of nut in engagement with screw. **[16]**

OR

Q4) a) Prove that maximum efficiency of self-locking square threads is 50%. **[8]**

b) Explain following power screw threads with neat sketch. **[8]**

i) Square threads

ii) Trapezoidal threads

iii) ACME threads

iv) Buttress threads

Q5) a) What are the advantages and disadvantages of welded joints? **[4]**

b) A steel plate subjected to a force of 3 kN and fixed to a vertical channel by using four identical bolts as shown in figure 1. The bolts are made of plain carbon steel (S_{yt} = 380 N/mm^2). If factor safety is 2, find diameter of bolts. **[12]**

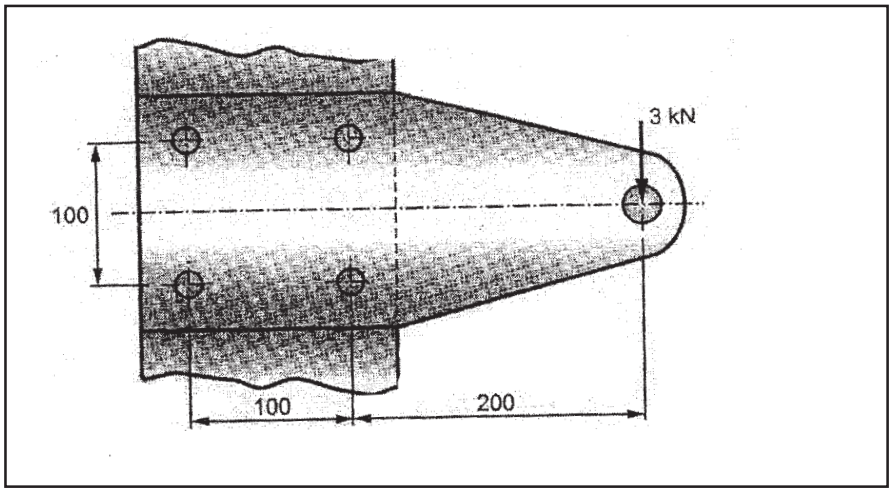


Fig. 1

OR

Q6) a) Explain with neat sketch 4 types of screw fasteners. **[8]**

b) Determine the weld size of an annular fillet used to weld a circular cantilever shaft of a diameter 30 mm and length 100 mm. The force acting at the free end of the shaft is 5 kN and the permissible weld stress is 80 N/mm^2. **[8]**

SECTION - II

Q7) a) Explain different types of stresses induced in

i) Flywheel rim

ii) Flywheel arm **[10]**

b) Explain types of flywheel applications. **[8]**

OR

Q8) a) The torque developed by engine and the load torque of machine are given by

$T_e = 5000 + 3000 \sin 2\theta$; and

$T_m = 5000 + 3000 \cos 2\theta$, Where, θ is the crank angle.

The mean speed of flywheel is 240 r.p.m. with coefficient of fluctuation as 0.03. If the mean rim diameter is 800 mm and the density of the flywheel material is 7200 kg/m^3. find

i) Maximum fluctuation of energy; and

ii) The flywheel rim dimensions, neglecting inertia due to arms. Assume flywheel rim width to thickness ratio as 2.0. **[14]**

b) Define: **[4]**

i) Coefficient of fluctuation of speed

ii) Coefficient of fluctuation of energy

Q9) a) Explain following terms used for helical spring. **[8]**

i) Wahl factor

ii) Active and inactive coils

iii) Spring index

iv) Spring rate

b) Draw a neat sketch of a multi-leaf spring and also state use of its essential parts. **[8]**

OR

Q10)a) Design a helical compression spring for a maximum load of 1500 N and a deflection of 30 mm. Assume permissible shear stress for spring material as 420 N/mm^2 and spring index 5.

Take G = 84 GPa. **[10]**

b) Determine required number of coils and the allowable deflection in helical spring made of 1.6 mm diameter wire. Assume the spring index as 6 and a permissible shear stress as 345 N/mm^2. The stiffness of the spring is to be 1.8 N/mm. Take G = 80 GPa. **[6]**

Q11)a) Explain procedure of selection of flat belt from manufacturer's catalogue. **[8]**

b) How wire ropes are designated? Discuss construction and lay of wire ropes. **[8]**

OR

Q12)a) What are different types of belt tensioning methods, explain any one with neat sketch. **[6]**

b) A Pulley of 1000 mm diameter is driven by an open type flat belt from 25 kW, 1440 rpm electric motor. The pulley on the motor shaft is 250 mm in diameter and the center distance between the two shafts is 2.0m. The allowable tensile stress for the belt material is 2 N/mm^2 and the coefficient of friction between the belt and pulley is 0.28.

The density of the belt material is 900 kg/m^3.

If the width of the belt is 125 mm, determine:

i) The thickness of belt

ii) The length of belt and

iii) The initial tension required in the belt. **[10]**

Total No. of Questions :12]

SEAT No. :

P2810

[Total No. of Pages :4

[4958]-112

T.E. (Mechanical/Automobile)

COMPUTER ORIENTED NUMERICAL METHODS (302045)

(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Draw Flow chart for 'Newton Raphson' Method. **[8]**

b) Use Trapezoidal rule to evaluate take h=k=0.25 **[8]**

$$I = \int_2^3 \int_2^3 \frac{dx\,dy}{x^2 + y^2}$$

OR

Q2) a) Draw Flow chart for 'Gauss Quadrature 2 Point Formula'. **[8]**

b) Apply Successive Approximation Method to determine the root of equation $x^3 - 2x - 3 = 0$ to three decimal accuracy **[8]**

Q3) a) Draw flowchart for 'Lagrange' s Interpolation' Method. **[8]**

b) Determine y' and y'' at $x = 1.2$ for following data **[8]**

x	1.2	1.4	1.6	1.8	2.0
y	0.1	0.5	1.25	2.4	3.9

OR

P.T.O.

Q4) a) Explain: **[6]**

Interpolation

Inverse Interpolation

Extrapolation

b) Find f(1986) using Newton's Backward Interpolation Method. **[10]**

X	1951	1961	1971	1981	1991
f(x)	13	17	22	28	41

Q5) a) Explain partial pivoting with example. **[6]**

b) Solve following set of equations using Gauss Elimination Method. **[12]**

$$2X + 4Y - 6Z = -4$$
$$X + 5Y + 3Z = 10$$
$$X + 3Y + 2Z = 5$$

OR

Q6) a) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss – Elimination method. **[6]**

b) Using Gauss Siedel method, solve the following set of simultaneous equations up to two decimal place accuracy. **[12]**

$$8X + 2Y - 2Z = 8$$
$$X - 8Y + 3Z = -4$$
$$2X + Y + 9Z = 12$$

SECTION - II

Q7) a) Draw flow chart to fit an equation $y = ax^b$ using Least Square Method. **[8]**

b) Fit a curve of the form $xy^a = b$ through following set of points **[8]**

x	200	150	100	60	40	10
y	1	1.5	1.8	2.4	4.1	10

OR

Q8) a) Fit a straight line through following set of points **[8]**

x	47	54	26	38	62	20
y	250	300	100	150	500	75

b) The value of u is given by equation, $= 3v^7 - 6v$. Find the absolute error, relative error and percentage error in u at v = 1 if the error in v = 0.05. **[8]**

Q9) a) Draw flow chart to solve Ordinary differential equations using Modified Euler's method. **[8]**

b) Given $\frac{dy}{dx} = \sin$ (y) with initial condition as y(0)=1, find y(0.3) with step size of 0.1. Use Runge Kutta 2nd order method. **[8]**

OR

Q10)a) Draw flow chart to solve simultaneous first order differential equations using RK4 method. **[8]**

b) Solve the equation $\frac{dy}{dx} = 2xy.$ Given the initial condition y(1)=1, find y(1.4) taking step size of 0.2 and accuracy of 0.001 using Modified Euler's formula. **[8]**

Q11)a) Draw flow chart to solve Parabolic Equation by Explicit Method. **[8]**

b) Solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$

Over the square with x=y=0 and x=y=3, with u=0 on the boundary and mesh length 1. **[10]**

OR

Q12) a) Draw flow chart to solve Laplace Equation for given no of iterations.**[8]**

b) A simply supported beam of length 'L' 1200mm, is loaded by a uniformly distributed load 'w' of intensity 1kN/m. The governing Exact Differential Equation is, $\frac{d^2y}{dx^2} = \frac{1}{EI}\left[\frac{wLx}{2} - \frac{wx^2}{2}\right]$, where 'x' is distance from a support and 'y' is displacement. Using finite difference method, calculate the deflection at distance 400mm and 800mm from a support. Take E = 200 X 10^3 N/mm^2 and I = 100 X 10^6 mm^4. **[10]**

Total No. of Questions :12]

SEAT No. :

P2811

[Total No. of Pages :5

[4958]-113
T.E. (Mechanical)
HEAT TRANSFER [302042]
(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Sections II.***
2) ***Answers to the Two Sections should be written in separate answer books.***
3) ***Draw Neat diagrams wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data wher ever necessary.***

SECTION - I

Q1) a) Write short notes on the following:- **[12]**

i) Fourier's law of heat conduction

ii) Thermal conductivity

iii) Overall heat transfer coefficient

b) A steel tube with 5 cm ID, 7.6 cm OD and k = 15 W/mK, is covered with an insulation covering of thickness 2cm and k = 0.2 W/mK. A hot gas at 330°C with hg = 400 W/m2K flows inside, the tube. The outer surface of insulation is exposed to cooler air at 30°C with ha = 60 W/m2K. Calculate heat loss from the tube for 10m length. **[6]**

OR

Q2) a) Derive an expression for the rate of heat transfer in case of an infinite slab. Also derive formula for temperature at any intermediate location.**[6]**

b) Explain the analogy between heat and electricity. **[4]**

P.T.O.

c) i) Estimate the rate of heat loss through a red brick wall of length 7m, height 5m and thickness 0. 5m, if the temp of the wall surfaces are maintained at 120°C and 50°C. K for red brick is 0.72 W/mK. Also find temp at a distance of 10cm from hot surface.

ii) If it is followed by layer of plaster of paris (K = 1 W/mK) with thickness 1.5 cm and a plastic foam of thickness 3 cm (K = 0.2 W/mK) on outside. Estimate rate of heat transfer. **[8]**

Q3) a) Explain significance of critical radius of insulation. Derive an expression for critical radius of insulation for cylinder using standard notations. **[8]**

b) A long hollow cylinder has inner and outer radii as 10cm and 20cm respectively. The rate of heat generation is 1 KW/m^3. the thermal conductivity of cylinder material is 0.2 W/mK. If the maximum temperature occurs at radius of 15cm and temperature of Outer surface is 60°C, find:- **[8]**

i) Temperature at inner surface.

ii) Maximum temperature in the cylinder.

OR

Q4) a) Derive general three dimensional heat conduction equation in Cartesian coordinates and reduce it to Fourier's equation. **[8]**

b) An electrical conductor of 10mm diameter, insulated by PVC (k = 0.18 W/mK) is located in air at 30°C having convective heat transfer coefficient of 7.8 W/m^2K. If the surface temperature of the base conductor is 85°C, calculate:

i) current carrying capacity of the conductor when 2mm thick insulation is provided (resistivity of the conductor material 70 μΩ cm).

ii) Maximum current carrying capacity. **[8]**

Q5) a) Derive the formula for rate of heat transfer and efficiency for a fin with insulated end (adequately long fin). **[8]**

b) Write a note on:

i) Physical Significance of Biot and Fourier's numbers

ii) Significance of time constant for a thermocouple. **[8]**

OR

Q6) a) State assumptions made in lumped capacity method and using this method derive the following relation with usual notations; **[8]**

$$\frac{T - T_\infty}{T_0 - T_\infty} = e_{-BiF_0}$$

b) An aluminum rod 2.5cm in dia and 10cm long protrudes from a wall maintained at 250°C. Rod is exposed to atm at 15°C with h = 15 W/ m2K. Calculate heat loss by rod. Take k = 200 W/mK for aluminum. Also calculate temp at the end of the rod. **[8]**

SECTION - II

Q7) a) Explain in brief: **[8]**

i) Space resistance

ii) Surface resistance

iii) Emissivity

iv) Radiosity

b) A gray opaque surface has an absorptivity = 0.7. It is maintained at 200°C. It receives an irradiation of 1,000 W/m^2. Its surface area is 0.2 m^2. Calculate, **[8]**

i) Radiosity of the surface,

ii) Net radiative heat transfer rate from the surface

Recalculate the above quantities, if the surface is black.

c) List few applications of radiation shield. **[2]**

OR

Q8) a) Write the statements and mathematical expressions of the following laws in radiation heat transfer: **[8]**

i) Planck's law

ii) Wien's law,

iii) Kirchhoff's law,

iv) Lambert's cosine rule

b) What do you mean by radiation shape factor? List any 4 properties/rules of radiation shape factor. **[6]**

c) A long pipe 50 mm in diameter passes through a room which is exposed to air at 20°C. Pipe surface temperature is 93°C. Emissivity of the surface is 0.6. Calculate the net radiant heat loss per metre length of pipe. **[4]**

Q9) a) Liquid mercury flows at a rate of 1.6 kg/s through a copper tube of 20 mm diameter. The mercury enters the tube at 15°C and leaves at 35°C. Calculate the tube length if the tube wall temperature is 50°C. the properties of mercury at 25°C are **[8]**

$\rho = 13582$ kg/m^3, Cp = 140 j/kgK, k = 8.69 W/mK, $\upsilon = 1.5 \times 10^{-7}$ m^2/s, Pr = 0.0248

Use $Nu = 7+0.025\ (RePr)^{0.8}$

b) Define and give the significance of

i) Nusselt number,

ii) Prandtl number

iii) Grashof number

iv) Reynolds number **[8]**

OR

Q10)a) Draw neat diagrams to show directions of natural convection fluid flow (development of thermal boundary layers) when: **[8]**

i) Plate is kept vertical and surrounding fluid temperature is higher than plate

ii) Cylinder is kept horizontal and surrounding fluid temperature is lower than cylinder

iii) Plate is horizontal and surrounding fluid temperature is lower than the plate

iv) Cylinder is vertical and surrounding fluid temperature is lower than the cylinder

b) Consider a human body in vertical position of height 167 cm at an average temperature of 37.3°C exposed to atmospheric air at – 5.7°C at Nainital during winters. Human body can be approximated to a cylinder of diameter 40 cm. Calculate total heat loss rate from the body by convection. Neglect heat loss from the feet (bottom surface). You may use the following empirical correlation; **[8]**

$Nu = 0.56 (Gr. Pr)^{0.25}$ for vertical surface

$Nu = 0.14 (Gr. Pr)^{0.34}$ for horizontal upper surface

Take the following air properties:

$Pr = 0.715$, $K = 0.025$ W/mK, $\upsilon = 13.55 \times 10^{-6}$ m^2/s

Characteristic length for horizontal surface can be taken as A/P; where A is the area of the surface and P is its perimeter.

Q11)a) A hot fluid at 200°C enters a heat exchanger at a mass flow rate of 10000 kg/hour. Its specific heat is 2 kJ/kgK. It is to be cooled by another fluid entering at 25°C with a mass flow rate of 2500 kg/hour and specific heat of 4000 J/kg K. The overall heat transfer coefficient based on outside area of 20 m^2 is 250 W/m^2K. Determine the effectiveness of heat exchanger. Also find the exit temperature of both the fluids, considering fluids are in parallel flow arrangement. **[8]**

b) Explain regimes of pool boiling. **[8]**

OR

Q12)a) Explain the following terms related to heat exchangers: **[8]**

i) LMTD

ii) NTU

iii) Effectiveness

iv) Fouling

b) Derive the expression of LMTD for counter flow heat exchanger with usual notations. **[8]**

Total No. of Questions :12]

SEAT No. :

P2812

[Total No. of Pages :5

[4958] - 114

T. E. (Mechanical)

THEORY OF MACHINES - II

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answers three questions from Sections I and "three questions from Sections II.***
2) ***Answers to the two Sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Friction in slider crank mechanism. **[4]**

b) Derive an expression for frictional torque of a flat collar bearing assuming uniform pressure & uniform wear theory. **[6]**

c) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. **[8]**

OR

Q2) a) Write short note on Epicyclic - train Dynamometer. **[4]**

b) Explain cone clutch with the help of neat sketch. **[4]**

P.T.O.

c) A band and block brake, having 14 blocks each of which subtends an angle of 15° at the centre, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum, find:

i) Maximum braking torque

ii) Angular retardation of the drum, and

iii) Time taken by the system to come to rest from the rated speed of 360 r.p.m. The coefficient of friction between blocks and drum may be taken as 0.25. **[10]**

Q3) Draw a cam profile to drive an oscillating roller follower to the specifications given below: **[16]**

a) Follower to move outwards through an angular displacement of 20° during the first 120° rotation of the cam;

b) Follower to return to its intial position during next 120° rotation of the cam;

c) Follower to dwell during the next 120° of cam rotation.

The distance between pivot centre and roller centre = 120 mm; distance between pivot centre and cam axis = 130 mm; minimum radius of cam = 40 mm; radius of roller = 10 mm; inward and outward strokes take place with simple harmonic motion.

OR

Q4) a) Write short note on Eccentric cam. **[4]**

b) What do you mean by advanced cam curves? Explain. **[4]**

c) Derive expressions for displacement, velocity and acceleration for circular arc cam operating a flat faced follower:- **[8]**

i) When the contact has on the nose.

Q5) a) Write short note on: **[6]**

i) Controlling force diagram

ii) Coefficient of insensitiveness.

b) A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2100 r.p.m. The rotor has a radius of gyration of 0.5 m and rotates in a clockwise direction when viewed from the stern. Find the gyroscopic effects in the following conditions: **[10]**

i) The ship sails at a speed of 30 km/h and steers to the left in a curve having 60 m radius.

ii) The ship pitches 6 degree above and 6 degree below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 20 seconds.

iii) The ship rolls and at a certain instant it has an angular velocity of 0.03 rad/s clockwise when viewed from stern.

Determine also the maximum angular acceleration during pitching. Explain how the direction of motion due to gyroscopic effect is determined in each case.

OR

Q6) a) Derive from the first principles an expression of the gyroscopic couple. **[8]**

b) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor. **[8]**

SECTION - II

Q7) a) State and prove the law of gearing. **[4]**

b) Derive an expression for minimum number of teeth on a gear wheel when it is in mesh with a pinion for involute tooth profile. **[6]**

c) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. **[8]**

OR

Q8) a) Explain the term interference in connection with gears. **[4]**

b) Compare the cycloidal and involute gear tooth profile. **[4]**

c) Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 6 mm, addendum = one module, pressure angle = 20°. The pinion rotates at 90 r.p.m. Determine:

i) The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel,

ii) The length of path and arc of contact,

iii) The number of pairs of teeth in contact, and

iv) The maximum velocity of sliding. **[10]**

Q9) a) Two helical gears are to be used to transmit 150 KW with a velocity ratio of 3:1 in between parallel shafts. The teeth are of involute shape with a normal pressure angle of 20°, normal module of 12.5 mm and standard module of one module, and pinion has 20 teeth and rotates at 600 rpm. If helix angle is 30°, determine;

i) The centre distance,

ii) The axial trust on the gear,

iii) The transverse pressure angle and

iv) Normal tooth load. **[10]**

b) Derive an expression for maximum efficiency in case of spiral gears in terms of spiral angle and angle of friction. **[6]**

OR

Q10)a) A three start worm has a fixed diameter of 80 mm and pitch of 20 mm. It rotates at 750 rpm and drives a 40 tooth worm gear. If coefficient of friction is 0.06, find; **[8]**

i) the helix angle of worm

ii) the speed of gear,

iii) the centre distance,

iv) efficiency,

v) the lead angle for maximum efficiency and

vi) maximum efficiency.

b) A pair of straight bevel gears has a velocity ratio 4:1. The pitch circle diameter of the pinion is 75 mm at the large end of the tooth. A 6 KW power is supplied to the pinion, which rotates at 750 rpm. The face width is 28 mm and pressure angle is 20°. Calculate the tangential, radial and axial component of the resultant tooth force acting on the pinion.**[8]**

Q11) Two shafts A and B are co-axial. A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m. find the speed of shaft B. **[16]**

OR

Q12) a) Explain the terms: **[6]**

i) Simple gear train,

ii) Compound gear train and

iii) Epicyclic gear train, giving one practical example of each with sketch.

b) An electric motor drive a machine through a speed reduction gear of ratio 9:1. The motor armature with its shaft and gear wheel has moment of inertia of 0.65 Kgm^2. The rotating part of the driven machine has moment of inertia of 50 Kgm^2. The driven machine has a resisting torque of 100 Nm, Assuming no loss in the reduction gear find **[10]**

i) Power of the motor at a speed of 150 rpm and

ii) Time required for the speed of machine to increase from zero to 50 rpm, when the torque developed by the motor in starting from rest is 30 Nm.

Total No. of Questions :10]

SEAT No. :

P2813

[Total No. of Pages :3

[4958] - 115

T.E. (Mechanical)

INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

(Semester - I) (2008 Course) (302044)

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

Instructions to the candidates:

1) ***Answers to the two Sections should be written in separate answer books.***
2) ***Answer any one question from 1&2, 3&4, 6&7, 8&9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What is scientific Management? Explain in brief various functions of Management. **[10]**

b) Discuss different principles of material handling. **[6]**

OR

Q2) a) What is plant layout? Explain various factors affecting selection of site for good plant. **[10]**

b) Write a note on various leadership styles adopted in industry. **[6]**

Q3) a) What is Method Study? Explain its procedure. **[10]**

b) What is Work Measurement? What is its importance? **[6]**

OR

P.T.O.

Q4) a) What is 'THERBLIG'? Draw any 5 symbols. **[10]**

b) What is two handed process chart? Explain. **[6]**

Q5) Write notes on any three of following: **[18]**

a) Zero based budgeting.

b) SIMO chart.

c) ABC analysis

d) Aggregate planning

e) EOQ.

f) Work space design.

SECTION - II

Q6) a) Discuss evolution and growth of technology. **[10]**

b) Discuss advantages of new technology. **[6]**

OR

Q7) a) How society and business is affected by technology? **[10]**

b) Discuss Intellectual Property. **[6]**

Q8) a) What do you mean by Technological Forecasting? Explain various techniques used in Technology Forecasting. **[10]**

b) List the various methods of Technology Acquisition. Explain any two in detail. **[6]**

OR

Q9) a) Explain the following: **[10]**

i) Technological Leadership

ii) Technology Monitoring

iii) Mission Flow diagram

b) What do you mean by Technology Assessment? **[6]**

Q10) Write notes on any three of following: **[18]**

a) Technology adoption

b) IPR

c) Technology transfer

d) Technology diffusion

e) Technology absorption

f) Steps in technology planning

Total No. of Questions :12]

SEAT No. :

P2814

[Total No. of Pages :8

[4958]-116
T.E. (Mechanical Engineering)
MACHINE DESIGN - II
(2008 Course) (Semester - II) (302047)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate answer- books.***
3) ***Figures to the right side indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of Electronic Pocket Calculator is allowed.***
6) ***Assume suitable data, if necessary, and mention it clearly.***

SECTION-I

Q1) a) A single row deep groove ball bearing operated with following work cycle. If the expected life of bearing is 13,000 hours with reliability of 90%. Calculate the dynamic load rating of the bearing and determine reliability of a system consisting of four such bearings. The work cycle is **[12]**

Element no	Element time	Fr (kN)	Fa (kN)	Radial factor	Thrust factor	Race Rotating	CS	Speed (r.p.m.)
1	30%	5	1.5	0.56	1.1	Inner	1.25	960
2	40%	3.7	0.73	0.56	1.3	Outer	1.4	1440
3	30%	-	-	-	-	Outer	-	720

b) Explain the mounting and preloading of a taper roller bearing with appropriate sketch. **[6]**

OR

P.T.O.

Q2) a) A transmission shaft is supported by two deep grove ball bearings at two ends. The centre distance between the bearings is 160 mm. A load of 300 N acts vertically downwards at 60 mm distance from the left hand bearing whereas a load of 550 N acts horizontally at 50 mm distance from right had bearing.

Shaft speed is 3000 rpm and expected life of bearing is 7000 hours with a reliability of 95%. It is intended to use same bearing at both ends of the shaft. Calculate dynamic load rating of the bearing so that it can be selected from manufacturer's catalogue. **[11]**

b) Derive Stribeck's equation for static capacity of a rolling contact bearing. **[7]**

Q3) Following data is given for a 360^{o} hydrodynamic bearing. **[16]**

Radial load = 10kN,

Journal speed = 1440 rpm,

Unit pressure in bearing = 1000 KPa,

Clearance ratio (r/c) = 800

l/d = 1

Viscosity of lubricant = 30 mPa-S.

Assuming that total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate

a) Dimensions of bearings

b) Coefficient of friction

c) Power lost in friction

d) Total flow of oil

e) Side leakage

f) Temperature rise

g) Average temperature (inlet temperature is 40^{o}C)

h) Find maximum pressure (P_{max})

Use the data given in table No.1.

OR

Q4) a) Explain significance of following variables in connection with hydrodynamic bearing. **[8]**

i) l/d ratio

ii) unit bearing pressure

iii) radial clearance

iv) Minimum oil film thickness

b) Derive Petroff's equation for hydrodynamic bearing. **[8]**

Q5) A cantilever beam of circular cross section is fixed at the end and is subjected to completely reversed load of $\pm$ 100 N at the free end. The force is perpendicular to the axis of beam. The distance between the fixed and the free end is 400 mm. There is no stress concentration in the beam. The beam is made of steel with an ultimate tensile strength of 1300 MPa. The surface finish factor for the beam is 0.87 and size factor is 0.85 respectively. The reliability factor is 0.868. Determine the diameter of the beam for a life of 47500 cycles. **[16]**

OR

Q6) a) Explain stress concentration, its causes. What are methods of reducing stress concentration? Explain with neat sketch. **[8]**

b) Explain modified Goodman diagram for **[8]**

i) Fluctuating axial or bending stresses

ii) Fluctuating torsional shear stresses.

SECTION-II

Q7) a) A double block brack with an identical pivoted shoes is to be used for braking torque capacity of 1kN/m the diameter of brake drum is 400 mm & angle of wrap for each shoe is 120^{o}. The coefficient of friction is 0.3 and the permissible intensity of pressure is 0.8 N/mm^2. The pivot of each shoe is located in such a way that moment of frictional force on the shoe about pivot is zero. Calculate, **[8]**

i) Distance of pivot from the axis of brake drum.

ii) The width of friction lining parallel to axis of drum.

b) Explain **[8]**

i) Parameters to be considered for the selection of the friction lining for brakes

ii) Self energizing and self locking of brakes.

OR

Q8) a) Discuss the properties of friction lining materials. Draw a labeled sketch of Multi-plate clutch. **[6]**

b) Design a centrifugal clutch for the following data: **[10]**

- Power to be transmitted = 15kW
- Running speed = 720 rpm
- Engagement speed = 540 rpm
- No. of shoes = 4
- Inner radius of the drum = 162.5 mm
- The radius of C.G. of the shoe = 150 mm, when the clutch is engaged
- The coefficient of friction is 0.25
- Permissible pressure on friction lining is 0.21 N/mm^2

Calculate

i) The mass of each shoe.

ii) The dimensions of friction lining. Assume shoe subtends an angle of 60^o at the center of the spider.

Q9) a) A spur gear pair transmitting 5kW power from an electric motor running at 1440 rpm to a machine running at 480 rpm. **[12]**

- Consider the following data
- No. of teeth on pinion = 18

- Center distance = 216 mm
- Face width = 10 x module mm.
- Allowable bending stress for pinion and gear = 160 N/mm^2
- Surface hardness for gear pair = 300 B.H.N.
- Tooth system = 20^o full depth involute.
- Deformation factor = 11500 e. N/mm

The gears are machined to the specifications of grade 6,

e = 8+0.63 Φ μm Where, Φ= m+0.25$\sqrt{d}$

Lewis form factor $Y = 0484 - \frac{2.87}{Z}$

Assuming dynamic load is accounted by the Buckingham's equations.

$$F_d = \frac{21V(bC + Ft\max)}{21V + \sqrt{bC + Ft\max}}$$

Calculate:

i) The factor of safety against bending failure and

ii) The factor of safety against pitting failure.

b) What are the assumptions in the analysis of beam strength of spur gear tooth. Write beam strength equation only. **[4]**

OR

Q10)a) A pair of helical gear consist of 24 teeth pinion rotating at 5000 rpm and supplying 2.5 kW power to a gear. The speed reduction is 4:1. The normal pressure angle and helix angle are 20^o and 23^o respectively. Both the gears are made of hardened steel (S_{ut} = 750 N/mm^2). The service factor, factor of safety and load concentration factor are 1.5, 2.0 and 1.0 respectively. The gears are finish as per grade -4. **[12]**

i) In initial stage of gear design assume velocity factor accounts dynamic load and face width is 10 X module and assume pitch line velocity V = 10 m/s. for estimating normal module.

ii) Select first preference module and calculate dimensions of gears.

iii) Determine the dynamic load by Buckingham's equation also calculate factor of safety in bending.

iv) Specify the surface hardness at factor of safety 2.0

Use following data:

- Lewis form factor $Y' = 0.484 - \frac{2.87}{Z'}$
- For grade 4 ; e= 3.20 + 0.25 ($m_n + 0.25\sqrt{d}$)
- Buckingham's equation $P_d = \frac{21V(bC.\cos^2\psi + P_{t\max})\cos\psi}{21V + \sqrt{bC.\cos^2\psi + P_{t\max}}}$
- Velocity factor $C_v = \frac{5.6}{5.6 + \sqrt{V}}$

First preference module (mm)-1.0, 1.25, 1.5, 2.0, 2.5, 3, 4, 5, 6, 8, 10, 12, 16 and 20.

b) Draw the neat sketch showing force analysis of helical gear pair, and state these forces. **[4]**

Q11)a) Explain with neat sketch hypoid gear and spiral bevel gear. **[6]**

b) A straight bevel pinion having 21 teeth to be made of alloy steel (S_{ut} = 800 N/mm^2) is to mesh with a gear to be made of plain carbon steel (S_{ut} = 720 N/mm^2). The axes of pinion and gear intersects at right angle. Gear pair is to transmit 20kW power from a spindle running at 500 rpm to a machine running at 300 rpm. The starting torque of the motor is 110% of the rated torque. The factor of safety required is 1.5. The tooth system is 20^o full depth involute. The gears are cut to meet the specifications grade 6. Hardness of gear pair is 350 BHN. The deformation factor C is 10900 e. N/mm. Design the gear pair. Use velocity factor for preliminary estimation and Buckingham's equation for precise estimation of dynamic load **[12]**

Use following data,

- Lewis form factor $Y = 0484 - \frac{2.87}{z'}$
- $K_v = \frac{6}{6+V}$
- $F_d = \frac{21V(bC + Ft\max)}{21V + \sqrt{bC + Ft\max}}$
- For grade 6, e = 8+0.63 Φ μm Where, Φ= m+0.25 $\sqrt{d}$
- Standard module in mm = 1, 1.25, 2, 3, 4, 5, 6, 8, 10, 12, 16.

OR

Q12)a) State materials used for worm & worm gear. Derive an expression for the efficiency of worm gear pair. **[6]**

b) A double start worm made of case hardened alloy steel 16Ni80Cr60 (S_{ut} = 700 N/mm^2) is to mesh with worm gear to be made of phosphor bronze (S_{ut} = 240 N/mm^2). The gear pair is required to transmit 5kW power from an electric motor running at 1500rpm to a machining running at 75rpm. The service factor is 1.25, while the factor of safety required is 2.0. The face width of worm gear is 0.73 times the pitch circle diameter of worm. The worm gear factor is 0.685 N/mm^2, while the diametrical quotient is 10. The normal pressure angle is 14.5^o. If the coefficient of friction between worm and worm gear teeth is 0.03, design the gear pair and find the power lost. Would you recommend a fan for the gear box? Assume the permissible temperature rise is 50^{o}C. **[12]**

Use following data,

- Lewis form factor -- $Y = 0.39 - \frac{2.15}{Z_G}$
- Velocity factor, $C_v = \frac{6}{6+V_G}$
- Area of housing, A = 1.14 x 10^{-4} x (a)$^{1.7}$ m^2, where a = centre distance in mm.

Table No-I *Dimensionless performance parameters for full journal bearing with side flow*

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max}}\right)$
∞	0	1.0	∞	(70.92)	∞	π	0	—
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0626	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.9	0.1	0.0115	31.62	0.756	0.411	0	0.358
	0.97	0.03	—	—	—	—	0	—
	1.0	0	0	0	0	0	0	0
1	0	1.0	∞	(85)	∞	π	0	—
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0
$\left(\frac{1}{2}\right)$	0	1.0	∞	(88.5)	∞	π	0	—
	0.1	0.9	4.31	81.62	85.6	3.43	0.173	0.523
	0.2	0.8	2.03	74.94	40.9	3.72	0.318	0.506
	0.4	0.6	0.779	61.45	17.0	4.29	0.552	0.441
	0.6	0.4	0.319	48.14	8.10	4.85	0.730	0.365
	0.8	0.2	0.0923	33.31	3.26	5.41	0.874	0.267
	0.9	0.1	0.0313	23.66	1.60	5.69	0.939	0.206
	0.97	0.03	0.00609	13.75	0.610	5.88	0.980	0.126
	1.0	0	0	0	0	—	1.0	0
$\left(\frac{1}{4}\right)$	0	1.0	∞	(89.5)	∞	π	0	–
	0.1	0.9	16.2	82.31	322.0	3.45	0.180	0.515
	0.2	0.8	7.57	75.18	153.0	3.76	0.330	0.489
	0.4	0.6	2.83	60.86	61.1	4.37	0 567	0.415
	0.6	0.4	1.07	46.72	26.7	4.99	0.746	0.334
	0.8	0.2	0.261	31.04	8.8	5.60	0.884	0.240
	0.9	0.1	0.0736	21.85	3.50	5.91	0.945	0.180
	0.97	0.03	0.0101	12.22	0.922	6.12	0.984	0.108
	1.0	0	0	0	0	–	1.0	0

Table No-I for Q.वर 3

EEE

Total No. of Questions : 12]

SEAT No. : ____

P4553

[Total No. of Pages : 4

[4958] - 117
T.E. (Mech. & Mech. S/W)
TURBO MACHINES
(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answers three questions from Section -I and three questions from Section -II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figure to the right indicate full marks.***
5) ***Use of logarithmic tables, electronics calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove that the maximum efficiency for curved vanes with jet strikes at the center is given by **[6]**

$$\eta_{max} = \frac{8}{27}(1+\cos\theta)$$

$$= \frac{16}{27}\cos^2\left(\frac{\theta}{2}\right)$$

The notations carry the usual meaning.

b) The following data refer to a Pelton wheel:
4 nozzles each 50 mm in diameter with C_p = 0.97; reservoir head 300m; Head loss in friction 30 m on 360 m of pipeline with f = 0.024; bucket pitch circle diameter 0.83m; bucket speed is equal to 0.46 of jet speed; bucket friction reduces the relative velocity by 15 percent; angle through which the buckets deflect the jet 165°; mechanical efficiency 94 percent. Determine: **[12]**

i) The diameter of penstock pipe
ii) The speed of rotation
iii) Hydraulic and overall efficiencies of the machine
iv) The output power
v) Specific speed

P.T.O.

OR

Q2) a) Prove that the hydraulic efficiency of Pelton wheel is given by **[6]**

$$\eta_h = \frac{2u_1(V_1 - u_1)(1 + k\cos\phi)}{V^2}$$

b) A Jet of water having a velocity of 40 m/s impinges on a series of vanes moving with a velocity of 20m/s. The jet makes an angle of 30° to the direction of motion of the vanes which entering and leaves at an angle of 120°. Draw a velocity triangle at inlet and outlet and find **[12]**

i) The vane angle at inlet and outlet
ii) Work done
iii) Efficiency

Q3) a) What is the governing of Water Turbine? Describe with sketch the working of a system to regulate the speed of Francis Turbine. **[6]**

b) The Propeller reaction turbine of runner diameter 4.5m is running at 48 rpm. The guide blade angle at inlet is 145° and runner blade angle at the outlet is 25° to the direction of the vane. The axial flow area of water through the runner is 30 m^2. If the runner blade angle at inlet is radial, determine: **[10]**

i) Hydraulic efficiency of the turbine,
ii) Discharge through the turbine, and
iii) Power developed by the runner.

OR

Q4) Write note on any four : **[16]**

a) Cavitation in water turbines & its control.
b) Comparison of : Francis Turbine & Kaplan Turbine.
c) Deriaz Turbine.
d) Draft Tube.
e) Operating characteristic.

Q5) a) Why is compounding of the steam turbine is necessary or what are the disadvantages of the single stage steam turbine? How can we overcome such disadvantages? **[8]**

b) What is governing of steam turbine? How is governing is done in steam turbine? Explain. **[8]**

OR

Q6) a) In Parson's reaction turbine running at 400 rpm with 50% reaction develops 75 kW per kg per second of steam. The exit angle of the blade is 20° and the steam velocity is 1.4 times the blade velocity determine **[10]**

i) Blade efficiency

ii) Diagram power

b) Discuss in detail various losses in a steam turbine. **[6]**

SECTION - II

Q7) a) The compressor and turbine unit of a small gas turbine plant have an isentropic efficiency of 85%. The temperature of the air at inlet to compressor is at 15°C and the maximum temperature during the cycle is limited to 700°C . The pressure ratio is 4. Assuming, C_p = 1.1 and C_v = 0.786 kj/kg K, calculate the specific output and the overall efficiency of the cycle. Neglecting all other losses. **[12]**

b) What are the advantages and disadvantages of liquid propellants compared to solid propellant? Explain in details. **[6]**

OR

Q8) a) What are the different methods used in improving the efficiency of the gas turbine? Explain any one method with a neat sketch. **[10]**

b) Compare the constructional features and operating performance of turboprop and turbojet engines. **[8]**

Q9) a) Define the following terms : **[8]**

i) Manometric head

ii) Manometric efficiency

iii) Net positive suction head

iv) Overall efficiency

b) Define the minimum starting speed of a centrifugal pump. Derive an expression to calculate the minimum starting speed. **[8]**

OR

Q10)a) Determine the manometric and overall efficiencies of a centrifugal pump from the following data. **[10]**

Head	:	22m
Discharge	:	160 lps
Liquid pumped	:	brine of specific gravity 1.18
Speed	:	1200 rpm
Diameter	:	30 cm
Width	:	5 cm
Shaft power	:	55 kW
Vane angle at outlet	:	35°

b) Why multiple pumps are required? Under what circumstances, do we use multiple pumps? Write a note on operation of multistage pumps. **[6]**

Q11)a) The diameter ratio of the impeller of a centrifugal compressor is 2 and the pressure ratio is 4. At a speed of 12000 rpm, the flow rate is 10 m^3/s of free air. The isentropic efficiency of compressor is 84%. The blades are radial at the outlet and the entry is radial at the inlet. The velocity of flow remains constant at 60 m/s through the impeller. Calculate **[10]**

i) Power input to the machine

ii) Impeller diameter at the inlet and outlet

The suction is from the atmosphere at 100 kPa and 300°K

b) Write short note on comparison between centrifugal and axial flow compressor. **[6]**

OR

Q12)a) A 16 stage axial flow compressor is to have an overall pressure ratio of 6.3. The test has shown that a stage efficiency of 89.5% can be obtained. The intake conditions are 1 bar and 288°K. Find the overall efficiency and polytropic efficiency. **[10]**

b) Discuss surging and chocking in a centrifugal compressor. How do these phenomena affect the working of the compressor? **[6]**

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Total No. of Questions :12]

SEAT No. :

P2815

[Total No. of Pages :5

[4958]-118

T.E. (Mechanical)

MECHATRONICS

(2008 Course) (Semester - II)

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

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain in brief Sensitivity, Accuracy and Precision with suitable example for each. **[8]**

b) Explain different dynamic characteristics of measurement system such as **[4]**

i) Response time

ii) Rise time

iii) Settling time

c) Sensitivity of a thermocouple is 0.01 V/^{o}C. Find the output voltage if the temperature is 200^{o}C. Also find temperature for 3.5V output. **[4]**

OR

P.T.O.

Q2) a) A strain gauge and bridge circuit are used to measure the tension force in a bar of steel that has a cross-sectional area of 13 cm^2. The strain gauge has a nominal resistance of 120Ω and a GF of 2. The bridge is supplied with 10 V. When the bar is unloaded, the bridge is balanced so the output is 0V. Then force is applied to the bar, and the bridge voltage goes to 0.0005 V. Find the force on the bar. (Youngs modulus 2×10^5 N/mm^2 for steel). **[6]**

b) What is meant by Temperature Compensation in Strain Gauges and how it is done? **[6]**

c) Explain capacitive type level measuring transducer. **[4]**

Q3) a) Write Construction, working, applications, advantages and disadvantages of LVDT. **[8]**

b) A potentiometer with a total range of 350^o is supplied with a voltage of 8 Vdc. The voltage at the wiper is 3.7 Vdc. What is the present angle of the pot? **[4]**

c) Describe proximity sensor with application. **[4]**

OR

Q4) a) What is meant by variable reluctance sensor? And write down its applications. **[6]**

b) Explain basic operation of rotary encoder? And its applications in CNC machine. **[5]**

c) Explain capacitive and inductive principles used in position sensing. **[5]**

Q5) a) Write a short note on SCADA system and its applications in industrial environment. **[8]**

b) Use block diagram reduction to simplify the block diagram shown in figure Q5 (b) below into a single block relating Y(s) to R(s). **[10]**

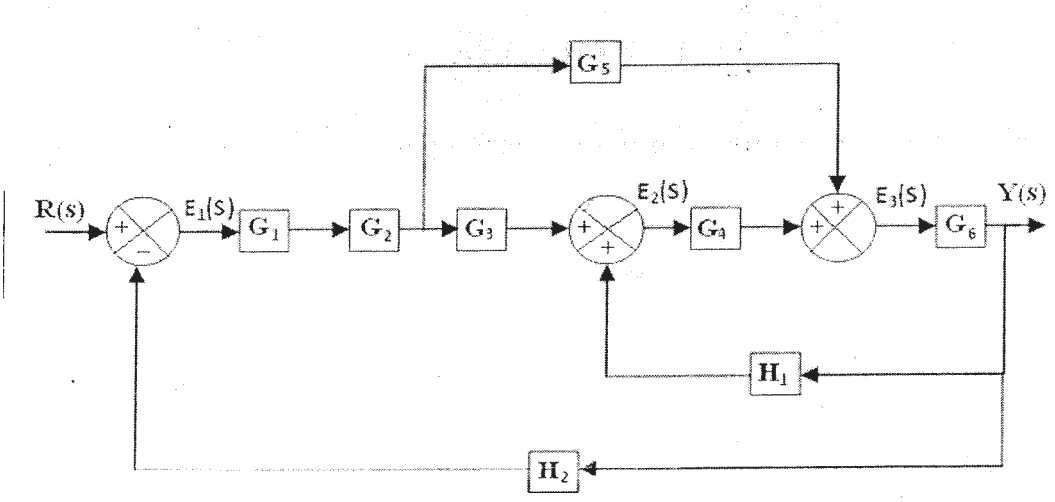

Figure Q 5 (b)

OR

Q6) a) Explain any one analog to digital converter. **[6]**

b) Explain Sample and hold circuit. **[6]**

c) Describe in brief mathematical model of Mechanical system. **[6]**

SECTION -II

Q7) a) Explain terms: **[4]**

i) Process load

ii) Dead Time

b) Differentiate between open loop and closed loop system. **[6]**

c) An open-loop system consists of three elements in series, the elements having transfer functions of 5, 1/s and 1/(s+1) with feedback element transfer function 5. What is the overall transfer function of the system? **[6]**

OR

Q8) a) Explain the terms: **[4]**

i) Process Variable.

ii) Process Error.

b) Give an example of the following: **[6]**

i) Feed forward control system.

ii) Feedback control system.

iii) Regulator control system.

c) In a certain system, an electric heating element was found to increase the temperature of a piece of metal 10^{o} for each ampere of current. The metal expands 0.001 inch /deg and pushes on a load sensor which outputs 1 V/0.005 inch of compression. **[6]**

i) Find the transfer functions of the three components and draw the block diagram.

ii) Calculate the overall transfer function of this system.

Q9) a) What are the major disadvantages of two position controller? **[4]**

b) A proportional controller is used to control temperature within 50^{o}C to 130^{o}C with a set point of 73.5^{o}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^{o}C. **[8]**

c) Write down the advantages and limitations of proportional control system. **[4]**

OR

Q10)a) Write note on Proportional Integral and Derivative control Actions and its effect on error and response time. **[8]**

b) Explain PID controller in detail. **[8]**

Q11)a) Explain the difference in Timers and Counters used in PLC programming with a suitable example each. **[6]**

b) Construct the ladder logic diagrams for **[12]**

i) OR gate

ii) AND gate

iii) NOT gate

Also develop a truth table for all three logics.

OR

Q12)a) Write a short note on concept and purpose of a programmable Logic Controller (PLC). Explain the basic instructions used in a PLC program. **[6]**

b) Consider a tank with inflow valve V1 and outflow valve V2 connected to a tank at top and bottom respectively. The level high (LH) and level low (LL) floats switches mounted at top and bottom to indicate the level. Develop a PLC ladder program for the following objectives **[12]**

i) When LL is OFF and LH is OFF, the V1 should be ON

ii) V1 shall continue to be ON till LH is ON

iii) When LL and LH is ON, V1 should be OFF and V2 should be ON

iv) V2 should continue to be ON till LL is OFF.

Mention the input and outputs and which input is connected to which PLC input terminal.

Write the Boolean equation of each rung.

Draw ladder diagram with Ex ON, Ex OFF and PLC output symbols (Do not show switches in ladder program).

EEE

Total No. of Questions :12]

SEAT No. :

P2816

[Total No. of Pages :4

[4958]-119
T.E. (Mechanical)
METROLOGY AND QUALITY CONTROL
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Logarithmic tables, slide rule, electronic non programmable pocket calculator is allowed.***
5) ***Assume suitable data it necessary.***

SECTION - I

Q1) a) Differentiate between Line and End Standards **[4]**

b) Explain construction working, application, advantages and limitations of Johansson's Microkator Comparator. **[8]**

c) What is the difference between Alignment test & performance test? Explain with neat sketch any one such tests on a Lathe machine. **[4]**

OR

Q2) a) Explain Different types of Errors in Measurement. **[8]**

b) Describe with neat sketches of autocollimator & sine bar. **[8]**

Q3) a) Difference between primary & secondary texture. **[4]**

b) Explain concept of RMS value for surface roughness. **[6]**

P.T.O.

c) Design and make a drawing of general purpose GO and NOGO plug gauge for inspecting hole of $70H_8$ Data with usual notation. **[8]**

i) i (micron) = $0.45 * 3 \sqrt{D} + 0.001D$,

ii) Diameter step 50 to 80 mm

iii) The value of tolerance for IT_8=25i

OR

Q4) a) What are optical flat? How are patterns of fringes interpreted? **[5]**

b) Explain working of LASER interferometer with neat sketch. **[5]**

c) Design GO and NOGO limit plug gauge for checking a hole having $50^{+0.06}_{-0.00}$ Size Assume gauge maker's tolerance equal to 10% of work tolerance and wear allowance equal to 10% of gauge maker's tolerance.**[8]**

Q5) a) Calculate the constant chord length & its distance below the tooth tip for gear of module 5mm & pressure angle 20^o **[6]**

b) describe working of universal measuring machine. **[4]**

c) Write a short note on computer controlled co-ordinate measuring machine. **[6]**

OR

Q6) a) Derive the relation for Best wire size for M24x3 mm external threads. Calculate the Diameter of the best wire size and the difference between the size under the wires and effective diameter. **[6]**

b) Write short note on, (Any Two): **[10]**

i) Gear tooth Vernier caliper.

ii) Lasers in Metrology.

iii) Machine Vision.

SECTION - II

Q7) a) Explain Cost of Quality and Value of Quality. **[6]**

b) Explain the concept of Quality Circle and their structure, advantages and limitations. **[5]**

c) Distinguish between Quality of design and Quality of Conformance. **[5]**

OR

Q8) a) Describe the steps to implement the Quality Policy and Quality Audit. **[6]**

b) Explain what do you understand by Concurrent Engineering. **[5]**

c) Explain PDSA and PDCA cycle for quality control. **[5]**

Q9) a) Explain ISO 9000 Quality system standard. **[6]**

b) What do you understand by FMECA. **[5]**

c) Write a note on 5s. **[5]**

OR

Q10)a) Explain following terms: **[12]**

i) JIT

ii) ISO 14000 and TS 16949

iii) Concept of zero defect

b) Explain the kanban **[4]**

Q11)a) Draw and Explain Operating Characteristics Curve. **[6]**

b) Explain different types of Sampling plans and state relative merits and demerits. **[6]**

c) What are the Objective of SQC. **[6]**

OR

Q12)a) Explain DMAIC used in Six sigma. **[4]**

b) The number of Defects found in each sample of cloth of one Sq. Meter area are noted down as Follows. Draw the appropriate control chart and state if the process is in Control or not **[10]**

Sr No	1	2	3	4	5	6	7	8	9	10	11	12
Defect	8	9	5	8	5	9	9	11	8	7	6	4

c) Write short note on “Control Chart Patterns **[4]**

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Total No. of Questions : 12]

SEAT No. :

P5112

[Total No. of Pages : 5

[4958]-120
T. E.
REFRIGERATION AND AIR - CONDITIONING
(2008 Pattern)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Draw vapour compression cycle on T-s and p-h diagram. Name the various processes and derive expression for COP. **[8]**

b) Air enters the compressor of an ideal Brayton Refrigeration Cycle at 101 kPa and 270 K with a volumetric flow rate of 1.5 m^3/s. If the compressor pressure ratio is 3 and the turbine inlet temperature is 300 K, determine. **[8]**

i) the net power input

ii) the refrigeration capacity

iii) coefficient of performance

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

OR

Q2) a) Explain working of vortex tube refrigeration. **[6]**

b) With neat diagram explain thermoelectric refrigeration. **[6]**

c) Explain applications of refrigeration in dairy plant. **[4]**

Q3) a) Discuss the effect of condenser and evaporator pressures on performance of VCC with the help of p-h or T-s diagram. **[8]**

b) An ideal vapour compression system uses R-12 as refrigerant. The system uses an evaporation temperature of 0^oC and condenser temperature of 40^oC, the capacity of the system is 10 TR. **[8]**

P.T.O.

Determine:

i) The mass flow rate of refrigerant

ii) Power required to run the compressor

iii) Heat rejected in the condenser, and

iv) COP of the system

Use the properties of R-12 from table given below:

Temp	Pressure	h_f	h_g	s_f	s_g
°C	bar	kJ/kg	kJ/kg	kJ/kg	kJ/kg.K
0	3.087	36.05	187.53	0.142	0.696
40	9.609	74.59	203.2	0.727	0.682

Take C_p for superheated vapour as 0.61 kJ/kg. K.

OR

Q4) a) Compare vapor absorption system with vapour compression system. **[4]**

b) Draw actual vapour compression cycle on p-h diagram and discuss the losses in the cycle and its effect on its performance. **[8]**

c) Prove that the maximum COP of an ideal vapour absorption refrigeration system is given by

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

Where T_L = evaporator temperature, T_C = condenser temperature and T_G = generator temperature. **[4]**

Q5) a) Draw the neat sketch of vapour compression system with two evaporators equipped with individual compressors and expansion valve and common condenser. Show all processes on p-h diagram and present the mathematical formulation of its COP. **[10]**

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

OR

Q6) a) Explain cascade refrigeration system. List its applications. **[7]**

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

c) Explain: refrigerant recovery, reclaim and recharge. **[5]**

SECTION - II

Q7) a) What are the factors that affect the human comfort? Discuss their effect in brief. **[4]**

b) In the summer the outer surface of glass filled with ice water frequently 'sweets'. How can you explain its mechanism? **[4]**

c) Air at 38°C and 60% RH is cooled to 24°C DBT. It is achieved by cooling and dehumidification. Air flow rate is 50 cmm. Using psychrometric chart, calculate: **[10]**

i) Dew point temperature

ii) Mass of water drained per hour

iii) Capacity of cooling coil, and

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

OR

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

b) Prove that the specific humidity is given by

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

Where p = total pressure of air, and p_v = partial pressure of moisture in air. **[6]**

c) Air enters a window air-conditioner at 101 kPa and 35°C and 80% RH at a rate of 10 cmm and leaves as saturated at 14°C. A part of moisture which condenses during the process is also removed at 14°C. Determine the heat flow rate and moisture removed from the air.

Show the process on psychrometric chart. **[8]**

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

b) State different methods of air cleaning for air conditioning space. Discuss any two of them. **[6]**

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

OR

Q10)a) Explain construction and working of an air handling unit with a neat sketch. **[7]**

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

c) Explain the working of flooded evaporator with a neat sketch. **[5]**

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

b) What is static regain factor? Explain the advantages and limitations of static regain method of duct design. **[4]**

c) A rectangular duct section 500mm × 350 mm carries 75 cmm of air having density of 1.12 kg/m^3. Calculate the equivalent diameter of circular duct for **[8]**

i) Same quantity of air handling in both cases.

ii) Same velocity of air in both cases.

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

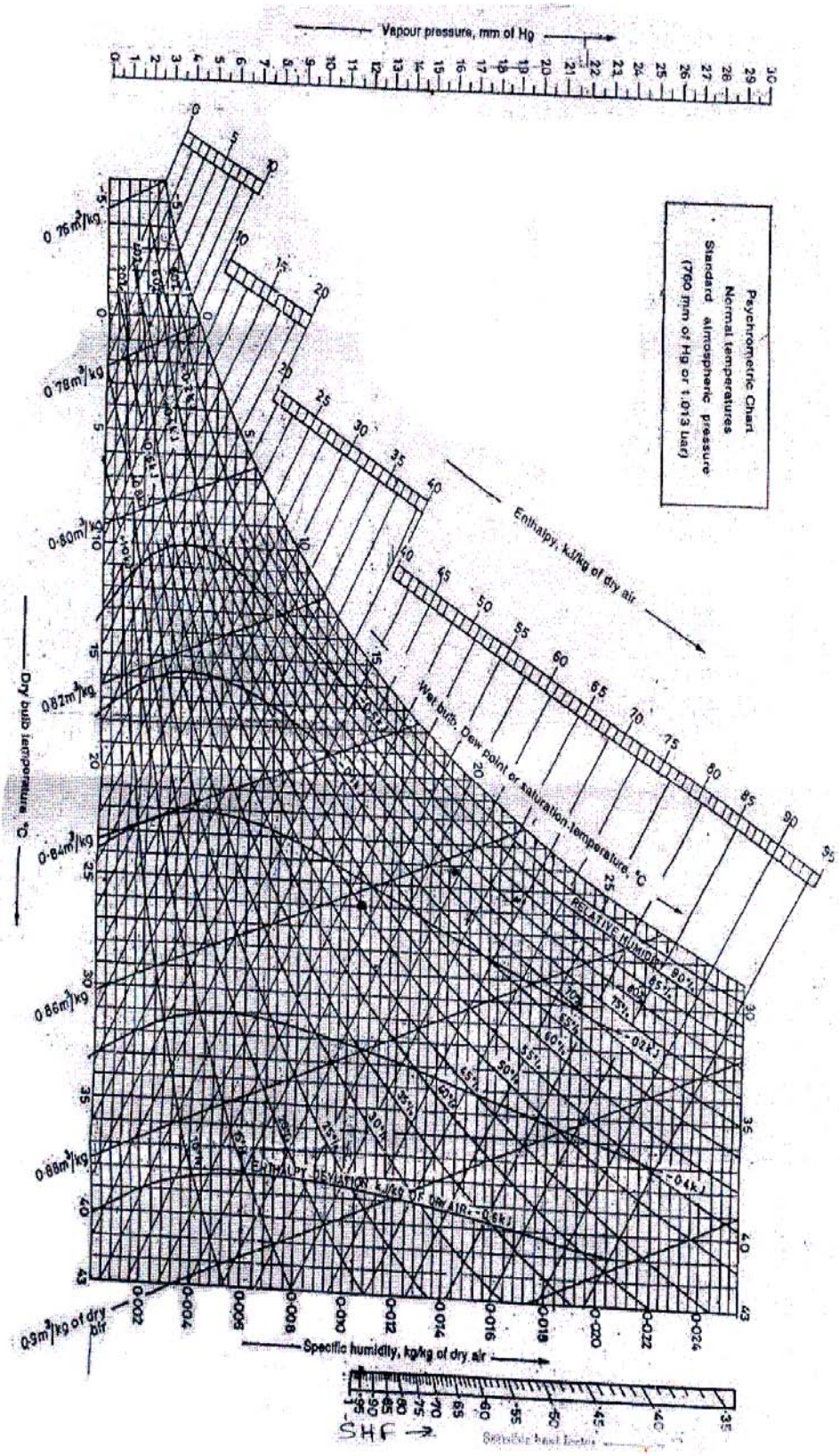
OR

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

b) Prove that for a rectangular duct of side a and b, the hydraulic diameter for same flow rate is given by **[6]**

$$D = 1.265\left(\frac{a^3b^3}{a+b}\right)^{1/5}$$

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


Vapour pressure, mm of Hg
Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Enthalpy, kJ/kg of dry air
Dry bulb temperature, °C
Wet bulb, Dew point or saturation temperature, °C
RELATIVE HUMIDITY 80%
ENTHALPY DEVIATION kJ/kg OF DRY AIR
Specific humidity, kg/kg of dry air
SHF

Total No. of Questions :10]

SEAT No. :

P2817

[Total No. of Pages :2

[4958] - 122

T. E. (Mechanicals S/W)

a:PRODUCTION MANAGEMENT(SELF STUDY)

(302061) (2008 Course) (Semester-I) (Elective - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the contributions of F.W Taylor and H. Fayol to the management thoughts? **[8]**

b) Explain different organisation types in a chart. **[8]**

OR

Q2) a) Explain any Eight principles of management proposed by H. Fayol. **[8]**

b) State advantages & disadvantages of a partnership firm over private limited company. **[8]**

Q3) a) Differentiate MTM 1 and MTM 2. **[8]**

b) Draw any four flow diagram symbols & explain its meaning. **[8]**

OR

Q4) a) Differentiate. Two Hand chart over SIMO chart. **[8]**

b) What is MOST? Draw any four symbols used in it? **[8]**

P.T.O.

Q5) Write short note on Any THREE: **[18]**

a) Time study

b) Method study

c) Facilities planning

d) Types of production

e) Group dynamics

SECTION - II

Q6) a) Differentiate advantages & disadvantages of Random Sampling Inspection with 100% inspections. **[8]**

b) What is importance of control charts? Explain control chart for variables. **[8]**

OR

Q7) a) Explain OC curve. How it can be used? **[8]**

b) Explain the theory of work sampling. **[8]**

Q8) a) Explain PDCA and PDSA cycle. **[8]**

b) Explain 5 s in Toyota production system. **[8]**

OR

Q9) a) Explain 7 QCtools used in quality improvement. **[8]**

b) Explain in brief. **[8]**

i) Six sigma.

ii) Pokayoke.

iii) Kaizen.

iv) Kanban.

Q10) Write short notes on (Any THREE): **[18]**

a) Concurrent Engineering.

b) Hypothesis testing.

c) Quality function deployment.

d) Just in Time.

e) Failure mode & Error Analysis.

Total No. of Questions : 8]

SEAT No. : ____

P4554

[Total No. of Pages : 2

[4958] - 123

T.E. (Mech.) (S/W)

BEHAVIOURAL SCIENCE (Self Study)

(2008 Pattern) (Elective - I(b))

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

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the formation and working of partnership organisation and joint stock company. Stating their merits and demerits. **[10]**

b) Compare different forms of public sector undertaking. **[6]**

Q2) a) Suggest a suitable organisational structure of a Automobile Ancillary industry. **[8]**

b) Explain the function of management. **[8]**

Q3) Explain the following : **[16]**

a) Wage legislations.

b) Trade Union Role.

Q4) Write a short note on : **[18]**

a) Theory of motivation.

b) Personality traits.

c) Planning and design.

P.T.O.

SECTION - II

Q5) a) Explain various types of group behaviour. **[10]**

b) Explain Resolution of conflicts. **[6]**

Q6) a) What are the various leadership process and leadership style. **[10]**

b) Discuss quality awards models and role of self assessment. **[6]**

Q7) Explain the following : **[16]**

a) Transitional Analysis.

b) Model of motivation.

Q8) Write a short note on : **[18]**

a) Interview technique.

b) Path-goal model of leadership.

c) Grape vine theory.

Total No. of Questions : 12]

SEAT No. :

P4555

[Total No. of Pages : 2

[4958] - 124

T.E. (Mechanical Sandwich)

WELDING TECHNOLOGY

(2008 Pattern) (Semester - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***

SECTION - I

Q1) a) Describe Classification of gas welding? **[6]**

b) Write short note Oxy Acetylene Welding? **[6]**

c) Explain applications of gas welding. **[6]**

OR

Q2) a) Explain advantages of gas welding? **[6]**

b) Write short note on gas Welding Techniques? **[6]**

c) Explain types of flames? **[6]**

Q3) a) What is Arc Welding and explain its process? **[8]**

b) Explain Submerged Arc welding and MIG? **[8]**

OR

Q4) a) Explain types of electrodes? **[8]**

b) Explain Plasma Arc Welding and Flux core Arc Welding? **[8]**

P.T.O.

Q5) a) Define and Explain Fundamentals of electric resistance welding? **[8]**
b) Advantages and Limitations of Resistance Welding? **[8]**

OR

Q6) a) Explain Spot Welding with diagram and advantages? **[8]**
b) Explain Projection welding with neat sketch? **[8]**

SECTION - II

Q7) a) Explain solid state welding and list types? **[6]**
b) Advantages of solid state welding? **[6]**
c) What is cold welding process? **[6]**

OR

Q8) a) Explain ultrasonic welding? **[6]**
b) Write short note on Thermit welding? **[6]**
c) Explain Electron beam Welding. **[6]**

Q9) a) What is Principle operation of Brazing and soldering? **[8]**
b) Advantages, Limitation and application of brazing welding? **[8]**

OR

Q10)a) Comparison of soldering, brazing and regular welding? **[8]**
b) Explain Adhesive Welding and its application? **[8]**

Q11)a) Explain defects in welding with neat sketch? **[8]**
b) Discontinues in welding and quality check of welding? **[8]**

OR

Q12)a) List different Factors involved in welding costing? **[8]**
b) What is remedies for welding defects? **[8]**

❖ ❖ ❖ ❖

Total No. of Questions :12]

SEAT No. :

P2818

[Total No. of Pages :7

[4958]-125

T.E. (Mechanical S/W)

THEORY OF MACHINES AND MACHINE DESIGN - II

(2008 Course) (Semester - II) (302064)

Time : 4Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain with the help of neat sketches, what is meant by 'function generation, and rigid body guidance? **[4]**

b) Construct the profile of a cam to suit the following specifications: **[12]**

Cam shaft diameter = 40 mm; Least radius of cam = 25 mm; Diameter of roller = 25 mm;

Angle of lift = 120^o ; Angle of fall = 150^o; Lift of the follower = 40 mm;

Number of pauses are two of equal interval between motions.

During the lift, the motion is S.H.M. During the fall the motion is uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the centre of the cam.

OR

Q2) a) Derive relation for displacement, velocity and acceleration of follower which has cycloidal motion during rise. **[6]**

b) Determine the proportions of four bar mechanism, by using three precision points, to generate $y = x^{1.5}$, where x varies between 1 and 4. Assume $\theta_S = 30^o$; $\Delta\theta = 90^o$, $\varphi_S = 90^o$; and $\Delta\varphi = 90^o$. Take length of the fixed link AD as 25 mm. **[10]**

P.T.O.

Q3) a) State and prove the law of gearing. **[6]**

b) Two helical gears are to be used to transmit 200 KW with a velocity ratio of 3:1 in between parallel shafts. The teeth are of involute shape with a normal pressure angle of 20^o, normal module of 12.5 mm and standard addendum of one module, and pinion has 20 teeth and rotates at 650 rpm. If the helix angle is 30^o, determine; **[10]**

i) the center distance,

ii) the axial thrust on the gear,

iii) the transverse pressure angle,

iv) normal tooth load.

OR

Q4) a) Two mating gears have 20 and 40 involute teeth of module 10 mm and 20^o pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio. **[6]**

b) An epicyclic train of gears is arranged as shown in Fig.1 How many revolutions does the arm, to which the pinions B and C are attached, make; 1. when A makes one revolution clockwise and D makes half a revolution anticlockwise, and 2. when A makes one revolution clockwise and D is stationary? The number of teeth on the gears A and D are 40 and 90 respectively. **[10]**

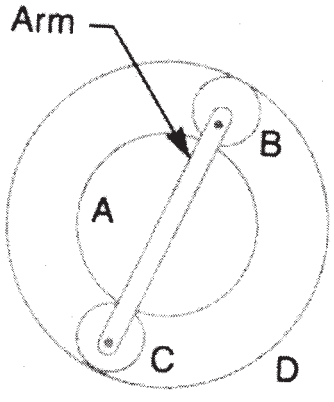


Figure 1

Q5) a) Derive an expression for tension ratio in case of band and block break in terms of coefficient of friction, block angle of contact and number of blocks in the shoe. **[8]**

b) The turbine rotor of a ship has a mass of 2000 kg and rotates at a speed of 3000 r.p.m. clockwise when looking from a stern. The radius of gyration of the rotor is 0.5 m. Determine the gyroscopic couple and its effects upon the ship when the ship is steering to the right in a curve of 100 m radius at a speed of 16.1 knots (1 knot = 1855 m/hr). Calculate also the torque and its effects when the ship is pitching in simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 50 seconds and the total angular displacement between the two extreme positions of pitching is 12^o. Find the maximum acceleration during pitching motion. **[10]**

OR

Q6) a) Explain belt transmission dynamometer with neat sketch. **[4]**

Explain the following terms with neat sketch: **[6]**

i) Precession in Gyroscope,

ii) Reactive Gyroscopic couple,

iii) Axis of spin,

iv) Axis of couple.

b) A band and block brake, having 14 blocks each of which subtends an angle of 15^o at the centre, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum, find: **[8]**

i) maximum braking torque,

ii) angular retardation of the drum, and

iii) time taken by the system to come to rest from the rated speed of 360 r.p.m.

The coefficient of friction between blocks and drum may be taken as 0.25.

SECTION-II

Q7) a) Explain various gear tooth failures along with the remedies. **[6]**

b) Following data is given for a helical gear pair hardened to 350 BHN (20^o full depth involute) transmitting 1 kW power from an electric motor at 720 r.p.m. to a machine running at 360 rpm. **[12]**

Number of teeth on pinion 18

Centre distance 180 mm

Helix angle 26^o

Permissible bending stress 150 MPa for both gears

Face width 12 times normal module

Service factor 1.1

Combined tooth error 40 microns

Deformation factor 11600 times total error in tooth profiles

Determine the factor of safety in pitting. Use

$$P_d = \frac{21v(bc\cos^2\alpha + P_{t\max})\cos\alpha}{21v + \sqrt{bc\cos^2 a + P_{t\max}}};\ \text{and}\ Y = 0.484 - \frac{2.87}{z'}.$$

OR

Q8) a) Design a worm gear pair based on wear strength and suggest the minimum surface area to be provided for the gear box if it has to work with natural circulation. Use following data **[13]**

- Number of starts on worm — single
- Motor power — 3kW
- Motor speed — 1500 rpm
- Required reduction — 30:1

- Wear factor $0.6N/mm^2$
- Gear tooth system 20^o full depth involute
- Service factor 1.2
- Factor of safety 1.4
- Permissible temperature rise 50^o
- Coefficient of friction 0.03
- Overall heat transfer coefficient 18 $W/m^2\ ^oC$
- Standard modules: 1, 1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12, 16 mm.

b) Explain the following terms related to helical gears. **[5]**

i) Tooth advance

ii) Leading edge

iii) Trailing edge

iv) Minimum face width

v) Normal pressure angle

Q9) a) Obtain an expression for the force required to disengage a cone clutch.**[4]**

b) A multi-plate clutch is used to transmit 5 kW power at 1440 rpm. The inner and outer diameters of contacting surfaces are 50 mm and 80 mm respectively. The coefficient of friction and average allowable pressure intensity for the lining may be assumed as 0.10 and 350 kPa. Determine **[12]**

i) Number of friction plates and presure plates.

ii) Axial force required to transmit power.

iii) The actual average pressure.

iv) Actual maximum pressure intensity after wear.

OR

Q10)a) A single row deep groove ball bearing is subjected to the following work cycle which is given in table 1. **[12]**

If the desired life of bearings is 8000 hours, select the bearing from the data given in table 2.

Table 1: Work cycle

Fraction of cycle	Radial load kN	Axial load kN	Radial factor X	Thrust factor Y	Race rotation	Service factor	RPM
1/10	1.5	0.25	1.0	0	Inner	1.2	400
1/4	1.0	0.75	0.56	2.0	Outer	1.8	500
1/2	5.0	1.1	0.56	2.0	Inner	1.5	600
balance	1.0	-	1.0	0	Outer	2.0	800

Table 2

Bearing Designation	6011	6211	6311	6411
Dynamic load carrying capacity C kN	28.1	43.6	71.5	99.5

b) What are various bearing mounting methods? Explain them using neat sketches. **[4]**

Q11)a) Describe the Soderberg, Goodman and Modified Goodman diagrams.**[6]**

b) A mechanical component is subjected to the following reversed bending stress cycles. **[10]**

i) 450 MPa for 30% of time.

ii) 750 MPa for 60% of time.

iii) 230 MPa for remaining time.

The component is made of plain carbon steel which has S_{ut} 660 MPa. If the corrected endurance limit of the component is 275 MPa, determine the life.

OR

Q12)a) What is Cumulative damage in fatigue? **[4]**

b) A solid circular shaft, 15 mm in diameter is subjected to torsional shear stress which varies from 0 to 35 MPa and at the same time is subjected to an axial stress that varies from - 15 MPa to + 35 MPa. The frequency of variation of these stresses is equal to the shaft speed. The shaft is made of steel with S_{ut} = 540 MPa and S_{yt} = 400 MPa and corrected endurance strength of the shaft is 200 MPa. Determine the factor of safety using modified Goodman diagram. **[12]**

EEE

Total No. of Questions :12]

SEAT No. :

P3893

[Total No. of Pages :3

[4958]-127
T.E. (Mechanical) (S/W)
MECHATRONICS
(2008 Pattern) (Semester - II) (302065)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer Q.No 1 or Q.No. 2, Q.No.3 or Q.No.4, and Q.No. 5 or Q.No. 6 from section-I and Q.No.7 or Q. No 8, Q.No.9 or Q.No.10, Q.No.11 or Q.No.12 from section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Electronic pocket calculator is allowed.***
6) ***Assume Suitable data, if necessary, and mention it clearly.***

SECTION - I

Q1) a) Draw a suitable diagram and discuss the use of capacitive sensor for measurement of level of liquid in a tank. Also, list two significant advantages offered by the capacitive sensor. **[8]**

b) Discuss four major categories for classifying a rotary position sensor. Also, list one example in each of the four categories. **[8]**

OR

Q2) a) Temperature of a liquid is to be measured using a RTD. Draw a suitable diagram and explain the construction as well as the working of the said sensor. **[8]**

b) Draw a suitable block diagram of a generic mechatronic system and discussthe working of each of the components in the block diagram.**[8]**

Q3) a) Using suitable diagram/s and explain the construction and working of the LVDT. **[8]**

b) Draw a suitable diagram and explain the construction and working of the optical encoder. **[8]**

OR

P.T.O.

Q4) a) Draw a suitable diagram and explain the working of linear potentiometer. Also, list the advantages and applications of the potentiometer. **[8]**

b) Draw suitable diagrams and explain the construction and working of the variable reluctance sensor. **[8]**

Q5) a) Explain the construction and working of a four bit SAR type Analog to Digital Converter. **[10]**

b) For the system in Figure 5b, derive the transfer function: (y(s)/f(s). **[8]**

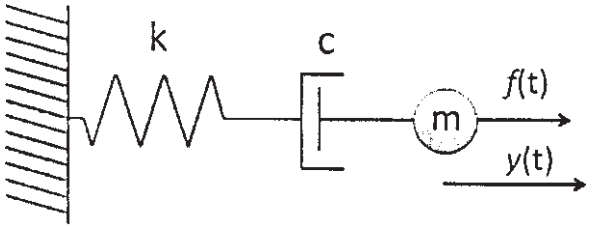


Figure 5b

OR

Q6) a) Explain the construction and working of a four bit R-2R type Digital to Analog Converter. **[10]**

b) Using a suitable circuit diagram explain the construction and working of a Sample & Hold Amplifier. **[8]**

SECTION - II

Q7) a) Differentiate between feedback and feed-forward control system. **[8]**

b) Discuss, in detail, following four terms: **[8]**

i) Process Load.

ii) Process Lag.

iii) Dead Time.

iv) Control Parameter Range.

OR

Q8) a) Draw a suitable block diagram and explain the working of a closed loop control system. Also, list two advantages and two dis-advantages of the closed loop control system. **[8]**

b) Discuss the assumptions made while using the transfer function approach for modelling a system. Also, list two advantages and two dis-advantages of the said approach. **[8]**

Q9) a) Derive the transfer function of the PD controller. Also, discuss the significance of adding the derivative term to the controller. **[8]**

b) Discuss the process of manual tuning of the PID controller. **[8]**

OR

Q10)a) Derive the transfer function of the PI controller. Also, discuss the significance of adding the integral term to the controller. **[8]**

b) A controller output 0 to 5 V DC to control the heater from 10 W to 100 W with linear dependence. Calculate: **[8]**

i) The voltage corresponding to 55 W.

ii) This value of voltage expressed as % of controller output.

Q11)a) Draw a suitable block diagram and explain the application of mechatronics in bottle filling. **[12]**

b) Write six distinct points of comparison between relay controller and PLC. **[6]**

OR

Q12)a) Write short note on: **[12]**

i) Counter.

ii) Communication Bus.

b) Explain on delayed timers used in PLC programming with one application and corresponding ladder program. **[6]**

Total No. of Questions :12]

SEAT No. :

P2819

[Total No. of Pages :3

[4958]-128
T.E. (Mechanical S/W)
TRIBOLOGY
(2008 Course) (302066) (Semester - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain use of tribology in design? **[8]**

b) Discuss the various types of lubricant properties physical and chemical? **[8]**

OR

Q2) a) What is lubrication? Write it's basic modes of lubrication? **[8]**

b) Write note on **[8]**

i) Sliding contact bearing

ii) Rolling contact bearing?

Q3) a) What are various laws of friction and explain them? **[8]**

b) Explain in detail causes of friction? **[8]**

OR

Q4) a) Write in detail various factor affecting on wear? **[8]**

b) Derive the equation for volume of abrasive wear with usual notation? **[8]**

Q5) a) Write in detail concept of temperature rise? **[8]**

b) Explain in detail infinitely long journal bearing? **[10]**

OR

P.T.O.

Q6) a) The following data is given for hydrodynamic journal bearing.

Journal diameter = 75 mm, radial load = 10 KN, journal speed = 1440rpm, minimum film thickness = 22.5 microns, inlet temperature = 400C, bearing material is babbit. Calculate

i) length of bearing

ii) select suitable oil for this application. **[10]**

b) Explain in detail bearing design – selection of parameters? **[8]**

SECTION - II

Q7) a) Write in detail basics modes of lubrications? **[8]**

b) Explain in detail viscous flow through rectangular slot? **[8]**

OR

Q8) a) Write in detail energy losses in hydrostatic bearing? **[8]**

b) The following data is given for hydrostatic step bearing of vertical turbo generator

Thrust load = 400KN, shaft diameter = 400mm, recess diameter = 200mm, shaft speed = 700 rpm, viscosity of lubricant = 30cp. Draw neat sketch showing effect of film thickness. Calculate **[8]**

a) optimum film thickness for minimum power loss.

Q9) a) Explain lubrication in rolling and forging? **[8]**

b) Explain in detail gas lubrication with its merits, demerits and application? **[8]**

OR

Q10)a) What is concept of maintenance of oil quality? **[8]**

b) A plate of 35 mm length and infinite width is separated from the plane by an oil film 30 microns thickness and having viscosity of 0.06 N-s/m^2. If the normal load per unit width of 25 KN/m is applied on the plate, determine:

i) The time required to reduce the film thickness to 3.5 microns; and

ii) The maximum pressure. **[8]**

Q11)a) Write short notes on **[10]**

i) Centre of pressure

ii) Labyrinth Seals.

b) Explain in detail equation of pressure in hydrostatic thrust bearing? **[8]**

OR

Q12)a) The following details are given for 360^{o} hydrodynamic bearing: **[10]**

- Radial Load = 3.2KN
- Journal Speed = 1490 Rpm
- Journal Diameter = 50 Mm
- Bearing Length = 50 Mm
- Radial Clearance = 0.05 mm
- Viscosity Of Lubricant = 25cp

Assuming that total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate:

i) Coefficient of friction

ii) Power lost in friction

iii) Minimum oil film thickness

iv) Flow requirement in 1 lit/min

v) Temperature rise

b) Write in detail throttling bush seals? **[8]**

x x x

Total No. of Questions :12]

SEAT No. :

P2820

[Total No. of Pages :4

[4958] - 131

T.E. (Automobile Engineering)

MACHINE DESIGN

(Semester - I) (2008 Pattern) (316481)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer to the two sections should be written in separate book.***
3) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) What are the stresses induced in shafts? **[3]**

b) A commercial steel shafting 2 m long between bearings carries a 1000 N pulley at its midpoint. The pulley is keyed to the shaft receives 30 kW at 150 RPM which is transmitted to a coupling. The belt drive is horizontal and ratio of tensions is 3 and diameter of pulley is 955 mm. Calculate the diameter of shaft. Take maximum shear stress for combined bending and torsion as 41 MPa. **[15]**

OR

Q2) a) Explain the different types of keys with sketches. **[8]**

b) Design a rigid flange coupling to transmit 40 kW at rated speed of 1000 RPM. Allowable shear stress is 81 MPa for shaft, allowable shear stress is 36.52 MPa for hub, bending stress is 194.4 MPa and allowable crushing stress is 324 MPa. **[10]**

P.T.O.

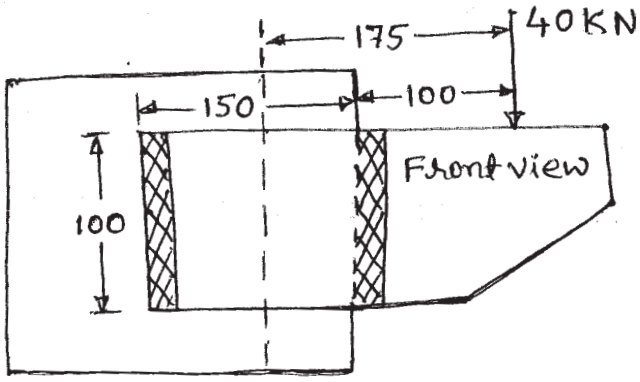
Q3) a) Derive an expression for torque required to raise the load. **[10]**

b) A square threaded power screw has a nominal diameter of 30 mm and a pitch of 6 mm with double threads. The load on the screw is 6 kN and the mean diameter of thrust collar is 40 mm. The coefficient of friction for the screw is 0.1 and for the collar is 0.09. Determine the torque required to raise the load, the torque required to lower the load and over all efficiency. **[6]**

OR

Q4) a) Explain the different types of threaded fastenings. **[6]**

b) Determine the size of weld for the bracket. Design stress for the plate material is 80 MPa. $\left(J = \frac{tm(m^2 + 3n^2)}{6} \right)$ **[10]**



Q5) a) What are the causes of stress concentration? **[2]**

b) Write short notes on Notch sensitivity and cumulative fatique damage. **[6]**

c) Derive Soderberg equation for fluctuating loads. **[8]**

OR

Q6) a) Draw the modified goodman diagram and explain. **[6]**

b) A simply supported beam has a concentrated load at the centre. The load fluctuates from p to 4P. The span of the beam is 500 mm, circular cross - section with diameter 60 mm. The yield stress is 390 mPa and endurance limit is 260 MPa. Surface correction factor is 0.85 and factor of safety is 1.5. Calculate P. (K_{ft} = 1, A = 1, B =1). **[10]**

SECTION - II

Q7) a) Derive an expression for shear stress in helical springs. **[6]**

b) Design a compression helical spring to carry a load of 500N with a deflection of 25 mm. The spring index may be taken as 8. Permissible shear stress is 350 MPa, modulus of rigidity is 84000 MPa and a = 6.68mm. **[10]**

OR

Q8) a) What is nipping in leaf springs? Explain. **[6]**

b) Find the thickness of semi-elliptical spring having 1m span carrying a load 5400N. The permissible stress for the spring is 490 MPa. Also calculate the width if leaves are unstressed initially and leaves are stressed initially. Given deflection = 75 mm, full length leaves = 2, graduated leaves = 6, E = 2.1×10^5MPa. (c_1 = 3 and c_2 = 2). **[10]**

Q9) a) Explain the hydrodynamic theory of lubrication. **[6]**

b) What is the significance of l/d ratio in bearing design? **[2]**

c) The following data is given for a 360° hydrodynamic bearing radial load = 3.2kN journal speed = 1490 rpm, journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm, viscosity of lubricant = 25 cP. Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate coefficient of friction, power lost in friction, minimum oil film thickness, flow requirement in litres/min and temperature rise. Refer the data from table. **[8]**

l/d	h_o/c	s	$\left(\frac{r}{c}\right)f$	$\frac{Q}{rcnl}$
∞	1	∞	∞	π
1	0.4	0.121	3.22	4.33
0.5	1	∞	∞	π

OR

Q10)a) Derive Petroff's equation for bearing. **[8]**

b) A 6306 radial ball bearing with inner ring rotation has a 10 seconds work cycle as follows.

	For 2 seconds	For 8 seconds
Radial load	4kN	3kN
Axial load	2kN	0
Speed	900 rpm	1200 rpm

If basic dynamic capacity of the bearing is 24.25 kN. Determine the expected life of this bearing (x = 0.56, y = 1.43) v = 1, average life of bearing is 5 times the rated life. **[8]**

Q11)a) Derive the Lewis equation for beam strength. **[10]**

b) What are the applications of worm and worm gears? **[5]**

c) What do you mean by miter gears? **[3]**

OR

Q12)a) Design a pair of helical gears are to transmit 15 kW at 10000 rpm of the pinion with PCD 80 mm. The transmission ratio is 3:1. The pinion and gear are made up of same material. Assume $\alpha = 20°$, $\beta = 45°$, $\sigma_d = 193.2$ MPa, BHN = 250 for both, $C_v = \frac{5.55}{5.55+\sqrt{v}}$, $C_w = 1.15$, Form factor $Y = \pi\left(0.154 - \frac{0.912}{z_e}\right)$, $b = \frac{1.15\pi m_n}{\sin\beta}$, $F_t = \frac{\sigma_d c_v b Y m_n}{C_w}$,

C = 145.315 N/mm, $F_d = F_t + \frac{k_3 v(cb.\cos^2\beta + F_t).\cos\beta}{k_3 v + \sqrt{cb.\cos^2\beta + F_t}}$,

$K_3 = 20.67$, $F_w = \frac{d_1 b Q k}{\cos^2\beta}$, $Q = \frac{2z_2}{z_1 + z_2}$. **[15]**

b) What are the applications of helical gears? **[3]**

Total No. of Questions :12]

SEAT No. :

P2821

[Total No. of Pages :6

[4958]-132
T.E. (Automobile)
AUTOMOTIVE ENGINE DESIGN
(2008 Pattern) (Semester - II) (316483)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Derive an expression for efficiency of Otto cycle. **[6]**

b) In an ideal diesel cycle, the pressure & temperature are 1.03 bar & 27°C respectively. The max pressure in cycle is 47 bar & the heat supplied during the cycle is 545 kJ/Kg determine **[10]**

i) The compression ratio.

ii) The temperature at the end of compression.

iii) The temperature at the end of constant pressure combustion.

iv) The air standard efficiency.

Assume $\gamma = 1.4$ & $C_p = 1.004$ kJ/KgK for air.

OR

Q2) a) Derive an expression for thermal efficiency of Diesel cycle. **[6]**

b) In an Otto cycle air at 17°C and 1 bar is compressed adiabatically until the pressure is 15 bar. Heat is added at constant volume until pressure rises to 40 bar. Calculate the air std efficiency, the compression ratio & the mean effective pressure for the cycle. Assume $C_V = 0.717$ kJ/kgK & R = 8.314 kJ/KmolK. **[10]**

P.T.O.

Q3) a) Explain the design considerations of combustion chamber for SI engine. **[6]**

b) Estimate-bore diameter, stroke length, swept volume, engine speed for a diesel engine which develops 91 KW power with mean effective pressure of 0.7 N/mm^2 & mean piston speed is 650m/min. **[10]**

OR

Q4) a) Explain engine balancing along with its methods. **[6]**

b) If 42.5 KW engine has a mechanical efficiency of 85%. Find the indicated power & frictional power. If the frictional power is assumed to be constant with load, what will be the mechanical efficiency at 60% of load? **[10]**

Q5) a) Explain Dry sump lubrication system with neat sketch. **[8]**

b) A two stroke diesel engine was motored when the meter reading was 1.5KW. Then the test on the engine was carried out for one hour & the following observations were recorded. **[10]**

Brake torque =125 Nm

Speed = 600rpm

Fuel used = 2.5kg/hr.

Calorific value of fuel = 40.3MJ/kg

Cooling water used = 818 kg/min

Rise in temperature of cooling water = 100 C

Exhaust gas temperature =3450 C

Room temperature = 250 C

A/F = 32 :1

Specific heat of exhaust gas = 1.05KJ/kg K

Determine:

i) Brake power

ii) Indicated power

iii) Mechanical efficiency

iv) Indicated thermal efficiency

v) Draw heat balance sheet on minute basis

OR

Q6) a) Describe the types of cooling system and explain their advantages and applications. **[6]**

b) The following observations were recorded during a trial on a four stroke diesel engine. Power absorbed by non-firing engine when driven by an electric motor = 10KW. Speed of engine = 1750rpm. **[12]**

Brake torque = 327.4 Nm

Fuel used = 15kg/hr.

Calorific value of fuel = 42000KJ/kg

Air supplied = 4.75 kg/min

Cooling water circulated = 16kg/ min

Outlet temperature of cooling water = 65.80C

Temperature of exhaust gas = 4000C

Room temperature = 20.80C

Specific heat of water = 4.19KJ/kg K

Specific heat of exhaust gas = 1.25KJ/kg K

Determine:

i) Brake power

ii) Indicated power

iii) Mechanical efficiency

iv) Indicated thermal efficiency

v) Brake thermal Efficiency

vi) Brake specific fuel consumption

vii) Draw heat balance sheet on kW basis

SECTION-II

Q7) a) Following data is given for a single acting four stroke diesel engine: **[10]**

Cylinder bore = 300mm

Length of stroke = 450mm

Speed = 300rpm

Indicated mean effective pressure = 0.85 MPa

Maximum gas pressure = 5 MPa

Fuel consumption = 0.30 kg per BP per hr.

Higher calorific value = 44000KJ/kg

Assume suitable data if required & state the assumptions you make. Design,

i) Piston head on the basis of stress & thermal Considerations.

ii) Piston rings.

b) The Cylinder of four stoke diesel engine has the following specification, **[8]**

Cylinder bore = 150mm,

Maximum gas pressure = 3.5 N/mm^2,

Cylinder material = Grey C.I FG200 (S_{ut} = 200MPa)

Factor of Safety = 5,

Poisson's ratio = 0.25,

Determine thickness of the wall & net circumferential stresses in the cylinder wall.

OR

Q8) a) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore = 150mm, length of stroke=275mm, engine speed = 500 rpm, maximum gas pressure = 3.5 MPa, seat angle = 45^{o}. Calculate: **[10]**

i) Diameter of the valve port

ii) Thickness of the valve head

iii) Diameter of the valve stem

iv) Maximum lift of the valve

Assume mean velocity of the gas = 50m/s, constant k for steel valve as 0.42 and permissible bending stress as 50 N/mm^2.

b) Determine the dimensions of cross section of the connecting rod for a diesel engine with following data: **[8]**

Cylinder bore = 100mm

Length of connecting rod = 350mm

Maximum gas pressure = 4MPa

Factor of safety = 6.

Q9) a) Explain Cylinder Compression Test procedure. **[8]**

b) Explain Cylinder Leakage Test procedure. **[8]**

OR

Q10) Write short notes on: **[16]**

a) Engine Vacuum Gauge Testing.

b) Engine Cylinder Power Balance Testing.

c) Ignition Timing Setting.

d) Exhaust Gas Analyzer.

Q11)a) Explain Homogeneous Charge Compression ignition (HCCI) Engine. **[8]**

b) Write the advantages of Dual Twin Spark-ignition (DTS-i) over single spark ignition Engine. **[8]**

OR

Q12)a) Write a note on Wankel Engine & Dual fuel engine. **[8]**

b) Explain the Variable valve timing (VVT) with neat sketch. **[8]**

EEE

Total No. of Questions :12]

SEAT No. :

P2823

[Total No. of Pages :3

[4958]-134
T.E. (Automobile)
AUTOTRONICS
(2008 Pattern) (Semester - II) (316485)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION -I

Q1) a) Write brief on static characteristics of instrument. **[6]**

b) List commonly used transduction systems in automobile. **[4]**

c) Explain principle of working of power window. **[6]**

OR

Q2) a) Define and explain stages of measurement. **[6]**

b) Define and explain loading of dead zone and dead time. **[4]**

c) Explain working principle of capacitive transducer. **[6]**

Q3) a) Explain construction, working and application of throttle position sensor. **[8]**

b) Explain Manifold Absolute Pressure (MAP) sensors. **[8]**

OR

P.T.O.

Q4) a) Explain construction and classification of combustion knock sensor. **[6]**

b) Explain working principle of Air flow measurement. **[4]**

c) Explain principle of working Optical Sensor. **[6]**

Q5) a) Explain the Ladder diagram programming with suitable example. **[8]**

b) Write in brief about sequential logic. **[6]**

c) What is timing diagrams? **[4]**

OR

Q6) Write short note on following: **[3×6=18]**

a) D/A converters.

b) Input/output processing.

c) Logic functions used for switches in series and parallel.

SECTION -II

Q7) a) Explain group and sequential injection system. **[9]**

b) Discuss about fuel system components. **[9]**

OR

Q8) a) Discuss in detail about fuel control MAPs. **[6]**

b) Explain ECU and microcontroller. **[6]**

c) Explain open loop and closed loop system. **[6]**

Q9) a) What is the need of ABS system. **[6]**

b) List various components of Global Positioning Systems. **[6]**

c) Explain in brief about Radar Warning System. **[4]**

OR

Q10)a) Explain crash sensors in airbag system. **[6]**

b) Explain seat belt tightening and Web clamps. **[6]**

c) Write in brief about cruise control system. **[4]**

Q11)a) Explain operation of rollover mitigation system. **[8]**

b) Explain in brief about sensors used for sensing vehicle moments. **[8]**

OR

Q12)a) Explain operation of electronic stability system. **[8]**

b) Discuss any 2 vehicle safety systems in brief. **[8]**

EEE

Total No. of Questions :12]

SEAT No. :

P2824

[Total No. of Pages :2

[4958]-136

T.E. (Automobile Engineering)

VEHICLE BODY ENGINEERING

(Semester - II) (2008 Pattern) (End Sem)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 from section - I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section - II.***
2) ***Assume suitable additional data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Answer to the two sections should be written in separate answer books.***

SECTION - I

Q1) a) Write in brief about Historical development of cars? **[8]**

b) Write in brief about closed wind tunnel. **[8]**

OR

Q2) a) Explain with neat sketch forces & moments on vehicle body. **[8]**

b) Explain car as bulf body & flow seperation around vehicle in brief. **[8]**

Q3) a) Draw & explain types of car. **[10]**

b) Explain car construction with nomenclature. **[8]**

OR

Q4) a) Explain the term 'Visibility & blind spot.' Give remedies to improve visibility. **[10]**

b) Draw driver cabin with controls in case of car. & explain in brief. **[8]**

Q5) a) Draw with suitable scale & dimensions. 30 capacity bus having rear engine, travelling 250 km/ day. **[10]**

b) Explain emergency exit. **[6]**

OR

P.T.O.

Q6) a) Draw with suitable scale & dimensions 40 capacity city bus. **[10]**

b) Explain seat construction in bus. **[6]**

SECTION - II

Q7) a) Explain different construction vehicle with neat sketch. **[8]**

b) Explain tanker with suitable diamentional sketch. **[8]**

OR

Q8) a) Write a short note on driver cabin of commercial vehicles. **[8]**

b) Explain tipper with suitable diamentional sketch. **[8]**

Q9) a) Write a short note on assymetric vertical loading of vehicle. **[8]**

b) Explain bending of frames. **[8]**

OR

Q10)a) Write a short note on idealized structure & its importance. **[8]**

b) Explain shear pannel method in brief. **[8]**

Q11)a) Enlist any 4 types of seats & draw with neat sketch. **[9]**

b) Draw & explain any 3 vehicle safety systems. **[9]**

OR

Q12)a) 'Antropometry is the important term in vehicle designing' Explain in brief. **[9]**

b) Explain in brief about energy absorbing devices. **[9]**

Total No. of Questions : 12]

SEAT No. :

P4512

[Total No. of Pages : 4

[4958] - 141
T.E. (E & TC)
CONTROL SYSTEMS
(2008 Pattern)

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

Instructions to the candidates :-

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

SECTION - I

Q1) a) Explain: **[8]**

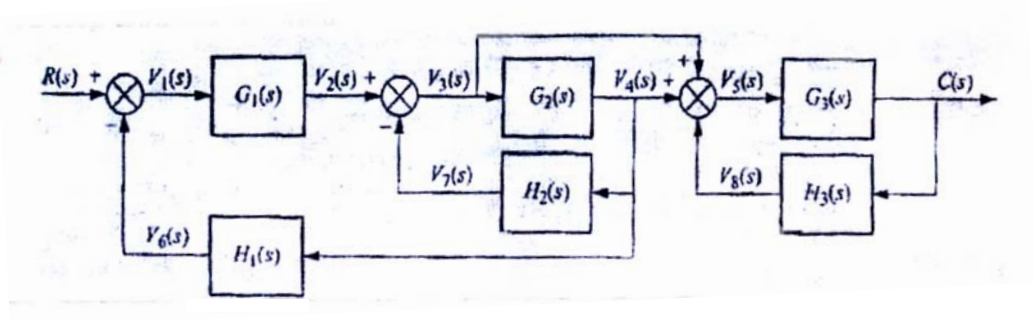
i) Linear Systems,

ii) Feedback and feed-forward formula,

iii) Stable systems,

iv) Open and closed loop systems

b) Reduce the block diagram shown in figure to single block diagram representing closed-loop transfer function. **[10]**



OR

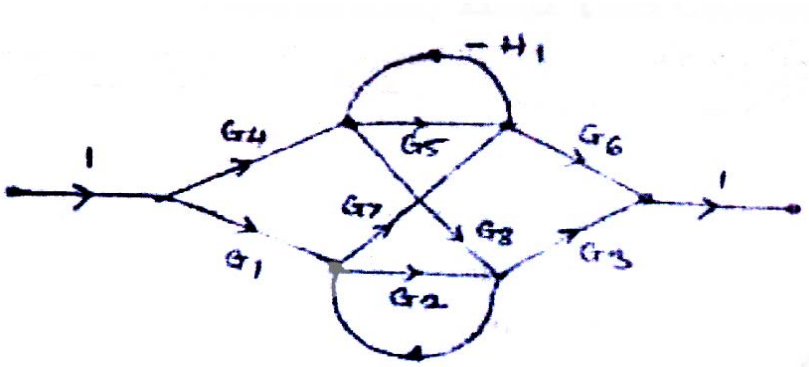
Q2) a) Explain: **[10]**

i) Mason's gain formula

ii) Block diagram reduction rules

P.T.O.

b) Using Masson's gain formula, find the closed-loop transfer function of following SFG. **[8]**



Assume input: R(s) and output: C(s)

Q3) a) Explain Routh-Hurwitz criteria with example. **[8]**

b) Find the time domain specifications of unity feedback systems with open loop transfer function (OLTF) **[8]**

G(s)=9/[s(s+5)]

OR

Q4) Derive an expression for error constants for unit step input. Also find steady state errors for unit step, unit ramp and unit acceleration inputs for **[16]**

i) $\dfrac{10}{s(0.1s+1)(0.5s+1)}$

ii) $\dfrac{1000(s+1)}{(s+10)(s+50)}$

iii) $\dfrac{1000}{s^2(s+1)(s+20)}$

Q5) The open loop transfer function of unity feedback system is

G(s) = k/[s(1+0.02s)(1+0.04s)]. Draw the bode plot and find GM, PM, phase and gain crossover frequencies. Also find oper loop gain so that the system has a phase margin of 45 degree. **[16]**

OR

Q6) List and define different frequency domain specifications and comment of their correlation with time domain specifications. Find the resonance peak and frequency if OLTF G(s)=9/[s(s+4)] **[16]**

SECTION - II

Q7) a) Draw a block diagram of a generalized state space representation of multiple input multiple output system. Write state and output equation and mention each term with dimensions. **[10]**

b) Determine state transition matrix of $A=\begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix}$. **[8]**

OR

Q8) a) Investigate for the complete state controllability and complete state observability of the system with state model matrices

$$A=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -7 & -5 \end{bmatrix}, B=\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, C=\begin{bmatrix} 1 & 0 & 3 \end{bmatrix}.$$

Assume D=[0] **[10]**

b) Obtain state model of the transfer function $G(s)=\dfrac{5s+3}{s^3+7s^2+11s+6}$

in controllable canonical form. **[8]**

Q9) a) Derive an expression for discrete PID controller from continuous PID controller. **[8]**

b) Write short note on programmable Logic Controllers. **[8]**

OR

Q10)a) What is effect of Proportional gain, integral gain and derivative gain of PID in closed loop performance of the systems? Explain any one method to tune the PID controller parameters. **[8]**

b) Explain with ladder diagram: Application of PLC for Elevator. **[8]**

Q11) Write short note on: **[16]**

a) Digital Control Systems

b) Distributed Control Systems and its application in automation

c) Adaptive Control Systems

OR

Q12) Write short note on: **[16]**

a) Predictive Control Concepts

b) SCADA and its application in automation

c) Concept of Robust Control

Total No. of Questions : 12]

SEAT No. :

P2825

[Total No. of Pages : 5

[4958]-142
T.E. (E & TC)
DIGITAL COMMUNICATION
(2008 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions:

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

SECTION - I

Q1) a) With the help of detail diagram explain function of each block of digital communication system. **[8]**

b) We wish to transmit a 100 character alphanumeric message in 2s using 7-bit ASCII coding, followed by an eighth bit for error detection per character. A multilevel PAM waveform with M=32 levels is used.

i) Calculate the effective transmitted bit rate and symbol rate.

ii) Repeat part (a) for 16 level PAM, 8 level PAM, 4 level PAM, PCM(Binary). **[8]**

OR

Q2) a) Compare PCM, DPCM, Delta modulation & Adaptive Delta modulation on the basis of Sampling Frequency, Bit rate & bandwidth requirement.**[8]**

b) Consider an audio signal with spectral components limited to the frequency band 300 to 3300Hz. Assume that the sampling rate of 8000 samples/s will be used to generate a PCM signal. Assume that the ratio of peak signal power to average quantization noise power at the output needs to be 30dB. **[8]**

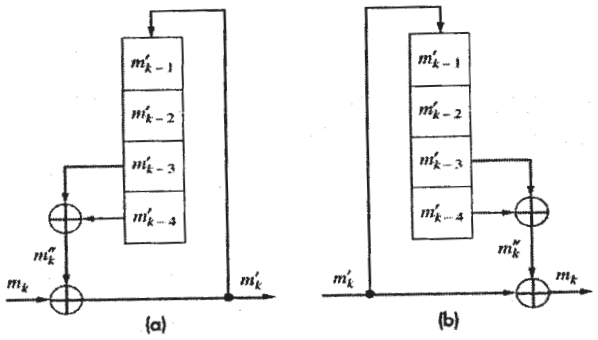
i) What is the minimum number of uniform quantization level needed and what is minimum number of bits per sample needed?

ii) Calculate the system bandwidth (as specified by the main spectral lobe of signal) required for detection of such a PCM signal.

P.T.O.

Q3) a) Explain need of Line coding. State its properties. Draw and give mathematical expression of Power Spectral density for unipolar NRZ, Polar RZ, AMI, and Manchester. **[10]**

b) A scrambler is shown in figure. Design the corresponding descrambler. If a sequence mk = 10110000000001 is applied to the input of this scrambler, determine the output sequence mk'. Verify that if this mk' is applied to the input of the scrambler, the output sequence mk. **[8]**



OR

Q4) a) What is digital Hierarchy used in digital Communication system? Explain anyone with a neat sketch. **[6]**

b) Explain Inter Symbol interference (ISI) with help of block diagram of a binary base band transmission system. Also explain Nyquist solution used for curing ISI. **[8]**

c) Explain the use of Eye Diagram to measure ISI. **[4]**

Q5) a) Show that a narrowband random process X(t) can be completely represented in terms of its in phase and Quadrature components. **[8]**

b) Two random processes z(t) and y(t) are given by **[8]**

$z(t) = A \cos(\omega_c t + \phi)$

$y(t) = A \sin(\omega_c t + \phi)$

Where A and ω_c are constants and ϕ is a uniform random variable over $(0, 2\pi)$. Find the auto correlation and cross correlation of z (t) and y (t).

OR

Q6) a) Explain Ergodic process. If $X(t) = A \cos(2\pi fct + \phi)$ is random process with ϕ as a random variable uniformly distributed over $(0, 2\pi)$. Prove that x(t) is ergodic in mean. **[8]**

b) What is a Wide Sense Stationary Process? When A WSS R.P. X(t) is applied to input of LTI system with impulse response $h(t) = 3\, e^{-2t}\, u(t)$, Find the mean value of system if $E[X(t)] = 2$ and its autocorrelation. **[8]**

SECTION - II

Q7) a) Explain MSK with the help waveforms for input sequence 11000111 along with respective mathematical representation. Compare it with QPSK. **[10]**

b) The bit rate if NRZ data stream is 10Mbps & average energy per bit is 0.02 units. Find the Euclidean Distancee 'd' & Bandwidth for the following Schemes.

i) BPSK ii) 8-PSK,

iii) QPSK, iv) BFSK **[4]**

c) Compare BFSK with BPSK and comment on which is better and why. **[4]**

OR

Q8) a) Compare the Euclidian distance 'd' and Bandwidth of M-ary PSK, M-Ary FSK and QAM with $M=2^n$ for n=3,4. **[10]**

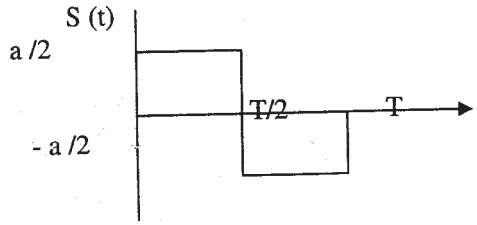
b) The following bit streams are to be transmitted using DPSK scheme **[8]**

i) 1011100011

ii) 0101000111

Determine and sketch the encoded sequence and transmitted phase sequence.

Q9) a) Consider the signal S (t) shown in fig **[8]**



Determine the impulse response of a filter matched to this signal and sketch it as a function of time, Plot the matched filter output as a function of time.

b) Derive the expression for the probability of error of a BFSK system.**[8]**

OR

Q10)a) What is Correlater? Compare its performance with Matched filter mathematically and relevant diagrams. **[8]**

b) Find the bit error probability for a BPSK system with bit rate of 1Mbps. The received waveforms S1 (t) = A $\cos\omega_0 t$ and S2(t) = -A $\cos\omega_0 t$ are coherently detected with a matched filter. The value of A is 10 mV. Assume that noise power special density N0/2 = 10^{-11} W/Hz and that signal power and energy per bit are normalised relative to 1Ω□ load. **[8]**

Given:

x	erfc(x)
1.56	0.02737
1.58	0.02545
1.6	0.02365
1.62	0.02196

Q11)a) Draw the block diagram of Satellite communication and Write a short note on radio link budget analysis. **[8]**

b) In a DSSS-BPSK system, the feedback shift register used to generate the PN sequence of length 15. The system is required to have an average probability of symbol error as 10^{-5} **[8]**

Calculate i) Processing gain ii) Antijam Margin.

Given:

x	erfc(x)
3.01	0.00002074
3.02	0.00001947
3.03	0.00001827
3.04	0.00001714

OR

Q12)a) Represent variation of the frequency of an slow hop spread spectrum system with binary FSK, having following parameters **[8]**

Number of bits per MFSK symbol K = 2.

Number of MFSK tones $M = 2^K = 4$

Length of PN segment per hop k = 3

Total number of frequency hops $2^k = 8$

for the binary message of 01111110001001111010

Generate the PN Sequence for the message to be transmitted. The period of the PN sequence is $2^4-1 = 15$ with initial shift register content of 1100.

b) What is multi-user communication ? Describe different multiple access techniques on the basis of channel sharing and applications. **[8]**

Total No. of Questions :12]

SEAT No. :

P2826

[Total No. of Pages :4

[4958]-143
T.E. (E & TC)
Network Synthesis and Filter Design
(2008 Pattern) (Semester -I) (304183)

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

Instructions to the candidates:

1) ***Answer three questions from section I and thee questions from section II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable additional data if necessary.***
6) ***Use of nonprogrammable calculator is permitted.***

SECTION -I

Q1) a) Check whether following polynomials are Hurwitz or not. **[8]**

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

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

b) What is positive real function? Give necessary and sufficient conditions for a function to be positive real function. **[6]**

c) What is the difference between a network analysis and network synthesis? **[4]**

OR

Q2) a) Comment on the poles positions and the stability of a systems. **[6]**

b) Determine the range of K so that polynomial $P(s) = s^3+3s^2+2s+K$ is Hurwitz. **[4]**

c) Test whether the functions are positive real function. **[8]**

i) $$F(s) = \frac{s^2+4}{s^3+3s^2+3s+1}$$

ii) $$F_5(s) = \frac{s^2+1}{s^3+4s}$$

P.T.O.

Q3) a) State the properties of RL driving point impedance function. **[4]**

b) Realize the following function into Cauer-I and Cauer-II forms. **[8]**

$$Z(s)=\frac{s^4+10s^2+9}{s^3+4s}$$

c) Realize the following function into Foster-I. **[4]**

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

OR

Q4) a) State the properties of RLC driving point function. **[4]**

b) Realize the following function into Foster-I and Foster-II forms. **[8]**

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

c) Synthesize the given impedance function into the network. **[4]**

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

Q5) a) Explain the concept and significance of zero of transmission in network synthesis. **[6]**

b) Synthesize the following into L-C network with 1Ω termination. **[6]**

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

c) Prove that $Z_aZ_b=R^2$ for constant resistance bridged T -networks. **[4]**

OR

Q6) a) Synthesize the voltage ratio $\frac{V_2}{V_1} = \frac{s^2+1}{s^2+2s+1}$ as a constant resistance bridged T network terminated in 1Ω resistance. **[8]**

b) Realize the following voltage ratio transfer function in terms of constant resistance lattice network terminated in 1Ω. **[8]**

$$\frac{V_2}{V_1} = \frac{1}{2}\left[\frac{s-1}{s+1}\right]\left[\frac{s^2-2s+2}{s^2+2s+2}\right]$$

SECTION -II

Q7) a) Find the transfer function of normalized third order (3rd) low pass Butterworth filter. Plot pole zero plot of function. **[6]**

b) Explain the need and concept of magnitude and frequency scaling as used in filter designing. **[4]**

c) Find the order required for Butterworth and Chebyshev approximation, for given specification of low pass filter. **[8]**

$\alpha_p \leq 1\,\text{dB} \qquad \omega \leq 150\text{k rad / sec}$

$\alpha_s \geq 60\,\text{dB} \qquad \omega \geq 200\text{k rad / sec}$

OR

Q8) a) Compare between Butterworth and Chebyshev filters. **[4]**

b) Explain the frequency and Network transformation. **[6]**

c) A low pass filter is shown in Fig.1 Convert this filter into a high pass filter with cut off frequency of 10^6 rad/sec and impedance level of 500Ω. **[8]**

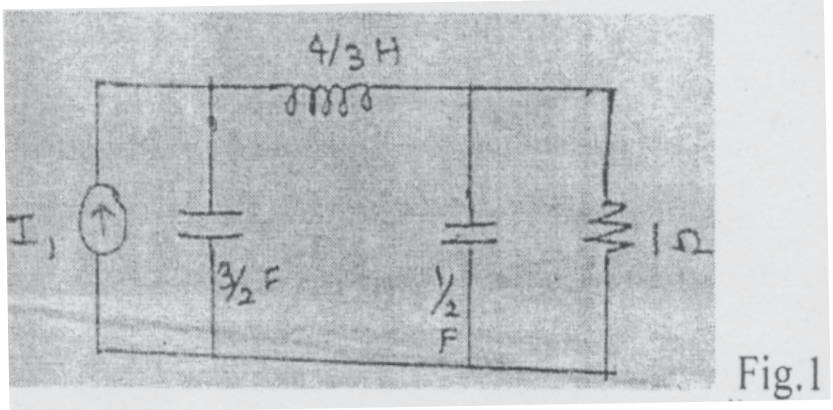


Fig.1

Q9) a) Explain different Biquad feedback topologies used in active filter designing. And list the important observations. **[8]**

b) 10 Synthesize a second order low pass filter to have a pole frequency of 2kHz and a pole 'Q' of 10 .Use Sallen Key circuit based on positive feedback topology. **[8]**

OR

Q10)a) Write short note on FDNR and Gyrator. **[8]**

b) Synthesize a second order band pass filter with center frequency at 5000 rad/sec and pole Q of 50, the gain at the center frequency is required to be 0dB. **[8]**

Q11)a) Explain the effect of following OP-AMP characteristics on the performance of the filter. **[8]**

i) Dynamic range.

ii) Slew rate.

iii) Offset voltage and currents.

iv) Common mode signals.

b) What is frequency compensation? Why is it required? Explain any two techniques used for frequency compensation. **[8]**

OR

Q12)a) What is sensitivity? Write the properties of sensitivity function. **[4]**

b) For the series R-L-C circuit shaw in fig.2 calculate the sensitivity of the resonant frequency (ω_0),the quality factor (Q_0) with respect to R,L and C. Comment on the results obtained. **[12]**

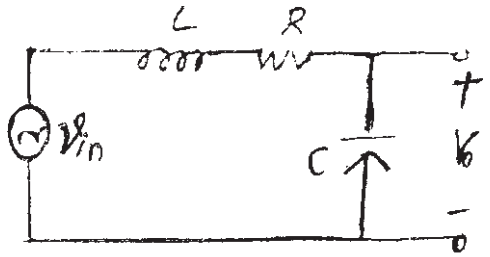


Fig.2

Total No. of Questions :12]

SEAT No. :

P3894

[Total No. of Pages :4

[4958]-144
T.E. (E & TC)
DIGITAL SIGNAL PROCESSING
(2008 Course) (Semester - I) (304185)

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

Instructions to the candidates:

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

SECTION -I

Q1) a) With the help of neat diagram explain the basic elements of DSP. **[5]**

b) Comment on stability of LTI DT System. **[5]**

c) Obtain direct form I and II realization of a system described by **[8]**

$y(n) - 3/4\ y(n-1) - 1/2\ y(n-2) + 1/8\ x(n-2) = x(n) + 1/4\ x(n-2)$

OR

Q2) a) State the sampling theorem. Explain the frequency domain representation of sampling process with reconstruction of the original signal. **[8]**

b) Find the convolution of the following sequences. **[8]**

$h(n) = a^n\ u(n)$ for all n i) $a \neq b$

$x(n) = b^n\ u(n)$ for all n ii) $a = b$

c) Test if the following system is stable or not **[2]**

$x(n) = u(n)$

P.T.O.

Q3) a) State and prove any six properties of DFT **[6]**

b) Compute DTFT of the sequence **[6]**

$x(n) = A$ for $0 \leq n \leq L - 1$

$= 0$ otherwise

c) The first five points of the 8 point DFT of real valued sequence are given below X(k) = {5, 1, 0, 2, 3, ---,---,---}
Determine the remaining three points. **[4]**

OR

Q4) a) Compute 8 point DFT by using DIT FFT algorithm

$x(n) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ **[8]**

b) Compute **[8]**

i) Linear Convolution and

ii) Circular convolution using the DFT and IDFT

$x_1(n) = \{1, 1, 2, 2\}$, $x_2(n) = \{1, 2, 3, 4\}$

Q5) a) State the relationship between Z transform and DFT **[4]**

b) Find the Z transform and Draw Region of Convergence **[6]**

i) $x(n) = 2\,u(n) + 4\,u(-n-1)$

ii) $x(n) = n\,u(n)$

c) Determine the system function and unit sample response of the system described by the difference equation **[6]**

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

OR

Q6) a) State any four important properties of ROC. **[4]**

b) Evaluate the inverse z transform of **[6]**

$$x(z) = \frac{1}{1 - az^{-1}} \qquad |z| > |a$$

c) Determine the causal signal x(n) having the z transform **[6]**

$$x(z) = \frac{1}{(1+z^{-1})((1+z^{-1})^2}$$

SECTION -II

Q7) a) The system function of filter is given by **[6]**

$$H_a(S) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

Design IIR filter using impulse invariance method.

b) Compare Impulse Invariance method with Bilinear Transformation method. **[6]**

c) An analog filter has the following transfer function $H(s) = \frac{1}{(s + 1)}$ using bilinear Transformation technique, determine the transfer function of digital filter H(z) and Write the difference equation of the filter. **[4]**

OR

Q8) a) Compare FIR filter with IIR filter. **[6]**

b) Explain Gibb's Phenomenon. **[6]**

c) Why FIR filters are called as linear phase filters? **[4]**

Q9) a) What do you mean by multirate digital signal processing? What are its applications? **[8]**

b) Draw and explain Polyphase interpolator. **[8]**

OR

Q10)a) Explain application of DAC in compact Hi-Fi system. **[8]**

b) Explain the need of antialiasing filter prior to down-sampling and anti-imaging filter after Upsampling of a signal? **[8]**

Q11)a) Draw the architectural block diagram and explain the important features of TMS 320C 67XX series DSP processor. **[10]**

b) Explain the application of DSP processors in speech processing. **[8]**

OR

Q12)a) Explain the necessity of **[8]**

i) MAC unit

ii) Data Address Generators in Digital Signal Processors.

b) Compare DSP processor with conventional microprocessor. What is use of DAG1 and DAG 2. **[10]**

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Total No. of Questions :12]

SEAT No. :

P2827

[Total No. of Pages :3

[4958] - 145

T.E. (E & TC)

MICRO CONTROLLER AND APPLICATIONS

(Semester - I) (2008 Pattern)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Figure to right indicates marks.***

SECTION - I

Q1) a) State family members and resources of 8051 microcontrollers series. **[8]**

b) i) Explain criteria for choosing microcontroller **[4]**

ii) Compare RISC and CISC processor. **[4]**

OR

Q2) a) Explain Harward & VonNeuman n architecture. **[8]**

b) Draw functional block diagram of 8051 microcontroller and explain in detail. **[8]**

Q3) a) Draw and Explain port structure of 8051 in detail. **[8]**

b) Explain interrupt structure or 8051. Draw the vector diagram of interrupt. **[8]**

OR

P.T.O.

Q4) a) Explain memory organization or 8051 microcontroller. **[8]**

b) Explain TMOD register or 8051. How it will be used as counter. Give significance of GATE bit in TMOD. **[8]**

Q5) a) State and explain addressing modes of following **[10]**

i) MOVC A ⓒA + DPTR

ii) ADDC A, B

iii) ANL A # data

iv) CJNE A, B label

v) MOV A, ⓒRo

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

i) NOP

ii) RETI

iii) MOVX

iv) POP

OR

Q6) a) Write ALP to find factorial of N with suitable example. **[6]**

b) Write an ALP to add two numbers in memory locations, 50 H & 51 H. If switch connected to pin 1.6 is high and perform substraction of same numbers if pin 1.6 is low. **[6]**

c) Find the contents of accumulator after excuting following code, **[6]**

MOV A, # 6 A H

MOV B, # 6 E H

Swap A

ADD A, B

RRC A

RRC A

SECTION - II

Q7) a) Write an ALP to generate square wave using 8 bit DAC. Draw an interfacing diagram. **[8]**

b) Draw and explain interfacing diagram of 8051 to control DC motor. **[8]**

OR

Q8) a) Explain in brief ADC interfacing with 8051. Draw an interfacing diagram. **[8]**

b) Draw 4×4 keyboard interface with 8051. Explain the alongwith or flow chart to know key pressed. **[8]**

Q9) a) Draw an interface or LED with each pin or port B or PIC 18 FXX. Write an ALP to flash it for 250 ms. **[8]**

b) State and explain addressing mode or PIC 18 FXX. **[8]**

OR

Q10)a) Explain capture and compare mode or PIC 18FXX. **[8]**

b) Draw and explain status register or PIC 18 FXX. **[8]**

Q11)Design a PIC/8051 based DAS to measure speed or synchronous motor and display it on LCD. Connect a switch to change direction or roation. Draw the flowchart and explain it's operation. **[18]**

Q12)Design a digital temperature monitoring system using 8051 / PIC 18F. If temperature exceeds 50°C; a fan connected to port should operate to cool it. If temperature falls below heater (a lamp) connected to another part should turn 'on' to heat it. Draw a complete interface diagram and write an ALP.**[18]**

Total No. of Questions :12]

SEAT No. :

P2828

[Total No. of Pages :5

[4958]-146
T.E. (E & TC)
SIGNAL CODING AND ESTIMATION THEORY
(2008 Course) (Semester - II) (304187)

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

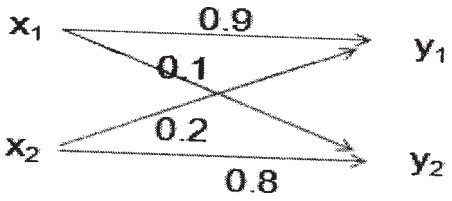
Instructions to the candidates:

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

SECTION-I

Q1) a) A high resolution B/W T.V picture consists about 2×10^6 picture element and 16 different brightness levels. Picture are repeated at the rate of 32 picture/second. All picture elements are assumed to be independent and all the levels have equiprobable. Calculate the average information and information rate conveyed by these T.V picture source. **[8]**

b) Consider the given binary channel. **[8]**



i) Construct the channel matrix.

ii) Find out the value of P(y); if the source is equiprobable.

iii) Calculate all entropies, mutual information and channel capacity.

OR

P.T.O.

Q2) a) State the significance of Kraft Inequality. Consider a DMS X with symbols; show that all codes except B satisfy krafts inequality. **[10]**

xi	codeA	codeB	CodeC	codeD
X1	00	0	0	0
X2	01	10	11	100
X3	10	11	100	110
X4	11	110	110	111

b) Explain Differential Entropy and Mutual Information for continuous Ensembles. **[6]**

Q3) a) Write in short about implications of information capacity theorem. **[8]**

b) Find out the encoding performed by the Lempel-Ziv algorithm on the binary Sequence 000101110010100101..... **[8]**

OR

Q4) a) For a systematic linear block code, the three parity check digits C4, C5, C6 are given by **[10]**

$C4 = d1 \oplus d2 \oplus d3$

$C5 = d1 \oplus d2$

$C6 = d1 \oplus d3$

i) Construct G Matrix, find out all possible code vectors.

ii) If the received code vector is 111101, find out transmitted code vectors.

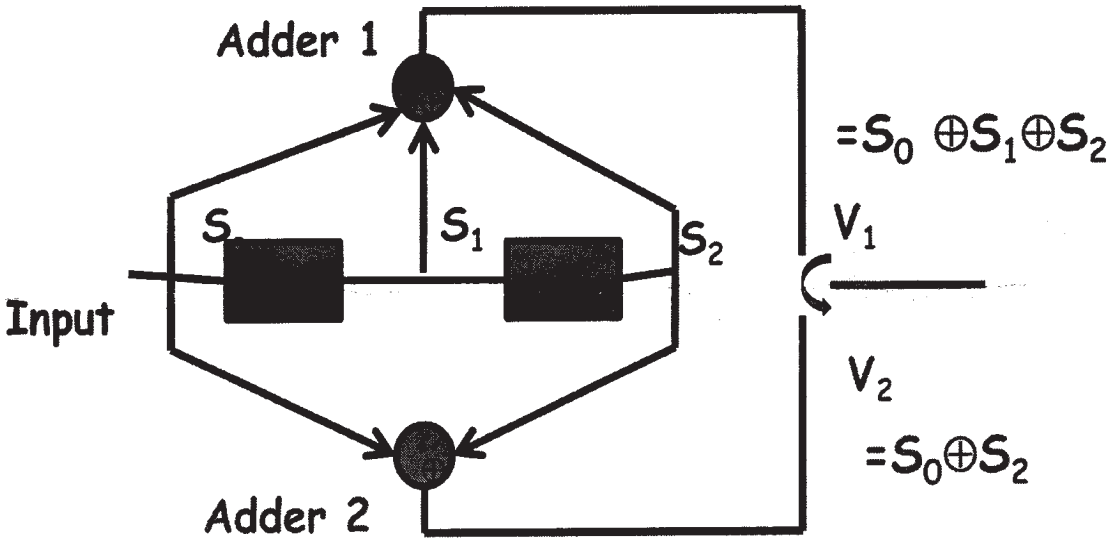
iii) Also draw the hardware arrangement for linear encoder.

b) Explain the following term: **[6]**

i) JPEG

ii) DCT

Q5) a) For the convolutional encoder shown above encode the sequence 10111 with Transform Domain and Time Domain approach. **[10]**

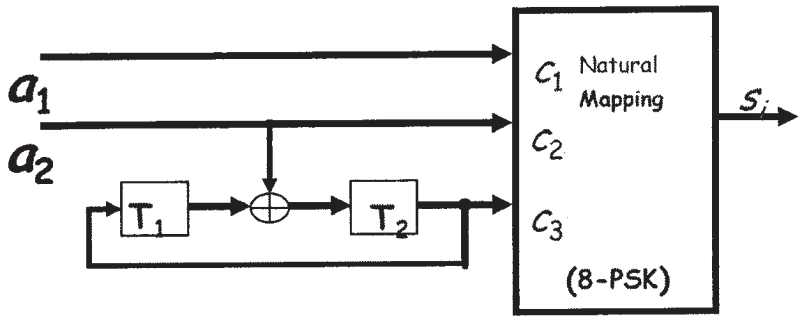


b) Write a short note on Turbo codes. **[8]**

OR

Q6) a) Compared state, tree and Trellis representation of convolution codes with example. **[9]**

b) Find the Asymptotic Coding Gain for the above TCM Encoder. **[9]**



SECTION-II

Q7) a) Find the generator polynomial for BCH code over GF(8) using the primitive polynomial $p(z) = z^3 + z + 1$ over GF(2) codeword. The code should correct t = 1, 2, ... errors. **[10]**

b) What is Cryptography? Explain RSA Algorithm. **[8]**

OR

Q8) a) Consider the (31, 15) Reed-Solomon code. **[6]**

i) How many bits are there in a symbol of the code?

ii) What is the block length in bits?

iii) What is the minimum distance of the code?

iv) How many symbols in error can the code correct?

b) Define the terms related to BCH Codes Primitive Polynomial, Minimal Polynomial and Generator Polynomial. **[12]**

Q9) a) Let Y1 and Y2 be two statistically independent Gaussian random variables, such that E[Y1]=m,E[Y2]=3m, and var [Y2]=1;m is unknown. Obtain the ML estimate of m. **[8]**

b) Write a note on Bayes Criteria. **[8]**

OR

Q10)a) In the received signal under hypothesis H_1 and H_0 was **[10]**

$H_1 : Y_k = m+N_k,\ k = 1, 2,...K$

$H_0 : Y_k = \quad N_k,\ k = 1, 2,...K$

i) Assuming the constant m is unknown. Obtain the Maximum Likelihood estimation of the mean.

ii) Suppose now mean 'm' is known but the variance is unknown. Obtain the MLE.

b) What are the criteria for the good Estimator, calculate the unbiased Estimation of DC level With 'A' as unknown in presence of WGN. **[6]**

Q11)a) In a digital communication system, consider a source whose output under hypothesis H_1 is a constant voltage of value m, while its output under H_0 is zero. The received signal is corrupted by N, an additive white Gaussian noise of zero mean, and variance σ^2. **[8]**

i) Set up the likelihood ratio test and determine the decision regions.

ii) Calculate the probability of false alarm and probability of detection.

b) Write short note on Neyman-Pearson detector. **[8]**

OR

Q12)a) A ternary communication system Transmits one of three amplitude signals {1, 2, 3} with equal probabilities, The independent received signal samples under each hypothesis are **[10]**

$H_1 : Y_k = 1+N \quad k = 1, 2,...K$

$H_2 : Y_k = 2+N \quad k = 1, 2,...K$

$H_3 : Y_k = 3+N \quad k = 1, 2,...K$

The additive noise N is Gaussian with zero mean and variance σ^2, the costs are $C_{ii}=0$, and $C_{ij}=1$, determine the decision regions.

b) Explain the concept of MINIMAX detector in detail. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P2829

[Total No. of Pages : 2

[4958]-147
T.E.(E&TC)
SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2008 Course)(Semester-II)(304188)

Time :4Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer-books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) What do you understand by Grammar? Explain the use of terminal & non-terminal in representing grammar. **[4]**

b) Explain language processing activities. **[4]**

c) Explain LEX & YACC. **[8]**

OR

Q2) a) Define following terms & explain where it is used with examples. **[8]**

i) DFA ii) Regular Expression

iii) Forward Reference iv) Back Tracking

b) Write the algorithm for a PASS II of a assembler. **[8]**

Q3) a) Explain the processing of LTORG, ORIGIN statements by PASS I and PASS II of a two pass assembler. **[8]**

b) Define macro & explain macro expansion with suitable example of nested macro. **[8]**

OR

Q4) a) Explain the need of lexical analyzer with suitable example and explain how it works. **[8]**

b) Explain Data structures of macro preprocessor. **[8]**

P.T.O.

Q5) a) What is a loader? Enlist the basic functions of a loader. **[8]**

b) Explain the function of compiler and go scheme. What are the advantages and disadvantages of the scheme. **[10]**

OR

Q6) a) Explain the design of a direct linking loader. Also explain all required data structures. **[9]**

b) Explain the design of an absolute loader. **[9]**

SECTION-II

Q7) a) What is Operating system? Explain hard real time system and soft real time system. **[8]**

b) Explain inter process communication. Explain any two IPC problems. **[8]**

OR

Q8) a) Explain deadlocks? Describe various methods for dead lock prevention. **[8]**

b) Explain Round Robin scheduling algorithm with example **[8]**

Q9) a) Compare Paging and Segmentation. **[8]**

b) What is page fault? How operating system handles page fault. **[8]**

OR

Q10) a) Mention different page replacement algorithms. Explain any one with example. **[8]**

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

i) Fragmentation ii) Swapping

Q11) a) Explain Input/Output software layers. **[9]**

b) Draw and briefly explain file structure. **[9]**

OR

Q12) Write short Note on(any three): **[18]**

a) Graphical User Interface

b) Clock Software

c) Directory Structure

d) Disk space Management

Total No. of Questions :12]

SEAT No. :

P2792

[Total No. of Pages :3

[4958]-148
T.E. (E & TC)
COMPUTER ORGANISATION AND ARCHITECTURE
(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***

SECTION -I

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

b) Perform (22) x (-5) using Booth's multiplication algorithm. **[12]**

OR

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

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

i) (100.125)

ii) (-64)

iii) (15)

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

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

OR

P.T.O.

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

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

i) Fetching a word from memory

ii) Storing a word in memory

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

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

OR

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

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

SECTION -II

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

b) Obtain the effective and physical address for the following addressing modes with the Contents of register as give: offset = 1000H, DS = 3000H, Displacement = 0400H, BX = 2000H, DI = 4000H. **[8]**

i) Register relative addressing mode.

ii) Based indexed addressing mode.

iii) Direct addressing mode.

iv) Immediate addressing mode.

OR

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

b) Explain the concept of segmentation. State its advantages and disadvantages. **[8]**

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

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

OR

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

b) Explain following related to multitasking 80386 . **[6]**

i) TSS

ii) TR

iii) Task Descriptor (TSS Descriptor)

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

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

OR

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

i) Pipelining in ARM.

ii) Superscalar processor.

iii) Tightly couples and loosely coupled Multiprocessor.

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

EEE

Total No. of Questions : 12]

SEAT No. :

P2830

[Total No. of Pages : 3

[4958]-149
T.E. (E & Tc)
INDUSTRIAL MANAGEMENT
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat Diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) What are the different managerial levels? Elaborate on the different skills required at each level. **[8]**

b) Define an "Organization". What are its common characteristics? Compare a "Traditional Organization" and "Modern Organization". **[8]**

OR

Q2) a) Discuss Fayol's 14 management principles. **[8]**

b) Explain different forms of ownerships. **[8]**

Q3) a) Explain Mintzberg's 5 Ps of strategy. How these will be useful in developing a robust business strategy? **[8]**

b) Prepare the Environmental Threat and Opportunity Profile (ETOP) of a manufacturing industry. **[8]**

OR

P.T.O.

Q4) a) Sketch the GE Nine cell Matrix and explain the three different zones. **[8]**

b) Prepare the Environmental Threat and Opportunity Profile of a Telecom Industry. **[8]**

Q5) a) Explain the basic philosophy of Total Quality Management (TQM). What are the Limitations of this technique? **[10]**

b) Explain the 5s Quality Management Standards. **[8]**

OR

Q6) a) Explain 'Six Sigma' Quality Management Standard. How it is superior to conventional statistical quality control techniques. **[10]**

b) What is Pokka-yoke? What are the micro level techniques used in this? **[8]**

SECTION - II

Q7) a) Draw the standard graph of Break Even Analysis and define the following terms **[8]**

i) Break even point

ii) Contribution per unit

iii) margin of Safety

iv) Marginal Cost

b) Explain the role of SEBI. **[8]**

OR

Q8) a) Explain the techniques of capital Budgeting. **[8]**

b) Write Short notes on: **[8]**

i) CPM

ii) Project crashing and resource leveling

Q9) a) What is meant by Supply Chain Management (SCM)? What is the role of SCM at Strategic, Tactical, Operational and Execution levels. **[8]**

b) Discuss various types of Inventories. **[8]**

OR

Q10)a) Explain the EOQ model with discounts. **[8]**

b) Explain the ABC Analysis in detail. **[8]**

Q11)a) List different types of e-Commerce. Explain C2C in detail. **[8]**

b) What is Information System? Differentiate between Information System and MIS. **[10]**

OR

Q12)a) Explain how MIS can help to increase the productivity of workers in an organization. **[10]**

b) What is meant by Decision Support System? What are its benefits? **[8]**

x x x

Total No. of Questions : 12]

SEAT No. :

P2916

[Total No. of Pages : 4

[4958]-150
T.E. (E & TC)
WAVE THEORY AND ANTENNAS
(2008 Course) (304191) (Semester - II)

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

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II (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) ***Answer to the two section should be written in separate books.***
3) ***Figures to the rights indicate full marks.***
4) ***Use of logarithmic tables, slid rule, mollier charts, Electronic calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) An Electric Field $\bar{E}$ in free space is given as $E = 1000 \cos (10^8 t - \beta y) \bar{a}_z$ (v/m).

Find β, λ, $\bar{H}$ at P(0.2, 2.5, 0.4) at 10 nsec. **[8]**

b) Derive an expression for α, β, v & η for the wave propagates in good conductor. **[8]**

OR

Q2) a) What is polarization? Explain linear, circular & Elliptical polarization. **[8]**

b) A uniform plane wave in air with **[8]**

$E = 8 \cos (\omega t - 4x - 3z) \bar{a}_y$ (v/m) is incident on a dielectric region ($z \geq 0$) with $\mu_r = 1$, $\in_r = 2.5$, $\sigma = 0$ find

i) Polarization of the wave

ii) Angle of incidence

iii) The reflected $\bar{E}$ field

iv) Transmitted $\bar{H}$ field.

P.T.O.

Q3) a) Explain the following concepts **[8]**

i) Maximum Usable Frequency (MUF)

ii) Optimum Working Frequency (OWF)

iii) Virtual Height of the Ionosphere layer.

b) A television transmitting antenna mounted at a height of 120 m radiates 15kW of power equally in all directions in azimuth at the frequency of 50MHz.

Calculate: **[8]**

i) Maximum line of sight range

ii) Field strength of receiving antenna mounted on height of 16m at a distance of 12 km.

iii) The distance at which the field strength reduces to 1mW/m.

OR

Q4) a) Write a detailed theory on Ionospheric abnormalities. **[8]**

b) Explain by what the surface wave travelling along the earth surface gets attenuated. **[8]**

Q5) a) State & explain the concept of Antenna Apertures with expression. **[8]**

b) An antenna has radiation resistance of 72Ω & a loss resistance of 8Ω, powergain 12 dB. Determine antenna efficiency & its directivity. **[10]**

OR

Q6) Explain following antenna concepts with diagram and mathematical expression. (any three) **[18]**

a) Receprocity Theorem

b) Friss Transmission Concept.

c) Far Field Radiation.

d) Antenna radiation Efficiency.

SECTION - II

Q7) a) For a Infinitesimal (Hertzian) Dipole, derive an expression of maximum radiation intensity, directivity & power radiated. **[8]**

Maximum effective aperture.

b) Write a short note on 'Finite length dipole' & also explain field pattern, current distribution and radiation resistance for the same. **[8]**

OR

Q8) a) An electric field strength of 20μv/m is to be measured at an observation point $\theta = \pi/2$ and r = 500km from a $\alpha/2$ dipole operating at 50 MHz. **[8]**

i) What is the physical length of dipole.

ii) Current that must be fed to the antenna.

iii) Avg power radiated.

iv) If a transmission line with $z_o = 75\Omega$ is connected to the antenna, determine SWR.

b) Describe the principles of End-Fire and broadside arrays. Explain the principle of pattern multiplication with illustrative diagram. **[8]**

Q9) a) Derive an expression of Radiation resistance, Directivity & radiation efficiency of small 100P. **[9]**

b) Write a short note on pattern multiplication. Also draw a pattern of any four Non isotropic sources. **[9]**

OR

Q10) Write a short note on the following antennas w.r. to radiation pattern. Structure & applications **[18]**

a) Whip Antenna.

b) Harmonic Antenna.

c) Travelling Wave Antenna.

d) Ferrite Rod antenna.

e) Isotropic radiator.

Q11) Write a short note on the following antenna with neat diagram & radiation pattern. (any four) **[16]**

a) Three Element Yagi Oda antenna.

b) In finite Biconical Antenna.

c) Horn antenna.

d) Slot antenna.

e) Microstrip antenna.

f) Turnstile antenna.

OR

Q12) a) Explain with neat diagram, working principle of parabolic reflector. Also explain various feed system with diagram for the parabolic reflector. State the applications of dish antenna. **[8]**

b) Design a rectangular microstrip patch with dimensions 'W' and 'L', over a single substrate, whose centers frequency is 10 GHz. The dielectric constant of the substrate is 10.2 and the height of the substrate is 0.127 cm (0.050 inch). Determine the physical dimension 'W' & 'L' (in cm) of the patch, taking into accounts field fringing. **[8]**

Total No. of Questions :12]

SEAT No. :

P2917

[Total No. of Pages :4

[4958] - 151

T.E. (Electronics)

FEEDBACK CONTROL SYSTEMS

(Semester - I) (2008 Course) (304201)

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

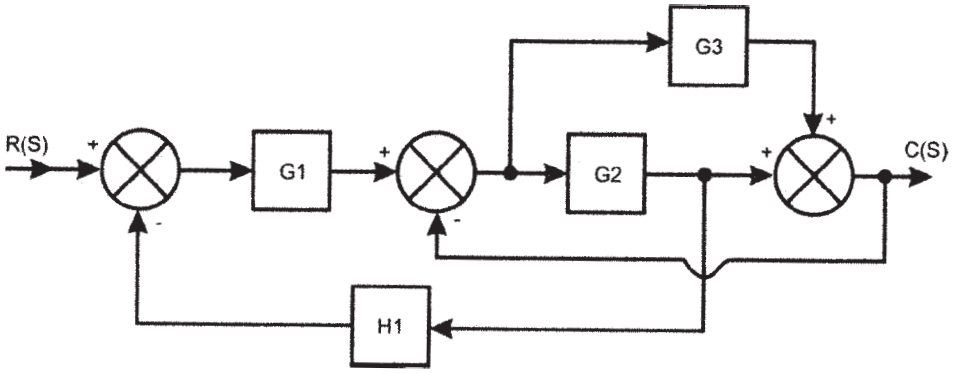
Instructions to the candidates:

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

SECTION - I

Q1) a) Explain with neat diagram and waveform working principle of synchro error detector. **[8]**

b) Reduce the block diagram to its Canonical form and obtain $\frac{C(s)}{R(s)}$. **[8]**

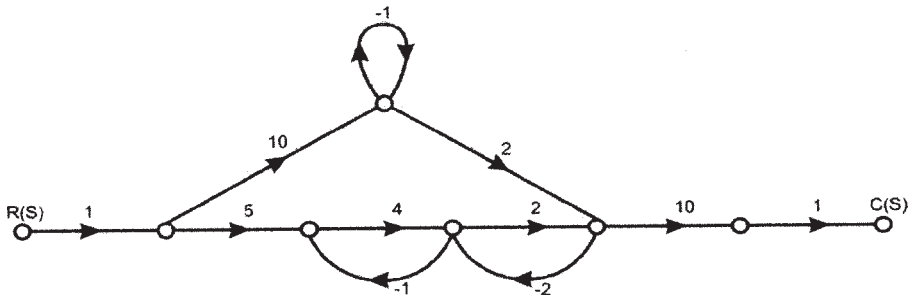


OR

P.T.O.

Q2) a) Represent the armature controlled DC motor with a block diagram and derive its transfer function. **[8]**

b) Find $\frac{C(s)}{R(s)}$ by using Mason's gain formula. **[8]**



Q3) a) Derive the value of static error constant and steady state error for. **[8]**

i) Type 0 systems.

ii) Type 1 system.

iii) Type 2 systems.

b) A unity feedback system has $G(s) = \frac{K}{s(s+10)(s^2+4s+5)}$ Determine the range of K for closed loop system to be stable. **[8]**

OR

Q4) a) Sketch the root locus for system with **[10]**

$$G(s).H(s) = \frac{K(s+4)}{s(s^2+6s+13)}.$$

b) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$ find it's rise time, peak time, peak overshoot and settling time if subjected to unit step input also calculate expression for its output response. **[6]**

Q5) a) A Unity feedback control system has G(s) = $\frac{40(s+5)}{s(s+10)(s+2)}$ Draw Bode plot. Determine G_M, P_M, ω_{gc}, ω_{pc}. Comment on the stability of the system. **[12]**

b) State and explain "Mapping theorem". **[6]**

OR

Q6) a) Sketch the Nyquist plot for the system with open loop Transfer function $G(s).H(s) = \frac{k}{s(s+2)(s+10)}$ and hence calculate the range of value of k for stability. **[12]**

b) Write a short note on correlation between time domain and frequency domain specification. **[6]**

SECTION - II

Q7) a) Obtain the state model of a field controlled DC servomotor. **[8]**

b) Consider the system having state model.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-2 & -3\\ 4 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}3\\ 5\end{bmatrix}u \text{ and } y=[11]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$ With D=0, obtain its Transfer function. **[8]**

OR

Q8) a) Find the state transition Matrix of the State Equation **[8]**

$$\begin{bmatrix}x_1\\ x_2\end{bmatrix}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}u$$

b) Find the Controllability and Observability of the State Model. **[8]**

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

Q9) a) What are thermistors? Explain their construction. Write advantages & limitation of Thermistor. **[8]**

b) Define the following: **[8]**

i) Proportional band.

ii) Integral gain.

iii) Derivative gain.

iv) Offset.

OR

Q10)a) Draw the PLC Ladder Diagram for "Conveyer system for bottle filling "consider all sensors are direct inputs to PLC. **[8]**

b) Draw & Explain response of PID controller for **[8]**

i) Unit step input.

ii) Unit ramp input.

Q11)a) Explain how fuzzy logic control scheme can be applied for temperature control of process. **[8]**

b) Draw a generator block schematic of a fuzzy controller and Explain the function of each block. **[6]**

c) What do you understand by the term "adaptive fuzzy system". **[4]**

OR

Q12)a) Explain with neat diagram of the biological and Artificial neuron models. **[8]**

b) Explain the following terms w.r.t. Neural network. **[6]**

i) Supervised learning.

ii) Unsupervised learning.

c) What are advantages of fuzzy controller over conventional PID controller? **[4]**

Total No. of Questions : 12]

SEAT No. :

P2918

[Total No. of Pages : 3

[4958]-152
T.E. (Electronics)
DATA COMMUNICATION
(2008 Course) (Semester - I)

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

Instructions:

1) ***Answer any 3 questions from each Section.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define auto correlation functions. State and explain any three properties of auto correlation function. **[8]**

b) Explain various probability distribution functions. **[8]**

OR

Q2) a) With a suitable example explain what is random process. What is ensemble average & time average. **[8]**

b) Explain diffrent properties of CDF and PDF for discrete and continuous random variables. **[8]**

Q3) a) For the sequence 10111010, sketch the waveform using the following data formats:

i) Unipolar Rz ii) Polar NRz

iii) Alternate Mark Inversion iv) Split phase Manchester coding.

Draw the corresponding spectrum of the above formats and explain. **[10]**

P.T.O.

b) Explain meaning of intersymbol interference. What is the cause behind? **[6]**

OR

Q4) a) Why synchronization in necessary in data communication? Explain bit and frame synchronization using suitable sketch. **[8]**

b) Explain Multi level schemes: 2B1Q, 8B16, MLT-3 and their comparison. **[8]**

Q5) a) What is entropy? For a discrete memory less source what is the upperbound on entropy. **[10]**

Show that equiprobable messages results to maximum entropy.

b) Explain in detail free distance and coding gain. **[8]**

OR

Q6) Writes Short Notes on. **[18]**

a) Continuous random variables.

b) Frame synchronization techniques.

c) Convolution code.

SECTION - II

Q7) a) State and explain properties of mutual information. **[8]**

b) Explain ARQ techniques. **[8]**

OR

Q8) a) Obtain generator matrix and parity check matrix for (7,3) systematic cyclic code verify the result with syndrome. **[10]**

b) Explain Shanon- Fano coding with example. **[6]**

Q9) a) Explain the transmission and reception of QPSK with mathematical expression. **[8]**

b) In a digital communication system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency of transmission is 50 MHz. Find the symbol rate of transmission and band width requirement of the channel in the following cases.

i) FSK ii) QPSK **[8]**

OR

Q10)a) Explain the necessity of continuous MSK. State and explain the basic principles of QAM with block schematic and suitable waveforms. **[8]**

b) Explain Phase diagrams and signal constellations diagrams of ASK. **[8]**

Q11)a) Design a 4-bit PN sequence generator and verify the properties of maximum length sequence. Assume that initial state is 10000. **[8]**

b) Explain Slow and Fast Frequency Hopped Spread Spectrum. **[10]**

OR

Q12)Writes Short Notes on. **[18]**

a) Noiseless and Lossless channel.

b) CSMA.

c) DSSS.

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Total No. of Questions : 12]

SEAT No. :

P2919

[Total No. of Pages : 5

[4958]-153
T.E. (Electronics)
NETWORK SYNTHESIS AND FILTER DESIGN
(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any 3 questions from each Section.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) When a polynomial is said to be Hurwitz? State the properties of Hurwitz polynomial. **[6]**

b) Explain how stability of a function gets affected due to addition of a pole and zero. **[6]**

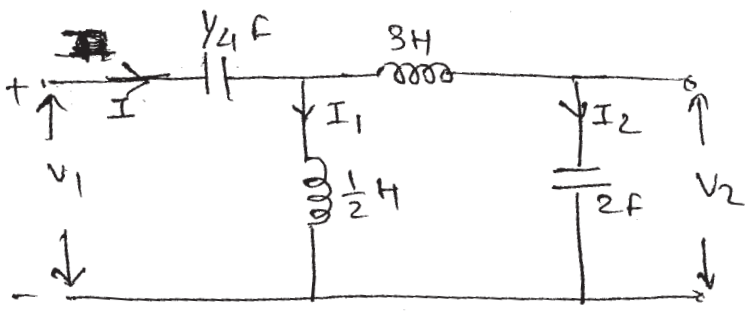
c) Test whether the given polynomial are Hurwitz. **[6]**

i) $G_1(s) = s^4 + 7s^3 + 6s^2 + 21\ s + 8$

ii) $G_2(s) = s^4 + s^3 + 2s^2 + 3s + 2$

OR

Q2) a) Calculate voltage ratio $\frac{V_2}{V_1}$, current ratio $\frac{I_2}{I_1}$, the input impedance $z_1 = \frac{V_1}{I_1}$ and transfer function $\frac{V_2}{I_1}$ for the ladder network shown below. **[12]**



P.T.O.

b) Determine whether the following functions are positive real or not. **[6]**

i) $\dfrac{7s+2}{2s+4}$

ii) $\dfrac{s^2+2s+6}{s(s+3)}$

Q3) a) From the pole zero plots shown in figure a,b,c, identify the plot indicating RL and RC impedances. Also give the reason for each. **[4]**

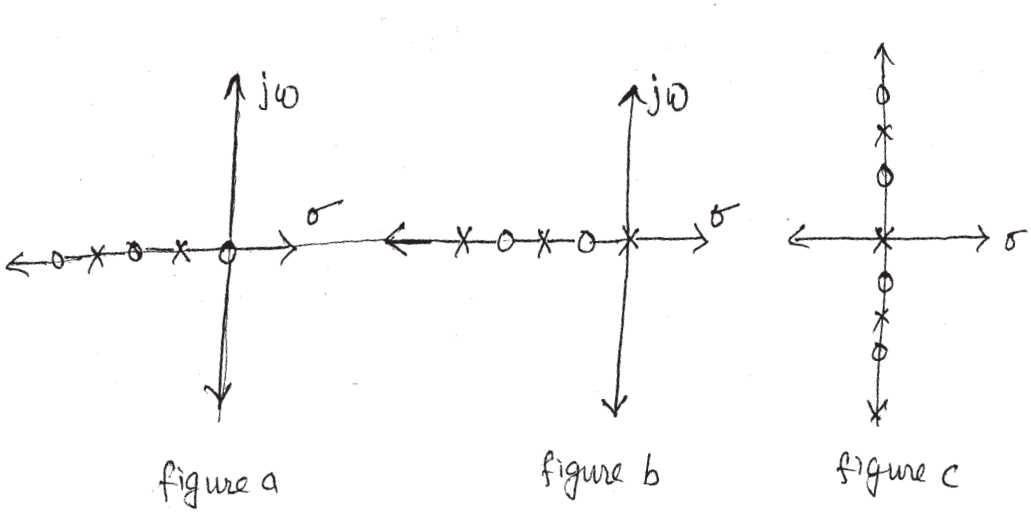


figure a figure b figure c

b) State the properties of RL driving point impedance function. **[4]**

c) The driving point impendance of a network is a positive real function given by $Z(s)=\dfrac{6s^3+3s^2+3s+1}{6s^3+3s}$. Determine the circuit components and structure using cauer I form.

Also state the properties of RLC function. **[8]**

OR

Q4) a) Write the properties of R-C driving point impedance function. **[4]**

b) Realize the given network function using cauer II form

$$z(s)=\frac{(s+1)(s+4)}{s(s+2)}$$ **[4]**

c) Synthesize the following function using foster I and foster II form.

$$z(s)=\frac{6(s+2)(s+4)}{s(s+3)}$$ **[8]**

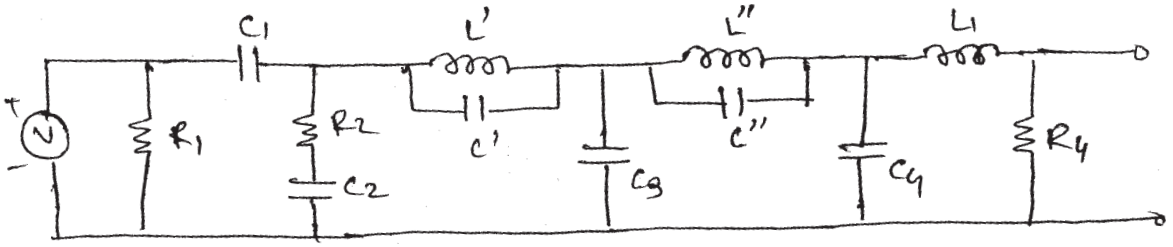
Define what do you mean by constant resistance Network & hence.

Q5) a) Synthesize given voltage ratio as a constant resistance bridge T network.

$$z_{12}(s)=\frac{s^2+1}{s^2+2s+1}$$ **[8]**

b) Explain the concept and significance of zeros of transmission, in network synthesis.

Identify zeros of transmission for the given network. **[8]**



OR

Q6) a) Define the following: **[8]**

i) Minimum phase function

ii) Non minimum phase function

iii) All pass function

iv) Pole and zero of a function

b) Synthesize the function as a constant resistance lattice terminated in 1Ω resistance. **[8]**

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

SECTION - II

Q7) a) Write a note on frequency and Impedance scaling. **[4]**

b) State the properties of Butterworth Approximation. **[4]**

c) Design a passive third order Butterworth band pass filter for the following specifications.

i) Stop band $\omega \leq 30k$ rad/sec and $\omega \geq 120k$ rad/sec

ii) Passband 50K rad/sec $<\omega <72k$ rad/sec **[8]**

OR

Q8) a) State the properties of Chebyshev Approximation. **[4]**

b) Synthesize a Chebyshev LPf with following specification. **[12]**

i) Load resistance 500Ω

ii) 1 dB ripple with passband

iii) Cut off frequency 3×10^5 rad/sec

iv) At 9×10^5 rad/sec down is 15dB

Q9) a) Explain the different biquad feedback topologies used in active filter designing and derive the expression of transfer function for negative feedback topology. **[6]**

b) Realize the transfer function of a third order normalized low pass Butterworth approximation filter. **[6]**

c) Design sallen and key 2^{nd} order Butterworth high pass filter having the cut off frequency of 175 Hz. **[4]**

OR

Q10)a) Synthesize second order low pass filter to have a pole frequency of 25KHz and a pole of 10. Use sallen and key circuits based on positive feedback topology. **[8]**

b) Write a note on RC – CR Transformation. **[4]**

c) Compare Active and passive filter. **[4]**

Q11)a) Compute the sensitivities of K, ωp and Qp with respect to the passive element R,L and C of series RLC circuit from voltage transfer function. **[8]**

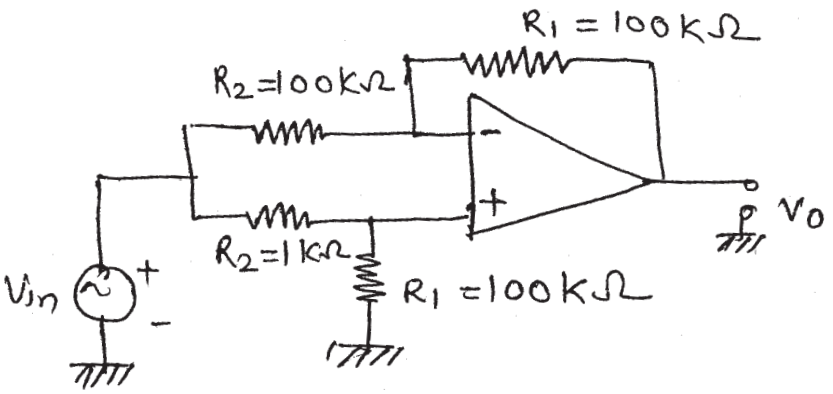
b) What is gain sensitivity? Explain various factors affecting gain sensitivity. **[6]**

c) Explain the effect of the following op-amp characteristics on the active filter.

i) CMRR ii) Dynamic range **[4]**

OR

Q12)a) The output voltage measured in the circuit is 10 mV. When the input voltage is 2.5 V. Find the CMRR **[8]**



b) Define sensitivity? Prove the following sensitivity relationship. **[10]**

i) $S_x^{P_1+P_2} = \dfrac{P_1 S_x^{P_1} + P_2 S_x^{P_2}}{P_1 + P_2}$

ii) $S_x^{P^n} = nS_x^P$

iii) $S_{x^2}^P = \dfrac{1}{2} S_x^P$

iv) $S_x^{P_1/P_2} = S_x^{P_1} - S_x^{P_2}$

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Total No. of Questions : 12]

SEAT No. :

P2920

[Total No. of Pages : 2

[4958]-154
T.E.(Electronics Engineering)
MICROCONTROLLERS
(2008 Pattern)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the 8051 microcontroller architecture with suitable diagram. **[10]**

b) Compare Harvard and Van-Neumann architecture **[6]**

OR

Q2) a) Draw and explain architecture of 8 bit of microprocessor. **[10]**

b) Explain various selection criteria of microcontroller. **[6]**

Q3) a) Explain the addressing modes of 8051 Microcontroller. **[8]**

b) Explain the following instructions with suitable example. **[8]**

i) MOVX A,@DPTR ii) XCH A, Rn

iii) ANL A, Rn iv) ADD A,Rn

OR

Q4) a) Assume that ROM space starting at 250H contains "SPPU", write an assembly language programme of 8051 to transfer the byte into RAM location starting at 40H. **[8]**

b) Explain the internal structure of port 1of 8051 microcontroller **[8]**

Q5) a) Draw an interfacing diagram for 4×4 keyboard with 8051 microcontroller.With the help of flowchart explain how the scanning of key is performed by microcontroller? **[9]**

b) Explain with diagram interfacing of LCD with 8051. **[9]**

OR

P.T.O.

Q6) a) Explain the interrupt structure in 8051 **[9]**

b) Draw an interfacing diagram for LCD with 8051 microcontroller and write an assembly language program for displaying 'PUNE on 1st line initial position. **[9]**

SECTION-II

Q7) a) Explain I2C communication protocol with timing diagram **[9]**

b) Compare RS485 vs RS232.why MAX232 chip is required in serial communication? **[9]**

OR

Q8) a) What is CAN bus protocol? And explain Message frame formats of CAN Protocol. **[9]**

b) Explain SPI bus in detail. **[9]**

Q9) a) Draw an interfacing diagram of LED with PORT B of PIC 18Fxx and write an embedded C programme for flashing of LED. **[8]**

b) Explain addressing modes of PIC 16FXX Microcontroller **[8]**

OR

Q10) a) Explain in detail program memory and data memory of PIC 18F Microcontroller. **[8]**

b) Explain features of AVR microcontroller series. **[8]**

Q11) a) Explain in brief various steps involved in designing of data acquisition system. **[12]**

b) Explain typical characteristics of RTD **[4]**

OR

Q12) a) Explain the working of stepper motor. Draw an hardware interfacing of stepper motor with 8051 microcontroller using L293D for driving a stepper motor and then write ALP to run the stepper motor in any one direction at alternately slower and faster speeds. **[12]**

b) Explain typical characteristics of thermocouple **[4]**

Total No. of Questions :12]

SEAT No. :

P2921

[Total No. of Pages :3

[4958] - 155

T.E. (Electronics)

POWER ELECTRONICS

(Semester - I) (2008 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) For 3ϕ fully controlled bridge converter with R-L load derive an equation for r.m.s output voltage. **[6]**

b) Explain the operation of 3ϕ fully controlled bridge converter with R-L load. Describe in detail the following modes of operation with associated waveforms. **[12]**

i) Rectifier mode

ii) Inverter mode

OR

Q2) a) What is dual converter? Explain in detail the operation of dual converter with Circulating current. List the advantage and disadvantage of the same. **[12]**

b) Define **[6]**

i) Holding Current

ii) Latching Current

iii) Forward break over voltage

P.T.O.

Q3) a) What is DC to DC converter? Explain with circuit diagram & waveforms working of chopper? Why it is preferred over phase controlled converters. **[10]**

b) Ad.c chopper circuit connected to a 100 V d.c source supplies an inductive load having 40mH in series with a resistance of 5Ω . A freewheeling diode is places across the load. The load current varies between the limits of 10A and 12A. Determine **[6]**

i) average value of load current

ii) maximum value of load current.

iii) the time raio of the chopper.

OR

Q4) a) Explain working of SLR half bridge DC ot DC converter along with waveforms. **[8]**

b) What is SMPS? Explain in brief. **[8]**

Q5) a) What is resonant converter? Explain the need of resonant converter. Give its classification. **[8]**

b) Define cycloconverter. Explain basic principle of operation of cycloconverter with neat equivalent circuit diagram. State its advantages & disadvantages. **[8]**

OR

Q6) Write short notes on any three, **[16]**

a) 4 Quadrant chopper.

b) 2 - quadrant type C chopper.

c) Inverse Cosine Method

d) Matrix converter

SECTION - II

Q7) a) Classify Inverters. Explain with circuit diagram & waveforms, working 3ϕ voltage source inverter operating in 120° mode with R - load. **[10]**

b) Explain the sinusoidal pulse width modulation tech used in inverter. **[8]**

OR

Q8) a) What is the need of cooling in industries? Suggest the remedies for reducing heating & power Dissipation in the Semi - conductor devices.**[10]**

b) What do you mean by Snubberscircuit. Give design of snubber circuit.**[8]**

Q9) a) Explain HF induction heating. **[8]**

b) What is the difference between soldering & welding? Explain at least onetype of welding techniques. **[8]**

OR

Q10)a) What is HVDC? Explain advantage of HVDC over HVAC. **[10]**

b) What is CTPT? Explain. **[6]**

Q11)a) What is importance of power factor. Explain the EAC method for PF improvement. **[10]**

b) Explain sequence control of series converters. **[6]**

OR

Q12)a) What is necessity of power quality? Explain with different types of power line disturbances. **[8]**

b) What is energy audit? Explain the required procedure for energy audit.**[8]**

Total No. of Questions :12]

SEAT No. :

P3895

[Total No. of Pages :3

[4958] - 156
T. E. (Electronics)
DRIVES & CONTROLS
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with a neat circuit diagram and relevant waveforms the working of 1 ϕ dual converter. **[8]**

b) Explain working of 1-Φ semi converter for continuous and discontinuous current mode of operation of separately excited DC motor drive. **[10]**

OR

Q2) a) Explain the motor selection parameters for elevator application. **[8]**

b) The speed of a separately excited motors is controlled by 1-Φ Full converter. The field current is controlled by a semiconverter and is set to maximum possible value. The ac supply voltage to the armature & field converter is 1Φ 240 50 Hz, Ra = 0.25Ω, kv = 0.7032 v/a-rad/s, T_L = 50 N-m at 1000 rpm. The armature & field current are continuous & ripple free. Determine **[10]**

i) The field current I_F

ii) Delay angle α_a

iii) I/p PF of armature circuit converter

P.T.O.

Q3) a) Explain closed loop control of separately excited DC motor drives with transfer function. **[8]**

b) Explain briefly the starting methods of AC motors. **[8]**

OR

Q4) a) What is regenerative braking? Explain in Brief. **[8]**

b) Explain in detail the symmetrical angle control method for power factor improvement. **[8]**

Q5) a) Why V/F speed control method is very popular for induction motors? **[8]**

b) Draw circuit diagram of static Krammer drive for induction motor. **[8]**

OR

Q6) a) Explain the various protections for induction motor. **[8]**

b) Explain the construction and operation of 3ϕ salient pole synchronous motor. **[8]**

SECTION - II

Q7) a) Explain the synchronous reluctance motor with torque angle diagram. **[8]**

b) Draw magnetic flux and winding current diagram of 3ϕ brushless DC motor drive. **[8]**

OR

Q8) a) With relevant diagram explain traction motor drive. **[8]**

b) Explain self-controlled synchronous motor fed from three phase Inverter. **[8]**

Q9) a) Explain the operation and advantages of permanent magnet synchronous motor. **[8]**

b) Describe construction and principle of working of hybrid stepper motors. **[8]**

OR

Q10)a) Why position sensors are essential in variable reluctance motor? **[8]**

b) Explain the circuit diagram and operation of bi-polar drive for stepper motor. **[8]**

Q11)a) Explain Neural network based PWM controller. **[10]**

b) Explain Fussy logic based wind generation system. **[8]**

OR

Q12)Write short notes on **[18]**

a) Series motor for Traction application.

b) Chopper fed DC drives.

c) Dynamic braking of Induction motor.

Total No. of Questions : 12]

SEAT No. :

P2922

[Total No. of Pages : 3

[4958]-157
T.E.(Electronics)
SENSORS & INTERFACES
(2008 Course) (Semester-II)(304208)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams 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 tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION-I

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

b) Explain pH measurement with neat diagram. **[8]**

OR

Q2) a) Explain selection criterion for choosing a sensor/transducer. **[8]**

b) Explain incremental and absolute rotary encoders for angular velocity measurement. **[8]**

Q3) a) Explain with neat diagram I/P converter and P/I converter. **[8]**

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

OR

Q4) a) A sensor outputs a range of 10 to 200mV, as a variable varies over its range. Develop a signal conditioning circuit using 3 Op Amp instrumentation amplifier so that it becomes 0 to 5 V. **[8]**

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

P.T.O.

Q5) a) Enlist the features of PIC microcontroller.Draw and explain interface of matrix keyboard with PIC 16 F 84. **[10]**

b) State the different types of ADC and state their specifications. **[8]**

OR

Q6) a) Enlist the features of 8051series microcontrollers. Draw and explain interfacing of following devices with 89 C 51 microcontroller.

i) ADC ii) Electromechanical relay **[10]**

b) Enlist different types of DAC and give performance for parameters for selection of DAC. **[8]**

SECTION-II

Q7) a) Write short note on I^2C bus. **[8]**

b) Explain with block diagram computer based data logger. **[8]**

OR

Q8) a) Write short note on foundation field bus. **[8]**

b) Explain HART communication protocol along with its modes of operation. **[8]**

Q9) a) Explain lift system to move the load up and down using pneumatic actuators. **[8]**

b) Explain principle of operation of D.C. motor. State various types of D.C. motor. **[8]**

OR

Q10) a) Explain with neat diagram pressure control valves. **[8]**

b) Explain following types of valves with neat diagram. **[8]**

i) Spool valve ii) Poppet valve

Q11) a) Explain the PLC operating cycle. **[8]**

b) With suitable assumptions draw the block diagram of a bottle filling plant and develope a PLC ladder diagram for the automatic operation of bottle filling plant. **[10]**

OR

Q12) Write short note on: **[18]**

a) Selection of PLC

b) Input and output devices for PLC.

c) Analog input/ output for PLC.

Total No. of Questions : 12]

SEAT No. :

P2923

[Total No. of Pages : 3

[4958]-158

T.E.(Electronics Engineering)

MICROCOMPUTER BASED SYSTEMS

(2008 Course) (Semester-II)

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

Instructions to the candidates:

1) ***AnswerQ.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 form section I and Q.7 or Q.8,Q.9 or Q.10,Q.11 or Q.12 form section II***
2) ***Answers to the two sections should be writtern in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if nesessary.***

SECTION-I

Q1) a) State functional units does 8086 contains. Draw and explain them in brief. **[10]**

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

i) READY ii) TEST

iii) MIN/$\overline{\text{MAX}}$ iv) BHE

OR

Q2) a) With suitable example explain any five addressing modes of 8086. **[10]**

b) Explain the concept of memory segmentation and show how 20 bit physical address is generated in 8086 processor using 16 bit registers.**[8]**

Q3) a) Explain the following instructions **[8]**

i) PUSH ii) JMP

iii) XCHG iv) DAA

b) Write an ALP for 8086 to find out number of positive and negative numbers in series **[8]**

OR

P.T.O.

Q4) a) Draw and Explain interrupt responce sequence of 8086 processor. **[8]**

b) Write an ALP of 8086 to display the message 'SPPU' on the computer screen **[8]**

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

b) Draw and explain register set available for programmers use in 80386 processor. **[8]**

OR

Q6) a) Draw and Explain structure of descriptors supported by 80386. **[8]**

b) Write short note on(any two). **[8]**

i) Virtual mode ii) Protected mode

iii) Real mode.

SECTION-II

Q7) a) Explain with block diagram IBM PC system based mother board. **[10]**

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

i) BIOS ii) PS/2

OR

Q8) a) Explain with respect to USB: **[10]**

i) Endpoint

ii) Enumeration

iii) Different types of data transfer

b) Explain serial communication standard RS 232C. **[8]**

Q9) a) Draw and explain data flow model of ARM core. **[8]**

b) Draw and Explain programmers model of ARM processor. **[8]**

OR

Q10) a) Explain following ARM instructions **[8]**

i) LDR R0, [R1], # 4

ii) MOV R2, R3, LSL # 2

iii) MLA R0, R1, R2, R3

iv) AND R0, R1, R2

b) With the help of Block diagram Explain three stage and five stage pipeline instruction execution in ARM7. **[8]**

Q11) Design and electronic weighing bridge system using 8086 processor **[16]**

i) Design signal conditioning circuit

ii) Draw complete interfacing diagram.

iii) Draw the flowchart.

OR

Q12) Design data acquisition system using 8086/ARM7 with following specification **[16]**

i) Temperatures sensor LM-35

ii) LCD display

iii) Programmable keyboard.4×4

iv) Load controlled 100 W

Total No. of Questions : 12]

SEAT No. :

P2924

[Total No. of Pages : 3

[4958]-159
T.E. (Electronics Engg)
INDUSTRIAL MANAGEMENT
(2008 Course) (Semester - II) (304210)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section – I and 3 questions from Section – II.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain F.W. Taylor's Theory of Scientific management. **[8]**

b) What are the different managerial levels? Elaborate on the different skills required at each level. **[8]**

OR

Q2) a) Discuss various practices followed in management theory. **[8]**

b) What do you mean by "Quality Management"? State different phases in quality management. **[8]**

Q3) a) Explain Mintzberg's 5 Ps of strategy. How these will be useful in developing a robust business strategy? **[8]**

b) Draw and explain Ishikawa diagram with a proper example from Industry. **[8]**

OR

P.T.O.

Q4) a) Explain the following levels of strategy – **[8]**

i) Corporate

ii) Business

iii) Functional

iv) Operational

b) Prepare the Environmental Threat and Opportunity Profile (ETOP) of a manufacturing industry. **[8]**

Q5) a) Explain the basic philosophy of Total Quality Management (TQM). What are the limitations of this technique? **[9]**

b) Explain the 5s Quality Management Standards. **[9]**

OR

Q6) a) Explain the importance of ISO 14001:2004 quality management system standards. **[9]**

b) Select any one type of industry; carry out its SWOT analysis in detail? Explain the importance of SWOT analysis? **[9]**

SECTION - II

Q7) a) Define fixed capital and working capital? What are financial sources to raise these capitals? **[8]**

b) Explain the role of Securities & Exchange Board of India (SEBI). **[8]**

OR

Q8) a) Draw the standard graph of Break Even Analysis and define the following terms: **[8]**

i) Break even point

ii) Contribution per unit

iii) Margin of Safety

iv) Marginal cost

b) With the help of an example, explain the Critical Path Method in Project Management. **[8]**

Q9) Write short notes (any 3) **[18]**

i) Objectives of HRM

ii) Recruitment and Selection strategies

iii) Management information system

iv) JIT

OR

Q10)a) Explain significance of training and development. **[9]**

b) Write Short notes on: **[9]**

i) Executive Management

ii) Talent acquisition

Q11)a) What do you understand by "Supply Chain Management (SCM)"? Explain the various stages in SCM. **[8]**

b) List different types of e-Commerce. Explain B2B in detail. **[8]**

OR

Q12)a) What is MIS? Explain its purpose and objectives with suitable example. **[8]**

b) Define ERP and ERP systems? What are its benefits? What are the difficulties in implementing ERP? **[8]**

x x x

Total No. of Questions : 12]

SEAT No. :

P2925

[Total No. of Pages : 5

[4958]-160
T.E. (Electronics)
DISCRETE TIME SIGNAL PROCESSING
(2008 Course) (304211) (Semester - II)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) An analog signal is represented as $x(t) = \sin 10\pi t + 2 \sin 20\pi t + 2 \cos 30 \pi t$

i) What is the Nyquist rate of the signal?

ii) If the signal is sampled at a rate of 20Hz, what is the folding frequency?

iii) Write the equation of sampled signal.

[6]

b) Obtain direct form I & direct form II realizations for the system. **[6]**

$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$.

c) Determine the zero input response of the system **[6]**

$$y(n) - \frac{1}{4} y(n-1) - \frac{1}{8} y(n-2) = x(n) + x(n-1)$$

OR

P.T.O.

Q2) a) Discrete time system $h_1(n) = \left\{\frac{1}{2}\ \frac{1}{4}\ \frac{1}{2}\right\}$ & $h_2(n) = \delta(n-2)$ are connected in cascade.

Determine the overall system function and impulse response. **[6]**

b) Define: **[6]**

i) Zero input response & zero state response.

ii) Energy signal & power signal.

c) Explain direct form II structures for realization of LTI discrete true systems. **[6]**

Q3) a) Compute the four point DFT of the following sequence. $x(n) = \{2\,1\,2\,1\}$ **[6]**

b) Compute circular convolution of two sequences using DFT - IDFT method. **[10]**

$x_1(n) = \{1\,2\,3\,4\}$ $x_2(n) = \{2\,1\,2\,1\}$

OR

Q4) a) Compute 8 point DFT of the following sequence using radix –2, DIT - FFT algorithm. **[10]**

$x(n) = \{1\ \ 2\ \ 3\ \ 4\ \ 4\ \ 3\ \ 2\ \ 1\}$

b) For a discrete time sequence $x(n) = \{1\ \ 2\ \ 3\ \ 4\}$.

DFT is given by X(K) = $\{10\ \ -2+j^2\ \ -2\ \ -2-j^2\}$.

Compute the DFT of $x\hat{}(n) = \{3,\ \ 4,\ \ 2,\ \ 1\}$ using circular time shift property of DFT. **[6]**

Q5) a) A causal discrete time system is described by

$$y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)$$ **[8]**

i) Determine the system function 4(2)

ii) Compute the impulse response of the system.

b) The impulse response of the systems are given by **[8]**

$h_1(n) = (a)^n u(n)$ $h_2(n) = n(a)^n u(n)$

Compute Z – transform and comment on the stability of the system for a = 0.2, a = 1, & a = 2.

OR

Q6) a) The system is characterised by **[8]**

$$H(z)=\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$$

Determine h(n) for

i) Causal system

ii) Anticausal system &

iii) Non - causal system

b) Determine the Z - transform of **[8]**

i) $x(n)=2^n u(n)+3\left(\frac{1}{2}\right)^n u(n)$

ii) $x(n)=\left(\frac{1}{2}\right)^n u(n+2)+3^n u(-n-1)$

iii) $x(n)=nu(n)$ (use differentiation property)

SECTION - II

Q7) a) An analog filter has the transfer function $H(s)=\frac{1}{s+1}$. **[6]**

Using bilinear transformation, determine the transfer function of digital filter H(z) & also write the difference equation of the filter. Assume T = 1sec.

b) Design a digital butterworth filter that satisfies the following constraint using Bilinear transformation

Assume $\frac{2}{T}=1\text{sec.}$ **[10]**

$$0.9 \le \left|H\left(e^{j\omega}\right)\right| < 1 \qquad 0 \le \omega \le \pi/2$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \qquad 3\pi/4 \le \omega < \pi$$

OR

Q8) a) Design a lowpass digital filter for a cut - off frequency of $\omega_c = S\pi/9$. using frequency sampling method. Length of filter = 9. **[10]**

b) Explain the different characteristics of window function. **[6]**

Q9) a) Explain the sampling rate conversion by a non-integer factor. **[8]**

b) Explain the application of multirate signal processing in compact Hi - fi system. **[8]**

OR

Q10)a) An audio signal is to be decimated by a factor of 30. Design a two stage decimeter with factors 15 & 2, that satisfy the following specifications.

Sampling frequency = 240 kHz. **[8]**

highest frequency of interest = 3.4 kHz.

δ_p = 0.05

δ_s = 0.01

b) Explain the polyphase structure used for interpolation. **[8]**

Q11)a) Explain the factors that influence the selection of a digital signal processor. **[10]**

b) Explain various architectures of digital signal processors. **[8]**

OR

Q12)a) Explain the following units of a digital signal processor. **[9]**

i) MAC

ii) Pipelining

iii) Barrel shifter

b) What is the difference between fixed point and floating point processor. Why is floating point representation preferred? **[9]**

Total No. of Questions :12]

SEAT No. :

P2926

[Total No. of Pages :3

[4958] - 161

T.E. (Electrical)

MICROCONTROLLER AND APPLICATION

(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Describe the functions of pins: PSEN, $\overline{EA}$, ALE, INT0 **[9]**

b) Explain function of Program Status Word in 8051 with it's significance. **[9]**

OR

Q2) a) Explain all ports and latches with neat sketch. **[9]**

b) Draw and explain 8051 Programming model (RAM and ROM structure). **[9]**

Q3) a) Using DPTR transfer the codes from 1000H & 1001H to 7Eh and 7Fh. **[8]**

b) Explain with at-least one example the various addressing modes used in 8051. **[8]**

OR

P.T.O.

Q4) a) Using the DPTR transfer the codes from 1000H and 1001H to the external Memory address 1000H & 1001H. **[8]**

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

i) MOV 0A8h, 77h

ii) MOV add1, add2

iii) XCH a, @R1

iv) ORL A, ≠n

Q5) a) Assuming that XTAL = 11.0592MHz. Write a program to generate a square wave of 1kHz frequency on pin 1.2 **[8]**

b) Complement the lower nibble of RAM location 2Ah. **[8]**

OR

Q6) a) Set port 0 bits 1, 3, 5 and 7 to 1 and rest to 0. **[8]**

b) Explain TCON register and function of each bit. Also comment on use of TMOD. **[8]**

SECTION - II

Q7) a) Draw and explain interfacing of 8KB ROM and 4KB RAM. Show memory mapping. **[10]**

b) Write a note on use of cross assembler and simulator. **[8]**

OR

Q8) a) Explain serial communication of 8051 with PC using RS232communication protocol. **[10]**

b) Explain interfacing of 8051 with 8255. **[8]**

Q9) a) Explain with suitable diagram, measurement of temperature using 8051. **[8]**

b) Draw the interfacing diagram of ADC with 8051 and explain the interfacing process. **[8]**

OR

Q10)a) Draw interfacing a stepper motor with 8051 and write ALP to rotate the stepper motor. **[8]**

b) Write a note on measurement of level measurement using 8051. **[8]**

Q11)a) Explain the interfacing of 4 × 4 matrix keyboard with 8051. Draw the suitable diagram. **[8]**

b) Explain the procedure for voltage measurement using 8051. Draw the relevant diagram. **[8]**

OR

Q12)a) Write a note on "AC motor control using 8051". **[8]**

b) Explain the interfacing of 16 × 2 LCD with 8051. Draw the suitable diagram. **[8]**

Total No. of Questions :10]

SEAT No. :

P2927

[Total No. of Pages :3

[4958] - 162

T.E. (Electrical)

ELECTRICAL MACHINES - II

(End - Sem.)(2012 Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Compare salient pole type rotor construction with non salient type in case of 3 phase alternator. **[4]**

b) A 3 phase 4 pole star connected alternator has 60 slots and 2 conductors per slot. The pitch of the coil is 3 slots less than a pole pitch. The flux per pole is 125 mwb sinusoidally distributed calculate the phase value of induced emf for the supply frequency of 50 Hz **[6]**

OR

Q2) a) Define voltage regulation of alternator at full load. Can voltage regulation be positive or negative? When? **[4]**

b) A 100 kvA 3000 V 50 Hz 3 phase star connected alternator has effective armature resistance of 0.2 Ω. The field current of 40 A produces short circuit current of 200 A and an open circuit emf of 1040 V (line) Calculate the full load voltage regulation at 0.8 p. f lag **[6]**

P.T.O.

Q3) a) Explain operation of synchronous motor at constant local and variable excitation mode. **[4]**

b) A 3 phase alternator has direct axis synchronous reactance of 1.2 per unit and quadrature axis synchronous reactance of 0.8 per unit calculate the no load excitation emf at 0.8 pf lag, at full local. Assume terminal voltage = 1 PV & armature current = 1 PV. **[6]**

OR

Q4) a) Explain dark lamp method of synchronization of 3 phase alternator. **[4]**

b) Describe the phenomenon of hunting in synchronous motor. Explain how it can be reduced. **[6]**

Q5) a) State different methods of controlling speed of 3 phase induction motor. Explain cascade control. **[8]**

b) With neat diagram explain construction & working of permanent magnet stepper motor. **[8]**

OR

Q6) a) With neat diagram explain the construction & working of linear Induction motor. State its applications. **[8]**

b) Write a short note on 3 phase Induction voltage regulator. **[8]**

Q7) a) Explain the operation of dc series motor on AC supply? Explain the problems associated with AC operation. **[8]**

b) Compare uncompensated AC series motor with compensated single phase series motor. **[8]**

OR

Q8) a) Describe in detail the transformer emf and rotational emf in plain ac series motor. **[8]**

b) Draw the circle diagram of plain AC siries motor. Explain how to final speed scale, torque scale, and efficiency. **[8]**

Q9) a) A 230 V, 1kw 2 pole 50 Hz single phase Induction motor has following parameters

$R_1 = 2.2\,\Omega$, $X_1 = 3\ \Omega$, $R_2^1 = 3.8\,\Omega$, $X_2^1 = 2.1\,\Omega$

total magnetizing reactance $X_m = 86\ \Omega$

Calculate current, powerfactor, efficiency when operating at 6% slip. Draw equivalent circuit and show all the terms in it. **[12]**

b) Explain double revolving field theory applied to single phase Induction motor. **[6]**

OR

Q10)a) Explain why single phase Induction motor is not self starting. What are different methods to self start it. Explain the construction & working of capacitor start Induction motor with neat diagram. **[12]**

b) With suitable circuit diagram explain no load test and blocked rotor test on single phase Induction motor. **[6]**

Total No. of Questions :12]

SEAT No. :

P2928

[Total No. of Pages :3

[4958]-163
T.E. (Electrical)
Power Electronics
(2008 Pattern) (Semester -I)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer three questions from section I with Q1 or Q2, Q3 or Q4 and Q5 or Q6 and Q7 or Q8,Q9, or Q10, or Q11, or Q12 from section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION -I

Q1) a) What are VI ratings of SCR? Explain with help of static characteristic. **[6]**

b) Describe the holding current and latching current as applicable to an SCR and with the help of a neat diagram explain the two transistor analogy of an SCR. **[10]**

Q2) a) Draw the turn-on characteristics of an SCR and explain the mechanism of turn on. **[8]**

b) Explain the following ratings of SCRs and their significance. **[8]**

i) Peak working reverse voltage.

ii) On state voltage.

iii) dV/dt & di/dt rating.

iv) Latching current & Holding Current.

P.T.O.

Q3) a) Describe the working of single phase fully controlled bridge converter feeding highly inductive load assuming continuous conduction. Also sketch the following waveforms for α =45° and α =120° **[10]**

i) Load voltage waveform.

ii) Load current waveform.

iii) Thyristor voltage waveform.

b) Explain the operation of single phase semi controlled bridge converter with inductive load with associated waveforms. **[6]**

Q4) a) Explain the operation of a three phase half controlled bridge converter with waveforms for output voltage for resistive load. Write expression for average output voltage. **[8]**

b) Describe the operation of single phase two pulse mid-point converter feeding resistive load with input and output voltage and current waveforms. Draw voltage across each SCR. **[8]**

Q5) a) For a single phase a.c voltage regulator feeding a resistive load draw the waveforms of source voltage, gating signals, output voltage, source and output currents and voltage across SCRs. Describe its working with reference to the waveforms drawn. **[9]**

b) Describe the operation of multistage sequence control of a.c. voltage regulator with suitable diagram. **[9]**

Q6) a) Describe TRIAC operation for ac voltage regulation when used as light dimmer switch. **[9]**

b) Discuss the working of a two stage sequence control of voltage regulators for R loads. What is the advantage of this regulator? **[9]**

SECTION -II

Q7) a) Draw and explain the output characteristics of n-channel enhancement mode MOSFET. **[8]**

b) With the help of neat structural diagram and suitable waveforms, explain the operation of insulated gate BJT (IGBT). **[8]**

Q8) a) Discuss the switching characteristics of the IGBT with the help of neat circuit diagrams and waveforms. **[8]**

b) With the help of neat structural diagram, explain the operation of MCT. **[8]**

Q9) a) Draw the schematics of step-down chopper and derive an expression for output voltage in terms of duty -cycle for a resistive load. **[8]**

b) Explain the time ratio control and current limit control, and control strategies used for chopper. **[8]**

Q10)a) Draw the circuit of a four quadrant chopper and explain its working modes using waveforms. **[8]**

b) A d.c chopper circuit connected to a 120 V d.c source supplies an inductive load having 40mH in series with a resistance of 5Ω. A freewheeling diode is placed across the load. Draw neat circuit diagram and waveforms. Determine the average load voltage & current for Duty cycle of 0.6 at switching frequency of 500 Hz. Determine the time ratio of chopper. **[8]**

Q11)a) With the help of neat circuit diagram and associated waveforms, explain the operation of single phase half bridge MOSFET based voltage source inverter with inductive load. What is need for feedback diodes? **[9]**

b) With the help of neat circuit diagram and waveforms, explain briefly the operation of three phase bridge inverter with resistive load in 120° conduction mode. **[9]**

Q12)a) With the help of neat circuit diagram and associated waveforms, explain the operation of single phase full bridge transistorized voltage source inverter. What is the advantage of PWM control? **[9]**

b) State the various methods of voltage control in inverter circuits and explain each of them briefly. **[9]**

Total No. of Questions : 12]

SEAT No. :

P2930

[Total No. of Pages : 2

[4958]-165

T.E. (Electrical Engineering)

ENGINEERING ECONOMICS & MANAGEMENT

(2008 Pattern) (Semester - I) (311121)

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

Instructions to candidates:

1) ***Answer any one question from each unit.***
2) ***Answer to the two sections should be written in sepacter books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

UNIT - I

Q1) Define organization. Explain types of ownership in detail. **[16]**

OR

Q2) What is demand forecasting? Explain its methods in detail. **[16]**

UNIT - II

Q3) a) Differentiate between Administration and management. **[8]**

b) Explain contribution of F.W. Taylor in management field. **[8]**

OR

Q4) Write short notes (Any Two)

a) Lean manufacturing. **[8]**

b) Kanban. **[8]**

c) ABC Analysis. **[8]**

d) T.Q.M. **[8]**

P.T.O.

UNIT - III

Q5) a) Define marketing. Explain 4 'P's of marketing. **[9]**

b) Explain online marketing method with Examples. **[9]**

OR

Q6) a) Define Financial management & Explain its functions. **[9]**

b) Explain Types of costs with examples. **[9]**

UNIT - IV

Q7) a) Define motivation. Explain Theory 'X' & 'Y' of motivation. **[8]**

b) Explain Maslow Hierarchy of needs Theory. **[8]**

OR

Q8) a) Explain different styles of Leadership. **[8]**

b) Explain different Qualities of "Entrepreneur". **[8]**

UNIT - V

Q9) Define Human Resources management. Explain its functions in detail. **[16]**

OR

Q10)a) Write a brief note on Personality Development. **[8]**

b) Explain the concept of Business ethics. **[8]**

UNIT - VI

Q11)Explain Disaster management. Explain various phases of Disaster management. **[18]**

OR

Q12)Prepare a detailed plan for managing Disaster like "Earthquake" in detail.**[18]**

Total No. of Questions :11]

SEAT No. :

P2931

[Total No. of Pages :3

[4958]-166
T.E. (Electrical)
ENERGY AUDIT AND MANAGEMENT
(2008 Course) (Semester - II) (303146)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain salient features of Electricity Act 2003. **[8]**

b) Explain in detail long term policies of Govt. of India. **[8]**

OR

Q2) a) Explain in detail various energy sources with examples: **[8]**

i) Primary and secondary energy sources.

ii) Conventional and non-conventional energy sources.

b) What do you mean by energy security? Explain few strategies to ensure energy security of our country. **[8]**

Q3) a) Explain DSM concept with advantages and disadvantages. **[8]**

b) Explain the duties of Energy Manager and Energy Auditor. **[8]**

OR

P.T.O.

Q4) a) What is Demand Side Management? What are the different areas of development? And what are the barriers of Demand Side Management? **[8]**

b) Explain Energy Management term and general structure of Energy Management. **[8]**

Q5) a) Explain step wise procedure to carry out detailed energy audit. **[10]**

b) Explain following techniques with their use for energy analysis **[8]**

i) Sankey diagram

ii) CUSUM technique.

OR

Q6) a) Explain various instruments with function of each used to carry out energy audit. **[10]**

b) Use CUSUM Technique and calculate energy savings. The average production can be 4000 MT/month. The specific energy consumption data is given below. **[8]**

Month	Actual-SEC KWh/MT	Predicted - SEC kWh/MT
Jan.	242	265
Feb.	238	265
Mar.	287	265
Apr.	237	265
May	295	265
June	246	265

Draw necessary CUSUM graph.

SECTION-II

Q7) a) Explain T.O.D. tariff and its benefits. **[8]**

b) Explain Net present value method and time value of money. **[8]**

OR

Q8) a) An investment of Rs. One Lakh is made for a variable speed drive at the beginning of the year, which is also the date of first operation. Savings expected over four years are Rs. 20,000, Rs. 30,000, Rs. 40,000 and Rs. 45,000 respectively. Find out the net present value at the end of fourth year, if the discount rate is 22%. Would you invest in this measure? Explain your decision. **[8]**

b) What do you mean sensitivity and risk analysis. **[8]**

Q9) a) What is Cogeneration? Explain Topping and Bottoming cycle with neat diagrams. **[8]**

b) Enlist energy conservation opportunities in Electric motors. **[8]**

OR

Q10)a) Enlist energy conservation opportunities in pumping systems. **[8]**

b) Enlist energy conservation opportunities in T& D sector. **[8]**

Q11)Write notes on Energy conservation case studies (Solve any three of the following): **[18]**

a) I.T. Industry

b) Sugar Industry

c) Steel Industry

d) Textile Industry

e) Agricultural sector

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Total No. of Questions : 12]

SEAT No. :

P2932

[Total No. of Pages : 4

[4958]-167
T.E.(Electrical)
POWER SYSTEM-II
(2008 Course) (Semester-II)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from section-I and Q7 or Q8, Q9 or Q10,Q11 or Q12 from section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Explain the procedure for drawing the receiving end circle diagram. What information can be obtained from power circle diagram? **[8]**

b) A three phase 220kV overhead line delivers 60MVA at 220kV and power factor 0.85 lagging at its receiving end. The constants of line are A=0.93, α=3° and B=125, β=75°ohm per phase. Find **[8]**

i) Sending end voltage and power angle

ii) Sending end active and reactive power

iii) Line losses and vars absorbed by the line

OR

Q2) a) Derive equation for receiving end active and reactive power flow in the transmission line and prove that reactive power flow in the transmission line proportional to voltage drop along the line. **[8]**

b) What is surge impedance loading? Explain different methods used to improve surge impedance loading. **[8]**

Q3) a) Explain the advantages and drawbacks of EHVAC transmission. **[8]**

b) Estimate the corona loss for a three phase, 110kV, 50Hz, 150km long transmission line consisting of three conductors each of 10mm diameter and spaced 2.5m apart in an equilateral triangle formation. The temperature of air is 30°C and the atmospheric pressure is 750mm of mercury. Take the irregularity factor as 0.85. Ionization of air may be assumed to take place at a maximum voltage gradient of 30kV/cm. **[8]**

OR

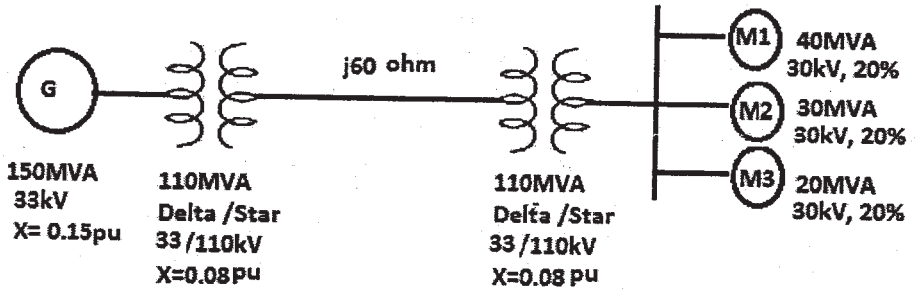
P.T.O.

Q4) a) Find the disruptive critical voltage and visual critical voltage for local and general corona for a three phase line consisting of 21mm diameter conductors spaced in 6m delta configuration. Take temperature 25°C, pressure 73 cm of mercury, surface factor 0.84, irregularity factor for local visual corona 0.72 and for general (decided)visual corona 0.82. **[8]**

b) Explain power handling capacity and power loss at different voltage levels. **[8]**

Q5) a) What is per unit system? Explain the advantages and applications of per unit system. **[9]**

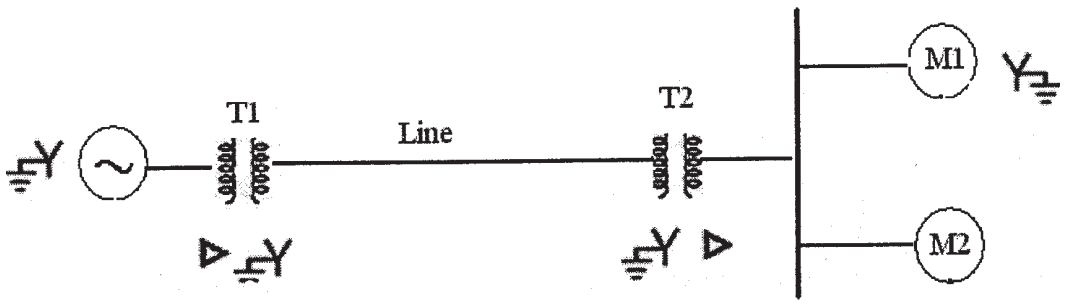
b) A 150MVA, 33kV, three phase generator has a reactance of 15%. The generator is connected to three motors through transmission line and transformers as shown in the fig. Motors have rated input of 40 MVA, 30MVA, 20MVA at 30kV with 20% reactance each. If a three phase short circuit fault occurs at generator terminals. Find the fault current &fault MVA. **[9]**



OR

Q6) a) What do you mean by DC offset current? What is the effect of instant of short circuit on the waveform of short circuit current of R-L circuit? **[9]**

b) A 50MVA, 15kV three phase generator has a sub transient reactance of 0.20pu. The generator supplies two motors over transmission line having transformers at both ends, as shown in the fig. The motors have rated inputs of 30MVA and 20MVA, both 30kV with 0.15pu subtransient reactance. The rating of the sending end transformer T_1 is 50 MVA 11Δ–132 Y with leakage reactance of 0.10 pu. Transformer T_2 at the receiving end has three single phase transformers connected as three phase unit. The rating of each individual transformer is 20MVA,33/76kV with leakage reactance of 0.12pu. Series impedance of the line is (25+j75) ohms. Draw the impedance diagram with all impedances marked in pu. select the generator rating as the base in the generator circuit. **[9]**



SECTION-II

Q7) a) Show that fault current $I_f = 3E/Z_1+Z_2+Z_0$ when L-G fault occurs at the terminals of solidly grounded star connected alternator. **[8]**

b) A 50 MVA, 11kV, 3 phase synchronous generator was sbjected to different types of faults. The fault currents are as follows, **[8]**

LG fault - 4500 amp, LL fault - 3000 amp, LLL fault-2500 amp

The generator neutral is solidly grounded. Find per unit values of 3 sequence reactance of generator.

OR

Q8) a) Draw zero sequence diagram for all types of combinations of transformers. **[8]**

b) A 3phase, 37.5 MVA, 33kV alternator having X_1=0.18 pu, X_2=0.12pu and X_0=0.1 pu based on its rating is connected to a 33kV overhead line having X_1=6.3Ω /ph, X_2=6.3Ω/ph and X_0=12.6 Ω /ph. A single line to ground fault occur at remote end of the line. The alternator neutral is solidly grounded. Calculate fault current. **[8]**

Q9) a) Write a general form of power flow equations for n-bus power system and explain **[10]**

i) Nature and characteristics of equations

ii) Various constraints to be considered

iii) Types of buses.

b) Determine the Y bus for the three bus system. Neglect the shunt capacitances of the lines. The line series impedances are as follows.**[6]**

Bus code	Impedance (pu)
1-2	0.08+ j0.24
1-3	0.02+ j0.06
2-3	0.06 + j0.18

OR

Q10)a) Explain in brief the procedure for formulation of Y_{bus} using singular transformation. **[8]**

b) Compare Newton Raphson method with Gauss Seidal method of load flow analysis. **[8]**

Q11)a) Explain different types of HVDC links. Name any two HVDC systems in India. **[8]**

b) Write short note on(any two): **[10]**

i) Bipolar and mono-polar HVDC transmission system

ii) Constant current control

iii) Constant extinction control

OR

Q12)a) Give advantages and disadvantages of HVDC transmission system. **[8]**

b) Explain components of HVDC transmission system with single line diagram. **[10]**

◀▶ ◀▶ ◀▶

Total No. of Questions : 12]

SEAT No. :

P2933

[Total No. of Pages : 3

[4958]-168
T.E.(Electrical)
DESIGN OF ELECTRICAL MACHINES
(2008 Course) (303148)(Semester-II)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain Carter's fringe curve and gap distribution factor in detail. **[8]**

b) Explain principal components of leakage flux for poly-phase machines. **[8]**

OR

Q2) a) Write note on magnetic leakage and state effects of magnetic leakage. **[8]**

b) Calculate the specific iron loss in a specimen of alloy steel for a maximum flux density on 3.2 Wb/m^2 and frequency of 50Hz, using 0.5 mm thick sheets. The resistivity of alloy steel is $0.3\times10^{-6}\Omega$ m. The density is $7.8\times10^3 kg/m^3$. Hysteresis loss in each cycle is $400J/m^3$. **[8]**

Q3) a) Determine the main dimensions of 500 KVA, 6600/400V, 3phase, 50 Hz core type oil immersed self-cooled distribution transformer. Voltage per turn is 20V, area factor for stepped core is 0.56, window space factor=0.3, current density is $3A/mm^2$, $B_m=1.2Wb/m^2$, width of largest stamping=0.85d, D=1.85a. Assume $A_y = A_i$ **[8]**

b) Derive output equation of single phase core type transformer. **[8]**

OR

P.T.O.

Q4) a) Enlist specifications of transformer as per IS 2026. **[8]**

b) Draw heating curve and cooling curve and explain the following: **[8]**

i) Heating time constant

ii) Cooling time constant

iii) Final steady temperature rise

iv) Hot spot temperature

Q5) a) Discuss mechanical forces in transformer and explain how they are taken into consideration while fabricating and how the mechanical bracing is provided? **[8]**

b) Determine the main dimension of core and yoke for a 200KVA, 50 Hz, 1phase, core type transformer. A cruciform core is used with distance between adjacent limbs is 1.5 times the width of core laminations. Assume voltage per turn=14V, B_m = 1.2T, K_w = 0.30, current density= 2.5A/mm^2, K_s=0.9, A_i=0.56d^2. Width of largest stamping is 0.85d. **[10]**

OR

Q6) a) Derive the formula for axial forces developed in transformers. **[8]**

b) A 500 KVA 11000/400 delta/star transformer has following details: HV turns = 1660, length of mean turn=93cm, length of coil=52cm, short circuit current=20 × rated current. Find radial force in tonnes on HV winding under short circuit conditions. **[10]**

SECTION-II

Q7) a) Derive the Output equation of 3ph. IM. State the units with meanings of each symbol used. **[8]**

b) Determine the main dimensions, turns per phase, number of slots, conductor cross-section and slot area of a 250hp, 3-phase 50Hz, 400V, 1410 rpm slip ring induction motor. Assume Bav=0.5 Wb/m^2, ac=30,000 A/m, efficiency =0.9 and power factor=0.9, winding factor=0.955, current density =3.5 A/mm^2. Slot space factor=0.4 and ratio L/τ= 1.2. The machine is delta connected. Assume 5 slots per pole per phase. **[10]**

OR

Q8) a) With reference to ac windings compare: **[8]**

i) Single layer and double layer winding

ii) Fractional slot and integral slot winding

b) Discuss factors governing choice of specific electrical loading and specific

magnetic loading for 3ph. IM. **[10]**

Q9) a) Explain various methods to eliminate harmonic torques. **[8]**

b) A 90kW, 500V, 50Hz, 3-phase, 8-pole induction motor has a star connected stator winding accommodated in 63 slots with 6conductors per slot. If the slip-ring voltages on open circuit is to be about 400V, find a suitable rotor winding, stating: **[8]**

i) Number of slots

ii) Number of conductors per slot

iii) Coil span

iv) Slip ring voltage on open circuit

v) Approximate full load current per phase in rotor.

Assume efficiency=0.9, power factor=0.86, slots per pole per phase=3, rotor mmf is 86% of stator mmf.

OR

Q10) a) Discuss factors that affect the choice of length air gap in IM. Why should air gap be as small as possible? **[8]**

b) Derive the equation for end ring current for the rotor of squirrel cage induction motor. **[8]**

Q11)a) Discuss various losses in case of three phase induction motor. **[8]**

b) A15 kW, 400 V, 50Hz, 6 pole, 3 phase star connected induction motor has a magnetizing current which is 35% of full load current. Calculate the value of stator turns per phase if mmf required for flux density at 30°C from pole axis 4005A. Assume winding factor = 0.95.Full load efficiency = 0.95 and full load power factor=0.86. **[8]**

OR

Q12)a) Write short notes on **[8]**

i) MMF calculations for air gap of three phase Induction motor

ii) Effect of saturation on calculation of mmf of 3 phase Induction motor

iii) Performance calculations of 3 ph. IM from circle diagram

b) Explain the procedure to calculate no load current of three phase induction motor. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2934

[Total No. of Pages : 4

[4958]-169
T.E. (Electrical)
CONTROL SYSTEM - I
(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any three questions from Section I and Section II.***
2) ***Answers to the two Sections should be written in separate answer books.***
3) ***Neat Diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables, slide rule, electronics pocket calculator is allowed.***
6) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain general classification of control systems. What the advantages are of closed loop systems over open loop system. **[6]**

b) Obtain the overall transfer function using Block Diagram Reduction Technique. **[10]**

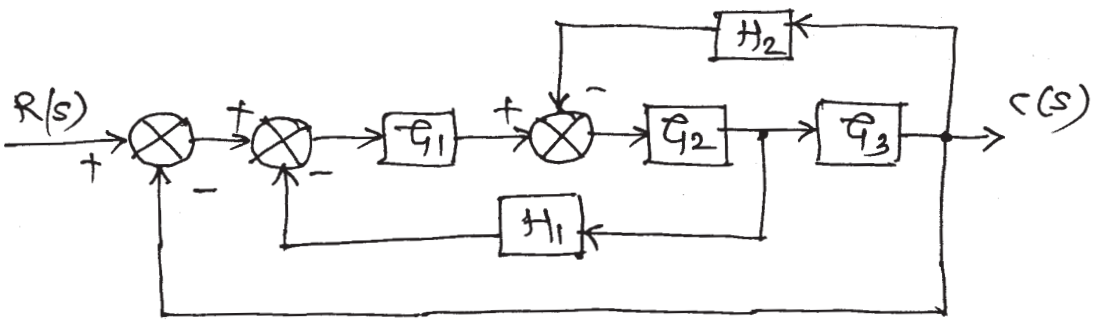


Fig 16.

OR

P.T.O.

Q2) a) State and explain the rules of Block diagram algebra used for block diagram reduction. **[8]**

b) For the mechanical system as shown in fig 2b, derive the Equivalent Electrical system using Force-Voltage analogy. **[8]**

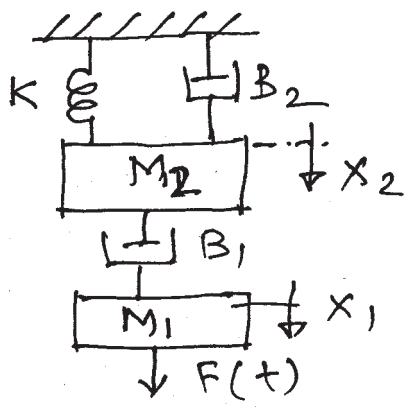


Fig 2b

Q3) a) Discuss steady state error for type '0', type '1', type '2' system. What are static error coefficients? **[8]**

b) For a unity feedback system with open loop transfer function $G(s)=\frac{K(s+2)}{s(s^2+7s+12)}$, determine static error constants and steady state error for parabolic input : $r(t) = t^2$ **[8]**

OR

Q4) a) For a second order, under damped system with step input, explain all the time response specifications. **[8]**

b) For the unity feedback system $G(s)H(s)=\frac{25}{s(s+8)}$, Determine damping ratio, peak time, peak overshoot, settling time and damped natural frequency. **[8]**

Q5) a) A unity feedback system has $G(s)H(s)=\frac{K}{s^2(s+4)}$, Sketch the root locus plot and investigate stability. **[12]**

b) Explain all the rules used for constructing root locus plot. **[6]**

OR

Q6) a) Explain necessary and sufficient conditions for Routh's Stability criteria. **[5]**

b) The characteristic equation of a third order system is given by:

$s^3 + 7s^2 + 25s + 39 = 0,$

Check whether the roots of the characteristic equation are more negative than -1 **[8]**

c) What are the effects on root locus due to addition of poles and zeros? **[5]**

SECTION - II

Q7) a) State and explain Nyquist stability criteria. **[8]**

b) Draw polar plot for type "0" and type "1" system. **[10]**

OR

Q8) a) Explain the relation between time domain specifications and frequency domain specifications of a second order system. **[6]**

b) Draw the Bode plot for a system $G(s)H(s)=\frac{100}{s(s+1)(s+2)}$ and discuss on closed loop stability. **[12]**

Q9) a) Explain the terms with example: **[6]**

i) State

ii) State Vector and

iii) State space

b) Consider the electrical circuit as shown in fig 9b. Obtain the state model of the system with zero initial condition. **[10]**

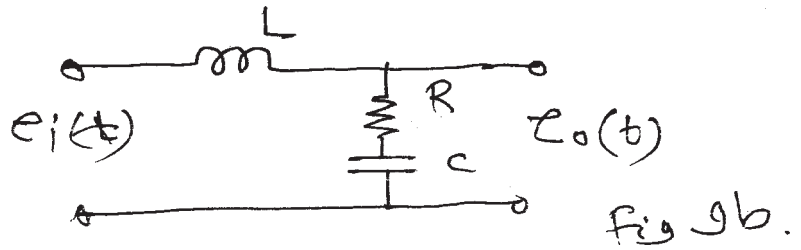


fig 9b.

OR

Q10)a) Explain various decomposition methods to obtain the state model. **[8]**

b) For the following transfer function of a system $\frac{Y(s)}{U(s)} = \frac{K(s+2)}{s(s^2+7s+12)}$, obtain its state space representation. **[8]**

Q11)Write note on

a) DC Servomotor. **[6]**

b) LEAD Compensator. **[6]**

c) AC Tachometer. **[4]**

OR

Q12)a) Derive transfer function of Lead Compensator network. **[8]**

b) Write a note on DC Servomotor. Derive its transfer function. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P4919

[Total No. of Pages : 3

[4958] - 170
T.E. (Electrical Engineering)
UTILIZATION OF ELECTRICAL ENERGY
(2008 Pattern)

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

Instructions to the candidates :-

1) ***Answers 3 Questions from section I and 3 Questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State advantages of electric heating. **[6]**

b) With suitable diagram explain ultrasonic welding. **[6]**

c) Compare direct arc furnace with indirect arc furnace. **[6]**

OR

Q2) a) Describe the various causes of failure of heating element. **[6]**

b) Calculate kvA rating, power factor, efficiency of a 3 phase electric arc furnace with following details-

3 phase- star connected furnace, current drawn = 4500 Amp, Arc voltage = 50 volt, resistance of transformer referred to secondary = 0.002Ω and reactance of transformer referred to secondary = 0.004 Ω. **[6]**

c) With suitable diagram explain - seam welding, Butt welding. State applications of each type. **[6]**

Q3) a) With suitable diagram explain working of plugging switch. **[8]**

b) With suitable diagram explain electro extraction of aluminium. **[8]**

OR

P.T.O.

Q4) a) With suitable diagram explain water level controller using float switch. **[8]**

b) With neat diagram explain electric circuit for refrigerator. **[8]**

Q5) a) Define - Candle power, space to height ratio. **[4]**

b) Explain Lambert's cosine law for illumination. **[4]**

c) State and explain the factors to be considered while designing illumination scheme for indoor installation. **[8]**

OR

Q6) a) With suitable diagram explain construction & working of metal halid lamp. state its applications. **[8]**

b) A room of length 20m and width 10m is to be illuminated by 8 lamps. Average illumination is expected to be 50 lux. Taking depreciation factor of 1.2 and utilization factor of 0.48, calculate MSCP of each lamp. **[8]**

SECTION - II

Q7) a) Compare - Diesel drive with electric drive. **[6]**

b) State the advantages and disadvantages of steam engine drive. **[6]**

c) Explain single phase low frequency Ac system for track electrification. **[6]**

OR

Q8) a) Compare third rail current collector system with over head system. **[6]**

b) With suitable diagram explain polygonal catenary. **[6]**

c) Compare 25 kv Ac system with DC system of track electrification. **[6]**

Q9) 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 on a simplified quadrilateral speed - time curve. If the maximum speed is to be limited to 64 kmph, acceleration to 2 kmph and coasting and braking retardation of 0.16 kmph ps and 3.2 kmph ps respectively. Determine the duration of acceleration, coasting and braking period. **[8]**

b) What is coefficient of adhesion? State the factors affecting coefficient of adhesion. **[8]**

OR

Q10) a) Draw and explain quadrilateral speed time curve. **[8]**

b) Write expression for total tractive effort for traction. Explain each part of tractive effort in detail. **[8]**

Q11) a) With suitable diagram explain series parallel control of 2 DC series motors. **[8]**

b) Discuss suitability of Ac series motor for traction work. **[8]**

OR

Q12) a) State the necessity of railway signalling. **[4]**

b) With suitable diagram explain absolute block system. **[6]**

c) Explain - French method for regenerative braking of DC series motor. **[6]**

Total No. of Questions :12]

SEAT No. :

P2935

[Total No. of Pages :3

[4958] - 171

T.E. (Instrumentation & Control Engg.)

Instrumentation For Chemical Analysis

(Semester - I) (2008 Course)

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

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) List Advantages and disadvantages of Instrumental method over chemical analysis method. **[8]**

b) Explain experimental set up of Voltametry with neat sketch. **[8]**

OR

Q2) a) List Radiometric and Photometric units of chemical analysis. **[8]**

b) Explain Potentiometry with neat sketch. **[8]**

Q3) a) Draw electromagnetic spectrum show one source and one detector in each region. **[8]**

b) What is spectrophotometer? Explain Direct reading spectrophotometer with neat sketch. **[10]**

OR

P.T.O.

Q4) a) List Various Types of nebulizer, Explain V-Grooves types nebulizer with sketch. **[10]**

b) Explain AAS with neat sketch. **[8]**

Q5) a) Explain Interferogram used in FTIR with neat sketch. **[8]**

b) Explain Atomic Emission Spectroscopy (AES) with neat sketch. **[8]**

OR

Q6) a) List Various IR Detector, Explain any one type of IR detector with neat sketch. **[8]**

b) Write short notes on **[8]**

i) Inductively coupled plasma(ICP).

ii) Integral burner type Atomiser.

SECTION - II

Q7) a) Explain with neat sketch Single beam fluoriometer. **[8]**

b) Explain with neat sketch phosporiometer. **[8]**

OR

Q8) a) Explain with neat sketch N2 Analyser. **[8]**

b) What is NMR? Explain the term chemical Shift with neat sketch. **[8]**

Q9) a) Enlist different types of Mass Spectrometer. Explain Working of Magnetic deplection mass spectrometer with neat sketch. **[10]**

b) Explain Gas Chromatography with neat sketch. **[8]**

OR

Q10)a) List and explain various factor affecting to separation in Gas Chromatography. **[10]**

b) Explain any one type of detector used in HPLC with neat sketch. **[8]**

Q11)a) Explain with neat sketch GM Counter. **[8]**

b) Explain Instrumentation for 'X-ray Spectroscopy. **[8]**

OR

Q12)a) Explain Proportional counter with neat sketch. **[8]**

b) What is ESCA? Explain auger emission spectroscopy. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2936

[Total No. of Pages : 3

[4958]-172

T.E.(Instrumentation and Control)

EMBEDDED SYSTEM DESIGN

(2008Pattern)(Semester-I)

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

Instructions to the candidates:

1) ***Answer any three questions from section I and three questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Draw and explain power on reset circuit of 8051μC. **[8]**

b) Describe the dual role of Port-3 of 8051 μC. **[8]**

OR

Q2) a) Explain with an example Timer Mode-2 operation of 8051 μC. **[8]**

b) Explain PSW register of 8051 μC. **[8]**

Q3) a) Explain with an example four addressing modes of 8051 μC. **[8]**

b) Explain following instructions of 8051 μC. **[8]**

i) JMP @ A+DPTR ii) SWAP A

iii) MOVC A, @A+ DPTR iv) MUL AB

OR

Q4) a) Write a program to transfer the message "Dare To Do Mistakes" serially at 9600 baud, 8 bit data, 1 stop bit.(Assume crystal frequency of 11.0592 MHz). **[8]**

b) Explain interrupt structure of 8051 μC. what are the vector addresses of all the interrupts? **[8]**

P.T.O.

Q5) a) With a neat sketch explain the interfacing of 4×4 matrix keyboard with 8051 μC. **[9]**

b) With a neat sketch explain the interfacing of DAC0808 with 8051 μC. **[9]**

OR

Q6) a) A ON-OFF temperature control system is designed with 8051 μC. Pt-100 temperature sensor and 4×4 matrix keyboard is used. The temperature is displayed on 16×2 LCD display. Draw and explain the complete interfacing diagram. **[12]**

b) Write short notes on:

i) RS-232 standards.

ii) I^2C interface

iii) SPI Communication. **[6]**

SECTION-II

Q7) a) Compare the ATTiny2313 and AT MEGA8535 μC. **[8]**

b) Explain Timer-0 operation of AT MEGA8535 μC. **[8]**

OR

Q8) a) Explain register file structure of ATMega 8535 AVR μC. **[8]**

b) What is a watch dog timer? Explain the watch dog timer in ATMega 8535 AVR μC. **[8]**

Q9) a) Explain with suitable block diagram reset logic of ATMega 8535 AVR μC. **[8]**

b) Explain RS-485 communication link of ATMega 8535 AVR μC. **[8]**

OR

Q10) a) Which register is used to set baud rate for serial communication in AVR µC? Calculate the count for baud rate of 3600. **[8]**

b) Explain the AVR hardware design issues with respect to power supply. **[8]**

Q11) a) Draw and explain interfacing of stepper motor with ATMega 8535 AVR µC. **[9]**

b) With the neat diagram, explain the interfacing of serial RTC with ATM ega 8535 AVR µC. **[9]**

OR

Q12) Discuss the design of Data Acquisition System with RS-232 interface using AVR µC based on the following points.

a) Blockdigram with explanation. **[6]**

b) Neat interfacing Diagram with explanation. **[6]**

c) A general algorithm **[6]**

Total No. of Questions : 12]

SEAT No. :

P2937

[Total No. of Pages : 3

[4958]-173

T.E.(Instrumentation & control)

CONTROL SYSTEM COMPONENTS

(2008 Course) (Semester-I)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Compare electromechanical relay with solid state relay. **[8]**

b) Explain the construction working & application of following types of switches. **[10]**

i) Temperature switch

ii) Push button

OR

Q2) a) Explain with neat sketch the working of a contactor. **[8]**

b) Give the application of following types of switches Draw standard symbols

i) DPST toggle switch

ii) Rotary switch

iii) Limit switch

iv) Pressure switch

v) DIP switch **[10]**

P.T.O.

Q3) a) State the advantages of MCC and Explain the interlocks related to motor control centre. **[10]**

b) Using standard symbols, draw electrical wiring diagram for DOL starter of 3 phase induction motor. **[6]**

OR

Q4) a) Explain with the help of neat sketch need, construction and working of thermal overload relay **[6]**

b) What do mean by braking of motors? Using standard symbols, draw electrical wiring diagram for any one method of braking. **[10]**

Q5) a) With the help of neat diagram, explain pneumatic supply. **[8]**

b) Draw pneumatic circuit for extending a single acting pneumatic cylinder with speed control only in the forward direction. **[8]**

OR

Q6) a) Draw pneumatic symbols for the following and give the use of each

i) Non-return Flow control valve

ii) Compressor

iii) 2/2 NC Direction control valve

iv) Unidirectional motor. **[8]**

b) Draw pneumatic circuit for automatic reciprocation a double acting pneumatic cylinder once command for extension is manually provided. **[8]**

SECTION-II

Q7) a) Explain meter- in and bleed off hydraulic circuits. **[8]**

b) Compare hydraulic systems with Pneumatic systems. **[8]**

OR

Q8) a) Write the properties of hydraulic fluids used in hydraulic systems. **[8]**

b) Using standard symbols, draw sequential operation of two hydraulic cylinders. **[8]**

Q9) a) Explain the following Auxiliary components **[10]**

i) High Selector

ii) Circuit breaker.

b) What are the standard sequences for alarm annunciator. **[8]**

OR

Q10) a) Compare fuse with circuit breaker **[6]**

b) What is fluidics. Explain the construction and working of any one type of fluidic component. **[6]**

c) Explain with the help of neat figure any one application of synchro. **[6]**

Q11) a) What is purging? What are different types of purging and the application. **[8]**

b) Explain different types of tube fittings. **[8]**

OR

Q12) a) Explain compression Pipe fittings. **[8]**

b) Compare explosion proof housing and intrinsic safety methods of protection. **[8]**

Total No. of Questions :12]

SEAT No. :

P2938

[Total No. of Pages :3

[4958] - 174

T. E. (Instrumentation and Control)

ELECTRONIC INSTRUMENTATION

(Semester - I) (2008 Course) (306264)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q2, Q3 or Q4, Q5 or Q6 in Section I, Q7 or Q8, Q9 or Q10 and Q11 or Q12 in Section II. Total six questions to be attempted minimum.***
2) ***Start each questions on a new page.***
3) ***Assume suitable data wherever required.***
4) ***Neat labelled diagrams are expected.***

SECTION - I

Q1) a) Explain the construction and working of the basic DMM with the help of a neat block diagram. **[8]**

b) State and Explain the two substitution methods to measure the unknown impedance using a Q meter. **[8]**

OR

Q2) a) Explain Automatic Ranging and Automatic Zeroing in VM. **[8]**

b) Explain what is stray capacitance in Q meter. The self - capacitance is measured by making two measurements at different frequencies.The values are, f1 = 1MHz, f2 = 2 MHz, C1 = 500pF, C2 = 110pF. Find the values of – stray capacitance and L. **[8]**

Q3) a) What is jitter? Explain various types of jitter with suitable waveforms.**[8]**

b) For wheatstone's bridge network, explain with suitable diagrams how amplitude stability is achieved. **[8]**

OR

P.T.O.

Q4) a) Explain in detail with suitable diagram, Direct synthesis type of frequency synthesizer. **[8]**

b) Draw and explain the internal block diagram of 8038. **[8]**

Q5) a) State the different types of probes. Explain the current probe and the attenuator probe. **[9]**

b) Explain the construction and working of CRT in CRO with the help of a neat labelled diagram. **[9]**

OR

Q6) a) State the various modes in DSO. Explain the roll mode and refresh mode in DSO. **[10]**

b) Differentiate between: **[8]**

i) Dual Beam and Dual Trace oscilloscope

ii) Analog CRO and Digital CRO

SECTION - II

Q7) a) State the various types of ADCs. Explain Dual Slope type of ADC with suitable diagrams. **[10]**

b) Explain what is quantization error? State its types with the help of neat suitable graphs. **[8]**

OR

Q8) a) Explain R-2R ladder type of DAC with suitable diagram and example. **[8]**

b) Explain SAR type of ADC with suitable diagram and example. **[10]**

Q9) a) Write short note on - digital capacitance meter. **[8]**

b) With a neat labelled diagram and / or necessary waveforms explain the totalizing mode and ratio mode of Universal counter. **[8]**

OR

Q10)a) State the different sources of error in digital instruments. Explain any three in detail. **[8]**

b) Draw and Explain the internal block diagram of Universal Counter. **[8]**

Q11)a) What is a spectrum analyser? Explain the heterodyne type of spectrum analyser with the help of a neat block diagram. **[8]**

b) Write short note on - Virtual Instrumentation. **[8]**

OR

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

a) Distortion meter.

b) THD analyser.

c) Wave analyser.

d) Virtual Instrumentation Architecture.

Total No. of Questions : 12]

SEAT No. : ____

P4556

[Total No. of Pages : 3

[4958] - 175

T.E. (Instrumentation & Control)

INDUSTRIAL MANAGEMENT

(2008 Pattern)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is business process re-engineering? Why it is important? Give different steps involved in it and also mention its advantages. **[10]**

b) Explain Porters five forces with neat diagram. How are useful in the business? **[8]**

OR

Q2) a) Write short notes on : **[10]**

i) Area Vs Product Matrix.

ii) SWOT analysis.

b) Explain Cause & Effect diagram. **[8]**

Q3) a) Briefly explain salient features of ISO 9001 standard. Explain the clauses Internal Audit, Statistical process control and Design & Data control.**[10]**

b) Explain with importance Quality Circle. **[6]**

OR

P.T.O.

Q4) Write notes on : **[16]**

a) Industry Institute interaction.

b) Business expansion in relation with global market.

Q5) a) Define 'Inventory'. Explain how inventory control is important in today's era? **[10]**

b) Explain the supply chain management concept along with its advantages? **[6]**

OR

Q6) a) Write short notes on : **[10]**

i) Outsourcing.

ii) Purchasing.

b) Explain Store keeping and Material handling. **[6]**

SECTION - II

Q7) a) Define Human Resource Management and explain its Aims, Principles and Functions. **[10]**

b) What is Leadership? What are functions and Qualities of Leadership? **[8]**

OR

Q8) a) Explain in detail Training. **[12]**

b) What is the role of Job description in manpower selection? **[6]**

Q9) a) Distinguish between CPM and PERT as project network analysis techniques. **[8]**

b) What is break even analysis? Give its assumptions and importance. **[8]**

OR

Q10)a) Write a note on 'Letter of Credit'. **[8]**

b) What is finance? Explain various sources of raising finance. **[8]**

Q11) Write short notes on : **[16]**

a) Disaster Management.

b) Global Warming.

OR

Q12) a) Explain the value added tax. **[8]**

b) Explain the provisions on safety precautions as specified in the Electricity Rules. **[8]**

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Total No. of Questions :12]

SEAT No. :

P2939

[Total No. of Pages :4

[4958] - 176

T. E. (Instrumentation & Control)

DIGITAL SIGNAL PROCESSING FUNDAMENTALS

(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer 03 questions from Section I and 03 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compute the linear convolution of following sequences: **[8]**

$x(n) = \{3, 5, 1, 1\}$

$h(n) = \{2, ,2, 1, 4\}$

b) State and explain the classification of discrete - time systems in detail. **[8]**

OR

Q2) a) Determine the cross-correlation of following sequences: **[8]**

$x(n) = \{2, 3, 1, 4\}$, $h(n) = \{4, 3, 2, 4\}$

b) State and explain the classification of signals in detail. **[8]**

P.T.O.

Q3) a) What are different types of ideal frequency selective filters? Explain each in short. **[8]**

b) Determine and plot the frequency response of the discrete-time system described by, $y(n)-0.5y(n-1)+0.25y(n-2)=x(n)$ to unit-step input. Use $\omega = 0, \pm\frac{\pi}{4}, \pm\frac{\pi}{2}, \pm\pi.$ Also, skecth its pole-zero plot. **[8]**

OR

Q4) a) Sketch the direct form structure of an FIR filter with system function **[8]**

$H(z) = 1 + 2.88\ z^{-1} + 3.4048\ z^{-2} + 1.74\ z^{-3} + 0.4z^{-4}.$

b) Obtain the direct-form II structure of discrete-time system described by: **[8]**

$2y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-5).$

Q5) a) Determine the 8-point discrete Fourier transform (DFT) of: **[9]**

$x(n) = \{2, 4, 6,8\}$

b) State any four properties of DTFT. **[9]**

OR

Q6) a) Compute the circular convolution of the sequences: **[9]**

$x_1(n) = \{2, 3, 1, 4\}, x_2(n) = \{4, 3, 2, 4\}$

b) State any four properties of DFT. **[9]**

SECTION - II

Q7) a) Sketch the decimation-in-time (DIT) FFT algorithm for N=8. **[9]**

b) Determine the 4-point DFT of $x(n) = \{3, 9, 3, 9\}$ using DIT FFT algorithm. **[9]**

OR

Q8) a) Sketch the decimation-in-frequency (DIF) FFT algorithm for N=8. **[9]**

b) Determine the 4-point DFT of $x(n) = \{3, 9, 3, 9\}$ using DIF FFT algorithm. **[9]**

Q9) a) Compare the FIR and IIR filter design methods in detail. **[8]**

b) What are different window functions used for FIR filter design? Explain. **[8]**

OR

Q10) The desired frequency response of an FIR low pass filter is described by:

$$H_d(\omega) = \begin{cases} 1 \text{ for } |\omega| \le \dfrac{\pi}{4} \\ 0 \quad \text{for } \dfrac{\pi}{4} < |\omega| \le \pi \end{cases}$$

a) Determine the coefficients of a 7-tap low pass filter based using rectangular window. **[8]**

b) Determine the coefficients of a 7-tap high pass filter based using rectangular window. **[8]**

Q11) Design a digital low pass Butterworth filter using Bilinear Transformation Method to meet the following specifications: **[16]**

Passband ripple: ≤ 1.25 dB

Passband edge: 200 Hz

Stopband attenuation: ≥ 15 dB

Stopband edge: 300 Hz

Sampling frequency: 2 kHz.

OR

Q12) a) Convert the analog filter with system function. **[8]**

$$H_a(s) = \frac{1}{s^2 + \sqrt{2}s + 1}$$

into a digital IIR filter by means of the bilinear transformation. Assume cut - off frequency of 1000 Hz and sampling frequency of 10 KHz.

b) Compare the impulse invariance method and bilinear transformation method in detail. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2940

[Total No. of Pages : 2

[4958]-177

T.E.(Instrumentation and Control)

INSTRUMENTATION SYSTEM DESIGN

(2008 Pattern) (306269)(Semester-II)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4,Q5 or Q6 in section-I and Q7 or Q8, Q9 or Q10, and Q11 or Q12 in section-II.***
2) ***Answer to the two sections should be writtren in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION-I

Q1) a) What is the need of specifications? What are the types of the specifications? **[8]**

b) What is the significance of "Index of Protection"? Explain IP 34. **[8]**

OR

Q2) a) Explain Bureau of Indian standard and NEEMA Standard. **[8]**

b) Explain different tests carried out on an enclosure. **[8]**

Q3) a) With the help of one example, explain the necessity of shielding. **[8]**

b) Explain cable design guidelines to minimize ESD. **[8]**

OR

Q4) a) Explain electrostatic discharge with reference to Human Body Model. **[8]**

b) Describe the enclosure design guidelines to protect the equipment against ESD. **[8]**

Q5) a) Explain features, operation of analog opto coupler HCNR200 with the help of neat diagram. **[9]**

b) What are the features of voltage to current converter XTR110? Explain any one application in detail. **[9]**

OR

Q6) a) Explain how pressure measurement is possible using AD620 instrumentation amplifier? **[9]**

P.T.O.

b) Explain working principle of AD594/AD495 with the help of block diagram. How does it can be used as a stand-alone celsius thermometer? **[9]**

SECTION-II

Q7) a) What is an isolation? Draw and explain with neat diagram one application of MCT2E. **[9]**

b) Explain any one application of CD4046B. **[9]**

OR

Q8) a) What are the features of ICL7107? Design digital voltmeter using ICL7107 for input voltage range of 0-2 V full scale. **[9]**

b) Draw and explain the test circuit of ICM7217A. **[9]**

Q9) a) Explain digital circuit PCB design rules. **[8]**

b) Explain the thumb rules to place the components on the PCB. **[8]**

OR

Q10)a) Enlist the different soldering techniques. Explain any one in detail. **[8]**

b) Write short notes on:(any two) **[8]**

i) Double sided PCB

ii) CAD package for artwork

iii) Analog PCB design

Q11)a) Explain "Bath Tub Curve" with neat diagram. **[8]**

b) Explain the causes of reliability. **[8]**

OR

Q12)a) Explain the term availability and treceability. **[8]**

b) Explain the advantages of system simulation using virtual instrumentation. **[8]**

Total No. of Questions :12]

SEAT No. :

P2941

[Total No. of Pages :2

[4958]-178
T.E. (Instrumentation & Control)
POWER PLANT INSTRUMENTATION
(2008 Course) (306268) (Semester - II)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section - I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) What is difference between Distillation and Extraction? **[8]**

b) Explain evaporation unit operation with neat sketch? **[8]**

OR

Q2) a) What are the different types of filter? Explain any one in detail. **[8]**

b) Explain the importance of fan and blower in process industry? **[8]**

Q3) a) Explain with neat sketch refrigeration unit operation? **[8]**

b) What is LMTD? Derive equation for LMTD for any heat exchange. **[8]**

OR

Q4) a) Explain in detail cooling tower and its importance. **[8]**

b) Explain in detail the need of water treatment plant. **[8]**

P.T.O.

Q5) a) Explain with neat sketch the components of solar power plant. **[9]**

b) Explain the working of thermal power plant. **[9]**

OR

Q6) a) What are advantages and disadvantages of nuclear power plant. **[9]**

b) Explain with neat sketch working of smoke detector. **[9]**

SECTION-II

Q7) a) Explain the startup procedure for boiler. **[8]**

b) Explain with neat sketch DIPC boiler. **[8]**

OR

Q8) a) Explain 2-element drum level control for boiler operation. **[8]**

b) Explain the working of carbon dioxide analyzer used for boiler. **[8]**

Q9) a) Enlist different types of sensors and their function used in turbine. **[8]**

b) Explain with neat sketch speed control system used for turbine. **[8]**

OR

Q10) a) Explain flue gas oxygen analyzer in power plant with neat diagram. **[8]**

b) Explain the importance steam analyzer in power plant. **[8]**

Q11) a) Explain with neat sketch working of boiling water reactor. **[9]**

b) Write note on conventional and non-conventional energy source. **[9]**

OR

Q12) a) Explain importance of instrumentation for wind power plant. **[9]**

b) Explain working of tidal power plant with neat sketch. **[9]**

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Total No. of Questions :12]

SEAT No. :

P2942

[Total No. of Pages :4

[4958]-179
T.E. (Instrumentation & Control)
CONTROL SYSTEM DESIGN
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of lagarithmic tables, electronic pocket calculator and steam table is allowed.***
6) ***Your anwer will be valued as a whole.***
7) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain need of compensator? Discuss the basis of selection of proper compensator for required performance. **[8]**

b) Derive the expression for Lag compensator for Electrical Network. **[8]**

OR

Q2) a) The open-loop transfer function of feedback control system is given: $G(s)H(s)=\frac{10}{s(s+1)}$ and compensator transfer function is given by $K\frac{T_1s+1}{T_2s+1}$. Determine the values of K, T_1, T_2. So that ξ= 0.5, ω_n = 3 rad/sec. **[10]**

b) Discuss the classification of Compensators. **[6]**

Q3) The unity feed back system whose open-loop transfer function is **[18]**

$$G(s)H(s)=\frac{5}{s(s+2)}$$

Design a suitable compensator to get desired specifications:

PM = 55^o

GM be 12db.or more

and static velocity error constants kV = 20/sec.

OR

P.T.O.

Q4) Apply Bode plot method to design a lag compensator for unity feedback system having transfer function **[18]**

$$G(s) = \frac{1}{s(s+1)(0.5s+1)}$$

such that $\text{P.M.} \approx 40^{o}$ $\text{G.M.} > 10\text{dB}$ and $K_v = 5$ Sec^{-1} for unit ramp input.

Q5) The transfer function of unity feedback system is given below: **[16]**

$$G(s) = \frac{K}{s(s+5)(s+8)}$$

Find the parameters for P, PI and PID using Ziegler-Nicholas method.

OR

Q6) The following transfer function is obtained from step response of the system **[16]**

$$G(s) = \frac{3e^{8s}}{(4s+1)}$$

Find the parameters for P, PI and PID using Cohen-Coon method.

SECTION-II

Q7) a) Design a PD Controller so that a unity feedback system with open loop transfer function **[9]**

$$G(s) = \frac{10}{s(s+1)(s+3)}$$

will have phase margin equal to 35^{o} and natural frequency of oscillation is 4 rad /sec.

b) Design a controller for the following first order system: **[9]**

$$G(s) = \frac{2}{(4s+1)}$$

Using direct synthesis method for desired close loop response

$$Q(s) = \frac{1}{(6s+1)}$$

OR

Q8) Design a PI Controller so that a unity feedback system with open loop transfer function **[18]**

$$G(s) = \frac{1}{(s+2)(s+5)}$$

So that the phase margin of the system will be 50^{o} and 3 rad/sec and steady state error will be 10% for unit ramp input.

Q9) a) The state space respresentation of a system is given by **[10]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -5 & -8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u; \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

Compute the state transition matrix and obtain state response for homogenous condition only.

b) Determine whether following system is controllable and observable or not **[6]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 4 \end{bmatrix} u; \quad y = [7] = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

Q10)a) Give derivation for the necessary and sufficiency condition for complete state Observability. **[8]**

b) Obtain e^{At} if $A = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ using Cayley Hamilton method. **[8]**

Q11)Design full order state observer that the system **[16]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Assume that the desired eigen values of the observer are –3 + j 2, –3 –j 2, –5.

OR

Q12)Obtain the state feedback gain matrix for the system shown **[16]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

The location of desired poles are -2, -1, -7.

EEE

Total No. of Questions : 12]

SEAT No. :

P4920

[Total No. of Pages : 3

[4958] - 180
T.E. (Instrumentation Engg.)
PROCESS LOOP COMPONENTS
(2008 Pattern) (Semester - II)

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

Instructions to the candidates :-

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

SECTION - I

Q1) a) Draw Temperature control loop using standard symbols and explain its components in brief. **[8]**

b) Resistances in a bridge circuit are $R_1 = R_2 = R_3 = 120\Omega$. $R_4 = 121\Omega$. If the supply voltage is 12 V. Find the offset voltage. Also design a signal conditioning circuit to get output 0 to 5V. **[10]**

OR

Q2) a) Draw P & ID symbols for the following components & also explain the use of each components **[10]**

i) Pneumatic Control Valve

ii) Pneumatic Signal Line

iii) Alarm Announciator

iv) Pressure Indicator and Controller

v) Temperature Transmitter

b) Explain zero elevation and zero suppression with respect to DPT for level measurement. **[8]**

Q3) a) Draw the response of P, PI & PID controller for step change in the error. **[8]**

b) Draw front panel of PID controller. Give the advantages of PID controller. **[8]**

P.T.O.

OR

Q4) a) Explain the following terms w.r.t. to controllers. **[8]**

i) Proportional offset,

ii) Distance velocity lag.

b) Explain ON-OFF control action in detail. Give its suitable application. Also write its advantages and disadvantages. **[8]**

Q5) a) What is mean by tuning of controller? List various methods of controller tuning. Explain ¼ decay method. **[8]**

b) What is reset windup? How to overcome reset windup? **[8]**

OR

Q6) a) Write & explain the equations for position & velocity algorithm for digital controller. **[8]**

b) Explain various criteria used for tuning of controllers. **[8]**

SECTION - II

Q7) a) Draw and explain block diagram of PLC and give its specification. **[10]**

b) State the advantages and limitations of a relay logic as compared to PLC ladder logic. **[8]**

OR

Q8) a) Develop physical ladder diagram for a motor with following: NO start P.B., NC stop P.B., thermal over load limit switch opens on high temperature, green light when running and red light for thermal overload. Assume suitable data if required. **[10]**

b) Explain in brief w.r.t. PLC. **[8]**

i) Rung,

ii) Watch-dog timer,

iii) Scan time,

iv) AI-AO.

Q9) a) What do you mean by "Installed characteristics of control valve"? Why they are different than inherent characteristics? **[8]**

b) Draw and explain the various control valve characteristics. (Min 3 characteristics) **[8]**

OR

Q10) a) Explain w.r.t control valve : **[8]**

i) Valve positioned,

ii) Rangeability,

iii) Yoke,

iv) Plug

b) State the importance of failsafe condition. Draw and explain fail safe action - {Air to Open (ATO) and Air to Closed (ATC) valve applications}. **[8]**

Q11) a) Explain effects and remedies for cavitations and flashing. **[8]**

b) What are different selection criteria for control valve? **[8]**

OR

Q12) a) Why sizing is necessary in control valve? List the different criteria's for control valve selection. **[8]**

b) Explain cavitation and flashing? List techniques to reduce it. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2943

[Total No. of Pages : 4

[4958]-181
T.E. (Computer)
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern) (Semester - I) (310241)

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

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.***
4) ***Answers to the two sections should be written in separate answer books.***
5) ***Answer any three questions from each section.***

Q1) a) Explain DBMS structure in detail. **[8]**

b) Explain different levels of abstraction. **[6]**

c) What is meant by mapping cardinality? **[2]**

OR

Q2) a) Explain following advantages of DBMS over file system: **[8]**

i) Data redundancy and isolation

ii) Data integrity

iii) Data isolation

iv) Concurrency

b) Explain the different constraints on specialisation & generalization with suitable example. **[4]**

c) Explain the concept of weak entity set with example. **[4]**

P.T.O.

Q3) a) Consider following relational database **[8]**

Employee (emp_name, street, city)

Works (emp_name, company_name, salary)

Company (company_name, city)

Manages (emp_name, manager_name)

For each of the given query, give an expression in relational algebra.

i) Find employee name, street and city of residence whose salary exist in between 30000 & 40000 and work in XYZ Ltd.

ii) Find names, cities of residence and salary of all managers.

b) Explain DDL and DML with different commands/statements used in SQL. **[8]**

OR

Q4) a) Write a short note on dynamic and embedded SQL. **[8]**

b) What is cursor? Explain explicit and reference cursor with example. How cursor is implemented using embedded SQL? **[8]**

Q5) a) Describe the concept of transitive dependency and explain how this concept is used to define 3 NF. **[6]**

b) Compute the closure of the following set F of functional dependencies for relational schema, R = (A, B, C, D, E) **[6]**

$A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A$

List the candidate keys for R.

c) Prove the soundness of pseudo transitive dependency. **[6]**

OR

Q6) a) Define and explain 1NF, 2NF and 3NF with examples. **[8]**

b) Explain different anomalies that exist in databases. **[6]**

c) Is a schema in 3NF always in 2Nf? Elaborate. **[4]**

SECTION - II

Q7) a) Explain in detail use of B-Tree as an indexing technique compare B - Tree and B+ Tree. **[8]**

b) What is ordered indices? Explain the types of ordered indices with suitable example. **[8]**

OR

Q8) a) What are the steps involved in query processing. Explain each in brief with diagram. **[8]**

b) What are the advantages and disadvantages of hash indices relative to B tree indices? How might the type of index influence the query processing? **[8]**

Q9) a) Explain the concept of transaction. Describe ACID properties for transaction. **[8]**

b) Explain shadow paging recovery scheme and log based recovery scheme. **[10]**

OR

Q10)a) Explain recoverable and cascade less schedules. **[8]**

b) Explain two phase locking protocol. How does it ensures serializability? **[10]**

Q11)a) Specify advantages and disadvantages of distributed database system. **[8]**

b) Write short note on any two **[8]**

i) Data warehouse

ii) Pointer swizzing techniques

iii) Data mining

OR

Q12)a) What is the difference between persistent and transient objects? How is persistence objects are handled in the typical OODatabase system? **[8]**

b) Explain 2-tier and 3-tier architecture. **[4]**

c) Explain steps in data mining. **[4]**

Total No. of Questions : 12]

SEAT No. :

P2944

[Total No. of Pages : 3

[4958]-182
T.E.(Computer Engineering)
DATA COMMUNICATIONS
(2008Course)(Semester-I) (310242)

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

Instructions to the candidates:

1) ***Answer Q1,or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 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.***

SECTION-I

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

b) Write short note on modem. **[6]**

c) Explain digital comunication system. **[8]**

OR

Q2) a) Compare Analog and digital modulation. **[4]**

b) Explain with block diagram PCM Encoder and decoder. **[6]**

c) What is quantization noise? Discuss the factors in which it depends & techniques used for reducing its effects. **[8]**

Q3) a) Explain the terms PWM,PPM and PAM. **[6]**

b) List and explain all types of ARQ System. **[10]**

OR

Q4) a) Write short notes on PSTN. **[8]**

b) With help of block diagram, explain BFSK transmitter and receiver. **[8]**

P.T.O.

Q5) a) List and explain Wireless transmission media. **[8]**

b) Explain Frequency Division Multiplexing(FDM) and Time Division Multiplexing(TDM) along with their suitable applications. **[8]**

OR

Q6) a) Explain piggybacking with advantages and disadvantages. **[6]**

b) Explain persistent and non-persistent CDMA. **[6]**

c) Write the short notes on stop-and-wait protocol **[4]**

SECTION-II

Q7) a) Explain the layers in OSI- ISO reference model. What is the difference between TCP/IP model and OSI model. **[8]**

b) Write short note on. **[6]**

i) video on Demand

ii) Code efficiency

iii) Hamming distance

c) Explain entropy and information rate **[4]**

OR

Q8) a) Explain Bluetooth protocol architecture. **[8]**

b) Explain wireless LAN and virtual LAN. **[4]**

c) Differentiate between optical fiber and coaxial fiber. **[6]**

Q9) a) Explain different switchig techniques. **[8]**

b) Describe different network topologies. **[8]**

OR

Q10) a) Explain sliding window protocol with neat diagram. **[8]**

b) Explain and list various levels of hierarchy used by telephone companies. **[8]**

Q11) Write short note on:(any two). **[16]**

a) ALOHA

b) CSMA

c) Frame Relay Technology

OR

Q12)a) Explain the following with respect to ATM. **[8]**

i) Constant Bit rate

ii) Variable Bit rate.

iii) Available Bit rate

iv) Unspecified Bit rate

b) What is ARQ? Explain selective repeat mechanism with suitable example. **[8]**

Total No. of Questions :12]

SEAT No. :

P2945

[Total No. of Pages :4

[4958]-183
T.E. (Computer)
MICROPROCESSORS AND MICROCONTROLLERS
(2008 Course) (Semester - I) (310243)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Compare 80386, 80486, and the Pentium based on architecture. **[6]**

b) Describe cache organization of the Pentium. **[4]**

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

OR

Q2) a) Explain Floating Point Unit of the Pentium? **[6]**

b) Which features makes the Pentium, a superscalar processor? Explain in detail. **[6]**

c) Explain following pins of the Pentium. **[6]**

i) ADS#

ii) D/C#

iii) RESET

P.T.O.

Q3) a) Explain addressing modes of the Pentium. **[8]**

b) Draw and explain memory interfacing mechanism for 32 and 64 bit memory with the Pentium. **[8]**

OR

Q4) a) With the help of neat diagram, explain non-pipelined read bus cycle of the Pentium. **[6]**

b) List and explain protected mode registers of the Pentium. **[6]**

c) Describe any two instructions. **[4]**

i) CMPXCHG

ii) PUSH

iii) BTC

Q5) a) How logical address is translated to linear address in the Pentium. Draw the required data structures. **[8]**

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

OR

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

b) What are the selectors in the Pentium? Explain their use in segmentation. **[4]**

c) Draw & explain the structure of a call gate. **[4]**

SECTION - II

Q7) a) How interrupts are handled in protected mode? Explain with the help of neat diagram. **[8]**

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

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

OR

Q8) a) What are the contents of TSS? Discuss the use of TSS in multitasking. **[8]**

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

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

Q9) a) Explain following 8051 instructions **[8]**

i) POP ii)ANL

iii) MULAB iv)LCALL

b) Draw and Explain internal RAM organization of 8051. **[8]**

OR

Q10)a) Explain addressing modes of 8051 microcontroller. Explain with suitable example. **[8]**

b) Explain following 8051 instructions **[8]**

i) MOVC ii) MOVX

iii) SETB iv) RETI

Q11)a) Draw and explain architecture of 8096 microcontroller. **[8]**

b) Explain IE register of 8051 microcontroller. **[4]**

c) Explain any two modes of timer operation in 8051. **[4]**

OR

Q12) a) What are the different sources of interrupts in 8051? Explain interrupt handling mechanism in 8051. **[8]**

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

x x x

Total No. of Questions :12]

SEAT No. :

P2946

[Total No. of Pages :3

[4958] - 184

T. E. (Computer)

DIGITAL SIGNAL PROCESSING

(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the ADC process as sampling, quantization and coding. **[9]**

b) Define $\partial(n)$ and u(*n*). Prove that $u(n)=\sum_{k=0}^{\infty}\partial(n-k)$. **[4]**

c) With example explain stability property of DT system. **[5]**

OR

Q2) a) Obtain a linear convolution of DT signal **[8]**

$x_1(n)=\{1, 0, -\underset{\uparrow}{2}, 1\}$ and $x_2(n)=\{-\underset{\uparrow}{1}, 2, -1, 1\}$

b) State and explain the sampling theorem. **[8]**

c) Define analog and digital signal. **[2]**

Q3) a) State DFT, IDFT and describe any two important properties of the same. **[12]**

b) Sketch the fourier transform of $\delta(n)$ and find the 5-point DFT of $\delta(n)$. **[4]**

OR

P.T.O.

Q4) a) Write a note on overlap-save and overlap-add algorithm. **[12]**

b) Find $x((n+2))_5$ and $x((-n))_5$ for the sequence $x(n) = \{1, 2, 3, 4\}$. **[4]**

Q5) a) Find the inverse z of: $X(z) = \frac{z}{z-1}$ $|z| > 1$. **[8]**

b) Derive the first stage of DIT FFT algorithm. **[8]**

OR

Q6) a) Obtain the inverse z transform using partial fraction expansion method

$$X(z) = \frac{1}{(z-1)(z-3)}.$$ **[8]**

b) Determine the z - transform and ROC of the signal: **[8]**
$x(n) = [3.\ (4^n) - 4.\ (2^n)]\ u(n)$.

SECTION - II

Q7) a) Determine the output $y(n)$ of a system with impulse response $h(n) = (0.5)^n\ u(n)$ to input signal $x(n) = u(-n)$. **[8]**

b) The system function of a causal LTI system is, $H(z) = \frac{1-z^{-1}}{1+\frac{3}{4}z^{-1}}$. **[8]**

Find the impulse response of the system. Also check is the system stable or not?

OR

Q8) a) Explain the method of simple geometric interpretation to obtain the frequency response of DT system. **[8]**

b) Determine H(z) and draw a pole zero plot for **[8]**

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

Q9) a) Explain Gibb's phenomenon associated with FIR filter design. What are the desirable features of window function to improve the frequency response? **[8]**

b) Explain the relationship of s-plane to z-plane. What are the disadvantages of impulse invariance method. **[8]**

OR

Q10)a) Explain the design steps of FIR filter using rectangular window. State the advantages of windowing method. **[8]**

b) A digital filter has frequency specification as: **[8]**

Passband frequency = $\omega_p = 0.2\pi$.

Stopband frequency = $\omega_s = 0.3\pi$ and sampling time = $T_s = 1$.

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

i) Impulse invariance techniques is used for designing

ii) Bilinear transformations is used for designing.

Q11)a) Explain the direct form structure of FIR filter. **[8]**

b) Explain cascade form structure for IIR systems and realize the following system function for the same. **[10]**

$$H(z) = \frac{1 + \frac{1}{5}z^{-1}}{\left(1 - \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2}\right)\left(1 + \frac{1}{4}z^{-1}\right)}.$$

OR

Q12)a) Explain desirable features of DSP processor. **[6]**

b) Explain parallel form structure for IIR systems and realize the following system function for the same. **[12]**

$$H(z) = \frac{3z(5z-2)}{\left(z + \frac{1}{2}\right)(3z-1)}.$$

Total No. of Questions :12]

SEAT No. :

P2947

[Total No. of Pages :5

[4958] - 185

T.E. (Computer Engineering)

THEORY OF COMPUTATION

(2008 Course) (Semester - I) (310245)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define following terms with example. **[4]**

i) Alphabet

ii) Languages

b) Draw DFA for following language. **[8]**

i) All string starting with abb

ii) All string ending with abb

c) Give Mealy and Moore machine for "For input from (0+1)*, if i/p ends in 101, output *x*, if i/p ends in 110. Output *y*, otherwise output *z*". **[6]**

OR

P.T.O.

Q2) a) Consider following ε - NFA **[10]**

	ε	a	b	c
$\rightarrow p$	{q, r}	ϕ	{q}	{r}
q	ϕ	{p}	{r}	{p, q}
r*	ϕ	ϕ	ϕ	ϕ

(r* = final state; p = initial state)

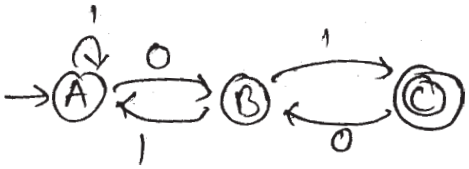
i) compute ε - closure of each state

ii) convert automata to DFA.

b) Define Mealy and Moore machine. Design Mealy machine which can output Even/odd if total no. of 1's in the i/p is even or odd. The i/p symbols are 0 and 1. **[8]**

Q3) a) Construct NFA with ε-moves for R.E. = 0.1 $[(10^*+111)^* + 0]^*1$. Convert it to DFA using direct method at conversion from NFA with ε-moves to DFA. **[8]**

b) Consider the following transition diagram, convert it to an equivalent regular expression using Arden's theorem. **[8]**



OR

Q4) a) Using pumping lemma of regular set prove the language. **[8]**

$L = \{ww \mid w \in \{0, 1\}^*\}$ is not regular.

b) Construct finite automata equivalent to following regular set **[8]**

i) $10 + (0 + 11)\ 0^*1$

ii) $01\ [((10)^* + 111)^* + 0]^*.1$

Q5) a) Give an ambiguous grammar at if -then- else statement and then rewrite equivalent unambiguous grammar. **[8]**

b) Convert following grammar to CNF **[4]**

$S \rightarrow Aba \quad S \rightarrow aab \quad B \rightarrow Ac$

c) Write short note on chomsky heirarchy. **[4]**

OR

Q6) a) Give context free grammar for following language. **[8]**

i) $(011\ +1)^*\ (0\ 1)^*$

ii) $0^i\ 1^{i+k}\ 0^k$ where $i, k > 0$

b) For grammar given below **[6]**

$S \rightarrow A/B$
$A \rightarrow OA/\varepsilon$
$B \rightarrow OB/\ 1B/\varepsilon$

Give Parse tree for leftmost & right most derivation of string 1001.

c) Define context free grammar. **[2]**

SECTION - II

Q7) a) Construct push down automata for accepting $\{a^n b^m a^n \mid m,n >= 1\}$. **[8]**

b) Consider the PDA of following moves, Obtain its equivalent CFG. **[10]**

$(q0, a\, z0) = (q0, az0)$, $(q0, a\, ,a) = (q0, aa)$, $(q0, b, a) = (q1, \varepsilon)$, $(q1, b, a) = (q1, \varepsilon)$, $(q1, \varepsilon, z0) = (q1, \varepsilon)$.

OR

Q8) a) Design push down automata for detection of palindromes over a, b. **[6]**

b) Write definition of DPDA and how it is different from NDPDA. **[4]**

c) Design push down automata for accepting the set of all strings over {a,b} with an equal number of a' s and b' s. The string should be accepted both by **[8]**

i) Final state

ii) Empty stack

Q9) a) Explain following Turing Machine. **[6]**

i) Single infinite length TM

ii) Multitape TM.

b) Construct TM for checking well formedness of parenthesis. **[6]**

c) Write a short note on universal TM. **[4]**

OR

Q10)a) Construct NDTM ot recognize words of the form ww over alphabet {a, b}.**[8]**

b) Design Post Machine which accepts the strings of a and b having odd length and the element at the center is 'a'. **[6]**

c) Define Turing Machine. **[2]**

Q11)a) Show that the set of languages L over {0, 1} so that neither L and L' is recursively enumerable nor is uncountable. **[6]**

b) Explain Chomsky hierarchy defined for languages and machines with neat diagram. **[8]**

c) What is undecidability? **[2]**

OR

Q12)a) Show that if L1 and L2 are recursive then **[6]**

$L1 \cup L2$ and $L1 \cap L2$ are also recursive.

b) Write a short note on POST correspondence problem. **[4]**

c) State the following: **[6]**

i) Solvability

ii) Semisolvability

iii) Unsolvability

Total No. of Questions :12]

SEAT No. :

P2948

[Total No. of Pages :3

[4958] - 186

T. E. (Computer Engg.)

PRINCIPLES OF PROGRAMMING LANGUAGES

(Semester - II) (2008 Pattern)

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

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. Q.9 OR Q10, Q11 OR Q12.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION - I

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

b) Explain role of programming languages? **[8]**

OR

Q2) a) Explain with examples different parameter passing methods. **[8]**

b) What is type checking and binding and binding times. **[8]**

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

b) What are the design principles of procedure programming. **[8]**

OR

P.T.O.

Q4) a) Explain the structure of program in PASCAL. **[8]**

b) Explain procedures and functions with example in PASCAL. **[8]**

Q5) a) Explain access specifies in Java with examples. **[8]**

b) What is Applet life cycle of applet. **[10]**

OR

Q6) a) What is exception and explain with example the types of exception. **[8]**

b) What is JDBC and JDBC drivers? Write simple program to display records from database. **[10]**

SECTION - II

Q7) a) Explain the inheritance, interface and sealed class in C#. **[8]**

b) Describe the structure of C# program. **[8]**

OR

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

b) Explain delegates and event handlers in C#. **[8]**

Q9) a) Explain backtracking and searching techniques. **[8]**

b) Explain resolution and unification with examples. **[8]**

OR

Q10)a) i) Explain fact, rule and goal statements. **[8]**

ii) What is cut operator in PROLOG?

b) Explain applications of logic programming. **[8]**

Q11)a) What is ambiguity, free and bound identifiers, reductions in lambda calculus. **[8]**

b) Explain the list manipulation functions. **[10]**

OR

Q12)a) What are different applications of Functional Programming? **[10]**

b) Write a program to calculate factorial in LISP. **[8]**

i) with loop

ii) without loop (recursion)

Total No. of Questions : 12]

SEAT No. :

P2949

[Total No. of Pages : 2

[4958]-187
T.E.(Computer Engineering)
COMPUTER NETWORKS
(2008 Course) (Semester-II)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) What is DNS? Explain with suitable example how query resolving process is done? **[8]**

b) What is the difference between persistent and non persisten HTTP? Also explain HTTP message format. **[8]**

OR

Q2) a) What are the Nuts & Bolts for Internet? Explain with suitable diagram? **[8]**

b) Compare circuit switching & packet switching techniques of network core? Explain in brief the functionality of DHCP server. **[8]**

Q3) a) Draw and explain three-way handshake process of TCP. **[6]**

b) Explain significance of following flags in TCP header SYN, RST, FIN, PSH **[6]**

c) Explain flow control in TCP. **[6]**

OR

Q4) a) Draw & Explain TCP Segment Structure? **[6]**

b) Suppose that we have the following three 16 bit words. **[6]**

0110011001100000

0101010101010101

1000111100001100

Calculate the UDP Checksum for above?

c) How connection Management is done in TCP? **[6]**

P.T.O.

Q5) a) Explain significance and working of RSVP protocol. **[8]**

b) What is QoS? Explain it with respect to reliability, delay, jitter and bit rate. **[8]**

OR

Q6) a) Describe in brief Integrated Services and Differentiated services. **[8]**

b) Explain Different Scheduling Algorithm? **[8]**

SECTION-II

Q7) a) Compare IPv4 and IPv6. Draw and Explain IPv6 header format. **[8]**

b) Explain network layer design issues. **[8]**

OR

Q8) a) Compare ARP with RARP? **[8]**

b) Explain Concept of Internet Control Message Protocol? **[8]**

Q9) a) Explain Distance vector Routing. What are the advantages and disadvantages of DVR? **[8]**

b) Explain RIP and OSPF in details. **[8]**

OR

Q10) a) Classify routing algorithms. Also compare link state and distance vector routing. **[8]**

b) Describe in brief ICMP messages. **[8]**

Q11) a) How Distance Vector Routing Algorithm works? **[6]**

b) Explain Routing policy of BGP? **[6]**

c) Compare Broadcast And Multicast Routing **[6]**

OR

Q12) a) Explain the principle characteristics of ATM **[6]**

b) Draw & Explain multiprotocol Label Switching (MPLS) Header format? **[6]**

c) Compare between switches and routers. **[6]**

Total No. of Questions :12]

SEAT No. :

P2950

[Total No. of Pages :3

[4958]-188
T.E. (Computer)
SYSTEMS PROGRAMMING AND OPERATING SYSTEMS
(2008 Course) (Semester - II)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain language processing activities. **[8]**

b) What is Intermediate Representation. What are forms of intermediate representation. **[10]**

OR

Q2) a) Explain the Data Structures required for 2 Pass Assembler. **[10]**

b) What are assembler directives? What is the purpose of LTORG directive and EQU directive? Explain with example. **[8]**

Q3) a) What is linking? Explain the difference between static linking and dynamic linking? **[8]**

b) Explain in brief compile and go scheme. What are advantages and disadvantages of it. **[8]**

OR

P.T.O.

Q4) a) Explain in brief a direct linking loader. **[8]**

b) Explain following terms. **[8]**

i) Subroutine Linkage

ii) Relocation

iii) Callback function

iv) Overlay

Q5) a) What are the functions of operating systems? **[4]**

b) Explain in detail concept of batch operating system and time sharing system. **[8]**

c) Explain the structure of operating system. **[4]**

OR

Q6) a) Draw and explain the process state transition diagram. **[6]**

b) Explain following system calls **[4]**

i) wait

ii) exec

c) Explain difference between preemptive and non preemptive algorithm with example. **[6]**

SECTION-II

Q7) a) What is critical section? What are requirements of critical section. **[8]**

b) What is producer consumer problem? Write a solution to producer consumer problem. **[10]**

OR

Q8) a) Explain interrupts handling approach and compare and swap instruction for mutual exclusion. **[8]**

b) What is Dining philosopher problem? Explain solution to dining philosopher problem using monitors. **[10]**

Q9) a) Explain memory partitioning techniques with example. **[8]**

b) What is paging? Explain the process of address translation in paging. **[8]**

OR

Q10)a) What is Page replacement? Explain page replacement algorithm with example. **[8]**

b) What is fragmentation? Explain the types of fragmentation. How it can be handled. **[8]**

Q11)a) Explain C-SCAN and SSTF disk scheduling algorithm with example. **[8]**

b) With respect file system explain disk block allocation methods. **[8]**

OR

Q12)a) What is record blocking? What are the methods of record blocking? **[8]**

b) What is RAID? Explain the advantages and disadvantages of RAID. Also explain seven RAID levels in brief. **[8]**

EEE

Total No. of Questions :12]

SEAT No. :

P2951

[Total No. of Pages :3

[4958]-189

T.E. (Computer Engineering)

FINANCE AND MANAGEMENT INFORMATION SYSTEMS

(2008 Course) (Semester - II) (Theory) (310251)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Define Management and its level. Explain Functions of manager in detail. **[10]**

b) Explain the concept of Multinational business unit with suitable example. **[8]**

OR

Q2) a) Define Total Quality Management(TQM). What are processes in TQM? **[10]**

b) What is a performance appraisal and carrier strategy in the international business? **[8]**

Q3) a) State and explain benefits and challenges of different forms of business organizations. **[8]**

b) What is significance of International corporate Security? Explain with proper example. **[8]**

OR

P.T.O.

Q4) a) Explain risk return trade off. Give example of short taxes and free cash flow? **[8]**

b) Explain fundamental principles of financial management in detail. **[8]**

Q5) a) How the Decision Support System helps management in decision making? **[8]**

b) Explain Knowledge Management process in detail with suitable example. **[8]**

OR

Q6) a) Explain Organizational decision making with appropriate example? **[8]**

b) Explain the role of MIS as a tool to support management functions. **[8]**

SECTION-II

Q7) Write notes on any three: **[18]**

a) e-business security issues

b) Content management system

c) Modern business technology

d) Real time enterprise

OR

Q8) Explain any three: **[18]**

a) Web enabled business

b) Security threats to e-commerce

c) e-commerce applications

d) e-collaboration

Q9) a) State threats and challenges involve with ERP implementation. **[8]**

b) Explain different components of Customer relationship management in detail. **[8]**

OR

Q10)a) Explain the process of Global management of IT infrastructure, in detail. **[8]**

b) Explain Supply chain management system and its advantages to the organization. **[8]**

Q11)Write notes on followings: **[16]**

a) Cyber crimes as a critical issue in organization.

b) Challenges with Right to Information act.

OR

Q12)Write notes on followings: **[16]**

a) IT impact on society.

b) Common scenarios in cyber crimes.

EEE

Total No. of Questions : 12]

SEAT No. :

P2952

[Total No. of Pages : 2

[4958]-190
T.E.(Computer Engineering)
SOFTWARE ENGINEERING
(2008 Course) (310253)(Semester-II)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Give the importance of software engineering and process model. Explain the general process framework. **[6]**

b) When do you apply RAD model to software development? Describe with its activities. **[6]**

c) What is prototyping? **[4]**

OR

Q2) a) Explain the Extreme programming. **[6]**

b) How do you overcome the disadvantages of waterfall model? Explain with a process model. **[6]**

c) What do you mean by personal software process? **[4]**

Q3) a) Explain the creation of DFD up to level 2 with an example. **[8]**

b) Explain the requirements engineering tasks in brief. **[8]**

OR

Q4) a) How do you model the flow of a process? Explain with an example. **[8]**

b) What are the elements of analysis model? Explain in brief. **[8]**

Q5) a) Describe the concepts of modularity and refactoring in design. **[8]**

P.T.O.

b) Create the class diagram for design of an online book store system. **[6]**

c) State the steps of user interface design. **[4]**

OR

Q6) a) Explain the user interface design rules. **[8]**

b) How do you model the software architecture using context diagram? **[6]**

c) What is a layered architecture? **[4]**

SECTION-II

Q7) a) What is the role of unit testing in software testing? Give the purpose of stubs and drivers in unit testing. **[8]**

b) Explain any two system testing methods. **[6]**

c) State the advantages of regression testing. **[4]**

OR

Q8) a) Give the steps of the basis path testing to derive test cases with an example. **[8]**

b) Explain the different debugging tactics. **[6]**

c) How do you derive test cases for condition testing? **[4]**

Q9) a) What is the role of estimation in project management? Explain any one estimation technique with an example. **[8]**

b) Describe the different types of team structures in project management. **[8]**

OR

Q10)a) Explain the quality factors in software development. **[8]**

b) Explain the role and process of formal technical reviews. **[8]**

Q11)a) How risk assessment is carried out? How it is used in risk analysis? **[8]**

b) Explain the techniques used in project scheduling **[8]**

OR

Q12) a) Explain McCall's quality factors. **[8]**

b) Explain the software configuration management process. **[8]**

Total No. of Questions :12]

SEAT No. :

P3896

[Total No. of Pages :3

[4958] - 191

T. E. (Chemical Engineering)

CHEMICAL ENGINEERING MATHEMATICS

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer-books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find real root of equation $x^3 - 4x - 9 = 0$ using bisection method if permissible error is 0.02. **[8]**

b) State and explain the graphical interpreation of secant method. **[8]**

OR

Q2) a) State and explain the graphical interpreation of false position method. **[8]**

b) Solve the equation cos x-xe^x = 0 using secant method upto '3' places of decimal Point. **[8]**

Q3) a) Solve the following system of equations using Gauss elimination method. **[8]**

$2x - y - z = 2,\ x + 2y + z = 2,\ 4x - 7y - 3z = 2.$

b) Solve the following system of equations using Gauss-Seidalmethod: **[8]**

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

OR

P.T.O.

Q4) a) Solve the following system of equations using LU decomposition method: **[8]**

$2x+3y+z=9,\ x+2y+3z=6,\ 3x+y+2z=8.$

b) Discuss in short the drawbacks of Elimination methods. **[8]**

Q5) a) Use least square regression to fit a strainght line to the following data: **[9]**

x	1	2	3	4	5	6	7
y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

b) Explain linear regression and write down the criteria for a "best" fit. **[9]**

OR

Q6) a) Fit a curve $y= ax^b$ using the following data. **[10]**

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

Find the values of a and b.

b) Explain linear regression for least squares. **[8]**

SECTION - II

Q7) a) Explain graphical interpretation of effect of step size on Euler's method. **[8]**

b) Using Euler's method, find an approximate value of y for $\frac{dy}{dx}=x-y^2$, for given boundry conditions, $x = 0$, $y = 1$, find y at $x = 4$. Take step size $h = 1$. **[8]**

OR

Q8) a) Discuss the stability region of Runge-Kutta method. **[8]**

b) Using Euler's method, find an approximate value of y for $\frac{dy}{dx} = x + 2y$, for given boundry conditions, $x = 1$, $y = 1$, find y at $x = 1.4$. Take step size $h = 0.1$. **[8]**

Q9) State the PDE representing neat flow in one-dimensional problem (i.e. parabolic equation). Using finite difference approximation derive Crank-Nicholson formula for solving the PDE. **[16]**

OR

Q10) Discuss in detail the algorithm and flow chart to generate forward differences. **[16]**

Q11) a) What are the six steps of optimization. **[6]**

b) How one dimensional search is applied in a multidimensionl problem. **[12]**

OR

Q12) a) Write the working procedure of the simplex method. **[9]**

b) Explain scanning and bracketing procedures for optimization of unconditional functions of one dimensional search. **[9]**

Total No. of Questions : 12]

SEAT No. :

P2953

[Total No. of Pages : 3

[4958]-192
T.E.(Chemical)
CHEMICAL ENGINEERING THERMODYNAMICS-II
(2008 Coures)(Semester-I) (309344)

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

Instructions to the candidates:

1) ***Answer to the two sections should be writtern in separate answer books.***
2) ***Answer Q1 or 2,Q3or 4, Q5 or 6 form section I and Q 7 or 8, Q 9 or 10, Q11 or 12 form sectionII.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) What is fugacity and fugacity coefficient? **[6]**

b) Calculate the fugacity of liquid water at 303 K and 10 bar if the saturation pressure at 303 K is 4.241 kPa and the specific volume of water(1) is $1.004\times10^{-4}m^3/kg$. **[5]**

c) What is the effect of temperature and pressure on activity coefficient? **[5]**

OR

Q2) a) What is an ideal solution? Derive equations for G^{id},S^{id},V^{id} and H^{id}. **[8]**

b) Calculate the fugacity of nitrogen at 800 bar and 273 K from the following data: **[8]**

P, bar	50	100	200	400	800	1000
PV/RT	0.9846	0.9914	1.0365	1.2557	1.7959	2.0641

Q3) a) Explain the van Laar and Margules models for excess Gibbs energy. **[9]**

b) Explain the Lewis Randall rule and derive the necessary equations. **[9]**

OR

P.T.O.

Q4) a) What are the different methods for determining partial molar properties? **[8]**

b) The enthalpy change of mixing for a binary mixture at 298K and 1 bar is given by $\Delta H = x_1 x_2(40x_1 + 20x_2)$ J/mol, x_1 and x_2 are mol fractions of the two components. The enthalpies of the pure liquids at the same temperature and pressure are 400 and 600J/mol for components 1 and 2 respectively. Determine the numerical values of the partial molar enthalpies at infinite dilution $\bar{H}_1^{\infty}$ and $\bar{H}_2^{\infty}$ at 298 K and 1 bar. **[10]**

Q5) a) Give the statement for Duhem's theorem and give it's significance. **[4]**

b) Calculate the mean heat capacity of a 20mol% solution of ethanol in water at 298 K. Data: Heat capacity of water is 4.18×10^3J/Kg K, Heat capacity of ethanol is 2.18×10^3J/kg K, Heat of mixing for 20 mol% solution of ethanol in water at 298 K is -758J/mol, Heat of mixing for 20 mol% solution of ethanol in water at 323 K is –415 J/mol. Assume that the heat capacities of pure liquids are constant between 298 and 323 K. **[8]**

c) Draw the partial pressure versus mole fraction curves for low boiling and high boiling azeotropes? **[4]**

OR

Q6) a) Construct the P – x,y diagram for the cyclohexane(1)–benzene(2) system at 313 K given that at 313 K the vapour pressures are $P_1^s = 24.62$kPa and $P_2^s = 24.41$kPa. The liquid phase activity coefficients are given by $\ln \gamma_1 = 0.458\ x_2^2$ and $\ln \gamma_2 = 0.458\, x_1^2$. **[12]**

b) Explain the T-x,y diagram in detail. **[4]**

SECTION-II

Q7) a) Explain liquid-liquid equilibrium. **[8]**

b) The activity coefficient for component 1 in a binary mixture is given by the expression $\ln \gamma_1 = ax_2^2 + bx_2^3 + cx_2^4$ where a, b and c are concentration independent constants. Derive an equation for $\ln \gamma_2$ in terms of x_1 **[8]**

OR

Q8) a) Describe any two methods for finding thermodynamics consistency. **[8]**

b) Explain the criterion for equilibrium and stability in phase equilibrium. **[8]**

Q9) a) Give the different methods for evaluating equilibrium constants. **[8]**

b) For a system in which the following reaction occurs $CH_4 + H_2O \rightarrow CO + 3H_2$ assume there are 4 mol CH_4,2 mol H_2O,2 mol CO and 4mol H_2 present initially. Determine the expressions for the mole fractions of each component as a function of reaction coordinate. **[6]**

c) Explain how the Gibbs criterion for equilibrium applies to reacting systems. **[4]**

OR

Q10) a) Explain the feasibility criteria for reacting systems. **[6]**

b) Consider a reaction $H_2O \rightarrow H_2 + 1/2O_2$ occurring in a closed vessel with n_0 moles of water vapor initially. Derive an expression for the mole fractions of all the components and the fractional decomposition of water in terms of the reaction coordianate. **[6]**

c) Derive an expression giving the effect of pressure on reaction equilibrium constant. **[6]**

Q11) a) Derive an expression giving the relation between equilibrium constant and composition for gas phase reactions and state the effect of presence of inerts. **[8]**

b) One mole of steam undergoes the water gas shift reaction at 1100 K and 1 bar. $CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$. The equilibrium constant for the reaction K = 1. Assuming ideal behavior calculate the fractional dissociation of steam when CO is supplied in 100% excess of theoretical requirement. **[8]**

OR

Q12) a) Derive an expression relating mole fractions of components to reaction coordinate for a multiple reaction system. **[8]**

b) Ammonia is synthesized from nitrogen and hydrogen taken in stoichiometric proportion. The reaction: $N_2 + 3H_2 \rightarrow 2NH_3$. The equilibrium constant for the reaction at 675 K may be taken as 2×10^{-4}. Determine the percentage conversion of nitrogen at 675 K and 20 bar. What would be the conversion at 675 K and 200 bar. **[8]**

Total No. of Questions :12]

SEAT No. :

P2954

[Total No. of Pages :3

[4958]-193
T.E. (Chemical)
CHEMICAL PROCESS TECHNOLOGY
(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss the Recovery of mg salt form sea water. **[10]**

b) Explain the various Reaction for solvry process. **[8]**

OR

Q2) a) Compare unit operation and unit processes with example draw any 4 schematic representation of unit operation. **[10]**

b) Discuss the production of sodium carbonate. **[8]**

Q3) a) Described production of ammonium sulphate. **[8]**

b) Discuss the production of urea. **[8]**

OR

Q4) a) Discuss the production of sulphur by Frasch process. **[8]**

b) Explain the manufacturing of ammonium nilrate. **[8]**

P.T.O.

Q5) a) Explain production of ethyl alcohol by Fermentation. **[8]**

b) Described process of Manufacturing paper pulp. **[8]**

OR

Q6) a) Discuss Recovery of sucrose from suqercane. **[8]**

b) Explain paper pulping process. **[8]**

SECTION - II

Q7) a) Discuss the production of pencillin. **[8]**

b) Describe production of soap and natural glycerine. **[8]**

OR

Q8) a) Explain with diagram hydroqenation of oil. **[8]**

b) Explain destructive distillation of coal. **[8]**

Q9) a) Give details of thermal and catalytic pyrolysis. **[10]**

b) Explain production and application of water gas. **[8]**

OR

Q10)a) Explain alkylation process in petroleum industry. **[8]**

b) Explain Manufacturing of **[10]**

i) Natural gas

ii) Water gas

iii) Producer gas

Q11)a) Discuss production of styrene. **[8]**

b) Describe Methanol production process. **[8]**

OR

Q12)**W**rite a short note on **[16]**

a) Catalytic reforming in petroleum industry.

b) Producer gas.

c) Water gas.

x x x

Total No. of Questions :12]

SEAT No. :

P2955

[Total No. of Pages :3

[4958] - 194

T. E. (Chemical)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume Suitable data if necessary.***

SECTION - I

Q1) Write distinguishing points for partnership and Joint Stock Company, State and explain the formation and function of partnership with its merits and demerits. **[16]**

OR

Q2) What is management? Explain in detail various functions of management. State role of managers in a changing global business environment. **[16]**

Q3) a) What is recruitment? Explain sources of manpower and recruitment procedure. **[8]**

b) Define Job Evaluation. Explain any two methods of job evaluation along with merits and demerits. **[8]**

OR

P.T.O.

Q4) a) What is Industrial Fatigue? Write down various causes and effects of Industrial fatigue. **[8]**

b) Explain manpower planning. State various objectives and benefits of manpower planning. **[8]**

Q5) a) State various functions of purchase department. **[9]**

b) Explain the process of purchase through quotation. Tender and comparative statement. **[9]**

OR

Q6) Explain the following (any three): **[18]**

a) Bin cards

b) Stores ledger

c) LIFO, FIFO

d) Inventory control.

SECTION - II

Q7) a) Distinguish between marketing and selling. **[8]**

b) Explain advertising. Enlist various advantages of advertising. **[8]**

OR

Q8) a) Write an explanatory note on sales and channel of distributions. **[8]**

b) Explain in detail Marketing mix. **[8]**

Q9) a) Explain role of international trade in supporting Indian Economy. **[8]**

b) Explain the various steps involved in exporting goods to a foreign based customer. **[8]**

OR

Q10)a) Explain in detail any two duties related to import and export. **[8]**

b) Write an explanatory note on patent and Patent Act. **[8]**

Q11)Write short notes on: **[18]**

a) MRTP and FERA.

b) Flow diagram and string diagram.

c) Work study.

OR

Q12)a) Define time study. Illustrate how will you carry out time study in chemical organisation. **[9]**

b) Write an explanatory note on Contract Act. **[9]**

Total No. of Questions :12]

SEAT No. :

P2956

[Total No. of Pages :4

[4958] - 195

T.E. (Chemical)

MASS TRANSFER - I

(Semester - I) (2008 Course)

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

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

SECTION - I

Q1) a) What is mass transfer? Define molecular diffusion and Fick's law of diffusion. **[4]**

b) Discuss general principle of mass transfer operation and classify different mass transfer operations. **[6]**

c) In the Oxygen - Nitrogen mixture at 10 atm and 25°C and Concentrations of oxygen at two places of 0.2 cm apart are 10 and 20 volume percent respectively. Calculate the rate of diffusion of Oxygen expressed as gm per cm^2. hr for the case of uni component Diffusion. Value of diffusivity between oxygen-nitrogen=0.181 cm^2/sec. **[8]**

R = 82.06 atm.cm^3/gm mole K.

OR

Q2) a) Derive the expression of Maxwell's law of diffusion. **[6]**

b) Unsteady state mass transfer. **[4]**

P.T.O.

c) Ammonia is diffusing through a stagnant layer gas mixture consisting of 25% nitrogen and 75% hydrogen by volume at 0°C and 1 atm pressure. Calculate the rate of diffusion of ammonia in gm mole/cm^2. sec. through a gas film of 0.03 cm thick. The partial pressure of ammonia across the film being 100 and 50 mmHg respectively. **[8]**

$D_{NH_3-N_2}$ = 0.158 cm^2/sec.

$D_{NH_3-H_2}$ = 0.588 cm^2/sec.

Q3) a) Explain film theory and compare with penetration theory. **[6]**

b) Ammonia is absorbed by water in a wetted wall column using operating temperature 20°C and 1 atm. pressure. The overall gas coefficient is 1 kmol/m^3. atm. At one point in the column the gas contains 10 mole% NH_3 and the liquid phase contains 0.155 male NH_3/m^3 of solution. 96% of total resistance is in the gas phase. Assume Henry's law constant at 293°K = 4.247×10^{-3} atm/mol/m^3. Determine individual film coefficients and the molar flux. **[10]**

OR

Q4) a) Write short note on mass, heat and momentum transfer analogies. **[4]**

b) Write short note on any three **[12]**

i) Theoretical stage

ii) Principle and working of wetted wall tower/column

iii) Overall and individual mass transfer coefficient

iv) Mass transfer coefficient in turbulent flow

Q5) a) What are the factors to be considered for selecting solvent for Absorption. **[4]**

b) Explain the absorption factor 'A'. **[4]**

c) Gas containing 2% (by volume) solute A is fed to an absorption tower at a rate of 0.35 m^3/sec at 26°C and 106.658 kPa pressure and 95% of original solute is removed by absorbing it in solvent B. Solvent containing 0.005 mole fraction of solute enters the tower at top and exit liquid streams from absorption tower contains 0.12 mole of A per mole of B. Find the flowrate of liquid solvent entering the absorption tower on solute free basis. **[8]**

OR

Q6) a) What is absorption factor & minimum L/G Ratio in absorbers? What are the significance of both? **[6]**

b) A packed tower is designed to recover 98% CO_2 from a gas mixture containing 10% CO_2 and 90% air using water. The equilibrium relation is given as y = 14x, where y is kg CO_2 /kg dry air and x is kg CO_2/ kg H_2O/ The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if (HTU)OG = 1m. **[10]**

SECTION - II

Q7) a) Write a short note on any Two, **[10]**

i) Lewis relation

ii) Adiabatic Saturation Temperature

iii) Methods of increasing humidity of the gas

b) A mixture of nitrogen-acetone vapor at 800 mmHg and 25°C has percentage saturation of 80%. **[8]**

Calculate

i) Absolute humidity,

ii) Partial pressure of acetone,

iii) Absolute molal humidity.

OR

Q8) a) Derive an equation for height of packing required in forced draft counter current cooling tower in terms of Z = HTU × NTU **[10]**

Where, NTU = $\int_{H_{G_1}}^{H_{G_2}} \frac{dHg}{Hf - Hg}$.

State the assumptions and basic equation for heat and mass transfer in counter current cooling tower.

b) Define wet bulb Depression and psychrometric ratio. Derive an expression for wet bulb depression. **[8]**

Q9) a) Define the following terms **[8]**

i) Murphree tray efficiency

ii) Ideal Tray

iii) Overall tray efficiency

iv) Gas and liquid holdup

b) Define the following terms with the help of operating characteristics diagram of sieve plate column, **[8]**

i) Flooding

ii) Weeping

iii) Entrainment

iv) Coning

OR

Q10)a) Which are the equipments used for gas-liquid contact. Explain sparged vessel and mechanically agitated vessels with neat sketch. **[10]**

b) Discuss on the materials of packings and their desirable characteristics.**[6]**

Q11)a) A batch of the solid is to be dried from 25 to 6% moisture (wet basis). The initial weight of the weight solid is 160 kg and the drying surface is 1 m^2/40 kg dry weight. Determine the total time for drying. Xc = 0.2 (dry basis). **[10]**

X	0.2	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.07
0.064									
10^3xN	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.043
0.025									

b) Explain the phenomena of movement of moisture within the solid. **[6]**

OR

Q12)a) Explain the Principle, working and construction of Drum Dryer with neat sketch. **[8]**

b) A wet solid is to be dried from 35% to 10% moisture (wet basis) under constant drying conditions in fire hours. If the equilibrium moisture content is 4% and critical moisture content is 14%. How long it will take to dry solids to 6% moisture under the same conditions? **[8]**

Total No. of Questions :12]

SEAT No. :

P2957

[Total No. of Pages :3

[4958]-196
T.E. (Chemical)
TRANSPORT PHENOMENA
(2008 Course) (Semester - II) (309348)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of lagarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain momentum balance equation. **[4]**

b) Derive expression of momentum flux, maximum velocity, average velocity and discharge for flow of fluid along an inclined plate. **[14]**

OR

Q2) Derive Hagen poiseuille equation. **[18]**

Q3) a) What pressure gradient is required to cause N, N-diethylamine to flow in a horizontal smooth tube of inside diameter 3 cm at a rate of 1.1 lit/s. Density of diethylamine is 935 kg/m^3 and viscosity is 1.95 cp. Assume friction factor f = 0.0063. **[6]**

b) Derive Ergun equation for flow of fluid through packed bed. **[10]**

OR

Q4) Derive Navier Stokes equation of motion. **[16]**

P.T.O.

Q5) a) Derive heat flux and temperature distribution for an electric heat source. **[12]**

b) Compare free and forced convection. **[4]**

OR

Q6) a) Explain Fourier's law of heat conduction. **[4]**

b) Derive the expression of temperature distribution and heat flux for nuclear heat source of spherical form. **[12]**

SECTION-II

Q7) a) Derive the expression of heat flux for composite cylinder. **[14]**

b) State boundary conditions to solve heat transfer problems. **[4]**

OR

Q8) a) Derive the expression of heat flux for composite slab. **[14]**

b) Explain Von Karman similarity hypothesis for turbulent energy flux. **[4]**

Q9) Derive the expression of molar flux, concentration profile and average concentration for stagnant diffusion. **[16]**

OR

Q10)a) Derive the expression of molar flux and concentration profile for homogeneous chemical reaction. **[10]**

b) Diffusivity of gas-pair oxygen-carbon tetrachloride is determined by observing steady state evaporation of carbon tetrachloride. The distance between CCl_4 liquid level and top of tube is 17.1 cm. The total pressure on the system is 755 mm Hg. Vapor pressure of CCl_4 at this temperature is 33 mm Hg. Cross-sectional area of tube is 0.82 cm^2. If it is found that 0.0208 cm^3 of CCl_4 evaporate in 10-hour period. What is diffusivity of gas-pair CCl_4-O_2. **[6]**

Q11)a) Discuss transfer coefficients at high transfer rates by penetration theory. **[8]**

b) Distinguish between macroscopic and microscopic balance. **[8]**

OR

Q12)a) A spherical drop of water, 0.05 cm in diameter, is falling at a 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]**

b) Explain any one analogy among heat, mass and momentum transfer. **[8]**

EEE

Total No. of Questions :12]

SEAT No. :

P3897

[Total No. of Pages :5

[4958]-197
T.E. (Chemical)
CHEMICAL REACTION ENGINEERING - I
(2008 Course) (Semsester - II)

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

Instructions to candidates:

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

SECTION - I

Q1) a) How kinetic model is tested, explain rules for matching the predicted rate expression and found experimentally. **[4]**

b) On doubling the concentration of the reactant the rate of reaction triples. Find the reaction order. **[4]**

c) The rate constant of certain reaction are 1.6×10^{-3} and 1.625×10^{-2} sec^{-1} at 10°C and 30°C calculate the activation energy. **[4]**

d) Differentiate elementary and non-elementary reaction. **[4]**

OR

Q2) a) Explain temperature dependency from Arrhenius Law of rate expression. What is Activation Energy E? How does it affect the temperature sensitivity of reaction? **[8]**

b) For a first order reaction the following data is available. Estimate activation energy for the reaction. **[8]**

Temperature °C	310	330
K $(sec)^{-1}$	0.000886	0.0139

Assume R = 8.314 J/mol K

P.T.O.

Q3) a) What is meaning of Autocatalytic reaction? Draw and explain the X_A vs t and $-r_A$ vs C_A/C_{A0} curves for autocatalytic reactions. **[4]**

b) Derive integrated rate expression for first order reaction A $\rightarrow$ Product with variable volume system which is as follows. **[6]**

$$-\ln\left(1-X_A\right)=-\ln\left(1-\frac{\Delta V}{\in_A V_0}\right)$$

c) Explain in detail differential method of analysis. **[6]**

OR

Q4) a) Show that the decomposition of N_2O_5 at a70°C is first order reaction, calculate the value of rate constant, reaction is $N_2O_5 \rightarrow N_2O_4 + ½\ O_2$ **[10]**

b) At certain temperature, the half life peroid and initial concentration for a reaction are

t ½= 420 sec, C_{A0} = 0.405 mol/lit

t ½=275 sec,C_{A0} = 0.64 mol/lit

Find the rate constant of reaction. **[6]**

Q5) a) Derive performance equation of Plug Flow Reactor. **[9]**

b) In train of CSTR of equal volume, an irreversible constant density first order reaction is carried out show that if number of CSTR is very large, the total volume of all reactors in series tends to that of PFR for some extent of conversion and show that **[9]**

$$\tau_N=\frac{N}{K}\left[\left(C_0-C\right)^{1/N}-t\right]$$

$$\tau_p=\frac{1}{K}\ln\left(C_0-C\right)$$

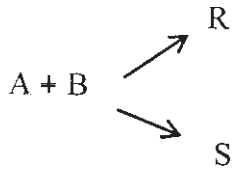
OR

Q6) a) The liquid phase reaction A + B $\rightarrow$ C + D takes place in a CSTR of volume 25 m^3. The feed stream contains 5 kmol/m^3 of A and 100 mol/m^3 of B. What volumetric flow rate and space time is required to obtain 50 % conversion of the limiting reactant? The reaction rate constant is 0.0001 m^3/kmol.s at the reaction temperature. **[9]**

b) Derive performance equation of Mixed Flow Reactor. **[9]**

SECTION - II

Q7) Consider the following aqueous reaction. **[16]**



$$\frac{dC_R}{dt} = 1.0\, C_A^{1.5} C_B^{0.3}$$

$$\frac{dC_S}{dt} = 1.0\, C_A^{0.5} C_B^{1.8}$$

For 90% conversion of A find the concentration of R in the product stream. Equal volumetric flow rates of the A and of B stream are fed to the reactor, and each stream has a concentration of 20 mol/lit of reactant. The flow in the reactor follow:

a) Plug flow.

b) Mixed flow.

c) Plug flow with low concentration of B when plug flow A with mixed flow B.

OR

Q8) a) The desired liquid phase reaction

$$A + B \rightarrow P + T \quad \frac{dC_P}{dt} = \frac{dC_T}{dt} = K_1 C_A^{1.5} C_B^{0.4}$$

is accompanied with undesirable side reaction

$$A + B \rightarrow S + U \quad \frac{dC_U}{dt} = \frac{dC_S}{dt} = K_2 C_A^{0.5} C_B^{1.8}$$

What contacting scheme (reactor type) would you use to carry above reaction to minimize concentration of undesired product? **[10]**

b) Define instantaneous fractional yield and overall fraction yield. **[6]**

Find out instantaneous fractional yield of reaction (Ψ).

$$A + B \xrightarrow{K1} R \qquad \frac{dC_R}{dt} = 1.0\ C_A^{1.2}\ C_B^{1.4}$$

$$A + B \xrightarrow{K2} S \qquad \frac{dC_S}{dt} = 1.0\ C_A^{0.6}\ C_B^{2.0}$$

Q9) a) Explain effect of temperature, pressure and inerts 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

Q10) Determine the equilibrium conversion for the following elementary reaction between 0°C to 100°C at 298 K **[16]**

$A \rightleftarrows R$, $\Delta G° = -14130$ J/mol, $\Delta H° = -75300$ J/mol, $C_{PA} = C_{PR}$ = constant

a) Construct a plot of temperature vs conversion.

b) What restrictions should be placed on reactor operating isothermally if conversion of 85% or higher is desired?

Q11) A sample of the tracer hytane at 320 K was injected as a pulse to a reactor and the effluent concentration measured as a function of time resulting in the following data. **[18]**

t (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

a) Construct figures showing C(t) and E(t) as function of time.

b) Determine fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor.

c) Determine fraction of material that has spent 3 min or less in the reactor.

OR

Q12) Write notes on (any three) **[18]**

a) Tank in series model.

b) C and E curve.

c) Micro and macro mixing of fluids.

d) Seggregation model.

e) Dispersion flow model.

Total No. of Questions :12]

SEAT No. :

P2958

[Total No. of Pages :4

[4958]-198

T.E. (Chemical)

CHEMICAL ENGINEERING DESIGN - I

(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of calculator and steam table is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Figures right indicates full marks.***

SECTION-I

Q1) a) Discuss the material of construction for chemical process equipment. **[8]**

b) Discuss in brief nondestructive tests for process vessels. **[8]**

OR

Q2) a) Describe optimization techniques in details. **[8]**

b) Explain plastic as material of construction for chemical plants. **[8]**

Q3) a) With neat sketches explain the constructional features of different types of heads and give their design equations. **[8]**

b) Explain types of pressure vessels and various stresses developed in the wall of pressure vessels with neat sketches. **[8]**

OR

P.T.O.

Q4) a) A Vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange. Design data: **[10]**

- Design pressure = 170 kg/cm^2, Design Temperature = 121 ^{o}C
- Allowable bolt stress at gasket seating and operating conditions = 1306 kg/cm^2.
- Allowable flange stress at gasket seating and operating condition = 1190 kg/cm^2.
- Inside dia of gasket = 34.4 cm
- Width of gasket = 2.5 cm, m = 3
- Ya = 680.3 kg/cm^2, BCD = 56.2 cm

  (50 mm diameter, 16 bolts are used)

b) Explain different types of gaskets. What are criteria for selection of gaskets? **[6]**

Q5) a) A tank is to store 26,000kg of liquid having density 980 kg/m^3. Due to space limitations the maximum tank diameter can be 2.4 m. Calculate height of the tank if liquid is filled upto roof to shell junction. No corrosion allowance is necessary. Welded joint efficiency is 85%. The permissible stress of the material is 1020 kg/cm^2. Also calculate various course thicknesses. **[10]**

b) Explain various types of losses during storage of volatile liquids. **[8]**

OR

Q6) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius for all shells is 1.4. The vessel is subjected to an internal pressure of 150 kg/cm^2. Pressure outside the vessel is atmospheric **[10]**

Estimate:

i) The maximum combined stress at the interfaces of concentric shells.

ii) Interface pressure resulting from internal pressure and shrinkage stresses.

Data: Modulus of elasticity = 2×10^6 kg/cm^2

Internal diameter of vessel = 400 mm

b) Explain construction of multilayered vessel. **[8]**

SECTION-II

Q7) a) Write design procedure for skirt support with relevant sketches and equation. It should include **[10]**

- Thickness of skirt
- Period of vibration
- Base bearing plate
- Anchor bolt

b) Explain saddle support design with neat diagram. **[6]**

OR

Q8) a) A tall vertical vessel 1.5 m in diameter and 13 m high is to be provided with vertical skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to the diameter of vessel. Height of skirt is 2.2 m, wind pressure acting over the vessel is 100 kg/m^2. Seismic coefficient = 0.08, permissible tensile stress of skirt material = 960 kg/m^2, permissible compressive stress is 1/3rd of yield stress of material. Yield stress is 2400 kg/cm^2. Estimate the thickness of skirt support. **[10]**

b) With neat sketches explain the leg support and lug support for vertical vessel. **[6]**

Q9) 1800 kg/hr of ethylene glycol is to be cooled form 100^{o}C to 60^{o}C by water available at 15^{o}C. The maximum temperature to which water can be heated is 42^{o}C. Ethylene glycol is circulated through the tubes while water flows through the annulus of concentric tube of heat exchanger, **[16]**

Inside tube is of copper while outside tube is of steel.

Inside diameter of copper tube = 12.5 mm

Outside diameter of copper tube = 14.5 mm

Inside diameter of outer steel tube = 22 mm

Fouling resistance and metal wall resistance can be neglected.

Suggest suitable design of a concentric tube heat exchanger,

The properties of ethylene glycol and water at mean temperature are

	Ethylene Glycol	Water
Density, kg/m^3	1078	995
Viscosity, N-s/m^2	3.2×10^{-3}	0.853×10^{-3}
Specific heat, J/kg. K	2650	4180
Thermal Conductivity, W/m.K	0.261	0.614

OR

Q10)a) Discuss design of double pipe heat exchanger. **[10]**

b) What do you mean by LMTD? Why is it used in heat exchanger design? **[6]**

Q11)a) Explain the forward feed and backward feed multiple effect evaporators with neat sketches. Mention their advantages and disadvantages. **[9]**

b) With neat sketches explain working of plate heat exchanger (PHE). Write down advantages and disadvantages of PHE. **[9]**

OR

Q12)5 kg/sec of an aqueous solution containing 12% solute is to be concentrated to 40% by weight. The feed solution at 21°C enters the last effect of a backward feed arrangement triple effect evaporator. Pressure of the heating steam is 4 kg/cm^2 and corresponding temperature is 143°C. Vacuum in last effect is 0.2 kg/cm^2 which correspond to a boiling temperature of 60°C. Overall heat transfer coefficients in individual units are as follows:

U1 = 1800 W/m^2. K; U2 = 1000 W/m^2. K; U3 = 600 W/m^2. K. **[18]**

Heat capacity of the liquor may be assumed as constant = 3700 J/kg.K

Latent heat of steam = 2241 kJ/kg;

Latent heat of vapor = 2357 kJ/kg.

Calculate

a) Total heat transfer area.

b) Steam required for evaporation.

c) Total water evaporated.

d) Mass of water required for condenser.

EEE

Total No. of Questions :12]

SEAT No. :

P2959

[Total No. of Pages :3

[4958]-199
T.E. (Chemical)
PROCESS INSTRUMENTATION AND CONTROL
(2008 Course) (Semester - II) (309351)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain types of transducers? **[8]**

b) Explain all the static characteristics of measuring instruments. **[8]**

OR

Q2) a) Give the classification of instruments. **[8]**

b) Define all the process variable and state their unit of measurement. **[8]**

Q3) a) Explain with diagram, construction and working calibration of pressure sensors using dead-weight tester. **[8]**

b) Explain with diagram, construction and working bellows. **[8]**

OR

Q4) a) Define temperature and give temperature scales with inter-relation. **[8]**

b) Explain with diagram, construction and working thermocouples. **[8]**

P.T.O.

Q5) a) Explain classification of flow measuring instruments. **[9]**

b) Explain with diagram, construction and working venturimeter. **[9]**

OR

Q6) a) Explain classification of level measuring instruments. **[9]**

b) Explain with diagram, construction and working ultrasonic level measurement method. **[9]**

SECTION - II

Q7) Describe with diagram the following techniques of composition analysis **[16]**

a) IR absorption spectroscopy

b) Mass spectroscopy

OR

Q8) Write note on **[16]**

a) HPLC.

b) refractometry.

Q9) a) Describe the heat exchanger automatic control system with block diagram. **[8]**

b) Describe the characteristics of step response of second order underdamped system. **[8]**

OR

Q10)a) State the differences between first order and second order system. **[8]**

b) Write note on servo & regulatory operation. **[8]**

Q11)a) An air to open valve on the inflow controls level in a tank. When the process is at the set point the valve opening is 50%. **[9]**

An increase in outflow results in the valve opening increasing to a new steady state value of 70%. What is the resulting offset if the controller PB is:

i) 15% ii) 25%

b) Explain with diagram different control actions. **[9]**

OR

Q12)a) State the differences between feedback and feed forward control. **[9]**

b) Explain with diagram, temperature control system in reactor. **[9]**

x x x

Total No. of Questions : 12]

SEAT No. :

P2960

[Total No. of Pages : 4

[4958]-200
T.E. (Chemical)
MASS TRANSFER - II
(2008 Pattern) (Semester - II) (Theory)

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

Instructions to the candidates:

1) ***Answer 3 questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

SECTION - I

Q1) a) A liquid mixture is subjected to differential distillation containing 50 mole % n-heptane and 50 mole % n-octanes at atmospheric pressure until the residual liquid contains 35 mole % n-heptane. Find out the % of feed left over as residue. **[12]**

X	0.5	0.46	0.42	0.38	0.34	0.32
Y	0.689	0.648	0.608	0.567	0.523	0.49

b) Define molecular Distillation? **[4]**

OR

Q2) a) Define distillation and differential distillation. Derive the Rayleigh equation. **[12]**

b) What you mean by flash vaporization? **[4]**

Q3) a) Write short note on steam distillation. **[12]**

b) Give detail procedure of finding number of plates by using ponchon savarit method. **[6]**

OR

P.T.O.

Q4) a) A liquid mixture containing 45 mol% benzene and 55 mole % toluene is separated to give an overhead product of 95 mole % benzene and the bottom product containing 5 mole % benzene. The feed is at its boiling point. Using Mc-Cabe Thiele method, find Minimum reflux ratio and no. of theoretical plates required. **[12]**

X	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Y	0.13	0.21	0.375	0.5	0.6	0.7	0.77	0.83	0.9	0.95	1.0

b) Derive equation of q-line and give its significance. **[6]**

Q5) If 100 kg of a solution of acetic acid (C) and water (A) containing 30% of acid is to be extracted three times with isopropyl ether (B) at 20 ^{o}C using 40 kg of solvent in each stage, determine the quantities and composition of the various streams. How much solvent would be required if the same final raffinate concentration were to be obtained with one stage? Horizontal lines i.e. the equilibrium data is **[16]**

Water Layer			Isopropyl Ether Layer		
Acetic Acid	Water	Iso. Ether	Acetic Acid	Water	Iso.Ether
0.69	98.1	1.2	0.18	0.5	99.3
1.41	97.1	1.5	0.37	0.7	98.9
2.89	95.5	1.6	0.39	0.8	98.4
6.42	91.7	1.9	1.93	1.0	97.1
13.30	84.4	2.3	4.82	1.9	93.3
25.50	71.1	3.4	11.40	3.9	84.7
36.70	58.9	4.4	21.60	6.9	71.5
44.30	45.1	10.6	31.1	10.8	58.1
46.40	37.1	16.5	36.20	15.1	48.7

OR

Q6) a) Give detail procedure for finding the number of stages in multistage cross-current extraction. **[12]**

b) Give the classification of liquid-liquid extraction equipments. **[4]**

SECTION - II

Q7) 350 kg per hour of halibut liver is to be extracted in a counter current cascade with ether to recover oil. The ether which has been partially purified contains 2% oil. The fresh liver contains 20% oil and are to be extracted to a composition 1% oil (on solvent free basis) 250 kg of solvent is to be used. **[16]**

a) What % of oil entering with the liver is recovered in the extract?

b) How many equilibrium stages are required?

Data:

kg oil/kg solution	0	0.1	0.2	0.3	0.4	0.5	0.6
kg solution/kg exhausted liver	0.288	0.368	0.44	0.51	0.6	0.71	0.87

OR

Q8) a) Roasted copper ore containing copper as $CuSO_4$ is to be extracted in a counter current extractor. The feed charge to be treated per hour comprises of 10 tones of gangue, 1.2 tons of copper sulphate and 0.5 tone of water. The strong solution produced is to consist of 90% H_2O and 10% $CuSO_4$ is to be 98% of that of ore. Pure water is to be used as the fresh solvent. After each stage one tone of gangue retains 2 tonnes of water plus copper sulphate dissolved in that water. Equilibrium is attained in each stage. How many stages are required? **[12]**

b) Write material balance for single stage leaching. **[4]**

Q9) a) The equilibrium relation for the decolourisation operation is $Y = 0.5\ X^{0.5}$ where Y = gm color removed/gm of adsorbent, X = gm color in oil/1000 gm of color free oil. 100 kg oil containing one part of color to three part of oil is agitated with 25 kg of adsorbent. Calculate the percentage color removed, if all 25 kg of adsorbent is used in one stage. **[10]**

b) Explain in brief Break through curve? **[6]**

OR

Q10)a) Give detail material balance and its application to freundlich adsorption isotherm for multistage countercurrent adsorption. **[10]**

b) Give classification of membrane processes. **[6]**

Q11)a) State methods of super saturation and explain Miers super saturation theory. **[12]**

b) Explain the principle of Nanofiltration. **[6]**

OR

Q12)a) A solution contains 500 kg Na_2CO_3 and water has a concentration of 25% by wt. of salt. It is cooled from 335 K to 285 K in agitated mild steel vessel. Wt. of the vessel is 750 kg. 2.0% water is lost by evaporation crystals of $Na_2CO_3.10\ H_2O$ are formed. Calculate the yield of crystals and the heat to be removed? **[12]**

Data: Solubility at 285K : 8.9 kg/100 kg water.

Heat capacity of solution : 3.6 kJ/kg K.

Heat capacity of M.S : 0.5 kJ/kg K.

Heat of Solution : 78.5 MJ/kmol.

Latent heat of Vaporization : 2395 kJ/kg.

b) Explain ion exchange process? **[6]**

Total No. of Questions :12]

SEAT No. :

P2961

[Total No. of Pages :4

[4958] - 201

T.E. (IT)

DETABASE MANAGEMENT SYSTEMS

(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain following Data Models: Hierarchicla, Network, ER and Object Relational model. **[8]**

b) Explain with appropriate example why it is said that file systems lack of data independence. **[4]**

c) What is a relation? What are the properties of a relation? Explain with example. **[6]**

OR

Q2) a) Explain good database design properties. With suitable example explain the consequences of bad designing. **[6]**

b) What is the need of mapping cardinality? For a binary relationship set what are the possible mapping cardinalities? Explain with diagrams. **[6]**

c) Define following terms: **[6]**

i) Primary key

ii) Foreign key

iii) Weak entity set

iv) Strong entity set

P.T.O.

Q3) a) Write short notes on: (any 2) **[8]**

i) Stored procedures

ii) Triggers

iii) Dynamic & embedded SQL

b) Consider the following database: **[8]**

Doctor (Doctor - no, Doctor - name, Address, City)

Hospital (Hospital - no, Name, street, City)

Doc - Hosp (Doctor - no, Hospital - no, Date)

Construct the following queries in SQL.

i) Find out all doctors who have visited to Hospital in same city in which they live.

ii) Find out to which Hospital 'Dr. Joshi' visited.

iii) Count no. of doctor visited to 'Shree clinic? On 25 March 2016.

OR

Q4) a) Explain aggregate functions in SQL with suitable example. **[8]**

b) What is a cursor? What are different types of cursors? Explain with suitable example the need of implicit & explicit cursors. **[8]**

Q5) a) When two sets of functional dependencies are said to be equivalent? **[6]**

Given:

$$F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$$

$$G = \{A \rightarrow CD, E \rightarrow AH\}$$

Check if F and G are equivalent?

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

i) Lossless decomposition.

ii) BCNF.

OR

Q6) a) What is Normalization? Explain difference between 2NF & 3NF with suitable example. **[8]**

b) What are Armstrong's axioms? Give the rules for axioms. Prove the pseudo transitivity. **[8]**

SECTION - II

Q7) a) Describe in brief dynamic hashing/ extensible hashing. **[6]**

b) Describe structure of B^+ tree. How does it differ from B. tree. How to implement dynamic multilevel indexes? **[6]**

c) Explain merge - join algorithm. **[6]**

OR

Q8) a) Define Indexing. Explain sparse, dense & clustered indexing with diagram. **[6]**

b) Explain the factors for evaluating the indexing techniques. **[6]**

c) Explain the techniques for improving speed of access of blocks. **[6]**

Q9) a) Explain how deadlock detection and prevention is done? **[8]**

b) Explain recoverable Q cascadeless schedules. **[8]**

OR

Q10)a) Check whether given schedule is view serializable? **[4]**

T_1	T_2	T_3
Read (Q)		
	Write (Q)	
Write (Q)		Write (Q)

b) What is extention in rigorous two phase locking protocal as compared to two phase locking protocol. **[6]**

c) Explain shadow paging with example. **[6]**

Q11)a) Define & explain distributed databases with its advantages & disadvantages. **[6]**

b) What is data mining? Explain the need of data mining. **[6]**

c) Explain pointer swizzling technique. **[4]**

OR

Q12)a) Explain association rules with support & confidence measure. **[8]**

b) Explain column oriented storage with its merits & demerits over the Row - oriented storage. **[8]**

Total No. of Questions :12]

SEAT No. :

P2962

[Total No. of Pages :3

[4958]-202
T.E. (IT)
SOFTWARE ENGINEERING
(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define software engineering. Explain software engineering as layered technology. **[10]**

b) Explain in detail spiral model with its merits and demerits. **[8]**

OR

Q2) a) Explain the unified processing model in detail. **[10]**

b) What are the characteristics of software? Explain in detail following software myths: **[8]**

i) Practitioners myths ii) Management myths

Q3) a) Explain in detail requirement engineering task. **[8]**

b) Draw level 0, level 1 and level 2 data flow diagram for hospital management system. The system keeps track patients, nurses, doctors, wards, operation theatre and bills. The system generates reports on demand.**[8]**

OR

P.T.O.

Q4) a) Explain in detail following UML diagrams stating purpose and applicability

i) Use case Diagram ii) State Diagram **[8]**

b) Explain Class Responsibility Collaborator modelling. **[8]**

Q5) a) Explain in details following design concepts **[8]**

i) Information hiding

ii) Function independence

b) Explain web design pyramid. What are interface design principles for web application? **[8]**

OR

Q6) a) Explain the interface design principles and guidelines. **[8]**

b) Explain all architectural styles in detail. **[8]**

SECTION - II

Q7) a) Explain loop testing for different types of loops with example. **[8]**

b) Compare and contrast integration testing for conventional and object oriented software. **[8]**

OR

Q8) a) Explain the difference between **[8]**

i) White box testing and Black box testing

ii) Alpha testing and Beta testing

b) Explain following types of system testing **[8]**

i) Stress testing ii) Security testing

iii) Recovery testing iv) Performance testing

Q9) a) What is the relevance of four P's in project planning? Explain in detail. **[8]**

b) Explain the W5HH principle. **[8]**

OR

Q10)a) Explain the decision tree to support make-buy decision with an example. **[8]**

b) Explain the COCOMO II estimation model. **[8]**

Q11)a) What is RMMM? Explain in detail. **[10]**

b) Define SCM. What are the contents of SCM repository? **[8]**

OR

Q12) a) What is a task network in project scheduling? Explain with an example. **[8]**

b) What are the software quality factors? Explain any five. **[10]**

x x x

Total No. of Questions :12]

SEAT No. :

P2963

[Total No. of Pages :3

[4958]-203

T.E. (Information Technology)

COMPUTER NETWORK TECHNOLOGY

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) What is routing? State different types of routing? Write properties of routing algorithm. **[8]**

b) What is flow control mechanism? What is the role of timer in the flow control. **[8]**

OR

Q2) a) Compare virtual circuit subnet and datagram subnet. **[8]**

b) Explain in detail Link State routing algorithm with example. **[8]**

Q3) a) What is fragmentation? Explain types of fragmentation with example. **[8]**

b) Explain in detail BGP. **[8]**

OR

P.T.O.

Q4) a) Is fragmentation supported by IPv4 and IPv6? Explain. **[6]**

b) Consider any class – C network with default subnet mask. **[10]**

How many actual hosts can be connected in that network? Divide that network into 8 equal subnets?

What is the new subnet mask?

What is the starting address of the 6^{th} Subnet?

What is the last address of the 6^{th} Subnet?

How many hosts can be connected in each subnet? (Give all details)

Q5) a) What is a Socket? Explain various socket primitives used in client-server interaction. **[8]**

b) Explain all the fields of TCP header. **[10]**

OR

Q6) a) Explain the three way handshake algorithm for TCP connection establishment. **[10]**

b) What do you mean by flow control in transport layer? What are the different methods to achieve it? **[8]**

SECTION - II

Q7) a) List the similarities and differences between POP3 and IMAP. **[8]**

b) Explain persistent and non-persistent HTTP Connection. **[8]**

OR

Q8) a) List and describe seven message types in SNMP. **[8]**

b) Where and when FTP is used? Explain the importance of two ports in FTP? **[8]**

Q9) a) Explain Round Robin and Weighted Fair Queuing algorithm for scheduling. **[8]**

b) Explain the RTSP protocol. Why this protocol is needed. **[8]**

OR

Q10)a) What do you mean by integrated services? Explain with suitable example. **[8]**

b) What is the need of scheduling and policing techniques in multimedia networking. **[8]**

Q11)a) Discuss various layers used in ATM architecture. **[9]**

b) Explain Bluetooth architecture with diagram. **[9]**

OR

Q12)Write short note on **[18]**

a) Limitations of Bluetooth.

b) ATM Protocol Stack.

c) Hidden Station problem.

x x x

Total No. of Questions :12]

SEAT No. :

P2964

[Total No. of Pages :4

[4958] - 205

T.E. (IT)

THEORY OF COMPUTATION

(2008 Course) (Semester - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Design FA that rear strings made up of letters in the word CHARIOT and accept those string that contain 'CAT' as a substring. **[8]**

b) Define and explain: **[6]**

i) Language

ii) Kleene Closure

iii) Regular Expression

c) Describe English language for following RE : $(1 + 01 + 001)^*$. $(\in + 0 + 00)$. **[4]**

OR

Q2) a) Design FA to accepts 'L'. Who L = {"String in which a always appear tripled"} **[8]**

b) Give RE for following language over = {0, 1} **[6]**

i) Language of all strings that begin with "00" and end with "01"

ii) Language of all strings not containing substring 000.

c) Limitation of Finite State Machine : Explain in detail with an example. **[4]**

P.T.O.

Q3) a) Design a Mealy machine to check divisibility of binary number by 3. **[8]**

b) Construct DFA for regular expression $(00 + 11).(0 + 1)^*$ **[8]**

OR

Q4) a) Convert the following NFA into equivalent DFA. **[8]**

NFA = $(\{p,q,r,s\}, \{0, 1\}, \delta, p, \{s\})$

Q\Σ	0	1
p	*p,q*	*p*
q	*r*	*r*
r	*s*	-
s	*s*	*s*

b) Construct NFA for the following regular expression. **[8]**

i) $a^+ b (bb)^*$

ii) $(a + b)^+ bab(a+b)^*$

Q5) a) Test whether the following grammars are ambiguous or not, if it is ambiguous then remove it. **[6]**

$S \rightarrow Ab, A \rightarrow a, B \rightarrow C \mid b, C \rightarrow D, D \rightarrow E, E \rightarrow a$

b) Convert the following grammar to Chomsky Normal Form (CNF). **[6]**

G= ({S}, {*a*, *b*}, P, S).

S->ABA, A->aA, A->ε , B->bB, B->ε

c) Write a CFG grammar to generate the language L = $\{a^{2n} b^n \mid n>0\}$. **[4]**

OR

Q6) a) Show that CFLs are closed under Union, Concatenation and Kleene closure. **[6]**

b) Convert the given grammar CFG to GNF. **[6]**

S->AA | a, A->SS | b.

c) Construct CFG for language L = $\{a^m\ b^n\ c^p \mid p=m+n$ and m, $n>1\}$. **[4]**

SECTION - II

Q7) a) State and prove pumping lemma theorem for regular language. **[6]**

b) Explain closure properties of regular expression. **[6]**

c) Let G = ({A0, A1}, {*a*, *b*}, P, A0)

Where P = {A0 -->aA1, A1-->bA1, A1-->a, A1-->bA0} Convert given grammar to equivalent Left linear grammar. **[6]**

OR

Q8) a) Explain Chomsky hierarchy with an example **[6]**

b) Let G = ({A, A}, {*a*, *b*}, P, A) where **[6]**

P = {A->*a*B

B->*b*B | *a* |*b*A}

Construct a FA equivalent to given grammar.

c) Construct a regular grammar G generating the regular set represented by

$P = a^{*}\ b\ (a^{*} + b^{*})^{*}$ **[6]**

Q9) a) Compare PDA with FSM and Construct PDA for S->0BB, B->0S |1S| 0. **[8]**

b) Design post machines following language: **[4]**

L = $\{a^n\ b^n \mid n>=1\}$.

c) Define acceptance by PDA **[4]**

i) By final state

ii) By empty stack

OR

Q10)a) Give the different between post machine with PDA. **[7]**

b) Obtain a PDA to accept the language L = $\{a^{2n}\ b^{\ n} \mid n > = 1\}$ by a final state **[9]**

Q11)a) Write short notes on: **[8]**

i) UTM

ii) Halting Problem of Turing Machine

b) Design a Turing machine to compute addition of two unary numbers. **[8]**

OR

Q12)a) Design a Turing machine which replaces occurrence of substring "111" by 101 over input = {0, 1}. **[8]**

b) Write short notes on: **[8]**

i) Types of Turing Machine

ii) Church Turing Hypotheses

Total No. of Questions :12]

SEAT No. :

P2965

[Total No. of Pages :3

[4958]-206
T.E. (Information Technology)
SYSTEM SOFTWARE PROGRAMMING
(2008 Course) (Semester - II)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Describe algorithm of Pass I of two Pass assembler with example. **[8]**

b) Describe forward reference and back-patching with suitable example. **[6]**

c) Explain the term System Programming. **[2]**

OR

Q2) a) Enlist different data structures required during Pass I and Pass II of two Pass assembler. **[8]**

b) Enlist different types of errors that are handled by Pass I and Pass II of Two Pass assembler. **[8]**

Q3) a) Describe Macro call and Macro Expansion in Macro processor with suitable example. **[6]**

b) Explain Advanced Macro facilities with examples. **[8]**

c) Enlist different data structures required during Pass I and Pass II of two pass Macro Processor. **[4]**

OR

P.T.O.

Q4) a) Explain two pass macro processor with suitable example and show the contents of different tables after processing macro call and macro expansion. **[12]**

b) Explain the actual arguments and dummy arguments with examples. **[6]**

Q5) a) Describe Shift Reduce parser with suitable examples. **[8]**

b) Differentiate between compiler and Interpreter. **[2]**

c) Write short note on top down parsing. **[6]**

OR

Q6) a) Describe lexical analyzer with example and also show the contents of different tables generated during Lexical Analyzer. **[10]**

b) Explain Ambiguous grammar in Compilers. Explain with example. **[6]**

SECTION-II

Q7) a) Explain Machine dependent code optimization techniques with suitable example. **[8]**

b) What are the issues in code generation? **[8]**

OR

Q8) a) Explain the processing of all phases of compiler with respect to the assignment statement given below. Clearly mention the input and output of each phase.

P = i* r/30.

Where i is an integer variable while P and r are float type variables. **[12]**

b) Write a short note on activation record. **[4]**

Q9) a) Draw the flow chart for Pass I of direct linking loader. **[12]**

b) What is loader? Enlist the basic functions of a loader? **[6]**

OR

Q10)a) Explain compile and Go loader scheme. **[6]**

b) Explain **[6]**

i) Overlay structure,

ii) Linkage editor.

c) Differentiate between absolute loader and relocating loader. **[6]**

Q11)a) Explain the following language processor tools. **[8]**

i) LEX

ii) YACC

b) Explain in detail typical editor structure. **[8]**

OR

Q12)a) State merits & demerits of Line & Screen editors, with example. **[8]**

b) What is the importance of user interface in system software development? Explain. **[4]**

c) Write the significance of debug monitor? **[4]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2966

[Total No. of Pages : 3

[4958]-207

T.E.(Information Technology)

PROGRAMMING PARADIGMS

(2008Course) (Semester-II) (314450)

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

Instructions to the candidates:

1) ***Answer question Q1 or 2,Q3or 4 and Q5 or 6 form section I and question Q 7 or 8, Q 9 or 10 and Q11 or 12 from section II.***
2) ***Answer to the two sections should be written in separate answer-books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION-I

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

i) Choice of Programming Languages.

ii) Design a new language.

b) Explain different aspects of cost of programming Languages. **[8]**

OR

Q2) a) Explain properties of structured and derived data types. **[8]**

b) Define the term "Binding". With suitable example explain: **[8]**

i) Language implementation time

ii) Translation time

Q3) a) Explain with example the content of code segment and activation record at run time. **[8]**

b) Define the following: **[8]**

i) Static scope rule

ii) Lifetime of a variable

iii) Scope of a variable

OR

P.T.O.

Q4) a) Explain the concept of sequence control in recursive subprograms. **[8]**

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

Q5) a) What do you mean by applet and further explain life cycle of applet with proper example. Write difference between. **[12]**

i) Applet and Application

ii) AWT and SWING

b) Explain difference between C++ and JAVA **[6]**

OR

Q6) a) Explain concept of abstract class and interface with respect to Java. **[9]**

b) Explain the concept of Multithreading? Explain the same with respect to JAVA with suitable example. **[9]**

SECTION-II

Q7) a) Explain approaches for garbage collection in LISP. **[8]**

b) Explain Unification and Backtracking with example in prolog. **[10]**

OR

Q8) a) i) Enlist Application of Logic programming. **[5]**

ii) What are cuts in Prolog? How it is used in program. **[4]**

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

i) Facts, Rules and Queries

ii) Lambda Calculus

iii) Reduction

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

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

OR

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

b) Explain Data flow diagram in detail with example. **[8]**

Q11) Write short notes on following:- **[16]**

a) Internet Programming.

b) Design principles of Database programming.

OR

Q12) Write short notes on following: **[16]**

a) Mapping and Granularity

b) Windows Programming

Total No. of Questions : 12]

SEAT No. :

P4557

[Total No. of Pages : 3

[4958] - 208

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION AND USABILITY

(2008 Pattern)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10., Q.11 or Q.12.***
2) ***Draw neat diagrams whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION - I

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

b) Define Ergonomics. Explain with example. **[8]**

OR

Q2) a) Compare STM and LTM of human with respect to capacity, access time and forgetting. **[8]**

b) What is reasoning? Discuss with example Inductive versus Deductive Reasoning. **[8]**

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

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

OR

P.T.O.

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

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

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

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

OR

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

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

SECTION - II

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

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

OR

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

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

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

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

OR

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

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

Q11)a) Discuss use of augmented reality in Education. **[8]**

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

- Shared PCs and shared window systems
- Shared editors.

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

OR

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

a) Information and data visualization.

b) Synchronous and asynchronous groupware applications.

c) Any three devices for virtual reality.

d) Ubiquitous computing.

Total No. of Questions :12]

SEAT No. :

P2967

[Total No. of Pages :3

[4958]-209
T.E. (Information Technology)
MANAGEMENT INFORMATION SYSTEM
(2008 Course) (Semester - II) (314449)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate sheet.***
2) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) What are different components and resources of information system? Explain with example. **[8]**

b) Define role and impact of Management Information System on Indian economy. **[8]**

OR

Q2) a) What are different functions of manager? **[8]**

b) How the strategies are useful for corporate planning? **[8]**

Q3) a) What are the different characteristics of expert system? Explain. **[9]**

b) What are the different components of Decision support system? **[9]**

OR

Q4) a) Explain the different analysis methods? **[9]**

b) What is Data warehouse? Explain role of data warehouse in decision support system. **[9]**

P.T.O.

Q5) a) What is the role of E-Commerce with respect to payment gateway in online shopping? **[8]**

b) Justify "e-governance is useful to increase the efficiency of the government". **[8]**

OR

Q6) a) What are the different challenges in electronics payment process? **[8]**

b) Explain the principles of ecommerce. **[8]**

SECTION-II

Q7) a) Define application of MIS in material management with example. **[9]**

b) What is enterprise application integraion? Explain. **[9]**

OR

Q8) a) Define application of MIS in education system. **[9]**

b) What is collaboration system in manufacturing? Explain advantages and disadvantages of it. **[9]**

Q9) a) What is the role of ERP in business growth? Explain with example. **[8]**

b) Explain the challenges and limitations of BPO in India. **[8]**

OR

Q10)a) What are the different objectives of medical transcription? Explain. **[8]**

b) Explain the ethical responsibility of business professional. **[8]**

Q11)a) Define the terms: **[8]**

i) Cyber law

ii) Patent

b) What are the different mechanisms to avoid software piracy? Explain. **[8]**

OR

Q12)a) What is hacking? Explain with example. **[8]**

b) Justify "Geo-Economical platform plays vital role in security". **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2968

[Total No. of Pages : 3

[4958]-210
T.E. (IT)
DESIGN AND ANALYSIS OF ALGORITHMS
(2008 Course) (314455) (Semester - II)

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

Instructions to the candidates:

1) ***Draw neat diagrams wherever necessary.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right side indicate full marks.***

SECTION - I

Q1) a) Prove by induction 1 + 2 + 3 + ... + n = n(n+1)/2. **[8]**

b) Write an algorithm for searching an element in an array of size n. Calculate complexity of this algorithm. **[8]**

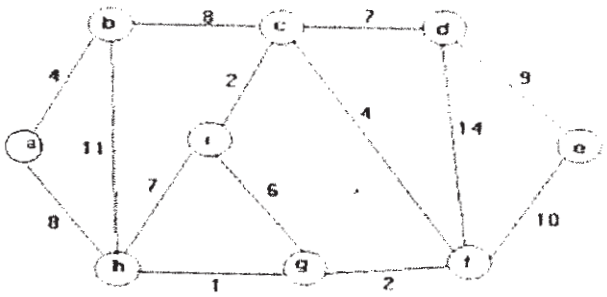
OR

Q2) a) Define best-case, worst-case and average-case efficiency. Is average-case efficiency, an average of best-case and worst-case efficiencies? **[8]**

b) Write an algorithm to find MaxElement from unsorted array of size n. Calculate complexity of this algorithm. **[8]**

Q3) a) Explain closest pair problem. **[8]**

b) Find MST using Prim's algorithm. Specify the complexity of Prim's algorithm. **[8]**

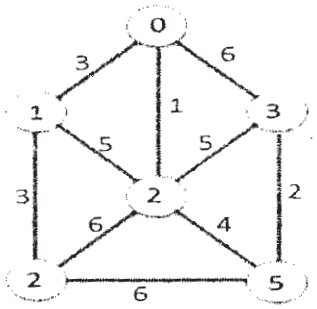


OR

P.T.O.

Q4) a) What is divide and conquer strategy? Explain Master's theorem. **[8]**

b) Find MST using Kruskal's algorithm. Specify the complexity of Kruskal's algorithm. **[8]**



Q5) a) Explain memory function? Specify its advantages? **[9]**

b) Explain knapsack problem. Why is it advantageous to solve knapsack problem using dynamic programming technique? **[9]**

OR

Q6) a) Dynamic programming is an optimization technique. Say True or False. Justify your answer. You may use an example to prove. **[9]**

b) Why is OBST better than BST? Is OBST an optimization technique? Does it use dynamic programming paradigm? **[9]**

SECTION - II

Q7) a) Write backtracking algorithm to solve N-Queen's problem. Find one solution for 4-queen's problem. **[8]**

b) Discuss graph coloring. How does it use backtracking technique? **[8]**

OR

Q8) a) W = (2,4,6,8,10) is a weight vector. If total sum, M, is 20, find all combinations of the weights that exactly add to M. **[8]**

b) What is a Hamiltonian cycle? How does it use backtracking technique? **[8]**

Q9) a) Explain for Branch and Bound- **[9]**

i) LIFO search

ii) FIFO search

iii) LC Search

b) Is Branch and Bound an optimization technique? Explain using an example. **[9]**

OR

Q10)a) Explain the terms:

Branch and Bound, LC, LIFO and Bounding function. **[9]**

b) Differentiate between Backtracking and Branch and Bound. **[9]**

Q11)a) Explain: NP - complete, NP-Hard, Decision Problem and Polynomial Time Algorithm. **[8]**

b) Write a note on halting problem. **[8]**

OR

Q12)a) What is a deterministic and non-deterministic algorithm? Write a non-deterministic algorithm for searching am element. **[8]**

b) Write a note on Cook's theorem. **[8]**

Total No. of Questions :6]

SEAT No. :

P3898

[Total No. of Pages :3

[4958] - 211

T. E. (Printing)

OFFSET MACHINES - I

(2008 Course) (Semester - I) (308281)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to two sections should be written in seperate books.***

SECTION - I

Q1) a) What is the purpose gear drive in offset machine? Explain with diagram the gears used to drive inkingx and blanket cylinder. **[8]**

b) Why perfecting system is necessary on sheet-fed machines, explain with neat diagram. **[8]**

OR

Q1) Explain the following **[16]**

a) Blanket cylinder

b) Cylinder Packing material

c) Cylinder gap of impression cylinder

d) Pitch circle diameter of gear

P.T.O.

Q2) a) Explain in brief factors affecting exposing and developing of P.S. plates. **[8]**

b) Explain in brief the step by step procedure of preparing the Positive working PS plate. **[8]**

OR

Q2) a) Explain the role of Silver halide layer in CTP plate. **[8]**

b) Explain in brief the selection criteria of a CTP plate technology for commercial printing applications. **[8]**

Q3) a) Explain the different methods of setting rollers in sheet fed offset dampening unit. **[9]**

b) Draw a neat diagram of multi-roller inking system. Label all rollers with diameters. Explain the purpose of various roller diameters used in offset. **[9]**

OR

Q3) a) Explain the ductor and ductorless type dampening system with diagram. **[9]**

b) List down various parts of inking system and explain in detail used in offset machines. **[9]**

SECTION - II

Q4) Explain importance of pH, conductivity, surface tension and temperature of F.S. **[18]**

OR

Q4) With help of Diagram explain combination continuous flow dampening system. Explain effect of IPA in printing. **[18]**

Q5) a) What is an IR dryer? Explain construction. **[8]**

b) Explain working of front lay stops. Explain swing arm gripper. **[8]**

OR

Q5) a) Explain various parts in delivery system of offset machine. **[8]**

b) Explain sequence of operation in single sheet feeder. **[8]**

Q6) a) What is the difference between premakeready and make ready. **[8]**

b) Explain waste generated in plate making and measures to reduce them. **[8]**

OR

Q6) Explain in brief the importance of quality control aids used for plate production. **[16]**

Total No. of Questions : 12]

SEAT No. :

P3899

[Total No. of Pages : 2

[4958]-212

T.E.(Printing)

PRINTING NETWORK TECHNOLOGY AND OPTO- ELECTRONICS

(2008Course) (Semester-I)(308282)

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

Instructions to the candidates:

1) ***Answer questions Q1 or Q2, Q3 or Q4,Q,5 or Q6 from section-I and questions Q7or Q8,Q9 or Q10,Q11 or Q12 from sectin-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Draw and explain block diagram of communication system. Explain necessity of modulation. **[10]**

b) Explain Amplitude modulation and frequency modulation in detail. **[8]**

OR

Q2) Write short notes on **[18]**

a) Quantization

b) Multiplexing technique

c) Pulse amplitude modulation

Q3) a) Explain data encryption and decryption **[8]**

b) Explain different types of fiber optic cable with suitable diagrams. **[8]**

OR

Q4) a) Draw and explain block diagram of basic fiber optic communication system. **[8]**

b) Explain different losses in fiber optic communication **[8]**

Q5) a) Explain application of RFID in field of printing **[8]**

b) Explain different types of RFID **[8]**

OR

P.T.O.

Q6) a) Explain Wi - Fi technology. **[10]**

b) Explain any one application of optoelectronics in printing **[6]**

SECTION-II

Q7) a) Explain different types operating system(OS). **[10]**

b) Explain any four MKDIR, TOUCH, CP,MV UNIX commands with examples. **[8]**

OR

Q8) Write short notes on(Any three) **[18]**

a) MAC operating system.

b) Design issues of operating system

c) Windows NT

d) Directory structure of UNIX.

Q9) Explain following protocols(Any two) **[16]**

a) IMAP

b) FTP

c) DNS

OR

Q10)a) Explain TCP/IP reference model. **[8]**

b) Explain different types of local area network(LAN). **[8]**

Q11) a) Explain what is ISDN **[8]**

b) Explain Bridges and routers. **[8]**

OR

Q12) a) Explain modems and hubs. **[8]**

b) Explain VPN and VSAT. **[8]**

Total No. of Questions : 6]

SEAT No. :

P3900

[Total No. of Pages : 2

[4958]-213
T.E. (Printing)
COLOR MANAGEMENT AND STANDARDIZATION
(2008 Course) (Semester - I) (308283)

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

Instructions to candidates:

1) ***Answer to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer any two. **[18]**

a) Explain hue error and gray error.

b) Explain the visible spectrum of Electromagnetic spectrum.

c) Printing is a combination of both additive and subtractive theory, explain.

Q2) Solve any two. **[16]**

a) Explain chromatic adaptation of the Human vision.

b) Explain Metameric match and spectral match.

c) Explain Human vision mechanism with neat diagram.

Q3) Answer any two. **[16]**

a) Explain CIE xy Y color system with their two advantages and two disadvantages.

b) Explain Natural color system with their two advantages and two disadvantages.

c) Explain Human matching experiment.

P.T.O.

SECTION - II

Q4) Answer any One. **[16]**

a) Explain the rules for visual color measurement.

b) Explain the color tolerance ellipse for CIE 2000 equation

Q5) Explain any one. **[16]**

a) Explain various types of profiles used in printing industry.

b) Explain the test charts used for scanner and printer profiling.

Q6) Answer any two. **[18]**

a) Explain Color management workflow.

b) Calculate Chromaticity coordinates for given sample Sample 1 :X= 60, Y = 75, Z = 20.

c) Explain the concept of hard proofing and soft proofing.

x x x

Total No. of Questions :12]

SEAT No. :

P2969

[Total No. of Pages :3

[4958] - 214

T. E. (Printing Engg.)

DESIGN OF PRINTING MACHINE COMPONENTS

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the factors considered while selecting a material? **[8]**

b) What is service factor, factor of safety and margin of safety? Explain the significance of each. Also explain the difference between service factor and factor of safety? **[10]**

OR

Q2) a) A shaft supported on two bearings at the ends carries the load of 10,000 N at the middle of the shaft. The length of the shaft is 150 mm. The power is transmitted to the shaft by gear drive. The power transmitted is 10 kW at 1440 rpm. The material used for shaft has ultimate strength of 620 N/mm^2 and yield strength 480 N/mm^2. The factor of safety = 1.5. Design the shaft using ASME code. **[10]**

b) Explain 'creativity' in design. **[4]**

c) Explain BIS system of designation of steel. **[4]**

Q3) a) Draw a neat sketch of cotter joint and also explain design of cotter joint. **[8]**

b) It is required to design knuckle joint to connect two circular rod, subjected to an axial tensile force of 50 kN, rods are co-axial & small amount of angular moment between their axis is permissible. Design the joint and specify the dimensions of its components, select suitable material for its parts. **[8]**

OR

P.T.O.

Q4) a) State the procedure of designing a shaft as per following approaches: **[8]**

i) Equivalent bending moment approach.

ii) Rigidity approach.

b) Write a note on tolerances. What are the different types of tolerances? Show how such tolerances are given to machine elements. **[8]**

Q5) Two 35 mm shafts of painting machine are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmits a torque of 800 N-m at 350 rpm. For safe stresses mentioned below, calculate: **[16]**

a) Diameter of bolt.

b) Thickness of flanges.

c) Key dimensions.

d) Hub length.

e) Power transmitted.

OR

Q6) a) What are the differences between the properties of brittle and ductile materials? **[8]**

b) Explain the important factor in selecting a coupling? **[8]**

SECTION - II

Q7) a) Derive the relation for torque required to raise had on a square threaded screw. **[8]**

b) Explain the construction and applications of recirculating ball screw. **[8]**

OR

Q8) a) Prove that maximum efficiency of square threaded screw can be given as $\eta_{max} = \frac{1-\sin\theta}{1+\sin\theta}$. **[8]**

b) A double threaded power screw with 180 metric trapezoidal and ASME code is used to raise the load of 300 kN. Nominal diameter 100 mm and pitch in 12 mm. Coeff. of friction at screw thread 0.15 selecting collar friction. Calculate friction torque to raise the load, and efficiency. **[8]**

OR

Q9) a) A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find the max. torque that the welded joint can sustain if the maximum shear stress intensity is the weld material is not to exceed 80 MPa. **[8]**

b) Explain basic types of screw fastening. **[8]**

OR

Q10)a) What are the different types of stresses including in screw threads? **[8]**

b) What are different methods to make bolt of uniform strength? **[8]**

Q11)Write a short note on following (any three): **[18]**

a) Load stress equation for helical spring.

b) Spring nomenclature.

c) load - deflection derivation.

d) types of spring.

OR

Q12)a) Draw a neat sketch of a spring? Label properly and explain each term. **[10]**

b) Derive the relation for deflection of helical torsional spring. **[8]**

Total No. of Questions : 6]

SEAT No. :

P3901

[Total No. of Pages : 2

[4958]-215
T.E. (Printing)
MANAGEMENT INFORMATION SYSTEM AND COST ESTIMATION
(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be write in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Black figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stem tables is allowed***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) List down the various types of business organizations and explain any two types in detail with suitable examples. **[16]**

OR

Q1) Explain the difference between the elements of Competitive Environment for the Manufacturing industry and Service industry with suitable examples.**[16]**

Q2) Explain the role of MIS in the process of deciding the strategy for the printing industry with suitable examples. **[16]**

OR

Q2) Explain the workflow of CIP3 and CIP4 technology. **[16]**

Q3) Explain the structure of DSS with suitable examples. **[18]**

OR

Q3) Explain the structure of GDSS with suitable examples. **[18]**

P.T.O.

SECTION - II

Q4) Write short notes on (Any 2) **[16]**

a) Data Definition language

b) Data Dictionary

c) Data mining

d) Data Base Management System

OR

Q4) Differentiate between Data Warehousing and Data Mining with suitable examples. **[16]**

Q5) Prepare the cost sheet with reference to the following data. **[16]**

Direct material: 27300

Direct labor: 15600

Direct expenses: 6420

Factory overheads are charged at 75% on labor cost.

Administration overheads are charged at 25% on factory cost.

Selling and Distribution overheads are 40% on total cost.

Profit 10% of the cost of sales.

OR

Q5) Write short note on (Any 2) **[16]**

a) Direct cost

b) Indirect cost

c) Material cost

d) Labor cost

Q6) Estimate the cloth roll of 60 cms wide and 40 meter in length will be required for making 5000 books in A4 size and with 25 mm spine. **[18]**

OR

Q6) Explain in detail with suitable example the difference between Order Qualifier and Order Winner. suitable examples. **[18]**

X X X

Total No. of Questions :6]

SEAT No. :

P3902

[Total No. of Pages :3

[4958] - 216
T. E. (Printing)
OFFSET MACHINES - II
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to two sections should be written in separate books.***

SECTION - I

Q1) Explain significance of the following: **[16]**

a) Different parts of reel.

b) Reel Brakes.

c) Festoon.

d) Dancer roller.

OR

Q1) Explain the following:

a) What conditions are considered at the time of selection of a specific splice pattern **[8]**

b) Explain the significance of the following: **[8]**

i) Acceleration belts.

ii) Paster brush.

iii) Pressure arm

iv) Knife.

P.T.O.

Q2) a) Describe procedure to check roller settings by stripe method. **[8]**

b) Describe problem of rollers in inking. Explain use of durometer. **[8]**

OR

Q2) Explain **[16]**

a) Y type configuration.

b) Vertical press.

c) Plate cylinder construction in web offset.

d) Satellite press.

Q3) Explain setting of UV inks. Describe any high velocity hot air type of dryer. **[18]**

OR

Q3) a) Explain double former folding mechanism and its use in commercial printing. **[10]**

b) Write significance of Tucker blades and jaws. **[8]**

SECTION - II

Q4) State effects on web tension due to ink water conditions on press and due to moisture in web. **[18]**

OR

Q4) Explain various tension zones in the web press. **[18]**

Q5) Explain use of chillers in web offset. How temperature control is done for the web on heatset press. **[16]**

OR

Q5) Explain why: **[16]**

a) Use of Web Preheaters.

b) Web break sensors are placed on the same side.

c) Remoisturizer unit.

d) Tension controller.

Q6) Explain following troubles: **[16]**

a) Curved edges.

b) Blistering.

c) Tone value increase.

d) Poor drying of ink.

OR

Q6) Explain problems occurring due to following defects: **[16]**

a) Damaged end.

b) Soft end and baggy end.

c) Telescoped roll.

d) Core damage.

Total No. of Questions :6]

SEAT No. :

P3903

[Total No. of Pages :3

[4958]-217
T.E. (Printing)
STATISTICAL PROCESS CONTROL
(2008 Course) (Semester-II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) Explain the concept of Quality with reference to Detection Technique and Prevention Technique in detail with suitable example. **[16]**

OR

Decide the basic symbols and their interpretations and prepare a flowchart for the premake ready operations on offset machine. **[16]**

Q2) Explain the various Histogram patterns in short with diagrams and its probable causes? **[16]**

OR

From the given data, arrange the data, prepare frequency distribution table and draw the Histogram only and comment on the same. **[16]**

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909				

P.T.O.

Q3) Explain process variation concept. And also types of variations with diagram and suitable examples. **[18]**

OR

With example, explain the term 'Mean, Median and Mode' along with their advantages and disadvantages. **[18]**

SECTION-II

Q4) Prepare X - MR chart from the given data. **[16]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	.0218	.0243	.0232	.0256	.0247	.0255	.0282	.0261	.0244	.0252

Sample No.	11	12	13	14	15	16	17	18	19	20
Measurements	.0265	.0267	.0254	.0238	.0249	.0275	.0265	.0232	.0294	.0281

Note: Use n = 2

Shewhart's Constants: E2 = 2.659

D3 = 0

D4 =3.3

OR

Prepare X bar R chart from the given data on graph paper. **[16]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note: Take fractional values only up to two digits

Shewhart's Constants: A2 = 0.577

D3 = 0

D4 = 2.1

Q5) Make two Pareto Charts for the data in the following list, one for the number of defectives and one for dollar loss. In each case, include a cumulative percentage graph. **[16]**

Department	Defectives	Dollar Loss
A	20	100
B	120	60
C	80	850
D	100	550
E	50	250
F	30	90

OR

Comment on the following: **[16]**

a) Cause and Effect Analysis.

b) Scatter diagram.

Q6) Explain the concept of DOE, and its various applications with suitable examples from printing industry. **[18]**

OR

Explain in detail Cp and Cpk Analysis with suitable diagrams. **[18]**

ℰℰℰ

Total No. of Questions :6]

SEAT No. :

P3904

[Total No. of Pages :2

[4958]-218
T.E. (Printing)
Digital Workflow and Image setting
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right side indicate full marks.***

SECTION - I

Q1) Explain in details JDF workflow with its features. **[18]**

OR

Q1) What is file format? Which are the most common file formats used while a job is designed and being processed? **[18]**

Q2) Explain the different modules of the PDF workflow. **[16]**

OR

Q2) What is workflow? Compare between conventional and digital workflow. **[16]**

Q3) Which are the different checks performed under Pre-flight checking? **[16]**

OR

Q3) Explain with neat diagram the External drum imagesetter principal. **[16]**

SECTION - II

Q4) What is job ticket? How is it useful for the smooth workflow of the job? **[16]**

OR

Q4) What is the significance of proofing? Which are the most common technologies used in industry today for proofing? Why these technologies are preferred over others? **[16]**

P.T.O.

Q5) Which are the steps followed while the image gets processed digitally? Explain each in details. **[18]**

OR

Q5) What are the techniques of compression? Explain in details any two commonly used techniques. **[18]**

Q6) What are the options used while riping of the job; explain in details. **[16]**

OR

Q6) Draw neat diagram of laser printer and explain its technology. **[16]**

Total No. of Questions :6]

SEAT No. :

P3905

[Total No. of Pages :2

[4958]-219
T.E. (Printing)
TECHNOLOGY OF FLEXOGRAPHY
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer to two sections should be written separately.***
2) ***Draw neat diagram wherever necessary.***

SECTION - I

Q1) Explain the properties of rubber plate. **[18]**

OR

Q1) Explain in detail the properties of photopolymer plate **[18]**

Q2) Explain the workflow of Flexographic reproduction. **[16]**

OR

Q2) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 30 cm **[16]**

Q3) Explain the process of making 3.18 mm photopolymer plate. **[16]**

OR

Q3) Explain standardization test for Main Exposure. **[16]**

SECTION - II

Q4) Explain the making of 1.14 mm flexo plate. **[16]**

OR

Q4) Explain in detail the impact of solvents used for plate repoduction. **[16]**

P.T.O.

Q5) Explain in detail Stack Flexo process. **[18]**

OR

Q5) Describe in detail flexo press used for label applications. **[18]**

Q6) Explain in detail role of Anilox screen ruling on flexo print quality. **[16]**

OR

Q6) Explain in detail different types of doctor blade in flexography. **[16]**

Total No. of Questions : 12]

SEAT No. :

P2970

[Total No. of Pages : 5

[4958]-220
T.E. (Printing)
THEORY OF PRINTING MACHINES & MACHINE DESIGN
(2008 Course) (302290) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronics pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) State and derive the law of gearing. **[8]**

b) Explain methods to avoid interference & undercutting. **[8]**

OR

Q2) a) Explain force analysis in helical gears with neat sketch. **[6]**

b) The following data relate to two mating involute gears with 20^o pressure angle. **[10]**

Number of teeth on pinion = 20

Gear ratio = 2

Module = 12mm

Speed of pinion = 250 rpm

If addendum of each wheel is such that the path of approach and path of recess on each side are half the maximum possible length each. Determine

i) Addendum for both the wheels

ii) Length of arc of contact

iii) Ratio of sliding and rolling velocities when contact just begins at pitch point and at the end of contact.

OR

P.T.O.

Q3) In the epicyclic train shown in Fig. Q3, the shaft with the arm is an output shaft. If the shaft on whom gears A and H are rigidly mounted rotates at 1400 rev/min counter clock wise, determine the speed of the output shaft. **[16]**

ELEMENT	A	C	D	G	E	F	H
TEETH	40	30	10	40	40	50	70

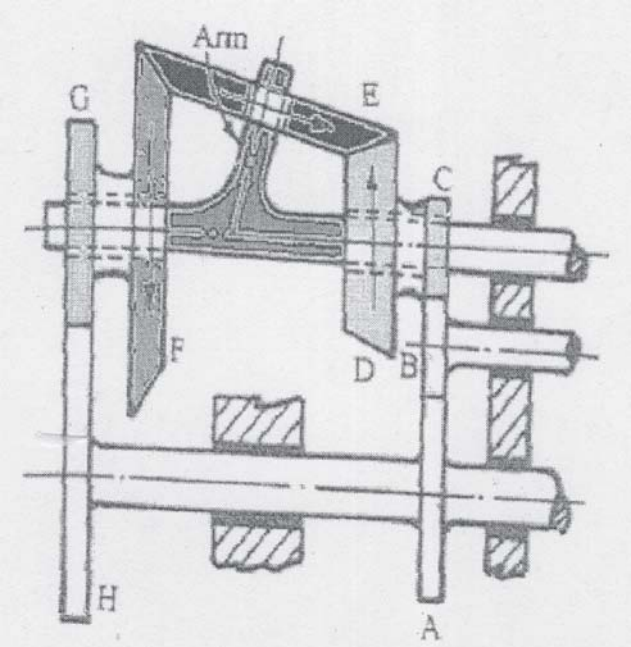


Fig.Q 3. Epicyclic Gear Train

OR

Q4) As shown in the fig. Q.4 the fixed internal gera B has 92 teeth. The wheels C and D have 25 and 15 teeth respectively. The wheel has 52 teeth. The arm makes 260 prm and transmits 0.4 kW. Calculate: **[16]**

i) Speed of E.

ii) The resisting torque on E and

iii) Teh holding torque on B

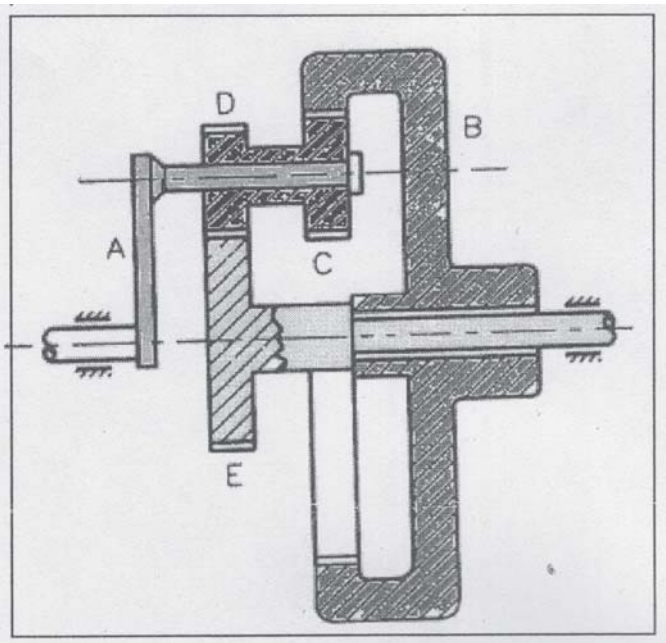


Fig. Q4 Epicyclic Gear Train

Q5) a) Explain different followers with neat sketches. **[8]**

b) Derive the expression for displacement, velocity and acceleration for simple harmonic motion of follower. **[10]**

OR

Q6) The following data relate to a cam profile with follower moving with uniform acceleration and retardation during ascent and descent. **[18]**

Min radius of cam : 25 mm

Roller diameter : 7.5 mm

Lift : 28mm

Offset of follower axis : 12 mm right

Angle of ascent : 60^o

Angle of descent : 90^o

First dwell : 45^o

Speed of cam : 200 rpm.

Draw cam profile and find max velocity , Max acceleration during both strokes.

SECTION - II

Q7) a) Explain the terms with neat sketches: **[8]**

i) Soderberg diagram

ii) Goodman diagram

iii) Modified Goodman diagram

b) A transmission shaft of cold drawn steel 27 Mn2 (S_{ut} = 500 N/mm^2 and S_{yt} = 300 N/mm^2) is subjected to a fluctuating torque which varies from - 100 N-mm to + 400 N-mm. The factor of safety is 2 and the expected reliability is 91%. Neglecting the effect of stress concentration, determine the diameter of the shaft. **[8]**

Take K_a = 0.8, K_b = 0.85, K_c = 0.897

Assume the distortion energy theory of failure.

OR

Q8) a) Differentiate between the various forms of dynamic loading. **[8]**

b) What is Stress concentration? What are its causes and explain the methods of reducing stress concentration. **[8]**

Q9) A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate tensile strengths of 650 N/mm^2 and 410 N/mm^2 respectively. The pinion is to be driven by a three phase induction motor having a speed of 1440 r.p.m. and 10kW rating. the starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN, design a gear pair with a factor of safety of 1.5. **[18]**

Assume velocity factor accounts for the dynamic load.

Assume 20^o full depth involute tooth system.

Y = 0.484 – (2.87/Z) and b= 10m

First choice of std. modules in mm recommended by ISO:

1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40.

K = 0.16[BHN/100]^2 K_a = 2 and K_m = 1

Q10) a) Draw the FBD of a spur gear pair and derive the relationship for the various forces acting on them. **[8]**

b) Derive the relationship for the beam strength of a helical gear pair. **[10]**

Q11) a) Compare ball and roller contact bearings. **[4]**

b) Write short note on **[12]**

i) Causes and remedies of bearing failure.

ii) Mounting of bearing.

OR

Q12) a) A deep-groove ball bearing having bore diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2500 N and an axial force of 1200 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 25,000 hours, calculate the required basic dynamic capacity of the bearing. **[8]**

b) Explain bearing life with the help of graph of percentage bearings in operation Vs the bearing life. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2971

[Total No. of Pages : 7

[4958]-221

T.E. (Petrochemical Engg.)

NUMERICAL AND STATISTICAL METHODS

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, from section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section II.***
2) ***Answers to the two sections must be in separate answer sheets.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable calculator allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find all basic solutions to the system of equations: **[6]**

$$x_1 + x_2 + 2x_3 = 4$$

$$2x_1 - x_2 + x_3 = 2$$

b) Solve the following Linear programming problem using simplex method: **[10]**

Maximize $Z = x_1 - x_2 + 3x_3$

Subject to the constraints:

$$x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_3 \leq 2$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

$$x_1, x_2, x_3 \geq 0$$

OR

P.T.O.

Q2) a) Write the dual of the following problem: **[6]**

Maximize $Z = 2x_1 + x_2$

Subject to the constraints:

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1$$

$$x_1, x_2 \geq 0$$

b) Use principle of duality to solve the following linear programming problem: **[10]**

Maximize $Z = 3x_1 - 2x_2$

Subject to constraints:

$$x_1 + x_2 \leq 5$$

$$x_1 \leq 4$$

$$x_2 \geq 1$$

$$x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

Q3) a) A company has four ware houses a, b, c, d and three plants A, B, C. The requirement at warehouses a, b, c and d are 15, 16, 12, 13 units respectively. At plants A, B, C, the availability is 18, 20, 18 units respectively. The cost of transportation for one unit from warehouses to plants is given below: **[10]**

	a	b	c	d
A	8	9	6	3
B	6	11	5	10
C	3	8	7	9

Solve the problem for minimum transportation cost.

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given below: **[6]**

		Jobs				
		1	2	3	4	5
	A	8	4	2	6	1
	B	0	9	5	5	4
Person	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

Determine the optimum assignment schedule for minimum cost.

OR

Q4) a) Solve the following transportation problem for minimum cost. Use Vogel's approximation method for initial basic feasible solution. **[10]**

		Destination				
		D_1	D_2	D_3	D_4	Availability
	O_1	1	2	1	4	30
Factory	O_2	3	3	2	1	50
	O_3	4	2	5	9	20
Requirement		20	40	30	10	

b) Solve the following assignment problem for minimum assignment time. The time required by each person for completing the job is given below. Figures in the table indicate the number of hours required to complete the job **[6]**

Person → / Jobs	1	2	3	4	5
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	125	170	185
D	50	50	80	80	110
E	55	35	80	80	105

Q5) a) Determine the coefficient of correlation between supply and price of commodity using following data: **[7]**

Supply(x)	152	158	169	182	160	166	182
Price(y)	198	178	167	152	180	170	162

b) The average number of misprints per page of a book is 1.5. Assuming the distribution of number of misprints to be Poisson, find the probability that a particular book is free from misprint. **[5]**

c) A machine is producing a large number of bolts. In a box of these bolts, 95% are within the permissible limits with respect to diameter. Seven bolts are drawn at random from box. Find the probability that **[6]**

i) two

ii) more than or equal to two bolts are not within the limits.

OR

Q6) a) The two lines of regression are $8x-10y+66=0$ and $40x - 18y = 214$. The value of variance of x is 9. Find **[7]**

i) The mean values of x and y.

ii) The correlation coefficient between x and y.

iii) The standard deviation of y.

b) In Mathematics Examination, 2000 students appeared. Average marks obtained were 50% with standard deviation 5%. How many students are expected to obtain more than 60% of marks, supposing that marks are normally distributed.

Given z = 2, area = 0.4772. **[5]**

c) Among 64 off springs of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to a model, these numbers should be in the ratio 9 : 3 : 4. **[6]**

Is the data consistent with the model at 5% level?

Given $\chi^2_{2:0.05} = 5.991$.

SECTION - II

Q7) a) With usual notations establish the following: **[8]**

i) $\Delta = \mu\delta + \frac{1}{2}\delta^2$.

ii) $1+\delta^2\mu^2 = \left(1+\frac{1}{2}\delta^2\right)^2$.

b) A function f(x) is described by following data: **[9]**

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Estimate the area bounded by the curve, the X-axis and the ordinates $x = 1$, $x = 4$.

OR

Q8) a) Use Trapezoidal rule to numerically evaluate $I = \int_0^1 xe^{x^2} dx$ by taking $h = 0.1$. **[8]**

b) From the tabulated values of x and y given below, prepare forward difference table. Find the polynomial passing through the paints and estimate the value of y, when $x = 1.5$. Also find the slope of the curve at $x = 1.5$. **[9]**

x	0	2	4	6	8
y	5	29	125	341	725

Q9) a) Find the real root of $x^3 - 3x + 1 = 0$ bying between 1 and 2 upto three decimal places by Newton Raphson method. **[8]**

b) Solve the following system of equations using Guass seidel method. **[9]**

$10x + 2y + z = 9$

$x + 10y - z = -22$

$-2x + 3y + 10z = 22$

OR

Q10)a) Solve the following system of equation using Guass elimination method. **[9]**

$$2x + y + 4z = 12$$

$$8x - 3y + 2z = 1$$

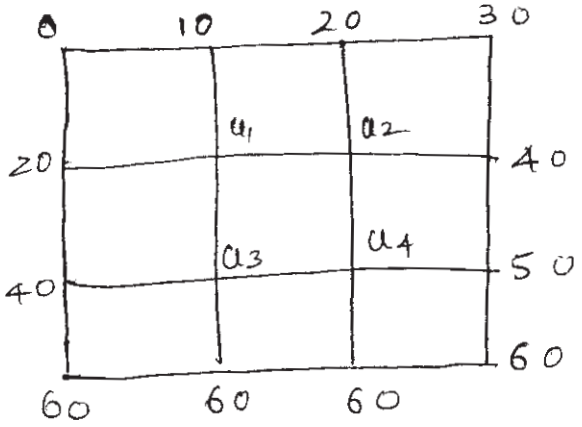
$$4x + 11y - z = 33$$

b) Fit a straight line to the following data: **[8]**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

Q11)a) Use modified Euler's method to solve $\frac{dy}{dx} = x - y^2, y(0) = 1$ to calculate $y(0.4)$ taking $h = 0.2$. **[8]**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 \mu}{\partial y^2} = 0$ at the nodal points for the following square region given the boundary conditions as given below. **[8]**



OR

Q12)a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 \mu}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ with u = 0 on the boundary and mesh length equal to 1unit. **[8]**

b) Use Runge-Kutta method of fourth order to obtain the numerical solutions of **[8]**

$\frac{dy}{dx} = x^2 + y^2, y(1) = 1.5$ in the interval (1, 1.2) with $h = 0.1$.

Total No. of Questions : 12]

SEAT No. :

P2972

[Total No. of Pages : 3

[4958]-222

T.E.(Petrochemical Engineering)

APPLIED HYDROCARBON THERMODYNAMICS

(2008 Coures) (Semester-I) (312402)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer Q1 or Q2, Q3or Q4, Q5 or Q6, Q 7 or Q8, Q 9 orQ 10, Q11 or Q12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Define: Extensive properties, Enthalpy, Reversible process, Heat Capacity **[8]**

b) What are the limitations of the first law of thermodynamics? How are they overcome by the second law? **[8]**

OR

Q2) a) One mole of an ideal gas with $\gamma = 1.4$ initially at 300 K and 1 bar is compressed reversibly and adiabatically to 6 bar and then it is cooled at constant pressure to the original temperature. The gas is then restored to the initial state through an isothermal process. Calculate the net work and heat interaction. **[8]**

b) Explain the Carnot principle. **[8]**

Q3) a) Explain the physical significance of the following: Triple Point, critical point, acentric factor, virial coefficients. **[8]**

b) Define compressibility factor. State its significance. Explain the use of compressibility charts. **[8]**

OR

P.T.O.

Q4) Assuming that ammonia obeys the Van der Waals equation of state, calculate the molar volumes of ammonia at 1.95 MPa and 321.55 K. The Van der Waals constants 'a' and 'b' for ammonia are 422.546 $\times 10^{-3}$ $Pa(m^3/mol)^2$ and $37 \times 10^{-6} m^3/mol$ respectively. **[16]**

Q5) a) Write a note on the Clausius-Clayperon equation. Derive the same. **[9]**

b) Define Gibbs free energy and show that at constant temperature and pressure the decrease in the Gibbs free energy measures the maximum net work available from a given change of state. **[9]**

OR

Q6) a) Carbon tetrachloride boils at 349.75 K and 1 bar. Its latent heat of vaporization is 194.8 kJ/kg. What would be its boiling point at 2 bar? **[9]**

b) What is meant by the activity of a pure fluid? How would you estimate the activity of an incompressible substance? **[9]**

SECTION-II

Q7) a) What is meant by a tie line? How does the tie line help in determining the amount of liquid and vapour in equilibrium? Explain with the help of the boiling point diagram. **[9]**

b) What do you mean by positive and negative deviations from ideality? Distinguish between maximum and minimum boiling azeotropes. **[9]**

OR

Q8) The binary system acetone (1) and acetonitrile (2) conforms closely to Raoult's law. Using the vapour pressure data given below plot the T-x_1 and T-y_1 curves at 53.32 kPa. **[18]**

T,K	311.45	315	319	323	327	331	335.33
P_1^s, kPa	53.32	61.09	70.91	81.97	94.36	108.2	124.95
P_2^s, kPa	21.35	24.61	28.90	33.79	39.35	45.62	53.32

Q9) a) Describe the tangent intercept method for determining the partial molar properties. **[8]**

b) What are the different types of thermodynamic diagrams? List their respective fields of applications. **[8]**

OR

Q10) The azeotrope of ethanol-benzene system has a composition of 44.8%(mol) ethanol with a boiling point of 341.4K at 101.3 kPa. At this temperature the vapour pressure of benzene is 68.9 kPa and the vapour pressure of ethanol is 67.4 kPa. What are the activity coefficients in a solution containing 10% alcohol? **[16]**

Q11) The standard heat of formation and the standard free energy of formation of ammonia at 298 K are -46100 J/mol and -16500J/mol respectivley. Calculate the equilibrium constant for the reaction. **[16]**

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

at 500 K assuming that the standard heat of reaction is constant in the temperature range 298 to 500 K

OR

Q12) a) Define equilibrium constant K. How is it related to standard free energy? **[8]**

b) Discuss the effect of presence of inerts on the equilibrium composition. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

P4558

[Total No. of Pages : 3

[4958] - 223
T.E. (Petrochemical)
MASS TRANSFER - I
(2008 Pattern)

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

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answer to the two sections should be written in two separate answerbooks.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data where ever necessary.***
5) ***Use of steam tables and electronic calculator is allowed.***

SECTION - I

Q1) Answer the following questions in brief **[16]**

a) Discuss mathematical model which can be used to estimate the diffusivity of a volatile solvent into a stagnant column of air.

b) State and explain Fick's first and second laws. State the situations when they are relevant.

Q2) At a particular point in a gas-liquid column, the bulk partial pressure of A on gas side and bulk concentration of A on liquid side were analyzed to be P_{AG} = 0.28 atm and C_{AL} = 0.03 mol/m^3 respectively. The Henry's constant for A in the solvent is 125 atm. cm^3 / mol. The overall gas side mass transfer coefficient is given as 6.45 × 10^{-6} gmol / cm^2 .sec. atm. It is also given that 20% of the total resistance to mass transfer lies in the gas film. Determine **[18]**

a) Whether stripping or absorption will take place

b) Overall liquid side driving force

c) Molar flux of A across the interface

Q3) Bulk gas near the catalyst surface at point 1 contains A and B only and no inerts. Composition at point 1 is 50 mol% A and 50 mol% B. Take local pressure and temperature to be 500 KPa and 100 C respectively. Assume gas film thickness to be 2×10^{-4} m and diffusivity of A through the film to be 3×10^{-9} m^2/s. Reaction at the catalyst surface is instantaneous. Calculate local reaction rate in Kmol A per hr per m^2 surface area of the catalyst.**[16]**

P.T.O.

Q4) a) Derive equations describing a single stage gas liquid mass transfer operation. Provide graphical representation of the equations derived by you.

b) Discuss what are different types of mass transfer coefficients and their significance.

[16]

SECTION - II

Q5) A stream of air with a bulk velocity of 40 m/sec at 120 kPa pressure and 300 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.2 m and width of 0.05 m. Calculate rate of loss of naphthalene from the surface per unit width. **[16]**

Data :

Kinematic viscosity of air = 1.6×10^{-5} m^2/s

Mass diffusivity of naphthalene vapour in air = 8×10^{-6} m^2/ sec.

Vapor pressure of naphthalene at 300 K = 0.12 mm Hg

Q6) A batch of solids is to be dried from 20% to 5% moisture content on wet basis. The initial weight of the wet solids is 300 Kg and the drying surface is reported to be 0.25 m^2 per 50 kg of dry weight. The critical moisture content is 25% dry basis and constant drying rate is 0.35 kg/hr.m^2 .For the falling rate period data available are given in the table below. **[16]**

x	25	22	19	16	13.6	11	8.2	7.5	6.4
N	0.3	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

x is % moisture content on dry basis and N is drying rate in Kg/m^2.hr. Calculate the batch time required for given drying duty.

Q7) Answer the following by using psychrometric chart for air-water system with reference to the air having dry bulb temperature of 75 C and wet bulb temperature of 25 C. Calculate: **[18]**

a) Absolute humidity

b) Dew point temperature

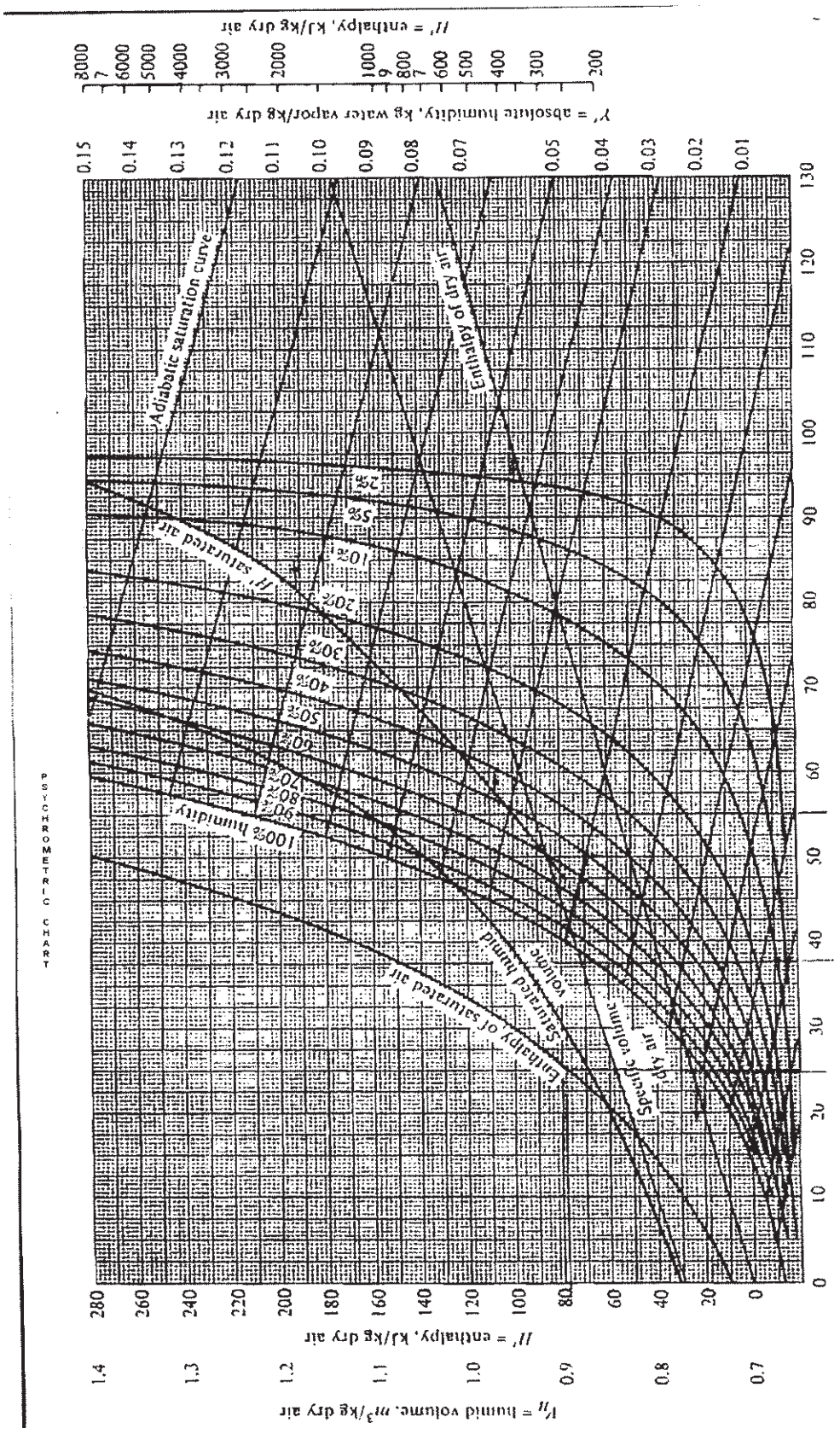
c) Calculate heat to be given per kg of dry air in a preheater under 1 atm pressure so as to bring down relative humidity of the air by 20%.

Q8) Write notes : **[16]**

a) Types of Cooling tower.

b) Spray Dryer.

c) Sherwood number.


PSYCHROMETRIC CHART
v'_H = humid volume, m^3/kg dry air
H' = enthalpy, kJ/kg dry air
Y' = absolute humidity, kg water vapor/kg dry air
H' = enthalpy, kJ/kg dry air
Adiabatic saturation curve
Enthalpy of dry air
Saturated air
100% humidity
Enthalpy of saturated air
Saturated humid volume
Adiabatic volume
Dry air
25%
50%
10%
20%
30%
40%
60%
70%
80%
90%

❖ ❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P4559

[Total No. of Pages : 2

[4958] - 224

T.E. (Petrochemical)

PETROCHEMICAL PROCESSES - I

(2008 Pattern)

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

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answer to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data where ever necessary.***
5) ***Use of steam tables and electronic calculator is allowed.***

SECTION - I

Q1) Discuss in brief capacity and potential growth of either Indian or global petrochemical sector. **[16]**

Q2) Discuss process of aromatic nitration with help of a flow sheet. Also discuss the heat and mass transfer challenges involved in the process. **[16]**

Q3) Discuss methods of manufacture and engineering problems therein for an organic amine and an organic acid. **[16]**

Q4) a) Explain reactive distillation technique with help of a specific example.
b) Explain design challenges involved in aromatic alkylation.
[18]

SECTION - II

Q5) a) Discuss with appropriate example sugar fermentation process yielding ethanol as a main product
b) Describe in detail lactic acid production from whey.
[16]

P.T.O.

Q6) a) discuss in detail suspension polymerization for manufacturing polystyrene.

b) Discuss in detail the commercial significance of crystallinity and orientation of polymers.

[16]

Q7) a) Explain importance and synthesis of aligned carbon nanotube.

b) Write a note on applications of nanotechnology.

[18]

Q8) Write notes : **[16]**

a) Bioreactor.

b) Vinyl Polymers.

c) Ethylene Oxide Manufacture.

❖ ❖ ❖ ❖

Total No. of Questions : 6]

SEAT No. :

P3906

[Total No. of Pages : 3

[4958]-225

T.E. (Petrochemical Engineering)

INSTRUMENTATION AND INSTRUMENTAL ANALYSIS

(2008 Course) (Semester - I)

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

Instructions to candidates:

1) *Attempt Q1A orB, Q2A or B, Q3A or B, Q4A or B, Q5A or B, Q6A or B.*
2) *Figures to the right indicate full marks.*
3) *Use of electronic calculators, steam table is allowed.*
4) *Draw neat sketch wherever necessary.*

SECTION - I

Q1) A) a) Explain the types of measurement uncertainties in detail. **[8]**

b) Define: Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **[8]**

OR

B) a) Give the classification of the measuring instruments. **[8]**

b) Explain hierarchy of standards and calibration. **[8]**

Q2) A) a) Explain the principle, construction and working of a radiation pyrometer. **[8]**

b) Explain pressure measurement using different types of manometers. **[8]**

OR

B) a) Explain the various types of level indicators using magnetic properties. **[8]**

b) Write a note on electromagnetic flow meter. **[8]**

P.T.O.

Q3) A) a) Explain the use of psychrometric chart. **[6]**

b) What do you mean by 'inherent characteristics' of control valves? **[6]**

c) Write a note on the programmable logic controller. **[6]**

OR

B) a) Write a note on hygrometer. **[6]**

b) What are the factors to be considered while selecting a control valve? **[6]**

c) Explain feed back control loop in automatic process control. **[6]**

SECTION - II

Q4) A) a) Describe the various sampling techniques. **[8]**

b) Write a note on HPLC. **[8]**

OR

B) a) Classify analysis instruments. **[8]**

b) Write a note on NMR spectroscopy. **[8]**

Q5) A) a) Zirconia cells are now frequently used as oxygen analysis cells, specially in power plants. Describe this method of analysis. **[8]**

b) Explain the method of analysis using thermal conductivity. **[8]**

OR

B) a) Discuss CO analyzer. **[8]**

b) Write a note on the mass spectrometer. **[8]**

Q6) A) a) Differentiate between turbidity meter and nephelometer. **[6]**

b) Describe the principle of FTIR and hence describe IR spectroscopy. **[6]**

c) Discuss Orsat analysis. **[6]**

OR

B) a) Explain composition analysis using refractive index method. **[6]**

b) Describe in brief pH measurement. **[6]**

c) Discuss the various methods of density measurement. **[6]**

x x x

Total No. of Questions :12]

SEAT No. :

P2973

[Total No. of Pages :3

[4958] - 226

T. E. (Petrochemical Engineering)

PETROCHEMICAL PROCESSES - II

(Semester - II) (2008 Course) (312410)

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

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Answer Q.1 or Q2, Q.3 or Q.4, Q.5 or Q. 6, Q. 7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Formation of Petroleum is a result of various physical and biological processes. Explain **[8]**

b) Give a brief review of the alternative feedstock sector. **[8]**

OR

Q2) a) Differentiate between TBP and ASTM distillation. **[8]**

b) Define: Cloud point, Pour point, Reid vapor pressure, Aniline point. **[8]**

Q3) a) What are the various impurities found in crude oil? How are they removed? **[8]**

b) Write a note on the preheating train. **[8]**

OR

P.T.O.

Q4) a) Discuss a typical propane deasphalting unit. **[8]**

b) Discuss the hydrofluoric acid process for alkylation. **[8]**

Q5) a) Draw a neat labeled diagram of the FCC unit. Hence explain its working. **[9]**

b) Explain the process of delayed coking with a neat diagram. **[9]**

OR

Q6) a) What is the need for sulphur recovery in the refinery? Explain the Claus process for sulphur recovery. **[9]**

b) Discuss the process of air blowing of bitumen. **[9]**

SECTION - I

Q7) a) Write a note on the various reforming catalysts. **[9]**

b) Which are the various aromatic conversion processes? Explain any one. **[9]**

OR

Q8) a) How is the steam cracking process technology used for the production of olefins? **[9]**

b) Describe the process of steam reforming for hydrogen production. **[9]**

Q9) a) What are polymers? Differentiate between thermosetting and thermoplastic polymers. **[8]**

b) Give the various process technologies for the manufacture of polyethylene. **[8]**

OR

Q10)a) Give the manufacture of polystyrene by bulk polymerisation. **[8]**

b) Write a note on formaldehyde resins. **[8]**

Q11)a) Describe the manufacture of caprolactum from toluene. **[8]**

b) Describe the manufacture of Nylon-6. **[8]**

OR

Q12)a) Give the manufacturing process for polyester from PTA (Purified Terepthalic Acid) **[8]**

b) Describe the manufacture of adipic acid by two step oxidation process. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

P4560

[Total No. of Pages : 3

[4958] - 227

T.E. (Petrochemical)

MASS TRANSFER - II

(2008 Pattern)

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

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of steam tables and electronic calculator is allowed.***

SECTION - I

Q1) Feed to distillation column consists of 30 Mol% Benzene and the rest toluene. The column is supposed to recover both benzene in distillate and toluene in bottoms at the purity specification of 98 Mol%. For 1000 Kmol/hr of 20% vaporized feed, **[18]**

a) Report distillate and bottoms stream rates and their molar compositions,

b) Using the operating reflux ratio as 1.5 times the minimum,calculate the number of theoretical stages required and the feed plate location.

Q2) With reference to flash distillation, answer the following : **[16]**

a) A feed to flash chamber consists of ethylene (40 Mol %) and ethane (60 Mol%) mixture at the flow rate of 1000 Kmol/hr. Temperature and pressure of the flash chamber are such that V/L ratio for the streams emerging from the chamber is 1/4. Assuming relative volatility of ethylene as 1.5 with respect to ethane, calculate the product stream flow rates and their compositions.

b) Represent flash operation graphically clearly showing operating and equilibrium lines.

P.T.O.

Q3) With reference to steam distillation, answer the following: **[16]**

a) Draw a pertinent sketch, suitably labelled, describing the graphical procedure to solve the governing equation for the operating temperature. Derive the governing equation.

b) At the operating steam distillation temperature, vapor pressures of water and the heavy organic (MW 170) are 730 mm Hg and 70 mm Hg respectively. What will be the steam consumption per Kg of organic recovered?

Q4) Write precise notes (not more than ten lines each): **[16]**

a) Where do you employ partial condenser and not total condenser.

b) Minimum and maximum boiling azeotropic systems.

c) Optimum reflux ratio.

SECTION - II

Q5) Determine the number of ideal stages required for the absorber designed for removing benzene vapors from a gas. Feed gas flow rate is $1Nm^3/s$ and contains 2 % by volume benzene vapors. Expected benzene recovery is 90%. Solvent (MW 230) fed counter-currently is free of benzene and is fed at the rate of 1.3 times the minimum. Henry's law is given as: $y = 0.125\ x$, where y is gas side mol fraction of benzene and x is solvent side mol fraction at equilibrium. **[18]**

Q6) Nicotine in water is to be extracted using pure kerosene as solvent. Distribution of nicotine in water and kerosene at equilibrium is given by the law: $y = 0.8\ x$ where y is kg nicotine/kg kerosene and x is kg nicotine/kg water. Water and kerosene are insoluble in each other. The scheme of extraction is to contact 100 kg of the aqueous solution containing 2 wt% nicotine with 70 kg kerosene in first stage and with another 50 kg kerosene in the second stage. Calculate % recovery of nicotine from the feed solution at the end of the second stage. **[16]**

Q7) With reference to adsorption ,write the following notes: **[16]**

a) Langmuir Adsorption isotherm.

b) Temperature Swing Adsorption.

c) Break through curve.

Q8) Write short notes : **[16]**

a) Reverse Osmosis.

b) Principles of ion exchange.

c) Choice of a separation equipment.

❖ ❖ ❖ ❖

Total No. of Questions :8]

SEAT No. :

P2974

[Total No. of Pages :3

[4958]-228
T.E. (Petrochemical)
REACTION ENGINEERING - I
(2008 Course) (312409) (Semester - II)

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

Instructions to the candidates:

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

SECTION -I

Q1) a) Define activation energy. Draw the diagram showing the activation energy for exothermic and Endothermic reversible reaction. What is the role of activation energy in a chemical reaction? **[6]**

b) At 500 K, the rate of a bimolecular reaction is ten times the rate at 400 K. Determine the activation energy of this reaction: **[12]**

i) From Arrhenius law.

ii) From Collision theory.

iii) What is the percentage difference in rate of reaction at 600 K predicted by these two methods?

Q2) Determine the reaction order and the rate constant for a single reaction of the type A $\rightarrow$ products based on the following experimental information obtained at isothermal conditions at V = const. **[16]**

t(min)	0	5	10	15	20	25	30	35	40
$C_A\left(\frac{mol}{lit}\right)$	1	0.58	0.41	0.32	0.25	0.22	0.19	0.16	0.14

P.T.O.

The last data point simply indicates that after a very long time (several hours as compared to minutes) practically no A is found. Thus, at the experimental conditions used the reaction is practically irreversible.

Note: You may use any method, i.e. Differential or Integral method to solve this problem.

Q3) a) The following liquid-phase consecutive reaction is taking place in a constant volume batch reactor, $A \xrightarrow{k_1} B \xrightarrow{k_2} C$. The first reaction is first order and the second reaction is zero order. Determine the concentrations of A, B and C as functions of time. **[8]**

b) Consider the elementary gas-phase reaction, $A + 2B \rightarrow C + D$ taking place in a constant volume batch reactor under isothermal conditions. The reactor volume is $1 m^3$. Initially there are 2 kmol of A, 4 kmol of B, and 2 kmol of an inert gas. The specific reaction rate is given by $k = 0.1\ s^{-1}$. $(kmol/m^3)^{-2}$. **[8]**

i) Determine the conversion of A when the total pressure in the reactor is 80% of its initial value.

ii) Determine the time taken to reach the conversion calculated in part (a).

Q4) a) Pure gaseous resactant A (CAo = 100 milli.molliter) is fed at a steady rate into a mixed flow reactor (V = 0.1 liter) where it dimerizes ($2A \rightarrow R$). For different gas feed rates the following data are obtained: **[10]**

Run number	1	2	3	4
υ_0, liter/hr	10.0	3.0	1.2	0.5
C_{Af}, millimol/liter	85.7	66.7	50	33.4

b) Write a brief note: Holding time and Space Time for Flow Reactors. **[6]**

SECTION -II

Q5) a) Discuss the effect of temperature on equilibrium conversion as predicted by thermodynamics keeping pressure fixed and discuss optimum temperature progression. **[8]**

b) Explain the best operating conditions for parallel reactions. **[8]**

Q6) Substance A in the liquid phase produces R and S by the following reactions: **[16]**

$$A \begin{cases} \nearrow R, & r_R = k_1 C_A^2 \\ \searrow S, & r_s = k_2 C_A \end{cases}$$

The feed (C_{AO} = 1.2, C_{RO} = O, C_{SO} = 0.4) enters two mixed flow reactors in series (τ_1 = 5 min, τ_2 = 10min.)

Knowing the composition in the first reactor (C_{A1} = 0.40, C_{R1} = 0.20, C_{S1} = 0.6), determine the composition leaving the second reactor.

Q7) a) Write a brief note on: Optimum Temperature Progression. **[6]**

b) What are causes of nonideality in process vessels? Explain with neat sketches. **[6]**

c) Define E, F and C Curve for nonideal flow by giving mathematical expressions. **[4]**

Q8) Write short notes on: **[18]**

a) Equal size Mixed Reactors in series.

b) Unequal sized CSTR/PFR.

c) Methods for analysis of Kinetic Data.

EEE

Total No. of Questions :12]

SEAT No. :

P2975

[Total No. of Pages :4

[4958]-229
T.E. (Petrochemical Engineering)
TRANSPORT PHENOMENA
(2008 Course) (Semester - II) (312407)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Discuss the usefulness of transport phenomena. **[8]**

b) Derive Reynolds Analogy and highlight all the assumptions clearly. **[8]**

OR

Q2) a) What is analogy? Discuss the analogy among momentum, heat and mass transfer with respect to transport mechanism. **[8]**

b) What are Newtonian and non-Newtonian fluids, explain with help of shear stress shear strain diagrams. Provide examples of each. **[8]**

Q3) a) With help of neat diagram derive equation of continuity for the Cartesian coordinate. **[9]**

b) Obtain the expression for velocity distribution inside a circular pipe considering Newtonian fluid. **[9]**

OR

P.T.O.

Q4) a) Draw the profile of a liquid falling over a plane surface inclined at an angle of 30^{o} film. Obtain the necessary mathematical expression. **[10]**

b) A power law fluid having $\rho = 1114$ kg/m^3 is flowing through 15.8 m tube with ID = 0.048 m with $\nu_{avg} = 0.072$ m/s. Rheological properties of fluids are K' = 14.03 N.s^n / m^2 and n' = 0.7. Calculate Δp and frictional loss. **[8]**

Q5) a) With help of neat diagram explain turbulence and its characteristics. Discuss its advantages. **[8]**

b) Expalin following terms and their inter-relations with help of schematic representation: **[8]**

i) instantaneous velocity,

ii) fluctuating velocity and

iii) time averaged velocity.

OR

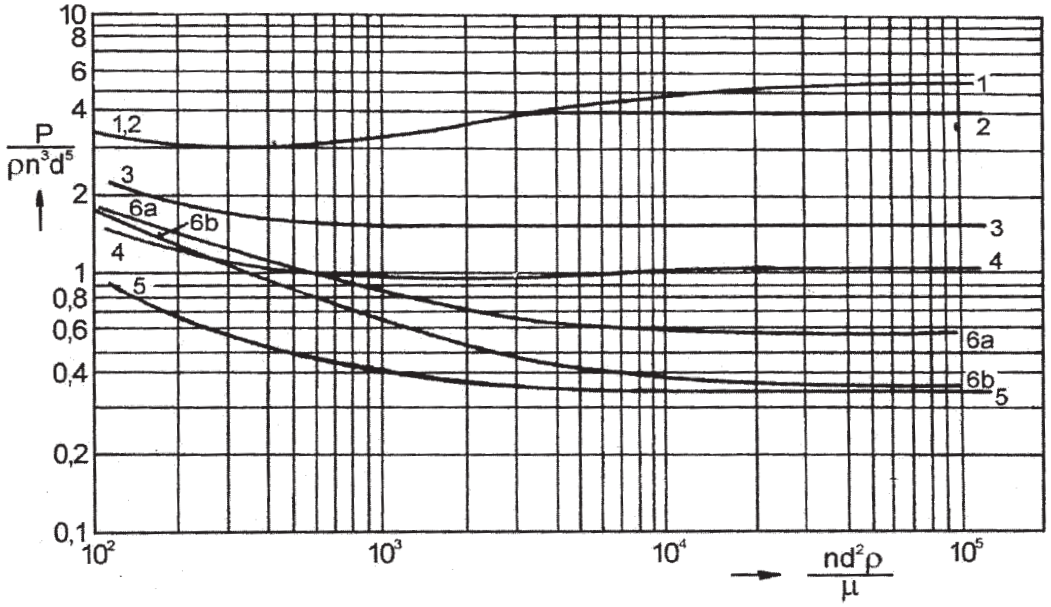
Q6) a) Write a short note on Prandtl's mixing length and Eddy thermal diffusivity. **[8]**

b) Define Reynolds stress. State and explain the terms involved in the modified equation of motion for turbulent flow. **[8]**

SECTION-II

Q7) a) It is desired to agitate a liquid having viscosity of 2.7×10^{-2} Pa.s and density of 945 kg/m^3 in a tank having a diameter of 2.4 m. The agitator will be a six-blade open turbine of diameter 0.4 m operating at 320 rpm. The tank has four vertical baffles, each with a width J of 0.2 m. Calculate the required kW. (Use the graph provided). **[10]**

Power characteristics of high-speed impellers operated in baffled vessel



***1** – six-blade turbine with disk (Ruschton turbine) (CVS 69 1021), **2** – six-blade open turbine, **3** – pitched six-blade turbine with pitch angle 45 (CVS 69 1020), **4** – Pitched three-blade turbine with pitch angle 45° (CVS 69 1025.3), **5** – propeller (CVS 60 1019), **6a,b** – high shear stress impeller (CVS 69 1038.1.2)*

b) Explain the standard design of agitated vessel along with the proper dimensions. **[8]**

OR

Q8) a) Differentiate between Agitation and Mixing - Provide relevant example. **[9]**

b) Explain with help of relevant examples how can CFD provide benefits in process industries. **[9]**

Q9) a) A slab of material 1.5 m thick is at uniform temperature of 100°C. The front surface is suddenly exposed to a constant bulk temperature of 0°C. The convective resistance is zero ($h = \infty$) and back surface of the slab is insulated. Considering thermal diffusivity (α) of 2.0×10^{-5} m^2 /s. Using five slices of thickness 0.2 m each, calculate the temperature profile at t = 6000 s. Schmidt method can be used for the simulation. **[10]**

b) Write a detailed note on Prandtl length mixing model in Heat Transfer. **[6]**

OR

Q10) With help of neat diagram explain the heat conduction through a metal rod. Write down all the important assumptions. Derive the unsteady state mathematical expression based on first principle approaches. Write down the steady state expression. Comment on the numerical solution of the unsteady and steady state models derived for the rod. **[16]**

Q11) a) Consider steady state simple diffusion of inert component A along z direction, the resultant equation is represented below: **[10]**

$$\frac{d^2C_A}{dz^2} = 0$$

If concentration of component A at the entry port be 50 kmol/m^3 and concentration measured at a location 2.0 m from entry port be 20 kmol/m^3, obtain the concentration at locations 0.5, 1.0 and 1.5m distant from the entry port using any suitable numerical technique.

Provide a neat sketch of the problem.

b) With help of suitable example explain how turbulence helps in enhanced mass transfer operations. **[6]**

OR

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

a) Thermal Boundary Layer

b) Turbulent Mass Diffusivity

c) Scale Up Challenges.

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Total No. of Questions : 12]

SEAT No. :

P2976

[Total No. of Pages : 5

[4958]-230

T.E. (Petrochemical Engg.)

PROCESS EQUIPMENT DESIGN & DRAWING

(2008 Course) (Semester - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the factors which creates stress concentration in a material?

Discuss it with the help of few examples. **[6]**

b) Discuss Role of designer in any equipment design? **[6]**

c) Which different engineering sections are associated with design engineer till the final delivery of any equipment? **[4]**

OR

Q2) a) How Factor of Safety (FOS) is important in design? What is general limit of FOS taken in designing various types of equipment? Discuss the factor on which this limit depends. **[8]**

b) What are the basic qualities required in Process Equipment design engineer for better designs? **[8]**

P.T.O.

Q3) Design a cast iron protective type flange coupling to transmit 15 kW at 900 rpm from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used:
Shear stress for shaft, bolt and key material = 40 MPa, Crushing stress for bolt and key = 80 MPa, Shear stress for cast iron = 8 Mpa. Assume appropriate suitable width & thickness for Key. **[16]**

OR

Q4) A cross belt arrangements has center distance between pulleys as 1.5m. The diameter of bigger and smaller pulleys are 'D' and 'd' respectively. The Smaller pulley rotates at 1000 r.p.m. and the bigger pulley at 500 r.p.m. The flat belt is 6 mm thick and transmits 7.5 kW power at belt speed of 13 m/s approximately. The coefficient of belt friction is 0.3 and the density of belt material is 950 kg/m^3. If the permissible tensile stress for the belt material is 1.75 MPa. Calculate:
Diameter of pulleys & Length and width of belt. **[16]**

Q5) Design a Shell of Pressure vessel with following details: **[18]**

Internal Diameter (Approx)	=	1400 mm
Permissible stress at 150^{o}C	=	140 N/mm^2
Internal pressure	=	0.35 N/mm^2
Weight	=	38000N
Joint Efficiency	=	0.85
Torque offset piping	=	500 N-m

Material used is stainless steel.

OR

Q6) a) Draw different types of heads used in pressure vessel along with their criteria for selection. **[9]**

b) A Pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm^2. If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these conditions and find out how much is the % material saving by welding a strip along the longitudinal joint. Allowable stress of the material = 1020 kg/cm^2. Corrosion allowance is 1mm. **[9]**

SECTION - II

Q7) a) How fouling effects the performance of heat exchanger. What are the different types of fouling which occurs in heat exchangers? **[8]**

b) What are the different criteria used for selection of any heat exchanger for desired operations? **[8]**

OR

Q8) For the heat exchanger data find out diameter and thickness of shell : Data:**[16]**

a)	Number of tubes	=	64
b)	Number of passes	=	2
c)	Outside diameter of tube	=	20mm
d)	Pitch (square)	=	25mm
e)	Proportionality Factor (β)	=	0.8 (Triangular Pitch)
		=	0.7 (Square Pitch)
f)	Internal shell pressure (Pi)	=	0.55N/mm^2
g)	Material is Carbon Steel.		
h)	Permissible stress of the material	=	130 N/mm^2
i)	Welding efficiency	=	85%

Also find the diameter of shell if triangular pitch is selected.

Q9) a) Discuss the various types of losses in storage vessels. **[8]**

b) Write the detailed process along with equations and diagrams for design of storage tank including the bottom plate, shell and roof dimensions calculations. **[8]**

OR

Q10) Design a Shell of Circular Cylindrical Tank for storage of crude oil: **[16]**

Tank diameter = 16 m(Approx)

Tank height = 12 m (Approx)

Material Mild Steel with permissible stress = 90 N/mm^2

Joint efficiency = 85%

Assume suitable density for crude oil.

Plate sizes available are

(6300mm × 1800mm, 5000mm × 2500mm, 5600mm × 1100mm)

Q11) Shell, Bottom plate of Circular Cylindrical Tank for storage of crude oil with conical roof. **[18]**

Tank diameter = 20 m(Approx)

Tank height = 12 m(Approx)

Material carbon Steel with permissible stress = 142 N/mm^2

Joint efficiency = 85%

Superimposed load = 1250 N/m^2

Density = 7.7

Plate size available are

(6300mm × 1800mm, 5000mm × 2500 mm, 5600 mm × 1100mm)

OR

Q12) Write Short Notes on (Any four): **[18]**

a) Use of Wind girders in Storage tank (With Sketch).

b) Pipeline color codes for different pipe lines.

c) IS Code for design of equipment.

d) Stress Concentration.

e) Steps in design activity.

f) ASME & TEMA CODES.

Total No. of Questions :12]

SEAT No. :

P2977

[Total No. of Pages :5

[4958] - 231

T.E. (Petroleum Engg.)

NUMERICAL METHODS AND GEO - STATISTICS

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer Q 1 or Q2, Q3 or Q4, Q5 or Q6 from Section I, Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non - programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) If $f(z) = a + iv$ is an analytic function, find $f(z)$ if $u = x^2 - y^2 - y$. **[5]**

b) Evaluate $\oint_c \frac{z^3 - 5}{(z+1)(z-2)}\,dz$, where c is the circle $|z| = 3$. **[6]**

c) Find the bilinear transformation which maps the points 1, 0, i of the z - plane on to the ponits $\infty, -2, -\frac{1}{2}, (1+i)$ of w plane. **[6]**

OR

P.T.O.

Q2) a) Show that analytic function $f(z)$ with constant modulus is constant. **[5]**

b) Evaluate $\oint_c \frac{3z^3+5z+2}{z-1}dz$ where 'C' is the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1.$ **[6]**

c) Show that under transformation $w=\frac{i-z}{i+z}$, x - axis in z - plane is mapped onto the wide $|w| = 1$. **[6]**

Q3) a) Find the correlation co - efficient between x and y from the given data: **[9]**

x :	78	89	97	69	59	79	68	57
y:	125	137	156	112	107	138	123	108

b) The first four moments about the value 45, of a distribution is 0.53, 114, 173.33 and 35400. Calculate the moments about mean and β_1 and β_2. **[8]**

OR

Q4) a) The two regression equations of the variables x and y all $3x + 2y = 26$ and $6x + y = 31$. Find the mean values and the correlation coefficient between x and y. **[8]**

b) Find the first four moments about mean for the following frequency distribution. **[9]**

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of students	5	10	40	20	25

Q5) a) A committee is to be formed by choosing two boys and four girls out of a group of five boys and six girls. What is the probability that a particular boy named A and a particular girl named B are selected in the committee? **[5]**

b) If the mean and variance of a binormal distribution are 4 and 2 respectively,find the probability of **[6]**

i) Exactly 2 successes and

ii) Less than 2 successes.

c) In a certain factory producing cycle tyres, there is a small chance of 1 in 500 tyres to be defective. The tyres are supplied in lots of 10. Using Poisson distribution, calculate the probability of lots containing no defective and one defective. **[5]**

OR

Q6) a) The breaking strength X of a fabric is normally distributed with mean 16 and S.D.(σ) = 1. The fabric is said to be good if X $\geq$ 14. What is the probability that a fabric choosen is good.

Area = 0.4772 when $z = 2$. **[5]**

b) The overall percentage of failures in a certain examination is 20. If six candidates appear in the examination, what is the probability that atleast five pass the examination. **[6]**

c) If a random variable has a Poisson distribution such that P(1) = P(2) find P(4). **[5]**

SECTION - II

Q7) a) Establish the following: **[9]**

i) $\Delta\nabla = \nabla\Delta = \delta^2$

ii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$

iii) $\mu^2 = 1 + \frac{\delta^2}{4}$

b) Use trapezoidal rule to evaluate

$I = \int_0^1 x.e^{x^2}\, dx$ by taking h = 0.1. **[8]**

OR

Q8) a) Construct a difference table for $y = x^3 + 1$, $x = 0$ (1)5. Find y at $x = 1.5$ and $x = 4.5$. **[9]**

b) The speed of a train which starts from rest is given by the following table, the time recorded in minutes and speed in kms per hour. **[8]**

t	2	4	6	8	10	12	14	16	18	20
v=speed	10	18	25	29	32	20	11	5	2	0

Find approximately the total distance run in 20 minutes.

Q9) a) Find the root of the equation $3x - 1 - \cos x = 0$ by using method of successive approximations perform 9 iterations. **[8]**

b) Use method of least squares to fit a parabola of the form $y = ax^2 + bx + c$ to the data. **[8]**

x	0	1	2	3	4	5	6
y	5	4	5	8	13	20	29

OR

Q10)a) Use Gauss - seidel method to solve the system of equations. **[8]**

$$83x_1 + 11x_2 - 4x_3 = 95$$

$$7x_1 + 52x_2 + 13x_3 = 104$$

$$3x_1 + 8x_2 + 29x_3 = 71$$

Finding solution at the end of fifth iteration.

b) Use Runge - Kutta method of fourth order to solve the equation

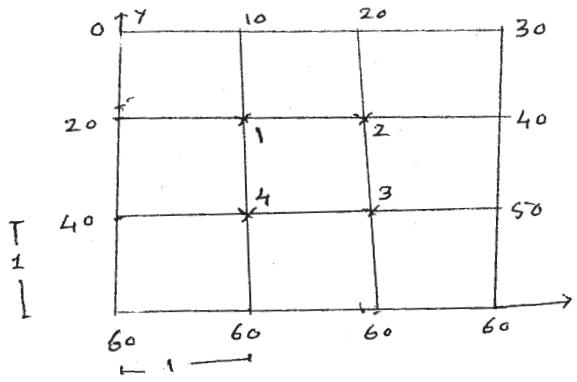
$$\frac{dy}{dx} = \sqrt{x^2 + y}$$

with $y(0) = 1$. Find y at $x = 0.4$ taking $h = 0.2$. **[8]**

Q11)a) Solve the equation **[9]**

$$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$$

with reference to the grid shown below



b) Solve the following LPP by simplex method **[8]**

Maximize $z=3x_1+2x_2$

Subject to $x_1+x_2\le 4$

$x_1-x_2\le 2$

and $x_1, x_2\ge 0$

OR

Q12)a) Explain explicit and inplicit finite difference methods to solve the one dimensional heat flow equation. **[8]**

$$\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$$

with given initial and boundary conditions

Write finite difference approximations in each case. State the stability criteria

b) Solve the following LPP by simplex method **[9]**

Maximize $z=3x_1+2x_2+5x_3$

Subject to $x_1+2x_2+x_3\le 430$

$3x_1+2x_3\le 460$

$x_1+4x_2\le 420$

$x_1, x_2, x_3\ge 0.$

Total No. of Questions : 7]

SEAT No. :

P3907

[Total No. of Pages : 2

[4958]-232
T.E.(Petroleum Engineering)
PETROLEUM GEOLOGY-I
(2008 Course)(Semester-I) (312382)

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

Instructions to the candidates:

1) ***Answer to the two sections should be writtren in separate answer books.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Figures to the right indicate marks.***

Q1) a) What is a "Rock Cycle"? Explain with suitable diagram. **[7]**

b) Discuss different processes/ steps involved in the formation of sedimentary rocks. **[8]**

OR

Q1) a) Explain the Hjulstroms' diagram? **[8]**

b) Explain in brief the observations carried out in sedimentary rocks. **[7]**

Q2) a) What is weathering? Discuss any two modes of chemical and mechanical weathering. **[7]**

b) In which tectonic setting, mid oceanic ridge and trenches occur? How is origin of Himalaya related to the theory of plate tectonics? **[8]**

OR

Q2) a) Discuss the classification of mass movement based on moisture content and velocity. **[7]**

b) How is occurrence of an earthquake discussed on the basis of elastic rebound theory? How earthquake waves are used to describe the internal structure of the earth. **[8]**

Q3) a) How is geometric classification of folds based on interlimb angle give broad idea about fold size? Explain with suitable figures. **[14]**

b) How to describe the discontinuity in quantitative manner? **[6]**

OR

P.T.O.

Q3) a) How are faults recognized in field? Explain Normal fault, and Reverse fault with the help of a neat diagram? **[12]**

b) Explain in Brief the concept of Mohr's Circle. **[8]**

SECTION-II

Q4) a) How bed forms are developed in response to flow velocity and mean sediment size? **[7]**

b) Explain with suitable diagrams how compaction, cementation, recrystallisation and dissolution as post depositional changes alter original nature of sediments/sedimentary rocks **[8]**

OR

Q4) a) What are the major components of clastic sedimentary rocks? Distinguish between mud supported and grain supported framework of sedimentary rocks. **[7]**

b) Explain in brief the triangular classification of Sand-mud-lime **[8]**

Q5) Write notes on any two of the following **[15]**

a) Use of microfossils in the exploration of hydrocarbon.

b) Evolution of coral reefs

c) Interpretation of sedimentary environment using ichnofossils

d) Marine depth zones and distribution of organsism.

Q6) a) Write Standard Geological Time scale in a tabular form with important events. **[10]**

b) What is transgression and regression? Explain in bred the concept using suitable figures. **[10]**

OR

Q7) a) What is an unconformity? What are the different types of unconformity? Explain with the help of suitable diagram **[12]**

b) What is an onlap and offlap deposit? Explain with suitable diagram. **[8]**

Total No. of Questions : 6]

SEAT No. :

P2793

[Total No. of Pages : 1

[4958]-233

T.E.(Petroleum Engineering)

DRILLING OPERATIONS

(2008Course) (Semester-I)

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

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.***

SECTION-I

Q1) a) What are different rig system? Explain hoisting system of a rig in detail. **[9]**

b) Explain working of a triplex single acting mud pump in detail. **[9]**

Q2) a) Discuss down hole problem-lost circulation with remedy to cure the loss problem. **[8]**

b) What is dull bit classification? **[8]**

Q3) a) What is kick? Discuss causes of kick. **[8]**

b) Write note on. **[8]**

i) BOP

ii) Coring

SECTION-II

Q4) Discuss different functions of cement and explain squeeze cementation in detail. **[18]**

Q5) a) Discuss use of Fann viscometer to find different rheological properties of mud. **[8]**

b) Write short note on KCL Polymer Mud. **[8]**

Q6) a) Draw circulation system of a drilling rig. **[8]**

b) Discuss optimum rig hydraulics. **[8]**

◀▶ ◀▶ ◀▶

Total No. of Questions :12]

SEAT No. :

P2978

[Total No. of Pages :3

[4958] - 234

T. E. (Petroleum Engineering)

HYDROCARBON PROPERTIES AND THERMODYNAMICS

(Semester - I) (2008 Course) (312384)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer Q.1 or Q.2 , Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Derive the first law of thermodynamics for non-flow systems. **[8]**

b) A system consisting of a gas confined in a cylinder is undergoing the following series of processes before it is brought back to the initial conditions: **[8]**

Step 1: A constant pressure process when it receives 50 J of work and gives up 25 J of heat.

Step 2: A constant volume process when it receives 75 J of heat.

Step 3: An adiabatic process

Determine the change in internal energy during each step and the work done during the adiabatic process.

OR

Q2) a) Write a note on the Clausius inequality. **[8]**

b) Explain the third law of thermodynamics. **[8]**

P.T.O.

Q3) a) Explain: Cricondentherm, Cricondenbar, Critical Point, Acentric factor. **[9]**

b) State any four equations of state for real gases. Explain any one. **[9]**

OR

Q4) Calculate the volume occupied by one mole of oxygen at 300 K and 100 bar using **[18]**

a) The ideal gas law

b) The van der Waals equation

Take 'a' = 0.1378 Nm^4/mol^2 and 'b' = 3.18×10^{-5} m^3/mol.

Q5) a) Write a note on the Gibbs free energy. **[8]**

b) What is fugacity? Enlist any four methods to determine fugacity. **[8]**

OR

Q6) a) Find the fugacity coefficient at 1 bar, 5 bar and 10 bar for a gas that follows the equation of state PV = RT (1-0.00513P). **[8]**

b) What are the characteristics of an ideal solution? Explain the Raoult's law and Henry's law. State their significance. **[8]**

SECTION - II

Q7) a) Draw the boiling point diagram. What is meant by a tie line? How does the tie line help in determining the amount of liquid and vapour in equilibrium? **[9]**

b) How do you estimate the bubble point temperature and dew point temperature of a multicomponent hydrocarbon system? What is the role of DePriester's charts in determining the same? **[9]**

OR

Q8) The vapour pressures of acetone **[18]**

a) and acetonitrile

b) can be evaluated by the Antoine equations

$$\ln P_1^s = 14.5463 - \frac{2940.46}{T - 35.93}$$

$$\ln P_2^s = 14.2724 - \frac{2945.47}{T - 49.15}$$

Where T is in K and P is in kPa. Assuming that the solutions formed by these are ideal, calculate

i) x_1 and y_1 at 327 K and 65 kPa.

ii) T and y_1 at 65 kPa and $x_1 = 0.4$.

iii) P and y_1 at 327 K and $x_1 = 0.4$.

Q9) a) What do you mean by imbibition and drainage? **[8]**

b) Derive the Laplace Young equation. **[8]**

OR

Q10)a) State the Kelvin quation. What are its limitations? **[8]**

b) State and explain the Darcy's law. **[8]**

Q11)a) With the help of neat diagrams, explain the solid liquid equilibrium phenomena. **[8]**

b) Write a note on the Asphaltene Precipitation Envelope (APE). **[8]**

OR

Q12)a) With the help of phase diagrams, explain the formation of gas hydrates. **[8]**

b) Give the various models for wax precipitation. Give their limitations. **[8]**

Total No. of Questions : 12]

SEAT No. :

P3908

[Total No. of Pages : 3

[4958]-235
T.E. (Petroleum)
PETROLEUM PRODUCTION OPERATIONS
(2008 Course) (312385)

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

Instructions to candidates:

1) ***Answer Q. No.1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, from Section I and Q. No.7 or 8, Q. No. 9 or 10, Q. No. 11 or 12. from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Black figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the neat schematic sketch of a typical christmas tree to be used in onshore operations and indicate various components of it. **[10]**

b) Draw the neat schematic sketch of a sub-surface choke and write its functions. **[8]**

OR

Q2) a) Write important components of a well head equipment and its functions. **[9]**

b) Write the advantages of a coiled tubing unit in brief. **[4]**

c) Write the general steps involved in well completion procedure. **[5]**

Q3) a) Draw the schematic sketch of any one type of packer and write its functions. **[8]**

b) Write functions of safety valves used in oil wells and draw the schematic sketch of any one type of it. **[8]**

OR

Q4) a) Explain any two types of well completion methods. **[12]**

b) What is packer unseating phenomena? Explain. **[4]**

P.T.O.

Q5) Describe in detail vertical lift performance and tubing optimization using Gilbert's method. Discuss the graphical procedure for tubing selection in detail. **[16]**

OR

Q6) a) Write various production tubing grades as per API. Standards. Which grade should be used for corrosive environment inside a wellbore? **[6]**

b) What is Productivity Index and IPR? Explain their relationship graphically. **[5]**

c) Explain heading cycle in brief. **[5]**

SECTION - II

Q7) a) Discuss general objectives of well completion operation in brief. **[9]**

b) Draw the neat schematic sketch of a typical multiple zone well completion. **[9]**

OR

Q8) a) Explain well perforation job in brief. **[8]**

b) Explain water loading and corrosion related workover jobs with solution in brief. **[10]**

Q9) a) Construct typical graphs in following cases. **[10]**

i) IPR for different reservoir drive mechanisms.

ii) IPR before and after improvement of formation damage problem.

iii) GOR and pressure trends against time for water drive reservoir.

b) Define oil and gas formation volume factor. **[6]**

OR

Q10)a) Discuss applications of horizontal well technology. **[8]**

b) For a test at bubble point pressure following data is available. **[8]**

Calculate: Maximum flow rate using Vogel's IPR

Oil flow rate at bottom hole pressure flowing pressure = 600 psia.

Also generate Vogel's IPR curve.

Other data given: Reservoir pressure = 3000 psi.

Bubble point pressure = 2800 psi. Flowing bottom hole pressure is,

1500 psi at test flow rate = 500bbls/day.

Q11)a) Discuss scale deposition and its removal operation for a wellbore in brief. **[4]**

b) Draw neat schematic sketch and explain gas and water 'coning' problem. Write the detail solution for this. **[12]**

OR

Q12)a) Write short notes on, **[10]**

i) well performance

ii) well stimulation

b) What is artificial lift technology? Explain. **[6]**

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Total No. of Questions :8]

SEAT No. :

P2794

[Total No. of Pages :2

[4958] - 236

T.E. (Petroleum)

PETROLEUM GEOLOGY - II

(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answers to the questions of each section should be written in separate answer books.***
2) ***Questions 4 and 8 are compulsory. Solve any two questions from remaining questions each from Section I and Section II.***
3) ***Draw neat diagrams wherever necessary.***

SECTION - I

Q1) List and explain in brief, important physical and chemical properties of gaseous and liquid hydrocarbons. **[15]**

Q2) What is kerogen? Explain types of kerogen. How does type of kerogen affects final product? **[15]**

Q3) a) Explain the processes of primary and secondary migration of hydrocarbons from source rocks to reservoirs. **[10]**

b) Explain one chemical and one genetic classification of oil field water. **[5]**

Q4) Answer any two of the following: **[20]**

a) Stratigraphic traps,

b) Source rock evaluation,

c) Geological conditions giving rise to sealing mechanism in sand shale sequence,

d) Causes of abnormal pressure.

P.T.O.

SECTION - II

Q5) Explain with the help of neat sketches shallow water sandstone-shale deposition. **[15]**

Q6) Describe Petroleum system and hydrocarbon potential of any one of the hydrocarbon producing basins of India. **[15]**

Q7) How are structure contour maps and thickness maps useful in the understanding of subsurface formations of the area? **[15]**

Q8) a) Describe in brief the procedure to carry out analysis of drill cuttings. **[10]**

b) Write in brief any two of the following: **[10]**

i) Importance of core cutting analysis during mud logging,

ii) Spatiotemporal distribution of hydrocarbons,

iii) Subsurface correlation

iv) Shale gas resources in India.

Total No. of Questions :8]

SEAT No. :

P3909

[Total No. of Pages :2

[4958]-237
T.E. (Petroleum Engineering)
RESERVOIR ENGINEERING - I
(2008 Course) (Semester-II)

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

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Questions No. 2(two) and 8 (eight) are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Answer 3 questions from section I and 3 questions from section II.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***Use of a non-programmable calculator, log-log, and semi-log paper is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain concept of vapor pressure and degrees of freedom. **[4]**

b) Derive the equation for radial laminar flow of gas in porous media. **[8]**

c) What do you mean by interfacial tension? How does it affect capillary pressure? **[4]**

Q2) a) Write a short note on retrograde condensation. **[2]**

b) Derive an expression for flowrate flowing inside a porous media of a Horizontal Radial Flow System. State necessary assumptions. **[8]**

c) Determine the oil flow rate in a radial system with the following set of conditions: K = 300 md, r_e = 330 ft, h = 20 ft r_w = 0.5 ft, P_e = 2,500 psia, r_e/r_w = 660, P_w = 1,740 psia, m = 1.3 cp. **[8]**

Q3) Write short notes on Relative permeability, J leveret Function, Saturation and Hysteresis. **[16]**

Q4) Explain types of crude oils. Draw their phase diagrms as well as Liquid volume vs. pressure diagrams. **[16]**

P.T.O.

SECTION-II

Q5) What do you mean by transition zone in a reservoir? Explain with the help of diagram, and show how it varies with the permeability of the reservoir. **[16]**

Q6) Derive an expression for gas in place and explain the effect of water influx on the p/z graph. **[16]**

Q7) Explain all drive mechanisms. Explain the GOR and pressure trends in different kinds of mechanisms, and elaborate on the reason for the trend's direction. **[16]**

Q8) Write down generalized material balanced equation and Solve following problem: **[18]**

A combination-drive reservoir contains 10 MMSTB of oil initially in place. The ratio of the original gas-cap volume to the original oil volume, i.e., m, is estimated as 0.25. The initial reservoir pressure is 3000 psia at 150°F. The reservoir produced 1 MMSTB of oil, 1100 MMscf of 0.8 specific gravity gas, and 50,000 STB of water by the time the reservoir pressure dropped to 2800 psi. The following PVT is available:

	3000 psi	2000 psi
B_o, bbl/STB	1.58	1.48
R_s, scf/STB	1040	850
B_g, bbl/scf	0.00080	0.00092
B_t, bbl/STB	1.58	1.655
B_w, bbl/STB	1.000	1.000

$S_{wi} = 0.20$ $C_w = 1.5*10^{-6}\ psi^{-1}$ $C_f = 1*10^{-6}\ psi^{-1}$

a) Cumulative water influx.

b) Net water influx.

c) All Drive Indices.

EEE

Total No. of Questions :12]

SEAT No. :

P3910

[Total No. of Pages :3

[4958]-238

T.E. (Petroleum)

PETROLEUM PRODUCTION ENGINEERING - I

(2008 Course) (312388)

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

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 from section - I and Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No. 10, Q.No.11 or Q.No.12 from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) Discuss working principle of different types of artificial lift systems in brief. **[18]**

OR

Q2) Discuss usability of gas lift and SRP only in terms of excellent/good/fair/poor in a tabular form for following well conditions. Low PI, Low GOR, adaptability to deviated wells, capability to produce sand, high volume lift capability , ability to handle viscous oil and depth limits. **[18]**

Q3) a) Calculate the casing pressure at 8000 ft. required to open the valve if, Ab = 0.75 inch^2, R= 0.085, Pd = 745 psi, Pt = 300 psi. What is the tubing effect caused by tubing pressure? How much pressure it would require to open the valve in the casing if, tubing pressure is zero psi at valve depth. Also explain meaning of spread and find its value for this valve. **[8]**

b) Draw the schematic sketch and explain in brief well unloading process in intermittent flow gas lift system. **[8]**

OR

P.T.O.

Q4) a) Which method or methods of artificial lifting you will propose for the following requirement and why? Write in brief. **[8]**

i) Offshore oil production from deviated wells with sand problem.

ii) Heavy oil product ion from a well along with high GOR.

b) Discuss the procedure to decide the depth of point of gas injection for a continuous flow injection. **[8]**

Q5) a) Discuss in detail, working and design of electrical submersible pumping system. **[10]**

b) Explain in brief, working of any one type of gas lift valve. **[6]**

OR

Q6) a) What is the effect of following, on functioning of ESP? Explain **[8]**

i) ESP motor with insufficient mineral oil.

ii) High and shallow, pump setting depth.

b) Discuss typical standard performance curve for a submersible pump. **[8]**

SECTION - II

Q7) Discuss in detail working and design of sucker rod pumping system. **[18]**

OR

Q8) Describe MPRL, PPRL, optimum counterweight and dynagraph in brief. **[18]**

Q9) Draw neat schematic sketch of a typical petroleum production system and discuss applications of nodal analysis for it in detail. **[16]**

OR

Q10) Following data is available which gives, bottom hole flowing pressure at sand face Vs production of gas flow rate and pressure drop in 1.99 inch tubing against the said flow rate and well conditions. Decide the appropriate perforation sizing, flow capacity and pressure loss across the sandface. **[16]**

Q_{sc} Mscfd	Pwfs. Psia	ΔP psi (d = 1.99 inch)
25,000	5000	470
20,000	5100	1470
15,000	5300	2200
10,000	5450	3060
5,000	5600	3710

Other details: $T_s = 110°F$, $\gamma_g = 0.80$, $\in = 0.0006$ inch, H = 11,0000 ft, $T_R = 260$ °F, $\mu_g = 0.011$ Cp, $r_e = 1100$ ft, $r_w = 0.50$ ft., S = 0, h = 20 ft., Perforation diameter = 0.7 inch., z = 0.97, Gravel permeability = 40 darcys. Screen O.D. = 3.06 inch., Hole diameter = 12.25 inch. Perforation density 4, 8 and 12 shots per foot are to be checked.

Q11) Draw neat schematic sketches and describe hydraulic fracturing job in detail. **[16]**

OR

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

a) Formation damage.

b) Fracturing fluids.

c) Acidizing job.

d) Workover for ALT wells.

Total No. of Questions : 12]

SEAT No. :

P4921

[Total No. of Pages : 5

[4958] - 239

T.E. (Petroleum Engineering)

NATURAL GAS ENGINEERING

(2008 Pattern)

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

Instructions to the candidates :-

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

SECTION -I

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

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

c) Calculate the reserves in a gas field of 1600 acres, with 20ft sand thickness, 18% porosity, 15% water saturation, BHP = 2000 Psi guage, BHT = 200 F. The natural gas has the following weight composition: $C_i = 0.85$, $C_2 = 0.05$, $N_2 = 0.1$. **[7]**

OR

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

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

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

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

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

OR

P.T.O.

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

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

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

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

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

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

OR

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

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

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

i) What is the expected daily flow rate?

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

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

C = 0.62, assume NRe is very high, μ = 0.01245.

SECTION - II

Q7) a) What is the criterion for choosing a CO_2 removal process? **[8]**

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

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

OR

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

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

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

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

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

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

OR

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

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

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

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

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

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

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

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

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

OR

Q12) a) Write short note on Pipeline effieciency. **[3]**

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

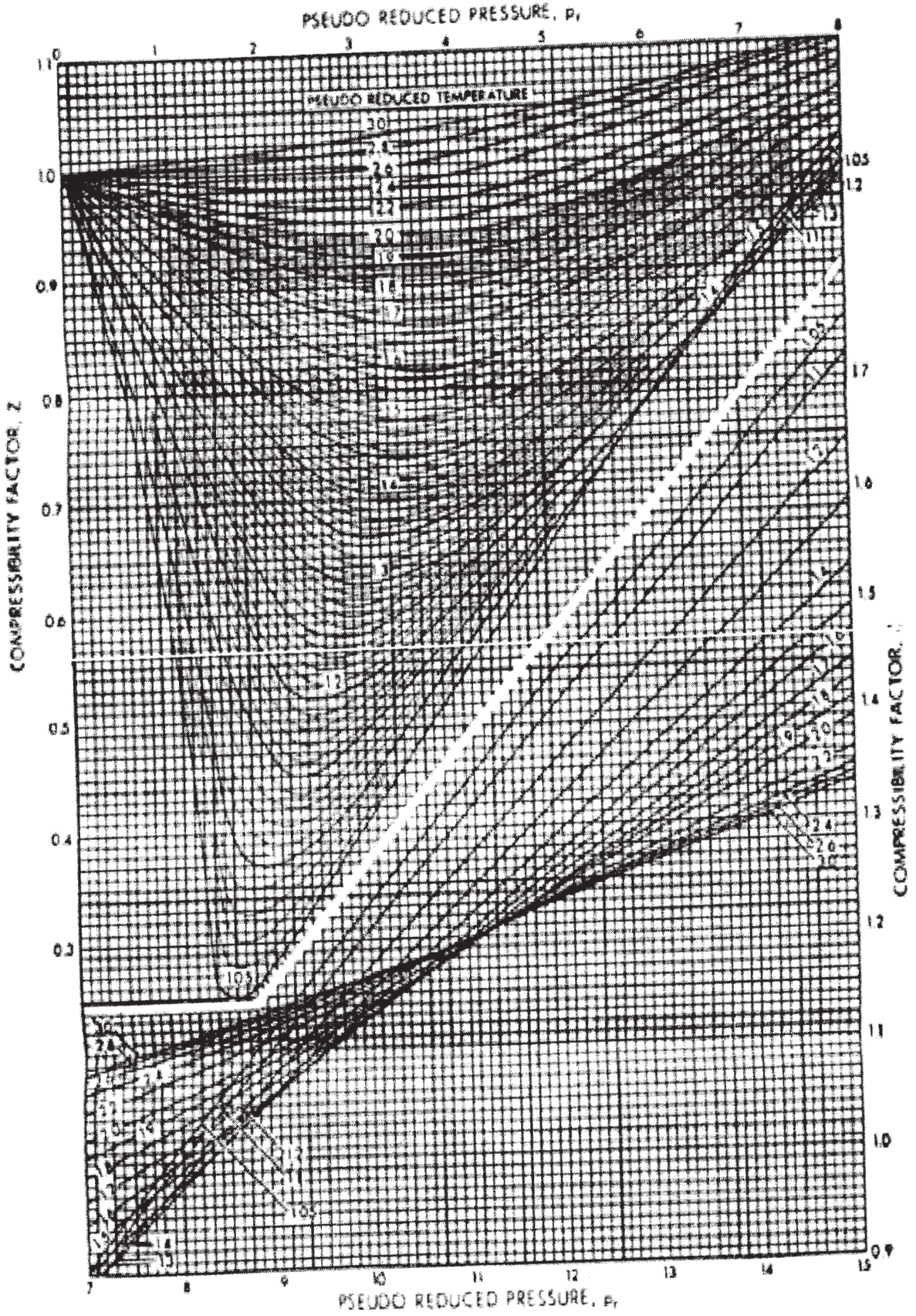
c) Give solutions for liquid loading problem. **[3]**

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

e) Write short note on pipeline cleanig and utility pigs. **[3]**

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

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


PSEUDO REDUCED PRESSURE, p_r
PSEUDO REDUCED TEMPERATURE
COMPRESSIBILITY FACTOR, Z
COMPRESSIBILITY FACTOR, Z
PSEUDO REDUCED PRESSURE, p_r

Total No. of Questions : 10]

SEAT No. :

P3911

[Total No. of Pages : 4

[4958]-240

T.E.(Petroleum Engg.)

PETROLEUM EQUIPMENT DESIGN& DRAWING

(2008 Course)(Semester-II)

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

Instructions to the candidates:

1) ***Answer any three questions from each section. Que 5 & Que 10 are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side 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.***

SECTION-I

Q1) a) How stress concentration creates the unbalance in stress distribution in a material? Discuss it with the help of few examples. **[5]**

b) Discuss Factor of safety & factors on which factors of safety depends. **[6]**

c) Discuss the design fundamentals applied to petroleum equipment. **[5]**

OR

Q2) a) What are the advantages and disadvantages of chain drive over belt drive? **[6]**

b) What will happen if proper codes and standards are not used for design of equipment? What facility codes and standard provides to designer? **[6]**

c) Discuss the role of design engineer in design of any equipment. **[4]**

Q3) a) A flat belt is required to transmit 50kW from a pulley of 2.0 M effective diameter running at 450 rpm. The angle of contact is spread over 11/24 of the circumference. The coefficient of friction between belt and pulley surface is 0.4. Determine taking centrifugal tension in account, width of the belt required. If it is given that belt thickness is 9.0 mm,density of its material is 1100 kg/m^3 and related permissible working stress is 3.5 MPa. **[10]**

P.T.O.

b) Two parallel shafts whose center line are 4.8 m apart are connected by an CROSS belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley is 1m. The initial tension in belt when belt is stationary is 3 kN. The mass of belt is 1.5 kg/m length. The coefficient of friction is 0.3. Taking centrifugal tension in account, calculate the power transmitted, when smaller pulley rotates at 400 rpm. **[8]**

OR

Q4) a) Design a cast- iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used. **[10]**

Shear stress for shaft, bolt & key material = 400 kgF/Cm^2

Crushing stress for bolt and key = 800kgF/cm^2

Shear stress for cast iron = 80 kgF/cm^2

b) Design and draw a bushed pin type of flexible coupling to connect a motor shaft to a pump shaft,transmitting 32 kW at 960 rpm. The overall torque is 20% more than mean torque. The material properties are as follows: **[8]**

i) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.

ii) The allowable shear stress for cast iron is 15MPa.

iii) The allowable bearing pressure for rubber bush is 0.8 N/mm^2

iv) The material of the pin is same as that of shaft and key. Diameter of pin may be increased for bending stresses. Brass bush thickness is 2 mm, whereas rubber bush is 6 mm thick. Enlarged portion in input flange is having 24 mm diameter. Clearance of 5 mm is left two halves of coupling.

Q5) a) A Pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm^2. If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these different conditions and find out how much is the % material saving by welding a strip along the longitudinal joint.

Allowable stress of the material = 1020 kg/cm^2. Corrosion allowance mm. **[6]**

b) Discuss various types of Heads used in pressure vessel along with the design formula used for calculating the thickness required. **[10]**

SECTION-II

Q6) a) Write functions of Baffles and Tie rods in shell and tube heat exchanger. Draw its neat sketch. **[8]**

b) Discuss advantages and disadvantages of fixed tube, floating head and U tube heat exchangers. **[8]**

OR

Q7) a) Discuss with neat sketches different types of head and closure used in shell and tube heat exchangers. **[6]**

b) A heat exchanger with installed heat transfer surface area of 8.1 m^2 is to be used for heating process liquor available at 16.5 °C. The heating is to be performed with water available at 93°C from another part of the plant. The arrangement of the unit is such that the fluids flow in true counter current manner. The flow rates of the process liquor and water are 3.1 kg/sec and 1.1 kg/sec respectively. Previous experience indicates that an overall heat transfer coefficient of 450W/m^2K is suitable. Estimate the exit temperature of the two fluids and determine the effectiveness of the heat exchanger. **[10]**

Q8) a) What are the different losses that can occur in storage tank? Explain the breathing loss in details. **[6]**

b) A cylindrical storage tank has diameter 30 m and the tank height is 15m. Liquid stored in the tank has a density 810 kg/m^3. Material of construction is carbon steel having permissible stress 1300 kg/cm^2.

Density of material used for fabrication is 7700 kg/m^3.

The plates of size 3 m × 1.2 m in varying thickness are available for fabrication. Welded joints efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of the tank at different height. Also estimate the total number of plates required. **[10]**

OR

Q9) a) Write and explain the formulae to calculate the thickness of torispherical and Elliptical head/closure. **[4]**

b) Discuss the design of flat bottom cylindrical storage tanks. What are the formulae used to get the shell thickness at different height. Also mention the plate thickness for bottom plates of this cylindrical tank. Also give design of conical roof with considering slope 1 in 5. **[12]**

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

a) IS Code for design of equipment.

b) ASME & TEMA CODES.

c) Different Drives for agitators.

d) Baffles and its need in mixing.

e) Welded joints.

Total No. of Questions :12]

SEAT No. :

P2979

[Total No. of Pages :3

[4958] - 241

T.E. (Polymer Engineering)

MASS TRANSFER AND REACTION ENGINEERING (309365)

(Semester - I) (2008 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION - I

Q1) a) Explain the term mass transfer and give any two examples of mass transfer and explain Fick's Law of Diffusion. **[9]**

b) Write a note on Overall Mass transfer Coefficient. **[9]**

OR

Q2) a) Oxygen (A) is diffusing through Carbon monoxide (B) under steady state condition, with the Carbon monoxide as non-diffusing. The total pressure is 1×10^5 N/m^2 and temperature 0 °C. The partial pressure of Oxygen at two planes 2 mm apart is 13000 N/m^2 and 6500 N/m^2 respectively. The diffusivity for the mixture is $(D_{A\text{-}B}) = 1.87\times10^{-5}$ m^2/sec. Find the rate of diffusion of oxygen through each square meter of the two planes. **[9]**

P.T.O.

b) Find the steady state flux of Ethanol (A) – Water (B) solution in the form of a stagnant film of 2 mm thick at 20 °C is in contact with an organic solvent in which A is soluble and B is non diffusing. When the concentration on the opposite sides are 16.8 wt% and 6.8 wt% of ethanol respectively. **[9]**

Diffusivity of Ethanol is 0.74×10^{-9} m^2/sec.

Density of 16.8 wt% acetic Acid = 972 Kg/m^3.

Density of 6.8 wt% acetic Acid = 988 Kg/m^3

Q3) a) Write a note on minimum liquid to gas ratio for gas absorber. **[8]**

b) Write a note on "Choice of Solvent" for gas Absorption. **[8]**

OR

Q4) a) Write a note on **[10]**

i) Liquid-Liquid extraction

ii) Simple Distillation.

b) Differentiate between Tray tower and Packed tower. **[6]**

Q5) a) A wet solid is to be dried from 35% to 10% moisture under constant drying condition in 5 hours. If equilibrium moisture content is 4% and critical moisture content is 14%. How long it will take to dry the solids to 6% moisture under same condition. **[8]**

b) Explain rate of drying curve. **[8]**

OR

Q6) a) Write a note on Tray Dryer, Drum Dryer, and Spray Dryer. **[8]**

b) Discuss the term Total Drying time. **[8]**

SECTION - II

Q7) a) Write a short note on Classification of chemical reactions useful for the reactor design. **[10]**

b) Explain in short factors affecting rate of reaction. Explain Elementary and Non-Elementary reaction with example. **[8]**

OR

Q8) a) Explain the following terms: **[10]**

Conversion, Molecularity of reaction, Order of Reaction, Reaction rate Constant, first order and second order reaction.

b) Explain temperature dependency from Collision, Transition and Arrhenius theory. **[8]**

Q9) a) Discuss the Integral Method of analysis of kinetics of constant volume batch reactor for the irrevrsible first order, second order, nth order and zero order reaction. **[8]**

b) Explain half life period for first and second order reaction. **[8]**

OR

Q10) Explain half life period for first and second order reaction. The half life period for a certain first order reaction is $2.5*10^3$ second. How long will it take for $1/4^{th}$ of reactant to be left behind? **[16]**

Q11) a) Differentiate between batch reactors, mixed flow reactor, plug flow reactor. **[8]**

b) Write short note on Best arrangement of ideal reactors for given reaction. **[8]**

OR

Q12) Write a short note on design of polymer reactors. Explain term space time and space velocity. **[16]**

Total No. of Questions : 12]

SEAT No. :

P3912

[Total No. of Pages : 2

[4958]-242
T.E.(Polymer Engineering)
POLYMER CHEMISTRY-I
(2008 Course) (Semester-I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION-I

Q1) a) What are oligomers? Discuss how stoichiometry leads to oligomer formation with suitable example. **[8]**

b) Explain the principle of osmometry. Discuss construction of dynamic membrane osmometer. **[8]**

OR

Q2) a) What is polydispersity? What are the probable reasons for a polymer to show polydispersed behavior? **[8]**

b) Discuss vapor pressure osmometry method in detail. **[8]**

Q3) a) Write a note on free radical initiators. Discuss various classes of the same with suitable structures/examples. **[8]**

b) Compare with the help of structures vinyl,allyl, olefin and diene monomers. **[8]**

OR

Q4) a) Give the reactions involved in solid phase polymerization of any one monomer. **[8]**

b) Explain in detail emulsion polymerization. **[8]**

Q5) a) Discuss the polymerization technique used for the preparation of Nylon-66. **[9]**

b) How will you arrive at the rate equation for condensation polymerization **[9]**

OR

P.T.O.

Q6) a) Explain gas phase polymerization with any one example. **[9]**

b) What is polyaddition reaction? Explain the mechanism. **[9]**

SECTION-II

Q7) a) Explain the importance of copolymer composition equation with suitable data. **[8]**

b) Write a note on Alfrey-Price equation and its significance. **[8]**

OR

Q8) a) Explain how various copolymerization behavior lead to various copolymer compositions. **[8]**

b) Discuss with suitable commercial examples importance of copolymerization. **[8]**

Q9) a) Explain how aminolysis and acidolysis reactions lead to polymer modifications? **[8]**

b) Polymer recycling is a boon for polymer engineers. Justify scientifically **[8]**

OR

Q10) a) Write a note on any two polymer reactions. **[8]**

b) What are biodegradable polymers? Discuss any one at length. **[8]**

Q11) a) Discuss the stereochemistry of polymers containing two chiral carbons in its repeating unit **[9]**

b) Discuss with suitable data the superiority of stereoregular polymers as compared to non-stereoregular polymers. **[9]**

OR

Q12) a) Write a note on metallocene catalyst with one example **[9]**

b) Explain bimetallic mechanism in detail. **[9]**

Total No. of Questions : 12]

SEAT No. :

P4561

[Total No. of Pages : 3

[4958] - 243

T.E. (Polymer)

POLYMER MATERIALS

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer 3 Questions from section I and 3 Questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Give any two examples of Thermoplastic polymers with their structure, morphology, and few important properties. **[5]**

b) Write a note on why polymers are classified as Commodity, Engineering & High performance. **[5]**

c) Give Industrial manufacturing processes, properties and applications for LDPE. **[8]**

OR

Q2) a) Give any two examples of thermoset polymers with their structure, morphology, and few important properties. **[5]**

b) Give Industrial manufacturing processes, properties and applications for PP. **[8]**

c) Give the processing techniques used for EVA and give the various applications of EVA. **[5]**

Q3) a) Explain various application of rigid and flexible PVC and what are the important additives required for processing. Also give the importance of K value. **[8]**

b) Give the properties, applications and brief idea about compounding & processing of PTFE. **[8]**

OR

P.T.O.

Q4) a) Give the properties, applications and brief idea about compounding & processing of HIPS. **[8]**

b) Write a short note on ABS and how the properties are affected by the influence of percentage of butadiene. **[8]**

Q5) a) Write a note on industrial manufacturing process used for Acrylics and explain the influence of process parameters on properties. **[8]**

b) Give properties and applications of polycarbonate. **[8]**

OR

Q6) a) Write a note on industrial manufacturing process used for Polycarbonate and explain the influence of process parameters on properties. **[8]**

b) Write a short note on celluloses and the need for their modification. **[8]**

SECTION - II

Q7) a) Explain the different types of adhesives and where and why are they needed. **[9]**

b) Write a short note on lacquer and primer. **[9]**

OR

Q8) a) Give the role of different additives used in adhesives. **[9]**

b) Write a short note on paints and coatings. **[9]**

Q9) a) Explain what are rubbers and how are they different than polymers. Explain how natural raw rubber is obtained. **[8]**

b) Give the Molecular requirements for a material to function as an elastomer. Give few application of natural rubber. **[8]**

OR

Q10) a) Explain the process of making gloves from natural rubber latex. **[8]**

b) Give the concept of mastication and how is it carried out in detail. **[8]**

Q11)a) Give the Industrial manufacturing processes, properties, and applications for SBR Rubber. **[8]**

b) Give the compounding and processing for nitrile rubber. **[8]**

OR

Q12)a) Give the Industrial manufacturing processes, properties, and applications for butyl Rubber. **[8]**

b) Explain what are synthetic rubbers and give list of different synthetic rubbers with one application of each. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P4562

[Total No. of Pages : 3

[4958] - 244

T.E. (Polymer)

POLYMER STRUCTURE PROPERTY RELATIONSHIP

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain what are the different atoms present in polymers & its effect on properties like mechanical, chemical, thermal, electrical, optical etc. **[10]**

b) Write a note on how the synthesis route and the parameters involved play an important role in deciding polymer properties with any one example. **[8]**

OR

Q2) a) Give the list of additives required in final polymer composition & their role in enhancing the properties. **[10]**

b) Give types of bonds in polymer structure & their effect on properties. **[8]**

Q3) a) With any example explain how molecular size and shape has effect on properties like mechanical,chemical,thermal and electrical. **[8]**

b) Explain Conversion methods from low to high M.W during blow molding and what effect is seen due to the conversion. **[8]**

OR

P.T.O.

Q4) a) Explain the terms M.W, M.W.D, and P.D.I and its effect on polymer properties. **[8]**

b) Explain Conversion methods from low to high M.W during injection molding and what effect is seen due to the conversion. **[8]**

Q5) a) What leads to molecular flexibility. Explain with examples. gs. **[8]**

b) Explain why HDPE has high melting point and density than LDPE.Also explain why PS is brittle and what is done to get flexibility in the matrix. **[8]**

OR

Q6) a) Explain the effect of copolymer & blends on polymer properties. **[8]**

b) Explain spherulitic growth & its effect on various properties. **[8]**

SECTION - II

Q7) a) Explain terms like Intermolecular order, amorphous & crystalline state giving the significance of each on polymer property. **[9]**

b) Give the thermodynamic factors affecting rate of crystallisation. **[9]**

OR

Q8) a) Explain what happen during Orientation & give relation between crystallization & orientation and also their effect on properties. **[9]**

b) Give the list of kinetic factors affecting rate of crystallization. **[9]**

Q9) a) What is meant by intermolecular bonding forces.Explain London Dispersion Forces in detail. **[8]**

b) Explain the term CED and solubility parameter and its effect on properties. **[8]**

OR

Q10)a) Explain intermolecular bonding forces due to induced and permanent dipoles. **[8]**

b) Explain cross linking, polarity and their effect on polymer properties like mechanical, chemical, thermal and electrical. **[8]**

Q11)a) What is meant by temporary heterogeneity .Explain with proper examples. **[8]**

b) Write a short note on emulsions and pastes and the properties offered by them. **[8]**

OR

Q12)a) What is meant by chemical microheterogenity .Explain with proper examples. **[8]**

b) Write a short note on foams and the properties offered by them. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P4563

[Total No. of Pages : 3

[4958] - 245

T.E. (Polymer)

DESIGN OF EQUIPMENTS AND MACHINE ELEMENTS

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***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.***

SECTION - I

Q1) a) Discuss the classification of tool steel and alloy steel in accordance with Indian standards. **[6]**

b) With a neat figure, explain the construction of a muff coupling. Write down all the formulae for designing muff coupling. **[8]**

c) Write a note on maximum stress failure theory. **[4]**

OR

Q2) a) Design a bush pin type flexible coupling if power transmitted is 45KW at 1000rpm. The allowable shear stress in the shaft and key material is 40MPa, allowable crushing stress in shaft and key material is 80MPa, allowable shear stress for cast iron is 15MPa and allowable bearing pressure in rubber bush is $0.8N/mm^2$. Pin and shaft material are the same. Overall torque is 20% greater than mean torque. **[10]**

b) Explain the following theories of failure for biaxial stress system: **[8]**

i) Hencky and Von Misses Theory

ii) Saint Venant's Theory

P.T.O.

Q3) a) Centre distance two shafts is 1.5 meters. The shafts are driven by a V belt. A 450mm driving pulley is supplied with 45kW power at 450rpm. The driven pulley rotates at 350rpm. The angle of groove on pulleys is 35°. The density of the belt material is 1000kg/m^3. Assume coefficient of friction between the pulley and belt to be 0.3. Take the belt cross sectional area as 400mm^2. The maximum permissible tension is to be limited to 2MPa. The driven pulley is overhung from nearest bearing by 100mm. If the permissible shear stress for the shaft is 40MPa and maximum tensile and compressive stress does not exceed 60MPa, determine diameter of the driven pulley shaft and number of belts required. **[8]**

b) Obtain an equation for equivalent twisting moment and equivalent bending moment in case of shafts subjected to combined twisting and bending moment. **[8]**

OR

Q4) a) A hollow shaft is supported at the ends in the bearings. The ratio of internal to external diameter is 0.5. The shaft transmits 5kW at 200 rpm through a straight spur gear exactly at mid span of bearings. Find diameter of shaft if pressure angle of gear is 20°, allowable shear stress for shaft material is 45MPa, pitch circle diameter of gear is 150mm and distance between bearings is 400mm. **[9]**

b) Derive the expression for length of an open belt drive. **[7]**

Q5) a) Explain the complete design procedure for journal bearings. **[8]**

b) Explain the term summerfield number. Explain its usage in journal bearing design. **[8]**

OR

Q6) a) Discuss the various materials used in manufacturing of sliding contact bearings. **[8]**

b) List the types of ball bearings. Explain any two in details with neat sketches. **[8]**

SECTION - II

Q7) a) Explain the construction and working of a balanced vane pump with neat sketches. **[8]**

b) Explain the functioning of pressure compensated restrictor type flow control valve. **[8]**

OR

Q8) a) Explain in details with neat sketches showing different positions of three position four way valve. **[8]**

b) Explain the function of intensifier. Explain the function of accumulator and explain different types of accumulators. **[8]**

Q9) a) Explain the (i) traverse and feed (ii) meter in and meter out (iii) counter balance circuits with neat sketches. **[9]**

b) Explain the concept of low mold safety/low closing force and high mold safety/high closing force. **[7]**

OR

Q10)a) Explain with a neat sketch hydraulic circuit for injection part of the injection molding cycle. Explain the valve positions during filling and hold on stages. **[10]**

b) Explain the mold opening and closing operations of injection molding machines using conventional hydraulics. **[6]**

Q11)a) List the different types of heads used in pressure vessels. Explain design calculations for any two. **[9]**

b) What are the methods used for nozzle reinforcement? Explain them in details. **[9]**

OR

Q12)a) Write a note on different types of end closures used in pressure vessels. **[9]**

b) Explain in details the design of pressure vessel with half coil design jacket construction. **[9]**

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Total No. of Questions :12]

SEAT No. :

P2980

[Total No. of Pages :7

[4958] - 246

T. E. (Polymer Engg.)

MATHEMATICAL METHODS FOR POLYMER ENGINEERING

(2008 Pattern) (Semester - II)

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

Instructions to candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I, and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non - programmable electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove that $(E^{½} + E^{-½})(1+\Delta)^{½} = 2 + \Delta$. **[3]**

b) A function $y = f(x)$ is given by the following table. Find $f(0.2)$ by a suitable formula. **[7]**

x	0	1	2	3	4	5	6
$y=f(x)$	176	185	194	203	212	220	229

c) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using Simpson $\frac{1}{3}^{rd}$ rule. **[7]**

OR

P.T.O.

Q2) a) Calculate $\int_{0.5}^{0.7} e^{-x}\sqrt{x}\,dx$ taking 5 ordinates by Simpson's $\frac{1}{3}$ rule. [$h = 0.04$]. **[6]**

b) Find $\frac{dy}{dx}$ given **[6]**

x	0	1	2	3	4
$y(x)$	1	1	15	40	85

c) Using hagrange's interpolation formula, find y (10) from the following table. **[5]**

x :	5	6	9	11
y :	12	13	14	16

Q3) a) Find an approximate value of the root of the equation $x^3 + x - 1 = 0$, near $x = 1$ using the method of false position. **[6]**

b) Solve the following equations by Gauss-seidal method. **[6]**

$8x - 3y + 2z = 20$

$4x - 11y - z = 33$

$6x + 3y + 12z = 35$

c) By the method of least squares find the best fitting straight line to the data given below: **[5]**

x :	5	10	15	20	25
y :	15	19	23	26	30

OR

Q4) a) Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root by iteration method. **[6]**

b) Fit a parabola to the following data. **[6]**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

c) Solve by Gauss-Elimination method, **[5]**

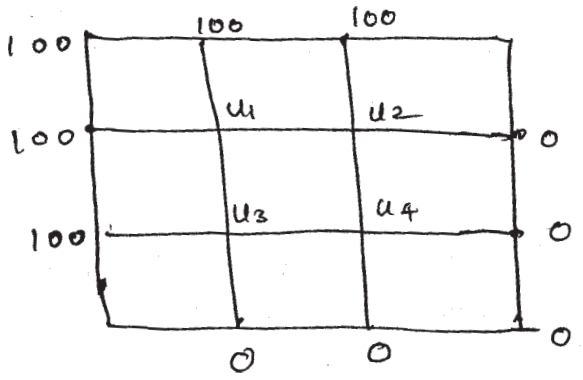
$3x + 4y + 5z = 18$

$2x - y + 8z = 13$

$5x - 2y + 7z = 20$

Q5) a) Use Runge - Kutta method to find y when $x = 1.2$ in steps of 0.1, given that $\frac{dy}{dx} = x^2 + y^2$ and $y(1) = 1.5$ **[8]**

b) Find the solution of the haplace equation $\frac{\partial^2 \mu}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square grid given at the grid points. **[8]**



OR

Q6) a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10\,(x^2 + y^2 + 10)$ over a square mesh with sides $x = 0$, $y = 0$, $x = 3$, $y = 3$ with $u = 0$ on the boundary and mesh length of 1 unit. **[8]**

b) Solve $\frac{dy}{dx} = y + x^2,\ y(0) = 1$ for y at 0.02 and 0.04 using Euler's modified method. **[8]**

SECTION - II

Q7) a) Maximize **[10]**

$$z = 3x_1 + 6x_2 + 2x_3$$

Subject to the constraints

$$3x_1 + 4x_2 + x_3 \le 2$$

$$x_1 + 3x_2 + 2x_3 \le 1$$

and $x_1, x_2, x_3 \ge 0$

use simplex technique

b) Write the dual of the following LPP **[6]**

Maximize $z = x_1 + 2x_2$

Subject to $x_1 + 2x_2 \le 5$

$$4x_1 - 2x_2 \le 9$$

$$x_1 + 4x_2 \le 19$$

$$0x_1 + 2x_2 \le 7$$

and $x_1, x_2 \ge 0$.

OR

Q8) a) Solve the following LPP by using simplex technique **[10]**

Maximize $z = 6x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 8$

$3x_1 + 3x_2 \leq 18$

$x_2 \leq 3$

and $x_1, x_2 \geq 0$.

b) Write the dual of the following LPP. **[6]**

Minimize $z = 4x_1 - 2x_2 + 5x_3$

Subject to $x_1 - x_2 + 2x_3 \leq 5$

$2x_1 - 3x_2 - 4x_3 \leq 1$

$x_2 + 3x_3 \leq 10$

$2x_1 - 3x_3 \leq 2$

and $x_1, x_2, x_3 \geq 0$.

Q9) a) Find the Arithmatic mean and standard deviation of the following frequency distribution. **[6]**

x	5	9	12	15	20	24	30	35	42	49
f	3	6	8	8	9	10	8	7	6	2

b) Obtain regression lines for the following data **[6]**

x	6	2	10	4	8
y	9	11	5	8	7

c) In a Poisson distribution if $p(r = 1) = 2p\ (r = 2)$ find $p\ (r = 3)$ **[5]**

OR

Q10)a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives? **[6]**

b) In a certain examination test, 2000 students appeared in a subject of Mathematics. Average marks obtained were 50% with standard deviation 5%. How many students are expected to obtain more than 60% marks, if marks are distributed normally [$z = 2$, A = 0.4772]. **[5]**

c) Calculate the first four moments about the mean of the following distribution. Calculate β_1 and β_2. **[6]**

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

Q11)a) Show that the sum of two tensors of the same rank and type is also a tensor. **[6]**

b) Determine the conjugate metric tensor in cylindrical coordinates. **[5]**

c) A covariant tensor has components xy^2, yz^2, zx in cartesian coordinates. Find its covariant components in spherical polar coordinates. **[6]**

OR

Q12)a) Determine whether each of the following quantities is a tensor. If so, state whether it is contravariant or covariant and give its rank: **[6]**

i) dx^k

ii) $\dfrac{\partial \phi\left(x^1, x^2, ..., x^N\right)}{\partial x^k}$

b) Prove that **[11]**

i) $[pq, r] = [qp, r]$

ii) $\left\{ \begin{matrix} s \\ p\,q \end{matrix} \right\} = \left\{ \begin{matrix} s \\ q\,p \end{matrix} \right\}$

iii) $[p\,q, r] = g_{rs} \left\{ \begin{matrix} s \\ p\,q \end{matrix} \right\}$

Total No. of Questions :12]

SEAT No. :

P3913

[Total No. of Pages :2

[4958]-247
T.E. (Polymer Engineering)
POLYMER CHEMISTRY-II
(2008 Course) (Semester - II)

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

Instructions to candidates:

1) ***All question are compulsory.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the synthesis of MF resin. **[8]**

b) Enlist the compounding ingredients of PF resin and the role of each ingredient. **[8]**

OR

Q2) a) Explain why silicone polymers are used in speciality applications? **[8]**

b) Write a note on curing agents and reactions involved in UF polymers. **[8]**

Q3) a) Explain the formulation of polyester coating resins **[8]**

b) Give the synthesis of monomers involved in polyesters preparation **[8]**

OR

Q4) a) Discuss crosslinking reactions involved in unsaturated polyester resins. **[8]**

b) Give the properties and applications of vinyl ester resins. **[8]**

Q5) a) Write a note on preparation of epoxy resins with reactions involved in it. **[9]**

b) Explain crosslinking of epoxy resin. Give reactions with various hardeners. **[9]**

OR

P.T.O.

Q6) a) Write a note on various forms of polyurethanes. **[9]**

b) Discuss PU resin manufacture and curing reactions involved in it.. **[9]**

SECTION - II

Q7) a) Differentiate polyamides and polyimides on the basis of properties and structure. **[8]**

b) Give the synthesis of modified polyimides. **[8]**

OR

Q8) a) Give the synthesis of aromatic polyamides. Discuss their properties. **[8]**

b) Differentiate polyesters and polyamides based on structure. **[8]**

Q9) a) Differentiate between PPP and PPO. Enlist properties and applications of both. **[8]**

b) Explain why and how PPS has different properties from PPO. **[8]**

OR

Q10)a) What are membranes? Enlist advantages of polymeric membranes. **[8]**

b) Explain how addition of one ether linkage in PEEK make it different from PEK based on properties **[8]**

Q11)a) Differentiate smectic and nematic phases with suitable diagram. **[9]**

b) What are conducting polymers? Explain synthesis of any one conducting polymer. **[9]**

OR

Q12)a) What is control release drug delivery? How polymers are useful in the same. **[9]**

b) Write a note on polymers in biomedical application. **[9]**

Total No. of Questions :12]

SEAT No. :

P2981

[Total No. of Pages :3

[4958]-248

T.E. (Polymer Engineering)

INSTRUMENTATION AND PROCESS CONTROL

(2008 Course) (Semester - II) (309368)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION-I

Q1) a) Explain the following term in detail: **[9]**

Repeatability, Reproducibility, Hysteresis, Drift, zero drift, Speed of response.

b) Explain the following: **[9]**

Dynamic error, Environmental error, observation error, Instrumental error, Minimization of error.

OR

Q2) a) Discuss the following with one example: **[9]**

Transducer, Signal conditioner and Display element.

b) What do you understand by the term Calibration? **[9]**

Q3) a) Explain with neat diagram, principle, construction, working, merits and demerits of any one instrument used to measure pressure. **[10]**

b) Write short note on Strain Gauge. **[6]**

OR

P.T.O.

Q4) Describe in detail with neat sketch Pyrometers. What is LVDT and explain its construction and working. **[16]**

Q5) Draw the diagram and explain principle, construction, working, advantages and disadvantages of Rotameter. **[16]**

OR

Q6) Explain the importance of viscosity measurement in polymer industry and suggest one suitable method for viscosity. **[16]**

SECTION-II

Q7) Derive the Transfer Function of Second order System. Explain the terms: Transfer Function, Block Diagram. **[18]**

OR

Q8) a) Explain significance of Process control and Differentiate between First order system and second order system. **[9]**

b) Find out the response of same at time = 10, 15, 20, 25, 30 min. A thermometer which is observed to exhibit the first order dynamics with time constant of 15 sec, which is placed in bath at temperature of 50°C and after reaching steady sate, temperature of bath linearly increases with time at 6°C/min. **[9]**

Q9) a) Explain Proportional and Integral Control action. **[8]**

b) If the Characteristics equation for give feedback loop control system is given by $s^3 + 3s^2 + (1+Kc)s + Kc=0$. Determine the value of Gain which causes just Instability and also determine the location of pair of the roots for given control system. **[8]**

OR

Q10)a) Explain the following terms: **[8]**

i) Controller

ii) Manipulated Variable

iii) Controlled variable

iv) Set point

b) Explain with standard block diagram Open loop Transfer Function and closed loop Transfer Function. **[8]**

Q11) Write a note on: **[16]**

a) Control of Polymer Processing,

b) Programmable Logic control.

OR

Q12) Explain the following: **[16]**

a) Cascade Control of Liquid Level in a Tank.

b) Digital Control System.

c) Control Tuning.

EEE

Total No. of Questions : 12]

SEAT No. : ____

P4922

[Total No. of Pages : 3

[4958] - 249
T.E. (Polymer) (Semester - II)
POLYMER PROCESSING OPERATIONS - I
(2008 Pattern)

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

Instructions to the candidates :-

1) ***Answer 3 Questions from section I and 3 Questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the extrusion process and how is it different that injection process. Give few applications where this process is used. **[10]**

b) Explain the working and advantages offered by single as well as twin screw in an extruder. **[8]**

OR

Q2) a) Explain how Drag flow and Pressure flow are occurring during extrusion process. Also explain the feeding mechanism for the extruder. **[10]**

b) Give the advantages offered by Barrier screws as well as Vented screw. **[8]**

Q3) a) Explain the extrusion process for monolayer and multiplayer blown film.**[8]**

b) What is the role of equipments used for sizing, cooling, take off and cutting during extrusion process. **[8]**

OR

Q4) a) Explain the role of Downstream equipment and Auxiliary units for extrusion lines. **[8]**

b) Explain the troubleshooting during extrusion line along with remedies. **[8]**

P.T.O.

Q5) a) Explain the molding process and stages involved with PVT diagram in injection molding. **[8]**

b) Give list of trouble shooting in injection molding and the remedies.[8]

OR

Q6) a) How does Orientation takes place during injection moulding and What are it's effects. Give the characteristics of typical materials used for injection molding. **[8]**

b) Explain close loop and open loop machines for injection molding **[8]**

SECTION - II

Q7) a) Give the working of Gas assist injection molding. **[9]**

b) Explain injection molding of DMC and also write a note on reaction injection molding. **[9]**

OR

Q8) a) Explain when and how to do dip coating and slush moulding. **[9]**

b) Explain process used by Two color two component injection molding machine. **[9]**

Q9) a) Give the Basic working principle with molding cycle and molding materials used for compression molding. Also explain effect of bulk factor, Flow properties and cure time on compression molding. **[8]**

b) Explain any two types of compression moulds. **[8]**

OR

Q10) a) Give list of defects & remedy during compression molding. **[8]**

b) Explain DMC and SMC process. **[8]**

Q11) a) Explain transfer molding process for integral pot and auxiliary ram. **[8]**

b) Give the process parameters and their effect on product quality during transfer molding. **[8]**

OR

Q12) a) Give the need for transfer molding and how is it different than injection and compression molding. **[8]**

b) Give the list of molding defects and applications by transfer molding. **[8]**

Total No. of Questions : 12]

SEAT No. :

P4923

[Total No. of Pages : 3

[4958] - 250
T.E. (Polymer)
POLYMER RHEOLOGY
(2008 Pattern) (Semester - II)

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

Instructions to the candidates :-

1) ***Answer 3 Questions from section I and 3 Questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Give the list of terms that shall explain Rheology. Explain time dependent fluids with examples. **[10]**

b) Explain and derive Continually equation. **[8]**

OR

Q2) a) Explain time independent fluids with examples. **[8]**

b) Explain Normal stress difference, Weissenberg's effect and melt fracture. **[10]**

Q3) a) Explain the terms Stress relaxation, relaxation modulus, creep compliance. **[8]**

b) Explain WLF equation and its significance. **[8]**

OR

Q4) a) Explain the terms dynamic modulus, dynamic compliance,shear viscosity and dynamic viscosity. **[8]**

b) Derive and explain Maxwell model for creep and stress relaxation conditions. **[8]**

P.T.O.

Q5) a) Give the effect of crosslinking, crystallinity and branching. **[8]**

b) Give the effect of copolymerization, types of fillers and plasticizers on viscosity. **[8]**

OR

Q6) a) Give the effect of pressure and temperature on viscosity and how is this effect seen during processing. **[8]**

b) Explain effect of molecular weight and molecular weight distribution on viscosity and thus on processing. **[8]**

SECTION - II

Q7) a) Derive a viscosity equation for laminar flow through circular c/s. **[9]**

b) Write a note on Ryan Johnson criterion and its applications. **[9]**

OR

Q8) a) Derive a viscosity equation for laminar flow through slit c/s. **[9]**

b) What leads to pressure drop at die entry . Also give analysis for flow in wedge shaped die. **[9]**

Q9) a) Explain Cone and plate rheometer and derive the equation for viscosity. **[8]**

b) Explain the working of capillary rheometer to find viscosity and also give equations for shear stress and shear rate. **[8]**

OR

Q10)a) Give the machine parameters that are to be fitted into the equations for capillary rheometer and so give the modified equation to find viscosity. **[8]**

b) Give the working and application for concentric rotating disk rheometer. **[8]**

Q11) a) Explain how rheology principles are used during injection molding. **[8]**

b) Explain compression and transfer molding for thermosets and tell how rheology plays a crucial role. **[8]**

OR

Q12) a) Explain role of viscosity and orientation during Blown film extrusion. **[8]**

b) During extrusion of pipe and sheet explain the role of viscosity of polymeric material. **[8]**

Total No. of Questions :12]

SEAT No. :

P2982

[Total No. of Pages :5

[4958] - 251

T.E. (Production)

KINEMATICS OF MANUFACTURING MACHINES (311082)

(Semester - I) (2008 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain kinematic analysis of any thread making machine. **[6]**

b) Synthesize a four bar mechanism by using three precision points to generate a function $y = 2x^2 - x$ for the range $1 \leq x \leq 4$. Assuming 30° starting position and 120° finishing position for input link and 90° starting position and 180° finishing position for the output link. Assume fixed link length is 15 cm. **[10]**

OR

Q2) a) Explain with neat sketch the kinematic analysis of gear hobbing machine. **[8]**

b) Design a slider crank mechanism to co-ordinate three positions of input and output links as follows:- **[8]**

$\theta_1 = 45°$ $\theta_2 = 60°$ $\theta_3 = 75°$

$S_1 = 100$ mm $S_2 = 80$ mm $S_3 = 50$ mm

P.T.O.

Q3) a) Derive an equation for minimum number of teeth on pinion to avoid interference. **[8]**

b) Two mating involute spur gears of 20° pressure angle have gear ratio 3. The number of teeth on pinion is 30 and its speed 300 rpm. The module of gear teeth is 12 mm. If addendum on each wheel is such that the path of approach and path of recess on each side are $2/3^{rd}$ of the maximum possible length each,

Assume pinion to be driver. Calculate:

i) Addendum for pinion and gear wheel.

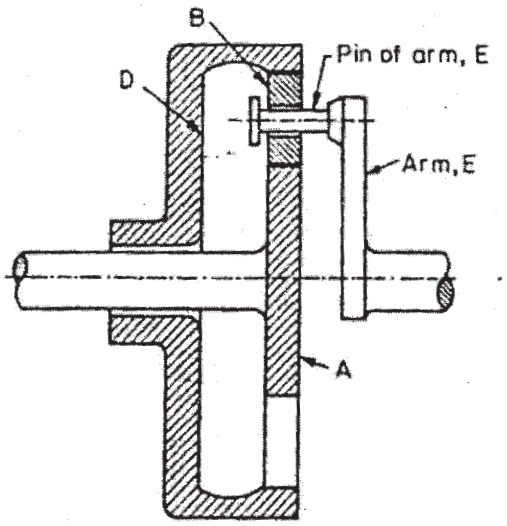
ii) Length of arc of contact.

iii) Maximum sliding velocity during approach and recess. **[10]**

OR

Q4) a) Explain the interference and undercutting in involute gears. **[8]**

b) The sun and planet gear of an epicyclic gear are shown in below given figure. The annular wheel D has 120 internal teeth, the sun gear has 60 teeth and planet gear B has 30 external teeth. The gear B meshes with gear D and gear A. The gear B is carried on the arm E, which rotate about the centre of annular gear D. If the dear D is fixed and arm rotate 20 rpm anticlockwise then find speed of gear A and B. **[10]**



Q5) a) Find relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and kinetic energy of the flywheel at mean speed. **[8]**

b) The turning movement diagram for multi-cylinder engine has drawn to a scale of 1mm = 325 Nm vertically and 1 mm = 3° horizontally. The areas above and below the mean torque line are –26, +378, –256, + 306, –302, +244, –380, +261 and –225 mm^2. The engine is running at mean speed of 600 rpm. The total fluctuation of speed is not to exceed ± 1.8% of mean speed. If radius of gyration of flywheel is 0.7 m, find mass of flywheel. **[8]**

OR

Q6) a) Explain turning moment diagram for 4 stroke single cylinder IC engine.**[6]**

b) A machine is required to punch 5 holes of 40 mm diameter in a plate of 30 mm thick per minute. The work required is 700 Nm per square cm of sheared area. The punch has stroke of 10 cm.The maximum peripheral speed of the flywheel at its radius of gyration is 30 m/sec. Find the mass of flywheel such that the speed does not fall below 28 m/sec at its radius of gyration and calculate power of motor for punching operation. **[10]**

SECTION - II

Q7) a) Explain different types of followers with suitable sketches. **[6]**

b) Following data relate to a cam profile, in which the knife edge follower moves with SHM during the lift and returning it with uniform acceleration and deceleration. **[10]**

The minimum cam radius = 25 mm.

Lift of roller follower = 35 mm

Offset of follower axis = 10 mm toward right

Angle of ascent = 60°

Angle of dwell between ascent and descent = 40°

Angle of descent = 90°

Angle of remaining dwell = 170°

Cam speed = 150 rpm. Draw cam profile.

OR

Q8) a) Differentiate between: **[6]**

i) Base circle and prime circle

ii) Pitch point and trace point

b) The following data refers a cam profile used to lift a knife edge follower through 45 mm. The follower gets lifted to its maximum position for 90° of cam rotation. Then it remains in lifted position for the next 60° of cam rotation. Remaining is a dwell period. Follower is required to be lifted with uniform velocity whereas during return, it is expected to follow uniform acceleration and retardation. Minimum cam radius is 37 mm and follower axis is offset by 12 mm. Draw cam profile. **[10]**

Q9) a) Discuss how a single revolving mass is balanced by two masses revolving in different planes. **[8]**

b) Four masses m_1, m_2, m_3 and m_4 are 225 kg, 325 kg, 265 kg and 285 kg respectively. The corresponding radii of rotation are 0.3 m, 0.25 m, 0.35 m and 0.4 m respectively and the angles between successive masses are 50°, 80° and 140°. Find position and magnitude of balance mass required, if its radius of rotation is 0.3 m. **[8]**

OR

Q10)a) Explain direct and reverse crank method. **[6]**

b) Four masses m_1, m_2, m_3 and m_4 are 100 kg, 175 kg, 200 kg and 25 kg respectively are fixed to the cranks of 200 mm radius and revolve in the planes 1, 2, 3 and 4. The angular positions of the cranks is planes 2, 3 and 4 with respect to crank in plane 1 are 75°, 135° and 200° taken in same sense. The distances of the planes 2, 3 and 4 from plane 1 are 0.6 m, 1.86 m and 2.4 m respectively. Determine position and magnitude of the balance masses at radius of 0.6 m in plane L and M located at the middle of planes 1 and 2 and 3 and 4 respectively. **[10]**

Q11)a) What do you mean by vibration damping? Discuss free vibration with viscous damping. **[8]**

b) A flywheel of mass 10 kg and radius of gyration 0.3 m makes torsional vibrations under a torsion spring of stiffness 5 Nm/rad. A viscous damper fitted and it is found that the amplitude of vibration is reduced by a factor of 100 over any two complete cycles. Find:

i) Damping factor

ii) Damping coefficient

iii) Periodic time of damped oscillations **[10]**

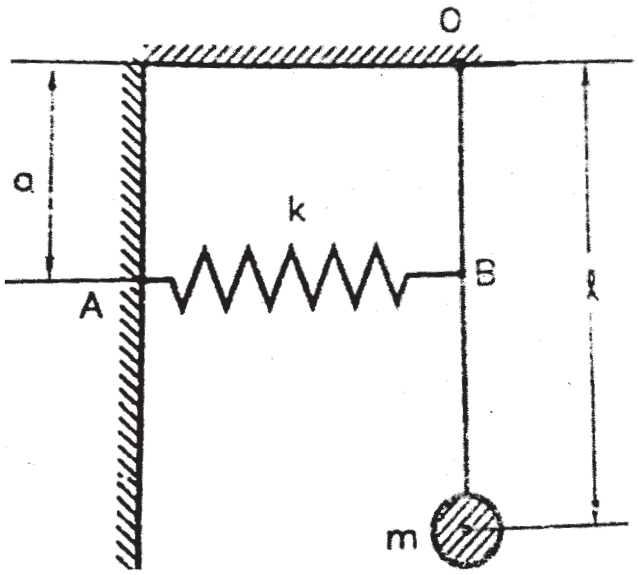
OR

Q12)a) Determine equivalent stiffness when:

i) Springs are in series

ii) Springs are in parallel **[8]**

b) Determine the natural frequency of vibration for the system shown in below given figure. **[10]**



Total No. of Questions :12]

SEAT No. :

P2983

[Total No. of Pages :5

[4958]-253
T.E. (Production)
PRODUCTION MANAGEMENT
(2008 Pattern) (Semester - I) (311084)

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

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, and Q11 or Q12.***
5) ***Use of electronic pocket Calculator is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) List chronological history of Production and Operations management. **[9]**

b) Explain the relationship of production department with Finance, Purchasing and Marketing department. **[9]**

OR

Q2) a) Discuss the scope and objectives of production management. **[9]**

b) What are the different types of Production Systems? Compare these systems. **[9]**

Q3) a) Explain the concept of Product Design and Product Cost giving suitable example. **[8]**

b) Explain the concept of Concurrent Engineering. **[8]**

OR

P.T.O.

Q4) a) With the help of figure explain stages in Life Cycle of Product. **[8]**

b) Define Production Planning and Control (PPC). state the objectives of PPC. **[8]**

Q5) a) Explain the need of computerized layout planning. Explain in brief any one type of computerized layout planning. **[8]**

b) A company is engaged in the assembly of a Machine on a continuously moving conveyor, 24 Machine assemblies are required per shift of 8 hours. The other information is given below regarding assembly steps and precedence relationship. **[8]**

Operation Number	Immediate Precedence Task	Duration (Min)
1	---	5
2	1	3
3	1	7
4	1	5
5	1	6
6	3,7	3
7	2	4
8	4,5	6
9	6	12
10	7,8,9	9

i) Draw the precedence diagram.

ii) What is the desired cycle time?

iii) What is the theoretical number of work stations?

iv) What is the efficiency and balance delay of the solution obtained?

OR

Q6) a) Define Plant Layout. Explain the objectives of good plant layout. **[8]**

b) Explain principles of material handling. **[8]**

SECTION - II

Q7) a) Define sales forecasting. Explain in detail Delphi technique and Seasonal forecasting giving suitable example. **[9]**

b) The demand for a product is given below. The forecast for the August was 350 units. Forecast the demand for the month of November taking the value of α=0.4. **[9]**

Month	August	September	October
Demand	310	370	420

OR

Q8) a) Explain with the help of figure various demand patterns used in Sales Forecasting. **[9]**

b) Find the coefficient of correlation between cost of production and the sales price for which data is as: **[9]**

Period	1	2	3	4	5	6	7	8
Cost	100	118	130	142	160	175	165	180

i) Calculate the demand for 9 the month using simple Moving Average Method for the moving average period of 3 months.

ii) Calculate MFE (Mean Forecast Error).

Q9) a) What are the different priority rules? Give suitable example for each. **[8]**

b) There are seven jobs, each of which has to go through the machines A and B in the order of BAC. Processing times in hours are given as:

Job	1	2	3	4	5	6
Machine A	2	7	6	7	8	5
Machine B	7	8	10	7	5	10
Machine C	9	11	11	10	13	8

[8]

Find the total elapsed time and idle time.

OR

Q10)a) Define the following: **[8]**

i) Forward and Backward Scheduling

ii) Finite Loading

iii) Critical Ratio Scheduling

b) A project consists of eight activities, Precedence relation and activity times are given. Draw the network diagram and compute the critical path for the activities. **[8]**

Activity	Immediate Predecessor	Activity Time (Week)
A	--	8
B	--	12
C	--	16
D	C	8
E	A,B	16
F	E,D	8
G	D	6
H	F,G	6

Q11) Write short note on (any two): **[16]**

a) Just – In – Time

b) Concept of World class manufacturing

c) Concept of Waste Management

d) Energy audit

OR

Q12) Write short note on (any two): **[16]**

a) Lean Manufacturing.

b) Advanced Manufacturing Philosophies.

c) Computerized Production Management.

d) Energy Conservation.

x x x

Total No. of Questions : 12]

SEAT No. :

P2984

[Total No. of Pages : 4

[4958]-254

T.E.(Production Engineering)

CUTTING TOOL ENGINEERING

(2008 Course) (Semester-I) (311085)

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

Instructions to the candidates:

1) ***Solve Q1 or 2,Q3or 4, Q5 or 6 , Q 7 or 8, Q 9 or 10, Q11 or 12.***
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 logarithmic tables,slide rules,Mollier charts,electronic pocket calculator and steam table is allowed.***

SECTION-I

Q1) a) Explain shear and chip flow velocity and prove that $V_s = (V_c \cos\alpha) / \cos(\Phi - \alpha)$ Where, V_s = shear velocity, V_c = cutting velocity, α = rake angle, Φ =shear plane angle. **[10]**

b) In an orthogonal cutting, the cutting velocity is 30m/min and chip velocity is 12m/min. the rake angle of tool is 10^o, cutting force is 800 N and feed force is 350 N,cutting chip thickness is 0.5mm, uncut chip thickness is 0.2 mm.calculate **[10]**

i) Chip thickness ratio

ii) Shear plane angle,

iii) Shear force,

iv) Coefficient of friction,

v) Shear velocity

OR

P.T.O.

Q2) a) A tubing of 50mm outside diameter is turned on a lathe at a cutting speed of 20 m/min and feed 0.5 mm/rev, the rake angle of tool is 18 degree,The cutting force is 700N and feed force 250N, the length of continuous chip in one revolution is 50mm- calculate -chip thickness ratio,chip thickness, shear plane angle,coefficient of friction,velocity of chip along face, power for cutting. **[10]**

b) Draw Merchant circle diagram and prove that, $\mu = (F_c \tan\alpha + F_t)/ (F_c - F_t \tan\alpha)$Where, μ= coefficient of friction, F_c= cutting force,F_t= Thrust force, α = Rake angle **[10]**

Q3) a) What is meant by negative rake tool? Distinguish between solid tool and tipped cutting tool? Explain why cemented carbide tool are provided with negative rake angle in machining high strength and hard materials.**[7]**

b) Discuss types of cutting fluids and their selection **[8]**

OR

Q4) a) Explain tool geometry in ASA style. **[7]**

b) What is the use of chip breakers? Sketch various types of chip breakers and explain how a chip breakers breaks up a chip **[8]**

Q5) a) Explain machinability machinability rating various machinability criterias.**[5]**

b) Write a short note on-

i) tool wear and factors affecting on tool wear,

ii) Economics of tooling **[10]**

OR

Q6) a) Find out optimum cutting speed and corresponding tool life for minimum cost for machining of mild steel work piece with HSS tool from following data. When the cutting speed was 30 m/min the tool life was 190 minutes and when the speed was increased to 40m/min, the tool life was dropped to 60 minutes. Operating cost is 25 paise/min, Tool cost/cutting edge/ tool failure is Rs.2 and tool changing time= 1.5min. **[8]**

b) Explain types of Chip breakers with suitable sketches. **[7]**

SECTION-II

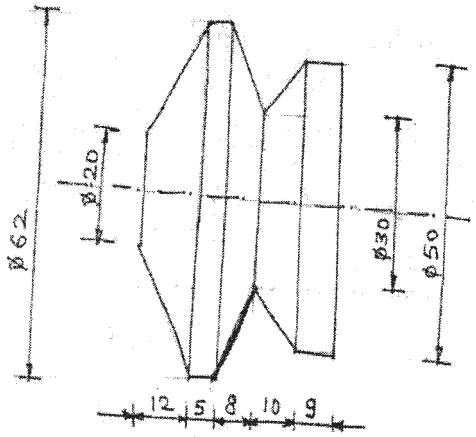
Q7) a) Calculate the cross section of a straight shank single point turning tool made of HSS. Data given are, allowable bending stress of HSS=200MPa, Young's modulus of HSS=2×10^5MPa, Main cutting force=1100,Permissible deflection of tool tip=0.05mm. Also draw the tool geometry of the tool by assuming angles **[8]**

b) Explain the various design aspect of a drill tool **[7]**

OR

Q8) a) The hole size prior to broaching in an alloy steel component is 32.25 mm with tolerance +0.05 and -0.00mm.The required finish broached size is 32.75mm with tolerance +0.01 and –0.00. If the length of bore is 35mm and the cutting speed is 0.15 m/s. Determine the power for broaching and design the broach. Assume,s=.05mm, C=45N/mm^2 and B=1.30 **[8]**

b) Design flat form tool for a given job by graphical method when, rake angle =20° and relief angle=30°. Raw material –Aluminum. **[7]**



Q9) a) What is indexing jig? Describe various indexing devices commonly used with suitable sketch. **[8]**

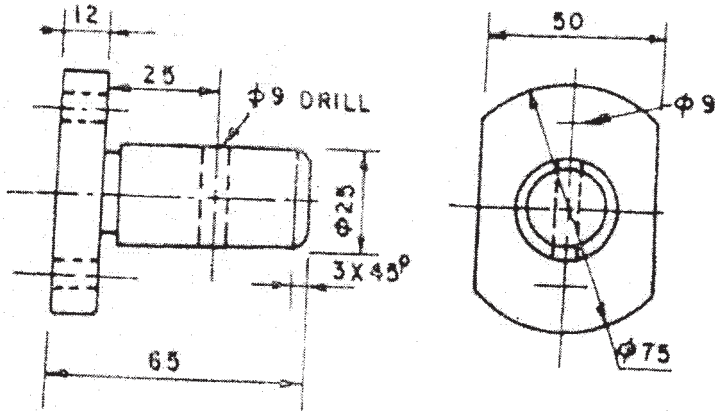
b) Explain 3-2-1 principle of location with suitable sketches. **[7]**

OR

Q10) a) Explain solid clamp and clamp with adjustable heel pin with suitable sketches. **[8]**

b) Explain redundant location with suitable sketches. **[7]**

Q11) Design a jig for a given job for hole size of diameter 9 mm and perpendicular to axis of job. Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing **[20]**



OR

Q12) Design a fixture for a component shown in fig.no1 Design a fixture for a given job to mill 6×6 mm slots. Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing **[20]**

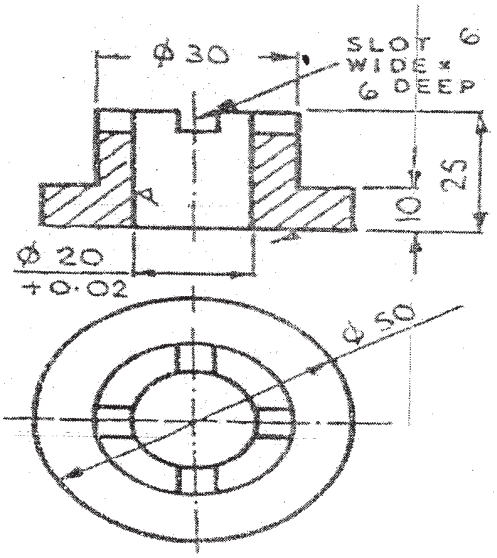


Fig.no.1

Total No. of Questions :12]

SEAT No. :

P2985

[Total No. of Pages :3

[4958] - 255

T.E. (Production)

MATERIAL FORMING

(2008 Course) (Semester - I) (311083)

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

Instructions to the candidates:

1) ***Answer three questions from section - I and Three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are the assumptions in material forming? What are the different methods used for the analysis of forming processes. **[8]**

b) Explain various yield criteria. **[8]**

OR

Q2) a) Derive an equation for the work done in elastic and plastic deformation. **[8]**

b) Explain and differentiate between hot forming and cold forming. **[8]**

Q3) a) Explain in detail how the stock size is calculated in impression die forging. **[8]**

b) Explain briefly the following with neat sketch. **[10]**

i) Shot blasting and tumbling process.

ii) Board drop hammer.

OR

P.T.O.

Q4) Write short note:

a) Forging design parameters **[6]**

b) Upsetting **[6]**

c) Impression die forging **[6]**

Q5) Derive an equation for the drawing stress (σ_d) in tube drawing operation using fixed tapered plug. **[16]**

OR

Q6) a) Explain with neat sketch the various forces acting on a tube during tube drawing operation using floating tapered plug. **[5]**

b) Show that the maximum permissible reduction in strip drawing using tapered dies is 60%. Assume coefficient of friction, $\mu = 0.05$ and semi die angle $\alpha = 15°$. **[6]**

c) Explain construction and working of Multi - stage wire drawing machine and multistage wire drawing machine. Also state its advantage and limitations. **[5]**

SECTION - II

Q7) a) Explain three high rolling mills with neat sketch. **[4]**

b) Explain four high rolling mills with neat sketch its advantages. **[4]**

c) Explain the breakdown pass in rolling with its principal series. [sequence] **[8]**

OR

Q8) a) Explain mill spring, mill modulus, ragging, overshooting and hunting in rolling. **[8]**

b) Explain AGC. Discuss the methods of AGC. **[8]**

Q9) a) Derive and equation for work done in extrusion. **[8]**

b) Explain and differentiate between forward hot & backward hot extrusion. **[8]**

OR

Q10)a) Explain the hydrostatic extrusion process with suitable sketch. **[6]**

b) An aluminum billet of 50 mm diameter and 1 m long is extruded to the final shape as shown in Figure. **[10]**

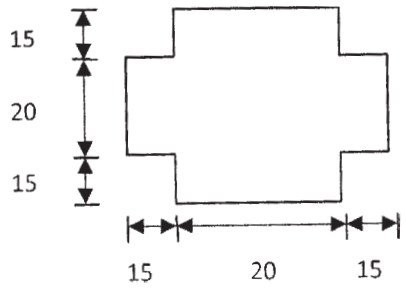
Explain and Calculate the following:

i) Extrusion ratio

ii) CCD

iii) Shape factor

iv) Work done



Q11)a) Define spinning. State the applications of metal spinning. **[8]**

b) Explain the importance of field shaper and drivers in electro - magnetic forming. **[5]**

c) Distinguish between explosive forming and electro-hydraulic forming. **[5]**

OR

Q12)Write short note on:

a) Manual spinning process. **[6]**

b) Stretch forming. **[6]**

c) Types of coils used in EMF with proper sketch state their applications. **[6]**

Total No. of Questions :12]

SEAT No. :

P2986

[Total No. of Pages :4

[4958] - 256
T. E. (Production)
TOOL DESIGN
(2008 Course) (311088) (Semester - II)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Design a blanking die for the component shown in figure 1.

a) Draw strip layout and find percentage utilisation of the strip. **[6]**

b) Find cutting force and press tonnage. **[4]**

c) Design die block and punch. **[6]**

Given: Strip size = 2440mm×1220mm, Thickness of strip = 1.5 mm, Shear strength of the material = 200MPa, % penetration = 70%.

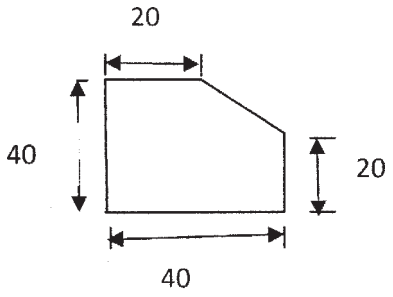


Figure 1

OR

P.T.O.

Q2) a) Calculate centre of pressure for the component shown in figure1. **[8]**

b) Explain various factors to be considered while laying out the sheet metal. **[8]**

Q3) Design a Drawing die for the component as shown in figure 2.

a) Calculate blank size by area method. **[6]**

b) Calculate number of draws, cup diameter and height in each draw. **[6]**

c) Determine press capacity. **[4]**

(Assume stock thickness = 1 mm, yield strength of material = 420 N/ mm^2).

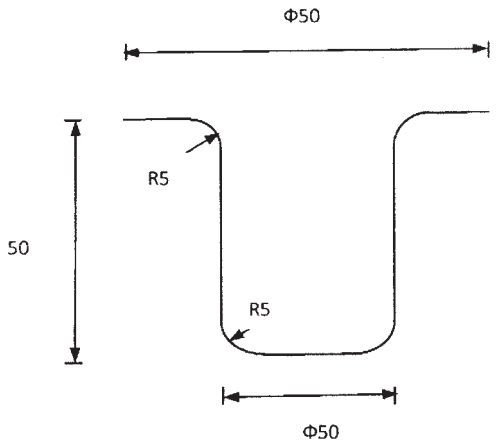


Figure 2

OR

Q4) a) Calculate blank size required to form a cup (figure 2) using graphical method. **[8]**

b) Explain various methods of bending. **[8]**

Q5) Design a complete progressive die for a component having circular blank of size ϕ60mm with central square hole of size 10mm × 10mm.

Given: Strip size = 2440mm × 1220mm, Thickness of strip = 1.5 mm, Shear strength of the material = 200MPa,% penetration=70%. **[18]**

OR

Q6) Design a compound die for the component having circular blank of size ϕ60mm and mm with central square hole of size 10mm×10mm.

Given: Strip size = 2440mm × 1220mm, Thickness of strip = 1.5 mm, Shear strength of the material = 200MPa,% penetration=70%. **[18]**

SECTION - II

Q7) a) Explain the steps to determine stock size in drop forging operation. **[8]**

b) Explain Vertical counter blow hammer with neat sketch. **[8]**

OR

Q8) a) Explain board drop hammer with neat sketch. **[8]**

b) Explain fullering and blocking impression in forging process. **[8]**

Q9) a) Explain injection molding terinology for multi-cavity mold with neat sketch. **[8]**

b) Explain the blow molding process with neat sketch. **[8]**

OR

Q10)a) Explain the rotational molding process with neat sketch. **[8]**

b) Explain types of cavity and core inserts with neat sketch. **[8]**

Q11)a) Derive an expression to determine the most economical number of cavities. **[9]**

b) Explain with suitable example the pin ejection method used in injection molding. Also state its merits and demerits. **[9]**

OR

Q12)Explain the following system required to design injection mold.

a) Feed system design. **[9]**

b) Cooling system design. **[9]**

Total No. of Questions : 11]

SEAT No. :

P2795

[Total No. of Pages : 4

[4958]-257

T.E.(Production & Industrial Engg.)

INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE

(2008 Pattern) (Semester-II)(311089)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Define Industrial Engineering. Explain in detail the contribution of F.W. Taylor and Gantt in the development of Industrial Engineering. **[10]**

b) Explain how the bad design of component increases total work content. **[8]**

OR

Q2) a) What are the tools and techniques of Industrial Engineering? Explain in brief. **[10]**

b) What are the functions of Industrial Engineering? **[8]**

Q3) a) Explain in short the economic, technical and human considerations in selecting the job for method study. **[8]**

b) Explain in brief the steps involved in the method study. **[8]**

OR

Q4) a) Explain with neat sketch standard five symbols used in method study for recording the activities. **[8]**

b) Explain with example flow process chart and SIMO charts used in method study **[8]**

Q5) a) What are the types of elements in time study? What are the reasons for breaking the job into elements? **[8]**

b) Explain with neat sketch the equipments used for doing the time study. **[8]**

OR

P.T.O.

Q6) a) What is PMTS in time study? What are the factors to be considered while doing time study? **[8]**

b) Explain in detail the allowances used in time study. **[8]**

SECTION-II

Q7) a) What do you know by cost of quality and value of quality? How to balance them? **[8]**

b) A machine is working to a specification of 12.58 ± 0.05 mm. A study of 50 consecutive pieces shows the following measurements: **[8]**

1	2	3	4	5	6	7	8	9	10
12.54	12.58	12.61	12.57	12.57	12.58	12.60	12.65	12.60	12.65
12.58	12.57	12.60	12.61	12.60	12.59	12.62	12.57	12.59	12.61
12.62	12.60	12.64	12.56	12.62	12.59	12.61	12.57	12.60	12.60
12.56	12.60	12.58	12.59	12.61	12.56	12.67	12.56	12.63	12.62
12.59	12.61	12.64	12.59	12.58	12.57	12.60	12.61	12.56	12.62

i) Determine the process capability.

ii) Determine $\bar{\bar{X}}$ and R control limits.

iii) State whether the machine is capable of meeting the tolerances?

iv) Calculate the % defective, if any

v) Suggest the possible ways by which the percent defective can be reduced.

Assume: a) Normal distribution

b) d_2 for sub-group size 5 is 2.326

OR

Q8) a) Explain the following as applied to quality control: **[8]**

i) Appraisal Cost

ii) Prevention Cost

iii) Failure Cost

iv) Optimum Cost

b) In a manufacturing process, the number of defectives found in the inspection of 15 lots of 400 items each are given below:. **[8]**

Lot no.	No.of defectives	Lot no.	No. of defectives
1	2	9	18
2	5	10	8
3	0	11	6
4	14	12	0
5	3	13	3
6	0	14	0
7	1	15	6
8	0		

i) Determine the trial control limits for np chart and state whether the process is in control.

ii) What will be new value of mean fraction defective if some obvious points outside control limits are eliminated. What will be the corresponding upper and lower control limits and examine whether the process is still in control or not.

Q9) a) What is definition of quality in Total quality management? Discuss in detail Deming's and Juran approaches **[10]**

b) Explain concept of six Sigma with appropriate manufacturing example.**[6]**

OR

Q10) a) What do you mean by term Reliability? **[4]**

b) What is Design of experiments? What are objectives for performing design of experiment? **[6]**

c) Explain with neat sketch cause and effect diagram used in quality assurance system. **[6]**

Q11) Write short note on(any three) **[18]**

a) Different ISO standards.

b) Total Productive Maintenance(TPM)

c) Process Capability & Process capability index

d) Operating Characteristic Curve(OC)

e) Pareto Analysis & Quality circle.

Total No. of Questions : 12]

SEAT No. :

P4924

[Total No. of Pages : 3

[4958] - 258
T.E. (Production Engineering)
MACHINE TOOL ENGINEERING
(2008 Pattern)

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

Instructions to the candidates :-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***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, and Q.11 or Q.12.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design and draw cam profile for the component shown in figure below. also workout the following requirements. **[18]**

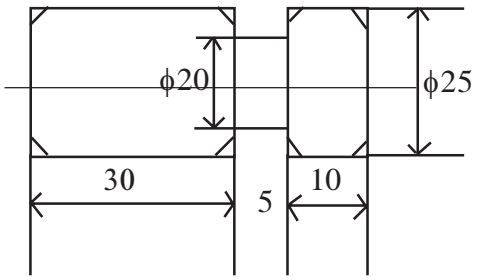
a) Sequence of operation

b) Table for cam angle and cycle time,

c) Cam profile for turret operation

Data given :

Operation	Speed	Feed
Turning	25M/min	0.2 mm/rev.
Grooving	12M/min	0.1 mm/rev.



All dimensions are in mm.

OR

P.T.O.

Q2) a) Explain automated production line. **[6]**

b) List the procedure for drawing cams for turret type automat. **[6]**

c) Explain with figure rotary type transfer machine. **[6]**

Q3) a) Explain Positioning system in Computer Numerical Controlled (CNC) machining. **[8]**

b) Explain difference between NC, CNC & DNC. **[8]**

OR

Q4) a) Explain open loop system and closed loop system of numerical control with suitable diagram. **[8]**

b) Write note on Machining Centre and Turning Centre. **[8]**

Q5) a) Explain principles of material handling. **[8]**

b) Write short note on Automated Guided Vehicle System (AGVS). **[8]**

OR

Q6) a) Explain with neat sketch Machine Vision System. **[8]**

b) Write short note on Automated Storage and Retrieval System (AS/RS). **[8]**

SECTION - II

Q7) a) Explain with neat diagram Electric Discharge Machine (EDM) with RC circuit. **[8]**

b) Write short note on Electro chemical machining (ECM) with various reactions those will take place on anode and cathode. **[8]**

OR

Q8) a) Explain the principle of working WJM. **[8]**

b) Explain working principle of Plasma Arc Machining with neat sketch. **[8]**

Q9) a) Explain with neat diagram Adaptive Control System in CNC machine. **[8]**

b) Write short on Reliability analysis of machine tool. **[8]**

OR

Q10) a) Explain various factors considered while designing the foundation of machine tool. Explain the method of vibration isolation. **[8]**

b) Explain maintenance policy, procedure adopted for Computer Numerical Controlled machine tool. **[8]**

Q11) a) Explain schematically the set up of a hobbing machine for cutting a spur gear. **[9]**

b) Why it is necessary to use Gear finishing operation? Explain any one gear finishing process. **[9]**

OR

Q12) a) Describe the working principle of Gear shaper machine with suitable example. **[9]**

b) Explain helical gear machining by using left hand / right hand hob.[9]

Total No. of Questions :12]

SEAT No. :

P2987

[Total No. of Pages :5

[4958]-259

T.E. (Production) (Production S/W)

NUMERICAL TECHNIQUES AND DATABASE

(2008 Course) (311090) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessry.***

SECTION-I

UNIT - I

Q1) a) What are the advantages and limitations of database processing? **[5]**

b) Explain the entity-relationship model with a suitable example? **[5]**

c) Explain the various components of DBMS with a neat sketch? **[6]**

OR

Q2) a) What is a data constraint? Explain column level and table level constraints with an example? **[7]**

b) Explain the following in brief: **[9]**

i) First order normalization

ii) Relational database management system

iii) Procedural and Non procedural languages

P.T.O.

UNIT - II

Q3) a) Explain with an example the primary key and foreign key concepts in databases? **[6]**

b) Create a table 'emp' with the following columns by assuming suitable data type and size with correct syntax in SQL. **[4]**

E_id, Ename, Address, City, State, Salary, Age, Hire_date.

c) Give an expression in SQL to solve each of the following queries: **[6]**

i) Find the names of all employees whose name starts with 'L'.

ii) List all the employees name and salary whose age is more than 5 years.

iii) Select the employees whose salary is between Rs.20,000 and Rs.60,000.

OR

Q4) a) Explain the use of compound conditions AND, OR, Joining in SQL programming with an example? **[6]**

b) Explain the following with reference to SQL programming: **[10]**

i) Principles of NULL value

ii) Grouping data from tables

iii) Any four aggregate functions

UNIT - III

Q5) a) Define electronic commerce. Explain how it works? List the consumer's benefits of electronic commerce? **[9]**

b) What is ERP? Explain ERP with respect to production and operations management? **[9]**

OR

Q6) a) Explain the following terms: **[8]**

i) Data

ii) Information

iii) Knowledge

iv) Artificial Intelligence

b) Explain in brief the applications of IT in the following areas: **[10]**

i) Materials requirement planning

ii) Project management

SECTION-II

UNIT - IV

Q7) a) Write a C program to determine the area of a triangle using the formula area $= \sqrt{s(s-a)(s-b)(s-c)}$, where $S = \frac{a+b+c}{2}$. **[6]**

b) Compute the percentage of error in the time period $T = 2.\Pi.\sqrt{\frac{1}{g}}$ for l = 1m, if the error in the measurement of l is 0.01. **[5]**

c) Find a real root of $e^x = 3.x$ by bisection method. **[5]**

OR

Q8) a) What do you mean by truncation error. Find the truncation error for e^x at x = 1/5 if first three terms are retained in expansion.

Take $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + ..., -\infty < x < \infty$. **[6]**

b) Given a circle $x^2 + y^2 = c$, write a C program to determine whether a point (x, y) lies inside the circle, on the circle or out side the circle. **[5]**

c) Perform 4 iterations of the Gauss-Seidal method for finding the solution of the linear system of equations: Assume the initial approximation as $x_1 = 0.6$, $x_2 = 0.2$ and $x_3 = 0.5$. **[5]**

$$4x_1 - 2x_2 + x_3 = 4$$
$$x_1 + 2x_2 + x_3 = 0.75$$
$$3x_1 - 3x_2 + 5x_3 = 5.5$$

UNIT - V

Q9) a) Fit a second degree parabola to the following data taking y as dependent variable: **[8]**

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

b) The following table gives the marks secured by 100 students in the Numerical Analysis subject. **[10]**

Range of marks:	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students:	25	35	22	11	7

Use Newton's forward difference interpolation formula to find:

i) Number of students who got more than 55 marks.

ii) Number of students who secured marks in the range from 36 to 45.

OR

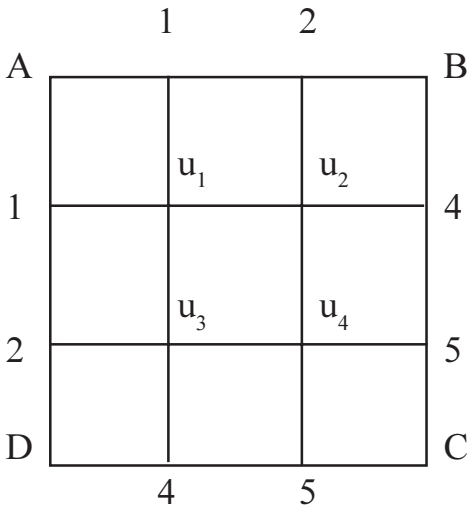
Q10)a) Draw a flow chart and write an algorithm for solving the problem of interpolation using Newton forward difference method? **[10]**

b) Compute $f(27)$ from the following data using Lagrange's interpolation formula: **[8]**

x :	14	17	31	35
$f(x)$:	68.7	64.0	44.0	39.1

UNIT -V I

Q11)a) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with two shown boundary values. Iterate until the maximum difference between successive values at any point is less than 0.001. **[8]**



b) Given $dy/dx = y - x$, $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ correct to four decimal places using Runge – Kutta method. **[8]**

OR

Q12)a) Solve the differential equation $d^4y/dx^4 - 16y = x$ for $y(0.25)$, $y(0.5)$ and $y(0.75)$ using finite difference method, given that $y(0) = 0, y'' = 0, y(1) = 0$ and $y'(1) = 0$. **[8]**

b) You want to buy a new car and have identified four models you like: a VW Golf, an Opel Astra, a Ford Focus and a Toyota Corolla. The dicision will be made according to price, petrol consumption, and power. You prefer a cheap and powerful car with low petrol consumption". Explain the concept of "*optimization*" by assuming suitable data for the parameters given in the above statement. **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2796

[Total No. of Pages : 4

[4958]-260

T.E. (Production & Production S/W)

PRODUCTION METALLURGY

(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
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 logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***

Q1) a) Draw and explain the widmanstatten structures in hypoeutectoid steels. **[6]**

b) Explain the following: **[6]**

i) AISI 2440

ii) En 31

iii) Fe 520 K

iv) 80 T 11

v) St 50

vi) 25C5

c) Calculate the amounts of phases in AISI 1040 steel at room temperature, assuming equilibrium cooling condition. Draw the microstructure and define those phases. **[6]**

OR

Q2) a) Write short notes: **[6]**

i) Electrolytic Polishing

ii) Metallurgical Microscope.

P.T.O.

b) Draw microstructures: **[6]**

i) 0.2% C Steel

ii) 0.8% C Steel

iii) 1.2% C Steel

c) State and explain the steps in brief to prepare the sample for microscopic examination. **[6]**

Q3) a) Explain the Jominy end quench test for measuring hardenability with a neat diagram and explain the factors affecting hardenability. **[8]**

b) Write Short notes: **[8]**

i) Spherodise Annealing

ii) Isothermal Annealing

OR

Q4) a) Draw the TTT diagram for eutectoid steel. What information is obtained from this diagram? **[8]**

b) Write short notes on : **[8]**

i) Secondary hardening

ii) Temper embrittlement

Q5) a) Compare induction hardening with flame hardening. **[8]**

b) Explain Patenting and Ausforming with neat sketches. **[8]**

OR

Q6) a) Write short notes on carbonitriding. **[8]**

b) Explain Austempering and Pack Carburising. **[8]**

SECTION - II

Q7) a) Write short notes: **[8]**

i) Silal and Nicrosilal

ii) Chilled Cast iron

b) Compare Martensitic Stainless steels with Austenitic Stainless steels. **[10]**

OR

Q8) a) Write short notes on : **[8]**

i) White cast iron

ii) Malleable cast iron

b) State the classification and effects of alloying elements on various properties. **[10]**

Q9) a) What is season cracking of brasses? How is it eliminated? **[8]**

b) Give the composition, one property and one application for the following: **[8]**

i) Phosphor bronze

ii) German Silver

iii) LM 11

iv) Elinvar

OR

Q10)a) Write short note on **[8]**

i) Dezincification

ii) Modification treatment of AI-Si alloys.

b) Give the composition, one property and one application for the following: **[8]**

i) Beryllium bronze

ii) Cartridge brass

iii) Y alloy

iv) Gun metal

Q11)a) What is aspect ratio? Explain effect of fiber length on tensile strength of composite **[8]**

b) Explain biocompatibility and state the requirements of biomaterial. **[8]**

OR

Q12)a) What unique properties do composites have over the conventional materials explain fibre reinforced composites. **[8]**

b) Explain the requirements of sports materials giving atleast tow examples. **[8]**

Total No. of Questions : 6]

SEAT No. :

P3914

[Total No. of Pages : 2

[4958]-261
T.E. (Production s/w)
MANUFACTURING TECHNOLOGY (Self Study)
(2008 Course) (Semester - I) (311122)

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

Instructions to candidates:

1) ***Answer two sections in different answerbooks.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) Compare various non-conventional machining process w.r.t. working principle, set ups, process parameters, applications etc. **[16]**

OR

Q1) Draw only sketch of experimental setups of **[16]**

a) Ion Beam Machining

b) Wire Cut EDM

c) Electron beam machining

d) Plasma Arc Machining

Q2) For plastic Processing explain **[16]**

a) Types of Plastics

b) Elastomers

c) Molding Process

d) Materials

OR

Q2) Write a note on **[16]**

a) Calendaring and Thermoforming

b) Laminating and reinforcing

P.T.O.

Q3) Explain MEMS in detail in terms of products, process, applications. **[18]**

OR

Q3) Explain **[18]**

a) Lithography

b) Nanotechnology

c) Top down and bottom up manufacturing

SECTION - II

Q4) Compare Mechanical, Electrical, Optical and Pneumatic comparators with sketch. **[16]**

OR

Q4) For measurements by light wave interference, draw various types of fringe patterns. **[16]**

Q5) Draw measurement set up **[16]**

a) Sine Bar

b) Angle Gauges

OR

Q5) Explain working principle of Angle Dekkor and Autocollimator. **[16]**

Q6) For fundamentals of estimating; explain objectives and functions of cost estimating, factors in estimating and estimating procedure. **[18]**

OR

Q6) Write short notes on **[18]**

a) Classification and methods of depreciation

b) Time and Value of Money

c) Replacement Techniques

X X X

Total No. of Questions :12]

SEAT No. :

P2988

[Total No. of Pages :6

[4958] - 262

T. E. Production (Sandwich)

KINEMATICS DESIGN OF MACHINE

(Semester - II) (2008 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain "Three position synthesis by Chebychev Spacing' with figure. **[8]**

b) Explain the following Kinematic chain representation with figure: **[8]**

i) E-21

ii) C-13

iii) K-25

iv) K-23

OR

Q2) a) Explain various Kinematics principles used in the operation of gear hobbing machine used to generate helical gear. **[10]**

b) Explain the following terms related to Kinematic Synthesis. **[6]**

i) Function Generation.

ii) Dimensional Synthesis.

iii) Path Generation.

P.T.O.

Q3) a) A cantilever beam of circular cross section is fixed at one end and subjected ot completely reversed force of 10KN at the free end. The force is perpendicular to the axis of the beam. The distance between free and fixed end is 100 mm. The beam is made up of steel with ultimate tensile strength 540N/mm^2 and tensile yield strength of 320 N/mm^2 . The construction of cantilever is such that there is no stress concentration. The size factor, surface finish factor and reliability factor are 0.85, 0.8 and 0.868. The operating temperature is 50°C for which temperature factor is 1.010 if the diameter of the beam is 35mm, determine the life of the beam. **[8]**

b) Briefly explain the 'rotating beam fatigue testing' method of finding endurance limit of the material with neat sketch? **[8]**

OR

Q4) a) A steel cantilever beam shown in figure is subjected to a transverse loading at its end that varies from 45N up to 125N down. Determine the required diameter at the change of cross section for infinite life using a factor of safety 2.0. **[12]**

Use following data:

Yield strength = 470N/mm^2

Ultimate tensile strength = 550N/mm^2

Stress concetration factor = 1.63

Notch sensitivity = 0.8

Load factor = 0.923

Surface finish factor = 0.9

Size factor = 0.85

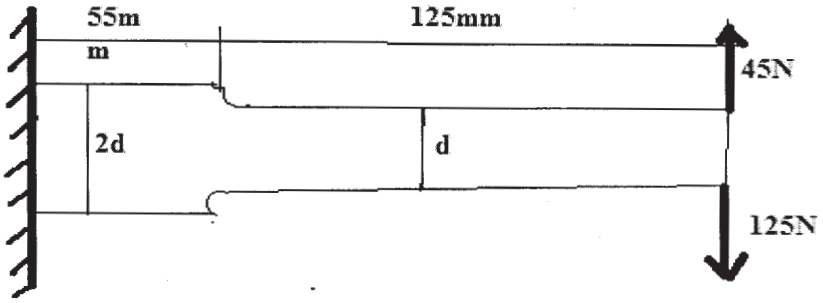


Figure Q4(a)

b) Define the following **[4]**

i) Fatigue.

ii) Endurance Limit.

Q5) a) A spur pinion having 18 teeth to be made-up of plain carbon steel (Sut = 580 N/mm^2) is to mesh with a gear having 60 teeth to be made up of gray cast iron FG260. The pinion shaft is connected to 10KW, 1440rpm electric motor. The starting torque of the motor is approximately twice the rated torque. The tooth system is 20° full depth involute. The face width is 10 times the module for which the load distribution factor is 1.4. The gears are to be machined to meet the specifications of grade 10. Design the gear pair against bending failure and factor of safety 1.5. **[14]**

Use Following Data:

$$Kv = \frac{6}{6+V},\ For\ Grade\ 10,\ e = 32.0 + 2.5\,[m + 0.25\sqrt{d}\,],\ Y = 0.484 - \frac{2.87}{Z}$$

$$Fd = \frac{e.np.zp.b.r_p.r_g}{3259\sqrt{r_p^2 + 0.92r_g^2}}.\cos\phi$$

b) Define the terms **[4]**

i) Barth factor

ii) Dynamic Load

OR

Q6) a) Design a pair of helical gears for transmitting 22KW. The speed of driver gear is 1800 rpm and that of driven gear is 600 rpm. The helix angle is 30° and profile is corresponding to 20° full depth involute system. The driver gear has 24 teeth both are made up of cast steel with allowable static stress as 50MPa, face width is 10 times normal module and starting torque is at 120% of running torque. The gears are required to be designed only against bending failure of teeths under dynamic conditions. **[14]**

Use following data:

$$\text{For Grade } 7 \rightarrow e = 11.0 + 0.9\left\lfloor m_n + 0.25\sqrt{d}\,\right\rfloor,\ \text{and } Y' = 0.484 - \frac{2.87}{Z'};\ Kv = \frac{5.6}{5.6\sqrt{V}}$$

$$Fd = \frac{e.np.Zp.b.rp.rg}{3785\sqrt{r_p^2 + r_g^2}}\ \cos\phi n\cos\psi,\qquad Z' = \frac{Z}{\cos 3\psi}$$

b) Explain in brief the significance of formative number of teeth. **[4]**

SECTION - II

Q7) a) A bearing is subjected to the following work cycle: radial load of 4.45KN at 150rpm for 30% of time, radial load of 6.675 KN at 600rpm for 10% of time, radial load of 2.25 KN at 300 rpm for the remaining time of the cycle. The inner ring rotates and the loads are steady. Find the expected life of this bearing in hours by considering the static and dynamic load carrying capacities of the bearings as 10013N and 14952N respectively. **[12]**

b) Explain the following properties of sliding contact bearing material. **[6]**

i) Conformability

ii) Bondability

iii) Corrosion resistant

OR

Q8) a) Select a single row deep groove ball bearing with the following operating cycle listed below, **[12]**

Which will have a life of 15,000hrs.

Fraction of cycle	Type of Load	Radial Load 'Fr' N	Thrust Load 'Fa' N	Speed rpm	Service Factor
1/10	Heavy Shocks	2000	1200	400	3.0
3/5	Light Shocks	1500	1000	500	1.5
3/10	Moderate Shocks	1000	1500	600	2.0

Assume radial and axial load factors to be 1.0 and 1.5 respectively and the inner race rotates.

Data for Deep Groove ball bearing selection is

Bearing No.	6015	6215	6315	6415
'C' KN	31	52	90	120

b) Explain the following terms as applied to journal bearings. **[6]**

i) Bearing characteristic number

ii) Bearing modulus

Q9) A machine shaft runs at a mean speed of 300 rpm. It requires a torque which varies uniformly from 1500Nm to 4000Nm during first half revolution, during next one revolution, the torque remains constant and then decreases uniformly to 1500Nm during next one revolution, and then it remains constant for remaining one revolution. The machine is coupled by a constant speed motor to which is connected a solid flywheel of radius 0.80m. If the fluctuation of speed is $\pm 2\%$ of mean speed. Find **[16]**

a) Power of motor

b) Mass of flywheel

c) Thickness of flywheel if $\rho = 7200 kg/m^3$

OR

Q10) A single cylinder internal combustion engine working on four stroke cycle develops 75KW at 360rpm. The fluctuation of energy can be assumed to be 0.9 times the energy developed per cycle. If the fluctuation of speed is not to be exceeds 1% and the maximum centrifugal stress in the flywheel is to be 5.5MPa, estimate the mean diameter and the cross sectional area of the rim. The material of the rim has a density of $7200 kg/m^3$. **[16]**

Q11)a) The tensile strengths of a population of 900 connecting rods are normally distributed with a mean of 450N/mm^2 and a standard deviation of 50N/mm^2. Determine **[12]**

i) The number of connecting rods having strength less than 395N/mm^2 and

ii) The number of connecting rods having strength between 395N/mm^2 and 595N/mm^2

The areas below the standard normal distribution curve are as follows:

Z	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Area	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713
Z	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
Area	0.4772	0.4821	0.4861	0.4893	0.4918	0.4938	0.4953	0.4965	0.4974
Z	2.9	3.0							
Area	0.4981	0.4987							

Use linear interpolation for intermediate values.

b) What is significance of the 'normal distribution curve' in engineering statistical analysis? State its limitations. **[4]**

OR

Q12)a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? **[8]**

b) Explain with suitable example the method of optimum design for normal specification. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2989

[Total No. of Pages : 3

[4958]-263

T.E.(Production Sandwich Engineering)

MATERIAL FORMING AND MOULD DESIGN

(Semester-II)(2008 Course) (311125)(Theory)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Solve Q1 or Q2, Q3 or Q4,Q5 or Q6,Q7 or Q8, Q9 or Q10,Q11 or Q12.***

SECTION-I

Q1) a) What is a yield criterion? Explain various yield criteria in detail. **[8]**

b) A metal body is in plastic state under the action of following stress state. **[8]**

$$T=\begin{pmatrix} 120 & 60 & 40 \\ 60 & -100 & 30 \\ 40 & 30 & 80 \end{pmatrix}$$

Determine the yield strength of material in tension & shear according to von mises yield condition. The stresses are in N/mm^2.

OR

Q2) a) Explain effect of temperature on metal forming processes. **[8]**

b) Explain concept of formability & forming limit diagram. **[8]**

Q3) a) Explain various defects in extrusion. **[8]**

b) Explain following(any two) **[8]**

i) Powder Metallurgy Forging

ii) Isothermal Forging

iii) Liquid Metal forging

OR

P.T.O.

Q4) a) Calculate work done in extruding an aluminum billet 780mm diameter and 1500 mm long to five square bars of 25 mm side. Flow stress of aluminum is 60MPa, coefficient of friction between billet and container is 0.25. Also determine power required if the process is completed in 10 minutes. **[8]**

b) Define forgability and explain various forgability tests. **[8]**

Q5) a) Explain various zones of wire drawing die with neat sketch. **[8]**

b) Explain Electro-Hydraulic forming in detail with neat sketch. **[10]**

OR

Q6) a) Calculate the drawing load required to achieve 40% reduction in area of 50mm X 10 mm annealed mild strip using straight tapered die having semi-die angle 26.5°, coefficient of friction is 0.1, yield stress of material is 300 N/mm^2. **[10]**

b) Explain magnetic pluse forming & process variables in detail with neat sketch. **[8]**

SECTION-II

Q7) a) Explain various method of automatic gauge control in rolling. **[8]**

b) Explain classification of passes in rolling. **[8]**

OR

Q8) a) Calculate the rolling load to reduce steel 600mm wide and 30 mm thick by 20%. Roll diameter is 800 mm & flow stress of steel is 150N/mm^2. Assume coefficient of friction as 0.15. What would be rolling load if,**[8]**

i) Sliding friction occurs.

ii) Sticking friction occurs.

b) Explain mill spring rolling. **[8]**

Q9) a) Explain about the various methods available for trapping slag in pouring basin. **[8]**

b) Explain following with neat sketch **[8]**

i) Hot Chamber Die Casting

ii) Cold Chamber Die Casting

OR

Q10 a) Explain points to be considered while designing sand casting. **[8]**

b) Explain heat transfer and cooling consideration in die casting. **[8]**

Q11)a) Explain procedure to derive edging impression in forging with suitable illustration. **[10]**

b) Explain importance of positioning of gate in injection moulding. **[8]**

OR

Q12)a) Explain ancillary items used in injection moulding. **[8]**

b) Explain various allowances considered in forging die design. **[5]**

c) Explain stripper plate ejection technique for injection moulding with suitable sketch. **[5]**

Total No. of Questions :12]

SEAT No. :

P2990

[Total No. of Pages :3

[4958]-264

T.E. (Production Sandwich Engineering)

PRODUCTION & INDUSTRIAL MANAGEMENT - II

(2008 Course) (Semester - II) (311126)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) State the following in economics context. **[8]**

i) Goods & Services

ii) Capital

iii) Scarcity

iv) Resources

b) Discuss Capital market and Money market. **[8]**

c) Explain the concept of equilibrium in supply and demand. **[2]**

OR

Q2) a) What happens when an entrepreneur starts his business without conducting a market survey. **[8]**

b) What are the objectives of Material Management? **[8]**

c) Explain ABC Analysis. **[2]**

P.T.O.

Q3) a) Discuss Time estimate and Time standard. **[8]**

b) What are the functions of process engineering? **[8]**

OR

Q4) a) Differentiate between special purpose and general purpose Machines. **[8]**

b) What are the functions of process engineering? **[8]**

Q5) a) Discuss Single and Double sampling plan. **[8]**

b) Explain Dimensional analysis. **[8]**

OR

Q6) a) What is the purpose and utilization of Tolerance chart? **[8]**

b) Explain six point location system? **[8]**

SECTION-II

Q7) a) Define following terminologies. **[8]**

i) Sampling Plan

ii) Sampling Inspection

iii) Lot Size

iv) Sample size

b) Draw and explain Operation Characteristic Curve. **[8]**

OR

Q8) a) Discuss Double sample plan wiht the help of flow chart. **[8]**

b) What is mean by variation and discuss the reasons for variations in manufacturing. **[8]**

Q9) a) Discuss any six 7QC tools with its application. **[12]**

b) What is Quality Circle? **[4]**

OR

Q10)a) Discuss House of quality. **[12]**

b) What is 5'S? **[4]**

Q11)a) Write down the short note on Design of Experiments. **[8]**

b) Explain Taguchi Method. **[8]**

c) Define: Fault Tree Analysis (FTA). **[2]**

OR

Q12)a) State advantage and disadvantages of ISO 9000. **[8]**

b) State the elements of Quality System. **[8]**

c) What is "continual improvement"? **[2]**

EEE

Total No. of Questions :11]

SEAT No. :

P2991

[Total No. of Pages :2

[4958] - 271

T.E. (Biotechnology)

GENETIC ENGINEERING

(Semester - I) (2008 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) What do you understand by 'reverse transcriptase polymerase chain reaction'? Why is it considered sensitive as compared to conventional PCR? Explain. **[16]**

OR

Q2) What is the principle of Sanger's DNA sequencing method? Discuss the method in details. **[16]**

Q3) Enlist different cloning vectors? Explain Plasmid as a cloning vector. **[16]**

OR

Q4) Write short notes: **[16]**

a) Phagemids

b) Cosmids

P.T.O.

Q5) Describe different screening strategies of genomic libraries. **[18]**

OR

Q6) Depict synthesis of C-DNA starting from m-RNA and design of C-DNA library. **[18]**

SECTION - II

Q7) Write notes on: **[16]**

a) Artificial DNA Synthesis

b) PCR in Cloning

OR

Q8) Give an account of different DNA sequencing methods. **[16]**

Q9) Answer in Brief: **[16]**

a) Transformation

b) Transfection

OR

Q10) How animal transgenesis is followed? Explain its importance with applications. **[16]**

Q11) Write notes on: (Any 2) (9M Each) **[18]**

a) Humulin

b) Factor VIII

c) Transfection

d) RAPD

Total No. of Questions : 12]

SEAT No. :

P3915

[Total No. of Pages : 2

[4958]-272
T.E. (Biotechnology)
FERMENTATION TECHNOLOGY - I
(2008 Course) (Semester - I) (315464)

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

Instructions to candidates:

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

SECTION - I

Q1) Explain concept of Upstream Processing with the following points:

a) Screening and isolation of microbes.

b) Preserving industrially important microbes.

c) Inoculum Preparation. **[16]**

OR

Q2) Explain the process of preserving industrially important microbes. Write in detail about inoculum preparation. **[16]**

Q3) Why sterilization is important in fermentation technology? Discuss different methods of sterilization and their mechanism of destructions. **[16]**

OR

Q4) What is a need for sterilization? Explain in detail kinetics of sterilization. **[16]**

Q5) Which medium component affects most on production of citric acid. Explain the effect with metabolic pathway of citric acid production. Describe the general production process of citric acid in detail. **[18]**

OR

P.T.O.

Q6) Explain in detail activities of lactic acid bacteria and industrial production of lactic acid. **[18]**

SECTION - II

Q7) What is the importance of Immobilization methods in Fermentation Technology? Elaborate the enzyme immobilization methods. Describe bioreactor design for immobilization application. **[16]**

OR

Q8) Define enzymes. Explain in detail isolation, production and use of any two microbial enzymes in detail. **[16]**

Q9) Draw neat labeled diagram of CSTR. Explain the parts and their functions of bioreactor in detail. **[16]**

OR

Q10) What is Solid State Fermentation? Describe the types of solid state bioreactors in detail. **[16]**

Q11) Why is the study of fermentation economics necessary? Explain with one example. **[18]**

OR

Q12) Explain the concept of scale up with the help of following points **[18]**

a) Principles.

b) Theoretical considerations.

c) Techniques used.

Total No. of Questions : 12]

SEAT No. :

P2992

[Total No. of Pages : 4

[4958]-273
T.E. (Biotechnology)
HEAT TRANSFER
(2008 Course) (Semester - I)

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

Instructions to candidates:

1) ***Answer Any three from section I and any three from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use graph sheets wherever required.***
6) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***

SECTION - I

Q1) a) How is dimensional analysis useful in data reduction and data analysis? **[4]**

b) By using Rayleigh's method of dimensional analysis show that for natural convection heat transfer is a function of Nusselt no., Grashof no. and Prandtl no. **[12]**

OR

Q2) a) Explain Fourier's law of heat conduction and Newton's law of cooling. **[6]**

b) State and explain Fourier law of heat conduction. Derive an expression for temperature distribution in infinitely hollow cylinder. **[10]**

Q3) a) Show that when a system contains several different heat transfer resistances in series, the overall resistance is equal to the sum of the individual resistance. **[8]**

b) Calculate the critical radius of insulation for asbestos (K = 0.17 W/m°C)surrounding a pipe and exposed to room air at 20°C, 5cm diameter pipe when covered with the critical radius of insulation and without insulation. **[8]**

OR

P.T.O.

Q4) a) What is the purpose of extended surfaces in heat exchange equipments? Derive an equation for calculating effectiveness and efficiency of pin fin. **[8]**

b) What is contact resistance? Derive the equation for contact resistance. **[8]**

Q5) a) What is boiling? What are types of boiling? Explain the different regimes in pool boiling. **[9]**

b) What is insulation? Explain in detail critical radius and optimum thickness of insulation. **[9]**

OR

Q6) a) Give physical significance of following nos. **[8]**

i) Prandtl No.

ii) Reynold's No.

iii) Nusselt No.

iv) Grashof No.

b) Distinguish between dropwise condensation and film condensation. **[6]**

c) Define: **[4]**

i) Overall Heat transfer Co-efficient

ii) Thermal Conductivity

SECTION - II

Q7) a) Two parallel black plates 0.5 by 1 m are spaced 0.5 m apart. One plate is maintained at 1000°C and the other at 500°C. What is the net radient heat exchange between the two plates? ($F_{12} = 0.285$ and $\sigma = 5.667 \times 10^{-8}$) **[4]**

b) Explain the laws of black body radiation. **[6]**

c) Suppose a sphere of surface area A_1 is completely enclosed by an irregular surface of area A_2, Determine the shape factors F_{12}, F_{21}, F_{11} and F_{22}. **[6]**

OR

Q8) a) Define the following: **[6]**

i) Absorptivity

ii) Reflectivity

iii) Transmissivity

iv) Emissivity

v) Grey body

vi) Shape factor

b) Derive the equation for net exchange of radient hat flux between two infinite parallel diffuse gray surfaces which are maintained at absolute temperatures T_1 and T_2 and have emissivities ε_1 and ε_2 respectively. **[10]**

Q9) a) Derive an expression for the mean film temperature difference in a parallel flow heat exchanger in which inlet and exit temperature on the hot side are T_{hi} and T_{he} and on the cold side are T_{ci} and T_{ce}, respectively. **[4]**

b) Explain the following types of heat exchangers with neat sketch. **[12]**

i) Double pipe heat exchanger

ii) 1-2 Shell and tube heat exchanger

iii) Cross flow heat exchanger

iv) Compact type heat exchanger

OR

Q10)a) Counter flow concentric heat exchanger is used to cool lubricating oil. (Specific heat 2131 J/kg K) for large industrial gas turbine engine. Flow rate of cooling water (Specific heat 4178 J/kg K) through the inner tube is 0.2 kg/sec. (tube diameter of 25 mm) while lubricating oil flows through the annulus (outer tube diameter 45 mm) with flow rate of 0.1 kg/sec. Oil and water enter at temperature of 100°C and 30°C respectively. How long must the tubes be made if outlet temperature of oil is to be 60°C? Compute the length by using LMTD method if U=380 W/m^2K. **[8]**

b) What is fouling? How fouling can affect performance of heat exchanger? Write an equation by considering fouling of heat exchanger. **[8]**

Q11)a) Write material and energy balance equations over a single effect evaporator. **[12]**

b) Draw and explain feed forward and feed backward feeding method in multiple effect evaporator. **[6]**

OR

Q12)a) A single effect evaporator is used to concentrate on aqueous solution from 5% to 25% solids content by weight using saturated steam at 2 bar gauge pressure. If overall heat transfer co-efficient is 2 kW/m^2°C, Calculate capacity, steam consumption, economy and heat transfer area required. Assume that feed is 4000 kg/hr at 50°C. Vapour space pressure remains constant at 1.013 bar absolute. **[8]**

Data Given: Heat capacity of feed = 4.2 kJ/kg°C.

Pressure of steam is 2 bar (gauge) T_s = 135.55°C and λ_s = 2163.9 kJ/kg.

Feed at 1.013 bar, T_{sat} = 100ºC and λ_v = 2256 kJ/kg

b) Write short notes on 'Boiling point Elevation' and Duhring's plot. **[6]**

c) Define and explain Evaporator capacity and Economy. **[4]**

Total No. of Questions : 12]

SEAT No. :

P2993

[Total No. of Pages : 4

[4958]-274
T.E.(Biotechnology)
COMPUTATIONAL TECHNIQUES & BIOSTATISTICS
(2008 Course)(315465)(Semester-I)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Determine the constants a and b by least square method such that $y=ae^{bx}$ fits the following data. **[8]**

X	0	1.2	1.4	1.6
Y	40.170	73.196	133.372	243.02

b) Find the values of a,b and c so that $Y=a+bx+cx^2$ is the best fit to the data. **[8]**

X	0	1	2	3	4
Y	1	0	3	10	21

OR

Q2) a) Following are the results of an experiment on friction of bearings, the speed being constant. Corresponding values of coefficient of friction and temperature are shown in the table. If μ and t are given by the law find the values of a and b. **[8]**

μ	120	110	100	90	80	70
t	0.0051	0.0059	0.0071	0.0085	0.00102	0.00124

P.T.O.

b) Fit a least square geometric curve of the form $y=ax^b$ to the data. **[8]**

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

Q3) a) Applying Lagrange's formula find a polynomial which approximates the following data. **[8]**

x	-2	-1	2	3
y	-12	-8	3	5

b) $\Delta^2(X^3)$ Evaluate it **[8]**

OR

Q4) a) The population of a town in decennial census was as under. Estimate the population of the year 1955 using Newton's interpolation formulae. **[8]**

Year	1921	1931	1941	1951	1961
Population(in Thousands)	46	66	81	93	101

b) The observed values of a function are 168, 120, 72and 63 at the four positions 3, 7, 9 and 10 of the independent variable respectively. What is the best estimate you can give for the value of the function at position 6 of the independent variable? Apply Lagrange's formula. **[8]**

Q5) a) Using Regula-Falsi method find the real root of the equation $x^3-5x+3=0$. **[9]**

b) Find a real root of the equation $x+\log x-2=0$ using Newton-Raphson Method. **[9]**

OR

Q6) a) Develop a formula for finding a root of N using Newton Raphson Method and find a root of the equation $f(x) = \sin x - x\cos x=0$, correct to three decimal places. Take initial approximation as $x_0= 3\pi /2$. **[9]**

b) Perform five iterations and find a real root of the equation $f(x)=x^3-x-1=0$ using bisection method. **[9]**

SECTION-II

Q7) Evaluate $I = \int_0^1 \frac{1}{1+x} dx,$ **[16]**

Correct to three decimal places. Solve this example by both the trapezoidal and Simpson's rule with h = 0.5, 0.25 and 0.125 respectively. Compare the results in each case and test the accuracy for both methods.

OR

Q8) a) The velocities of a car running on a straight rod at intervals of two minutes are given below **[8]**

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

Apply Simpson's 1/3 rd rule to find the total distance covered by the car. Compare with the actual value.

b) Determine the maximum error in evaluating the intergral $\int_0^{\pi/2} Cosdx$ by trapezoidal rule using four sub intervals. **[8]**

Q9) a) Give in a flow chart of various sampling methods. **[8]**

b) Give mertis and limitations of probability and non-probabiliy sampling. **[8]**

OR

Q10) a) Discuss importance of weighted and harmonic mean over simple arithmetic mean. Give one example of each. **[8]**

b) Discuss in detail Pictographs and Cartograms with suitable examples. **[8]**

Q11) a) A group of seven, a week old chickens reared on a high protein diet weigh 12,15,11,16,14,14 and 16 gms, a second group of five chickens similarly treated except that they receive a low protein diet weighted 8,10,14,10,13 gms. Test whether there is sufficient evidence that additional protein has increased the weight of the chickens.(The table value of t for v=10 at 5% level of significance is 2.33). Compute using student t-distribution. **[9]**

b) Comment on the performance of the students of the two colleges given below using simple and weighted averages: **[9]**

Course	Pass %	College A No.of Students in hundreds	Pass %	College B No.of Students in hundreds
M.A	71	3	82	2
M.Com	83	4	76	3
B.A.	73	5	73	6
B.Com	74	2	76	7
B.Sc	65	3	65	3
M.Sc	66	3	60	7

OR

Q12) a) In a survey of 200 boys of which 75 were intelligent, 40 had educated fathers; while 85 of the unintelligent boys had uneducated fathers. Do these figures support hypothesis that educated fathers have intelligent boys? Use x^2-test value of x^2 for 1degree of freedom at 5% level is 3.84. **[9]**

b) Calculate arithmetic mean,median and mode from the following frequency distribution. **[9]**

Variable	Frequency	Variable	Frequency
10-13	8	25-28	54
13-16	15	28-31	36
16-19	27	31-34	18
19-22	51	34-37	9
22-25	75	37-40	7

Total No. of Questions :12]

SEAT No. :

P2994

[Total No. of Pages :4

[4958] - 275

T.E. (Biotechnology)

MASS TRANSFER

(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any three from section I and any three from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use graph Sheets wherever required.***

SECTION - I

Q1) Write short notes on: **[16]**

a) Whitman's Two Film Theory

b) Hingbie's Penetration Theory

c) Dankwart's Surface renewal Theory

d) Film Penetration Theory

OR

Q2) Derive the equations for the following with proper assumptions and nomenclature: **[16]**

a) Steady state molecular diffusion in liquids at rest

b) Steady state equimolal diffusion

P.T.O.

Q3) a) A mixture containing benzene and toluene with 40% benzene and 60% toluene is to be separated in a fractionating column to give product containing 96% benzene and bottom product containing 95% toluene. Feed is a mixture of two-third vapour and one-third liquid. Find out the no. of theoretical stages required if reflux ratio is 1.5 times the minimum is required. **[8]**

Data: Relative volatility $\alpha_{AB} = 2.5$

b) What are azeotropes? Explain azeotropic system with neat temperature and equilibrium diagrams. **[8]**

OR

Q4) a) Write material balance over distillation column and derive an expression of operating line in rectifying section and stripping section. **[12]**

b) Define terms: **[4]**

i) Raoult's Law

ii) Dalton's Law

Q5) a) What is optimum reflux ratio? Draw and explain diagram showing relationship of cost versus reflux ratio. **[6]**

b) Write short notes on: **[12]**

i) Bubble cap Tray

ii) Sieve tray

iii) Downcomer & weir

iv) Entrainment

OR

Q6) a) A simple batch still is used to distill 1000 kg of a mixture containing 60 mass % ethyl alcohol and 40 mass % of water. After distillation the bottom product contains 5 mass % of alcohol. Determine the composition of the overhead product, its mass and mass of the bottom product. Equilibrium data is with respect to weight percentage values. Data is given as, **[12]**

x	5	10	20	30	40	50	60
y	36	51.6	65.5	71	74	76.7	78.9

b) Write short notes on: **[6]**

i) Jacketted kettle Reboilers

ii) Thermosyphon Reboilers

SECTION - II

Q7) a) Explain in detail concept of L_{min} in absorption column and write importance of L_{min} in absorption. **[9]**

b) 5000 kg/hr of a SO_2-air mixture containing 10% by volume of SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit conc. of SO_2 is reduced to 0.20%. The tower operates at 1 atm. The equilibrium relation is given by: $Y^* = 30X$, Where Y = Mole SO_2/Mole Air and X = Mole SO_2/ Mole water. If the packed bed height of tower is 0.52m, Calculate the height of transfer unit. **[9]**

OR

Q8) a) How HTU and NTU are correlated with ideal tray/plate in distillation column? **[9]**

b) Discuss with a neat diagram channeling misdistribution phenomena of liquid flow. **[9]**

Q9) a) Explain equilibrium moisture curve? **[8]**

b) Explain in detail equipment design and working of a rotary drum dryer. **[8]**

OR

Q10) a) Explain following drying equipments with diagram, working principle, advantages and disadvantages **[8]**

i) Tray dryer

ii) Spray dryer

b) What are different factors affecting drying process? **[8]**

Q11) Write enthalpy balance equations for following cases: **[16]**

a) With no evaporation of solvent

b) With evaporation of solvent during cooling

OR

Q12) A batch of 500 kg of KCl is dissolved in water to make a saturated solution at 350 K where the solubility is 30% by weight KCl in water. The solution is cooled to 293 K at which solubility is 25.4% by weight. Determine the quantity of crystals obtained if 3.5% of the original water evaporates on cooling. Also determine the capacity of the vessel in which this solution is cooled if it is 1.2 times the volume of the solution. Take density of solution as1200 kg/m^3. **[16]**

Total No. of Questions :12]

SEAT No. :

P3916

[Total No. of Pages :3

[4958] - 276

T. E. (Biotechnology)

REACTION ENGINEERING

(Semester - II) (2008 Course) (315466)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Differentiate between Elementary and non - elementary reaction. **[8]**

b) Discuss the concept about rate controlling step. **[8]**

OR

Q2) a) A human of 85 kgs consumes about 5000 kJ of food per day. Assume that the food is all glucose and overall reaction is **[8]**

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O, \quad \Delta H r = 281 k J$$

Find man's metabolic rate in terms of oxygen used per m^3 of person per second?

b) Write details note on collision theory. **[8]**

P.T.O.

Q3) a) A certain reaction has a rate given by $-r_A = 0.008C_A{}^*C_B$ mol/(cm^3. min). If the concentration is expressed in mol/lit and time in hours, what would be the value and unit of rate constant? **[9]**

b) Derive the performance equation for plug flow reactor. **[9]**

OR

Q4) a) In studying the kinetic of decomposition of a reaction, the concentration of a reaction were determined analytically at different times. The following results were obtained. **[9]**

Time, min	0	10	20	40	100	125
Conc. mol/lit	0.1	0.0714	0.0356	0.0385	0.02	0.0167

Determine the order of reaction.

b) Assuming a stoichiometry $A \rightarrow R$ for a first order reaction, the volume of plug flow reactor for 98.9% conversion of pure A is calculated to be 3.99 lit. In fact, however the reaction stoichiometry is $A \rightarrow 3R$. With this corrected stoichiometry. What is the required volume of a reactor? **[9]**

Q5) a) Derive expression for calculating E, F, and C curves. **[8]**

b) Write detail note on Segregated flow model. **[8]**

OR

Q6) a) Derive the expressions for residence time distribution for pulse input method. **[8]**

b) Discuss about tank in series model, dispersion model. **[8]**

SECTION - II

Q7) a) Write note on progressive conversion model. **[8]**

b) Two solid samples are kept in a constant environment in over for a period of 1 hr. 4mm partices are 77% converted and 2 mm particles are 97% converted. Find the time required for complete conversion of 1.5 mm particle in this oven? **[8]**

OR

Q8) a) Discuss about shrinking core model. **[8]**

b) Write detail note on Chemical reaction controls. **[8]**

Q9) a) Determine the amount of catalyst required in packed bed reactor for 80% conversion of 900 mol/min if C_{A0} = 10 mol/m^3 of feed. **[9]**

b) Derive the performance equation for porous catalyzed reaction. **[9]**

OR

Q10)a) Explain: pore diffusion resistance combined with surface kinetics with example. **[9]**

b) Discuss the effectiveness factor. **[9]**

Q11)a) Write a short note on mixed flow fermentor. **[8]**

b) Discuss on Enzyme deactivation kinetics. **[8]**

OR

Q12)a) Differentiate between microbial and enzyme fermentation. **[8]**

b) Explain Michaelis –Menten kinetics, considering the enzyme substrate reaction. **[8]**

A + E = R.

Total No. of Questions :12]

SEAT No. :

P3917

[Total No. of Pages :2

[4958]-277
T.E. (Biotechnology)
Fermentation Technology - II
(2008 Course)

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

Instructions to candidates:

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

SECTION - I

Q1) a) Explain a typical fermentor design with neat labeled diagram. Enlist the different parts of fermentor and its role. **[6]**

b) Explain which are the different parameters affecting performance of a fermentor along with the mechanism. **[10]**

OR

Q2) What is rheology? State different rheological properties and how the are important in operating fermentation. **[16]**

Q3) Explain the configuration, applications, advant ages and disadvantages of bubble column fermentor. **[16]**

OR

Q4) Explain in detail the Working and application of freeze dryer. **[16]**

Q5) What is absorption? State and explain its different types. Add a note on the nature of different adsorbents along with their industrial applications. **[18]**

OR

P.T.O.

Q6) Explain in detail adsorption isotherm. Write short notes on- **[18]**

a) Langmuir isotherm.

b) Freundlich isotherm.

SECTION - II

Q7) Define extraction. What are different types of extraction? Explain the principle and process of leaching in detail. **[16]**

OR

Q8) Write notes on- (8 marks each)

a) Single stage leaching. **[16]**

b) Continuous counter current leaching.

Q9) Define a membrane. What are the different criteria membrane separation processes? Add a note on different types of membranes. **[16]**

OR

Q10)Explain the basic principle behind following membrane separations-. **[16]**

a) Micro filtration.

b) Ultra filtration.

c) Reverse osmosis.

d) Electro dialysis.

Q11)Explain in detail the basic principle, theory and process of liquid-liquid extraction along with its applications. **[18]**

OR

Q12)Write notes on- **[18]**

a) Single stage extraction.

b) Multistage crosscurrent extraction.

Total No. of Questions :12]

SEAT No. :

P2995

[Total No. of Pages :2

[4958]-278
T.E. (Biotechnology)
BIOSEPARATION -I
(2008 Course)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) What is downstream Processing? How it is important for Biological product separation. **[8]**

b) Explain any two chemical cell disruption methods in detail. **[8]**

OR

Q2) a) Describe any two mechanical cell disruption methods in details. **[8]**

b) What is adsorption? Explain the process with Langmuir isotherm. **[8]**

Q3) a) What are major types of chromatography? Differentiate between planner and column chromatography. **[8]**

b) Explain the process of planner chromatography in details. **[8]**

OR

Q4) How many separation factors affect the process of column chromatography? Brief the theory of chromatography. **[16]**

P.T.O.

Q5) Write short notes on (Any 2): (9 M Each) **[18]**

a) Sedimentation

b) Traditional Filtration

c) Reverse Osmosis

d) Microfiltration

SECTION-II

Q7) What is liquid-liquid extraction? Explain the counter current LLE process with model expression. **[16]**

OR

Q8) Write short notes on: (8M Each) **[16]**

a) Leaching

b) Drying

Q9) Draw "Typical flow diagram of a protein production facility" and explain the process with insulin production. **[16]**

OR

Q10)"Economics of Bioproduct manufacturing depends on Bioseparation techniques used" Justify the statement. **[16]**

Q11)Explain with a neat sketch difference between primary and secondary metabolites. Give detail note on recovery of primary and secondary metabolites. **[18]**

OR

Q12)Elaborate on recent industrial advances in Bioseparation processes with example of secondary metabolite product like Antibiotics. **[18]**

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Total No. of Questions :11]

SEAT No. :

P2996

[Total No. of Pages :2

[4958]-279
T.E. (Biotechnology)
IMMUNOLOGY AND DIAGNOSTICS
(2008 Course) (Semester - II) (315469)

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

Instructions to the candidates:

1) ***Attempt 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***

SECTION-I

Q1) Describe various innate immune mechanisms. What are the differences in innate and adaptive immunity? **[18]**

OR

Q2) Name two major primary lymphoid organs and draw their structures. Discuss the role of primary lymphoid organs in development of immunity. **[18]**

Q3) With the help of graph explain prozone phenomenon. Write a note on rocket electrophoresis. **[16]**

OR

Q4) a) With the help of flow chart diagram show how will you produce human monoclonal antibody selective for rabies virus. **[8]**

b) Draw labeled diagram of haemagglutination inhibition. **[8]**

Q5) a) Write a note on T cell maturation and activation. **[8]**

b) Name the cells participating in antigen processing. Describe contact dermatitis. **[8]**

OR

P.T.O.

Q6) a) What are MHCs? What is it called in humans? What is MHC restriction? **[8]**

b) Write a note on erythroblastosis foetalis. **[8]**

SECTION-II

Q7) a) What is anaphylaxis? What is the underlying mechanism of anaphylaxix? **[10]**

b) Write notes on: **[8]**

i) Role of IgE in allergy,

ii) Complex mediated hypersensitivity.

OR

Q8) What are the differences between humoral immunity and cell mediated immunity? Briefly explain immune effector mechanism in both types. **[18]**

Q9) What is active immunity? How is it achieved? Explain the terms attenuation, adjuvants, PPD, OPV. **[16]**

OR

Q10) What is autoimunity? Give examples of local and systemic autoimmunity Describe systemic lupus erythematosus. (SLE) **[16]**

Q11) Write short notes on (any 2) (8 marks each): **[16]**

a) Antigens

b) Ig G structure and function

c) Complement

d) Natural Killer cells

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Total No. of Questions : 12]

SEAT No. :

P2798

[Total No. of Pages : 2

[4958]-280
T.E. (Biotechnology)
BIOINFORMATICS AND MANAGEMENT
(2008 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two Sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Describe relational and object oriented databases. What is the importance of databases in biological sciences? Write a note on database query language. **[18]**

OR

Q2) Discuss the following : (9 marks each) **[18]**

a) Primary and secondary protein data bases.

b) Entrez and SRS.

Q3) Write short notes on : (4 marks each) **[16]**

a) Genbank

b) NCBI

c) DDBJ

d) DNA sequencing method

OR

Q4) What is an algorithm? Explain different properties of algorithm and their significance in bioinformatics. **[16]**

P.T.O.

Q5) Write short notes on: **[16]**

SCOP

CATH

OR

Q6) Write a note on phi, psi and omega angles with respect to protein secondary structures. List any two structure visualization tools. Give a detailed account of the levels of protein sequence and structure organization? **[16]**

SECTION - II

Q7) Answer the following (9 marks each) **[18]**

a) Computer Aided Drug Designing.

b) PAM and BLOSUM matrices.

OR

Q8) Explain in detail working of BLAST and different variants of BLAST. **[18]**

Q9) Write a note on Vaccine designing. What is the application of computational biology in rational drug designing? Name the two basic drug designing approaches. **[16]**

OR

Q10) Define phylogeny. Explain briefly the methods to construct a phylogenetic tree. **[16]**

Q11) Briefly explain the four structural types of database management systems in details. **[16]**

OR

Q12) What is Biotechnology Management? Describe various fundamental processes or tasks in the field of management. List current problems faced by Biotechnology industry? **[16]**