Total No. of Questions : 12]

SEAT No. :

P3336

[Total No. of Pages : 3

[5353]-501

T.E. (Civil)

HYDROLOGY & WATER RESOURCE ENGINEERING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10 and Q11 or Q12.***

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

Q1) a) the isohytes due to storm were having following data; **[4]**

isohytes[mm]	Area[km^2]
150	40
170-150	150
150-140	70
140-130	200
130-110	25

Find the weighted precipitation for total catchment area

b) Why isohytel method of determination of average rainfall is more accurate than other two? **[3]**

OR

Q2) a) What are the different types of rain gauges? Explain non-recording type rain gauge with neat sketch. **[4]**

b) Explain any four factors affecting Evapouration of water from reservoir. **[3]**

Q3) a) Derive relationship between duty and delta. **[4]**

b) Write a short not on assessment of canal revenue? **[3]**

P.T.O.

OR

Q4) Estimate the number of days required between two watering for a crop having following data : **[7]**

i) Field capacity = 30%,

ii) permanent wilting point = 15%

iii) Apparent density of soil = 1.5

iv) effective depth of root zone = 755.55 mm,

v) daily consumptive use of water for crop = 10 mm

Q5) a) A 30 cm diameter well is pumped at a uniform rate of 3 m^3/min. in 230 m thick aquifer. Drawdown observed at 2m and 200m distances from center of well are 10 m and 0.5m respectively. Determine aquifer constant of water bearing statum. **[3]**

b) Distinguish between unconfined aquifer and perched aquifer. **[3]**

OR

Q6) a) State assumption in Dupits theory. **[3]**

b) Explain application of Darcys law. **[3]**

Q7) a) Define unit hydrograph. State factors affecting the unit hydrograph. Explain the components with the help of sketch. **[8]**

b) Explain extreme value (Gumbel) distribution. **[8]**

OR

Q8) a) State various methods to estimate flood and explain rational method in detail. **[8]**

b) What is Scurve hydrograph? Explain its components and construction with a neat sketch. **[8]**

Q9) a) Explain the different steps involved in calculating the useful life of reservoir. **[8]**

b) Write a note on B/C ratio for reservoir Explain any two methods. **[8]**

OR

Q10)a) Explain types of reservoirs and explain the points considered for selecting the site for a reservoir and state the investigations required for construction of reservoir. **[8]**

b) Explain I.S.D method of flood routing. **[8]**

Q11)a) What are the field information to be collected before providing Drainage channel to Irrigated Land? Explain Sub-Surface and Surface Drain. **[6]**

b) Explain the Participatory Irrigation Management? Explain Need and Objective of farmer Participation in Irrigation Management. **[6]**

c) How water management can be applied while Irrigation. **[6]**

OR

Q12)a) What is water logging? State methods to improve the sub-surface drainage. **[6]**

b) Explain different irrigation acts? **[6]**

c) Explain different methods of reclamation of water logged land. **[6]**

Total No. of Questions : 12]

SEAT No. :

P3337

[Total No. of Pages : 3

[5353]-502

T.E. (Civil)

INFRASTRUCTURE ENGG. & CONSTRUCTION TECHNIQUES

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8, Q.9 OR Q.10 and Q.11 OR Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume, suitable data, if necessary.***

Q1) Explain the salient features of smart city. **[6]**

OR

Q2) Define and give features of Bus rapid transit system. **[6]**

Q3) a) Define the terms : **[4]**

i) Equilibrium speed,

ii) Equilibrium cant,

iii) Cant deficiency,

iv) Cant excess.

b) What is Track Maintenance? Explain in brief concept of Directed Track Maintenance (DTM). **[4]**

OR

Q4) a) Define following terms : **[4]**

i) Tongue rail

ii) Stock rail

iii) Crossing

iv) Points

b) How the Maximum Permissible Speed on Transitioned Curves is determine by Indian Railway Formula. **[4]**

P.T.O.

Q5) What is Diaphragm walls? Explain its construction methods. **[6]**

OR

Q6) What is Grouting? Explain grouting methods in soft soil. **[6]**

Q7) a) State the various methods of tunneling in soft ground. Explain NATM in brief. **[6]**

b) What is Mucking? State various methods of mucking and explain any one in detail. **[6]**

c) Write a short note on TBM. **[4]**

OR

Q8) a) List the tunneling Methods in soft soil. Explain in brief earth pressure balance method of tunneling. **[6]**

b) Give the types and methods of Tunnel ventilation and explain any one detail. **[6]**

c) Write a short note on Micro tunneling. **[4]**

Q9) a) What are the various points to be considered for selection of a site for Harbour? Explain any two in detail. **[6]**

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

c) Define breakwater. What is the necessity of breakwater? **[4]**

OR

Q10)a) Define Dock. Differentiate between Wet Dock and Dry Dock. **[6]**

b) State the general sequence of operation for driving tunnels through hard rock. **[6]**

c) Define the following terms : **[4]**

i) Fenders

ii) Dolphins

Q11)a) List and Explain the selection criteria for cranes. **[6]**

b) Write short note on, Economic maintenance & repair of construction equipment. **[6]**

c) List the factors to be considered for calculation of output estimation of equipment? Explain any two in detail. **[6]**

OR

Q12)a) Write short note on, **[6]**

i) Tower Cranes

ii) Hoisting Equipments

b) What are the various factors that are considered for selection of an equipment for project? Explain any two giving examples. **[6]**

c) A shovel with 3 cubic yard heaped capacity bucket is loading well blasted rock on a highway project. The average face height is expected to be 22 ft. The shovel has a maximum rated digging height of 30 feet, with Optimum height of 50%. Most of the cut will require a 140 degrees swing of the shovel to load the haul units. What is a conservative production estimate in bank cubic yards, if the ideal cycle time is 21 sec? **[6]**

Percentage of optimum depth	**Angle of Swing (degrees)**					
	46	60	75	90	120	150
120	1.2	1.11	1.03	0.97	0.86	0.77
140	1.12	1.04	0.97	0.91	0.81	0.73
160	1.03	0.96	0.9	0.85	0.75	0.67

(**Note** - Assume efficiency 30 minutes per hour, Swell factor for rock = 0.63, Bucket Fill factor 110% for well blasted rock.)

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

P3973 **[Total No. of Pages : 3**

[5353]-503
T.E. (Civil) (Semester - I)
STRUCTURAL DESIGN - I
(2012 and 2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain modes of failure in compression member with sketch. **[5]**

b) Determine design tensile strength of an ISA 125 × 95 × 10 @16.5 kg/m in which longer leg connected to the gusset plate of thickness 12 mm by 3 number of M20 black bolts of 4.6 grade. **[5]**

OR

Q2) a) Why partial safety factors are used in LSM instead of factor of safety. **[5]**

b) Check the adequacy of an ISA 90 × 60 × 6 @ 6.8 kg/m to carry factored axial tensile load of 150 kN for yielding and block shear only. Assume angle is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts. **[5]**

Q3) a) A 5 m long column is effectively held in position at both ends and restrained against rotation at one end. If an ISHB 350 @ 67.4 Kg/m is used, Calculate design compressive strength. **[5]**

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

P.T.O.

OR

Q4) Design the slab base for a column ISHB 350 @ 66.1 kg/m supporting a factored axial compression of 1500 kN. Consider grade of concrete as M20. Take width of base plate as 410 mm. **[10]**

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

OR

Q6) a) Explain modes of failure in beams. **[6]**

b) Design a laterally supported beam of effective span 6 m for the following data: **[10]**

i) factor moment M = 120 kNm

ii) factor shear force V = 200 kN

Q7) a) Explain types of beam to beam and beam to column connections with suitable sketches. **[7]**

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

OR

Q8) A simply supported welded plate girder of an effective span of 24 m subjected to factored uniformly distributed load 50 kN/m throughout the span including the self weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa. Design cross section of plate girder, stiffeners and connections. Draw sectional plan and elevation.**[17]**

Q9) Determine the maximum wheel load, shear force and bending moment for the gantry girder as per the following data. Design the section and check for moment capacity of the section. Weight of crane girder: 150 kN, crane capacity: 180 kN, weight of crab and motor: 50 kN, span of crane girder: 15 m. minimum hook approach: 1 .2m, center to centre between gantry column: 5m, Weight of rail: 0.25 kN/m. **[17]**

OR

Q10) A truss shown in Fig.10 is used for an industrial building situated at Pune covered with AC sheets. Calculate the panel point dead, live, and wind load. Design the members $L_7 L_8$, $U_7 L_8$ and $L_7 U_7$. Assuming (Cpe – Cpi) = ± 0.8, $k_1 = 1$, $k_2 = 0.98$, $k_3 = 1$ and $f_y = 250$ MPa. Draw the design sketches. **[17]**

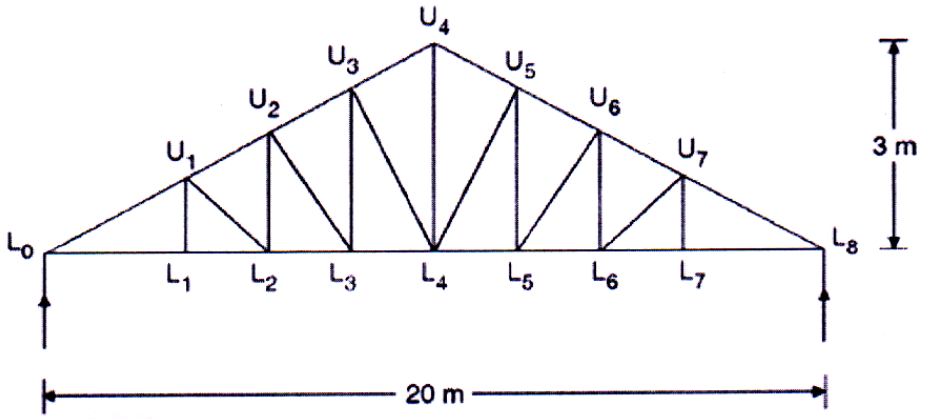


Fig. 10

Total No. of Questions : 8]

SEAT No. :

P3338

[Total No. of Pages : 4

[5353]-504

T.E. (Civil)

STRUCTURAL ANALYSIS - II

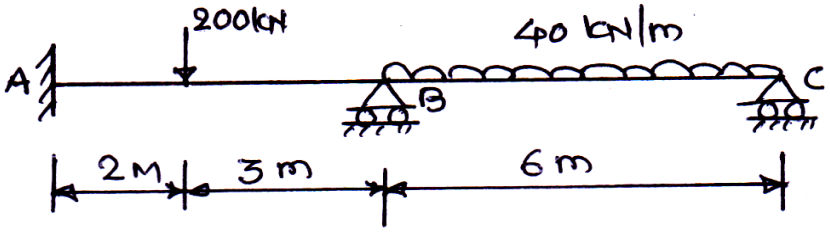
(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

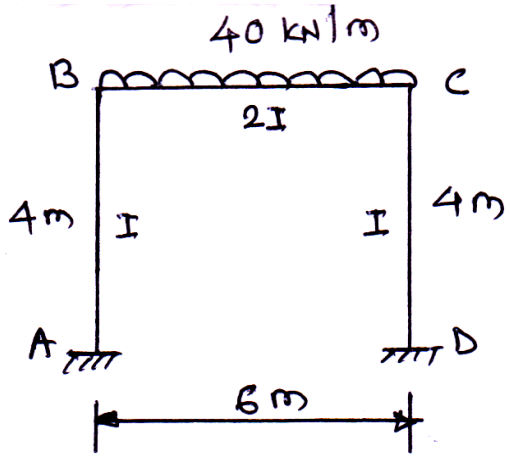
Instructions to the candidates:

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

Q1) a) Analyze the beam by slope deflection method. Draw B.M.D. Take EI = constant. **[10]**



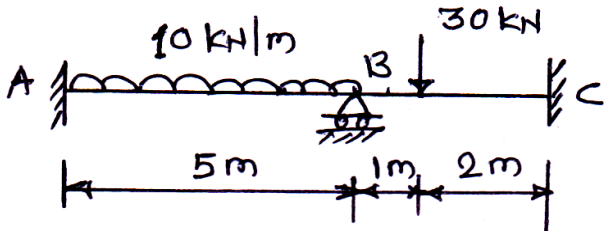
b) Analyze the frame as shown by moment distribution method. Draw B.M.D. **[10]**



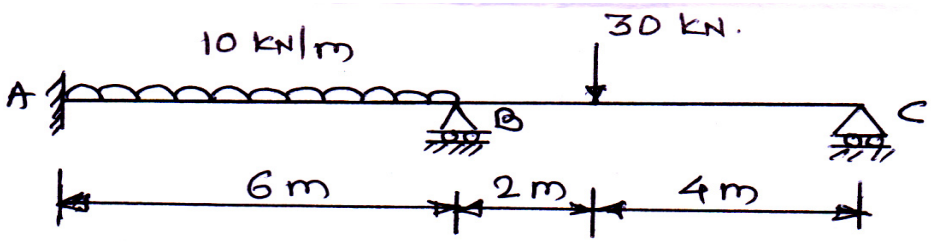
OR

P.T.O.

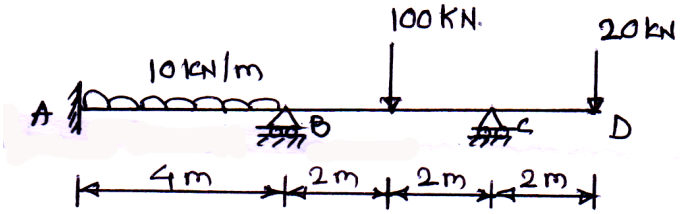
Q2) a) Analyze the continuous beam by moment distribution method. Draw S.F.D. and B.M.D. **[10]**



b) Analyze the beam by flexibility method if support B sink by 25mm. Take EI = 3800kN.m^2. **[10]**

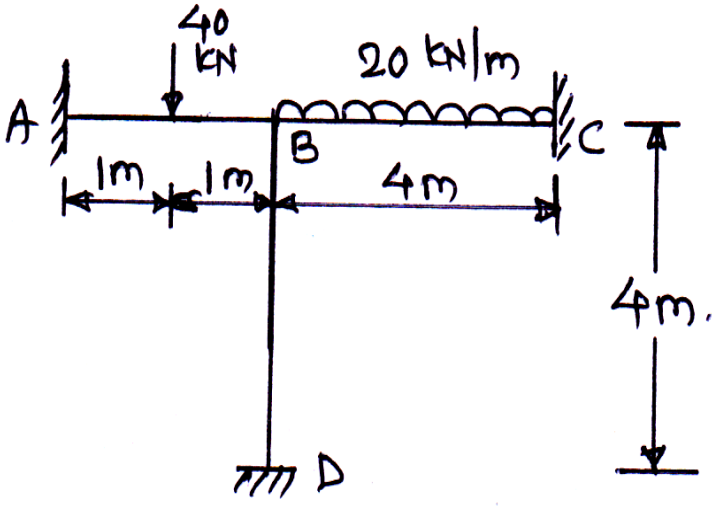


Q3) Analyze the beam by stiffness matrix method. Draw B.M.D. **[16]**

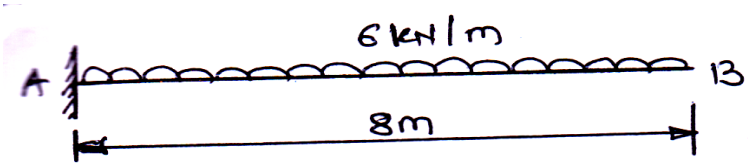


OR

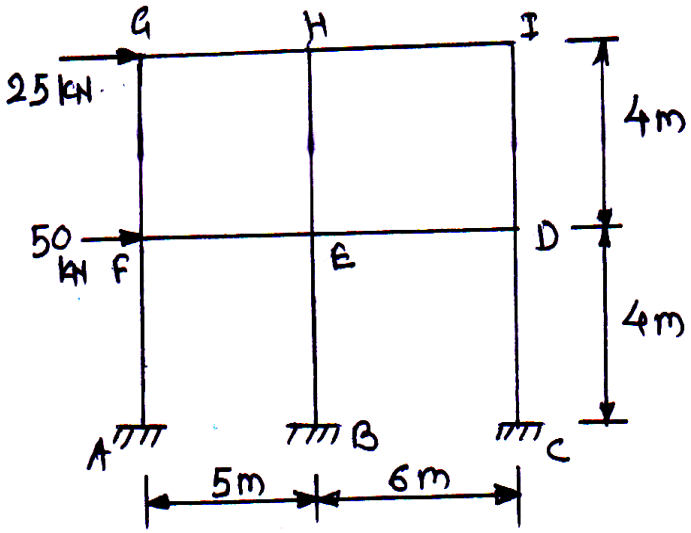
Q4) Analyze the frame by stiffness matrix method. Draw B.M.D. **[16]**



Q5) a) Find the nodal deflection for the beam by using FDM. Take 5 Nodes. **[6]**

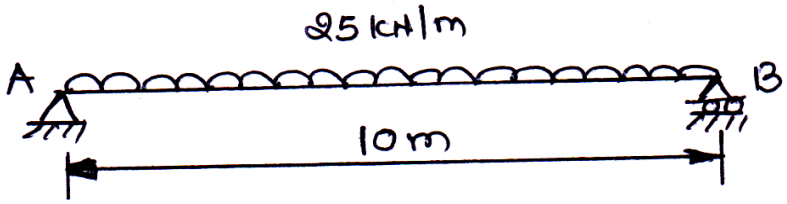


b) Analyze the frame by portal method. Draw B.M.D. **[12]**



OR

Q6) a) Find the maximum deflection for the beam by using FDM. Take 3 Nodes. **[6]**



b) Analyze the frame shown in fig. Q.5 (b) by cantilever method. Draw B.M.D. **[12]**

Q7) a) Explain plain stress and plain strain problem with example. **[8]**

b) Explain the concept of Pascals Triangle. **[4]**

c) Define CST and LST. **[4]**

OR

Q8) a) Define : **[8]**

i) Isoparametric element

ii) Subparametric element

iii) Superparametric element

iv) Shape function

b) Explain the concept of Discretization with example. **[4]**

c) Derive the equation for minimum potential energy. **[4]**

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

P2517 **[Total No. of Pages : 2**

[5356]-505
TYMCA (Engineering)
ANIMATION & GAMING
(Elective - II) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

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

Q1) a) Explain in detail DDA algorithm of line drawing. **[4]**

b) Write short note on CRT Monitors scan. **[4]**

OR

Q2) a) Explain in detail scan line polygon filling algorithm. **[4]**

b) Distinguish between Raster and Random scan display. **[4]**

Q3) a) What is meant by motion cycling and masking in animation? **[4]**

b) Discuss the role of shockwave format in web based animation. **[4]**

OR

Q4) a) Explain color cycling and morphing concept in animation. **[4]**

b) What is 3D animation? **[4]**

Q5) a) What are the qualities of good animation character? **[5]**

b) Explain steps in developing animation character. **[4]**

OR

Q6) a) Explain essentials of good animation character. **[4]**

b) Explain sketching and drawing in detail. **[5]**

Q7) a) Explain game design process in detail. **[7]**

b) What is game? **[2]**

OR

Q8) a) Explain architecture of game in detail. **[7]**

b) What is game theory? **[2]**

P.T.O.

Q9) a) What are Advantages of Writing Games in Java? **[4]**

b) Explain different types of computer games. **[4]**

OR

Q10) a) Explain basic JDK tools in java. **[4]**

b) State and explain different object oriented concepts in java. **[4]**

Q11) a) Explain rendering in game programming. **[4]**

b) Explain actor class and its methods. **[4]**

OR

Q12) a) Explain basic game structure in java. **[4]**

b) Explain collision detection in game programming. **[4]**

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

P2518 **[Total No. of Pages : 2**

[5356]-506
TY MCA (Engineering)
MOBILE COMPUTING
(2013 Pattern) (Semester - V) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 50***

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 jf necessary***

SECTION - I

Q1) What are the different mobile phone technologies? Compare the 1G, 2G, 2.5G & 3G. **[9]**

OR

Q2) What is cellular network? Explain with suitable diagram. **[9]**

Q3) What is WAP? Explain the architecture of WAP with suitable diagram. **[8]**

OR

Q4) What is Bluetooth? Explain the architecture of Bluetooth with suitable diagram. **[8]**

Q5) a) What are the different data management issues in mobile computing? Explain in detail. **[4]**

b) What is data replication? Give the different techniques of data replication. **[4]**

OR

Q6) a) Explain the CODA file system and its features. **[4]**

b) Write a short notes on disconnected operations. **[4]**

P.T.O.

SECTION - II

Q7) Write short notes on following mobile operating systems. **[8]**

a) Android

b) Windows Phone

OR

Q8) a) What are the different user interface layouts of Android? Explain each in short. **[4]**

b) What are the different steps of creating views? Explain in short. **[4]**

Q9) Explain the location based services. How can one access them in Android? **[8]**

OR

Q10) a) Explain the file system structure of Android. **[4]**

b) Explain the different file management tool in android? **[4]**

Q11) What is SQLite database? Create the database for Employee details and perform the following operations. **[9]**

a) insert

b) Delete

OR

Q12) Write a program for sending Email on Android OS. **[9]**

Total No. of Questions : 10]

SEAT No. :

P4264

[Total No. of Pages : 4

[5353]-507

TE. (Civil)

Project Management and Engineering Economics

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q. 9 or Q.10.

Q1) a) What are the objectives and importance of Project management? **[2+3]**

b) Explain with sketch matrix organizational structure. **[2+3]**

OR

Q2) a) Define Activity, event and critical event, critical path and slack. **[5]**

b) Explain Project Management Book of Knowledge {PMBOK} - Different Domain Areas. **[5]**

Q3) a) Following data is for small construction Project. Draw a network. Calculate expected mean time for each activity. **[2+3]**

Activity	Estimated duration in days		
	Optimistic	Most likely	Pessimistic
1-2	4	10	22
2-3	2	5	8
2-4	4	7	16
2-5	4	7	10
3-5	4	7	22
4-5	5	8	17
5-6	6	9	18

P.T.O.

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

OR

Q4) a) Listed below are the activities of a project along their durations. **[3+2]**

Activity	1-2	2-3	2-4	2-5	3-10	4-6	4-7	5-10	6-8	7-8	8-9	9-10
Duration (days)	4	5	7	4	15	7	Dummy	10	6	7	12	10

Draw network and calculate the total project duration.

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

Q5) a) Explain Resources Allocation. Write steps to do Resource Smoothening and Leveling. **[2+3]**

b) When to update the network? Write steps to update the network. **[2+3]**

c) Following table shows the data of small construction project. **[8]**

i) Draw the network diagram and update the network by using the following conditions at the end of 10 days.

ii) What is the change in the project duration?

iii) What is remaining duration of project?

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

At the end of 10 days review was taken which indicates ------

1) Activity 1-2 & 2-4 was completed as originally planned.

2) Activity 2-3 & 3-5 delayed drastically and requires 5 & 6 more days respectively for their completion.

3) Activity 4-5 & 5-6 is in progress and both require 8 more days for their completion.

4) Activity 6-7 yet to start and the original time estimate still appear to be accurate.

5) Activity 5-7 requires 8 days in place of 6 days for its completion.

OR

Q6) a) Comment on Project management software's and their applications in Infrastructure projects. **[1+4]**

b) What do you mean by EVA? Explain any one method in detail. **[2+3]**

c) Following table shows the cost duration data for a small construction project. Carry out step by step Crashing and how much you save by crashing the network. Indirect cost is Rs. 3000 week. **[8]**

Activity		1-2	1-3	2-3	2-4	3-4
Normal	Cost	7000	4000	6000	8000	5000
	Duration (Weeks)	6	8	4	5	5
Crash	Cost	14500	8500	9000	15000	11000
	Duration (Weeks)	3	5	1	3	3

Q7) a) Explain Importance of Project economics and its importance in construction industry. **[6]**

b) How to calculate simple and compound interest? What is the difference between the simple interest and compound interest payable on a principal of Rs 15,000 in 3 years at the rate of 20 % p.a. **[2+4]**

c) Explain Equilibrium price, Equilibrium Amount and Factors affecting Price Determination. **[2+2]**

OR

Q8) a) Explain Concept of Cost of Capital & Time Value of Money. **[3+3]**

b) Explain Types of Capital - Fixed and Working. **[3+3]**

c) Mrs. Mayuri brought a refrigerator for Rs. 20000; she paid tax of Rs 1000 and Rs. 200 for transport. If she sold it to a customer for Rs.23500, What is the percentage profit or loss? **[4]**

Q9) a) What are the different types of appraisals required to undertake any Project? Explain any one in detail. **[2+4]**

b) Write a short note on (with formula and selection criteria) **[3+3]**

i) NPV,

ii) Pay-Back Period

c) Explain IRR method with formula, selection criteria. **[2+2]**

OR

Q10)a) Following are the details of Project A and B. Suggest which one is to be accepted by using NPV (i=8%) **[6]**

Years	Project A	Project B
0	4,00,000	4,50,000
1	1,20,000	1,40,000
2	1,25,000	1,45,000
3	78,000	76,000
4	80,000	65,000
5	75,000	60,000
6	-	90,000

b) What is the role of Project management Consultant in Pre-tender and Post-tender of a Project? **[3+3]**

c) Explain Study of Project Feasibility report with example. **[2+2]**

Total No. of Questions : 12]

SEAT No. :

P4265

[Total No. of Pages : 3

[5353]-508

TE. (Civil) (Semester - II)

FOUNDATION ENGINEERING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q. 9 or Q.10 and Q.11 or Q.12.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

SECTION - I

Q1) Discuss SPT and what are the various corrections? What is the importance of the test in geotechnical engineering? **[6]**

OR

Q2) Discuss pressure meter test with diagram. **[6]**

Q3) Differentiate between GSF and LSF and also discuss the effect of water table on bearing capacity equation. **[8]**

OR

Q4) A square footing 2.6m × 2.6m is built in a homogenous bed of sand of unit weight 19KN/m^3 and having an angle of shearing resistance of 36°. The depth of footing 2m below the ground surface. Calculate the safe load. (FOS = 3, Nc = 65.4, Nq=49.4Nγ=54, Use Terzaghi analysis) **[8]**

Q5) Calculate average immediate settlement. Use following data: Footing =4m*2m, depth of foundation=2m, E=48MN/m^2, v=0.5, contact pressure=200kN/m^2, μ_0=78 and μ_1=84. **[6]**

P.T.O.

OR

Q6) A normally consolidated clay stratum of 5 m thickness has two permeable layers at its top and bottom. The liquid limit and the initial void ratio of the clay are 40% and 0.85 respectively, while the initial overburden pressure at the middle of clay layer is 300 kPa. Due to the construction of a new building this pressure increases by 150 KPa. Compute the probable primary consolidation settlement (expressed in mm) of the building. **[6]**

SECTION - II

Q7) a) A group pile consists of 16 piles arranged in 4 rows and 4 columns. Calculate efficiency of pile group by using feld's rule. **[6]**

b) Explain pile load test with its limitation **[6]**

c) What is caisson disease and how it's controlled **[4]**

OR

Q8) a) Explain the procedure of caisson sinking using Sand Island Method. **[5]**

b) Compute the settlement of pile group to carry a load of 3000kN including the weight of pile cap at a site where the soil is uniform clay to a depth of 20 m, underlain by rock and length of pile 10.5m, Diameter of pile 0.5m, no. of pile is 16, spacing of pile is 150cm .average confined compressive strength of the clay is 70kN/m^2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure, assume the load transfer at 2/3 length of the pile. **[7]**

c) Explain negative skin friction on Piles with sketch **[4]**

Q9) a) Discuss any two methods of cofferdam. **[7]**

b) List out various soil improvement techniques. Explain preloading techniques **[6]**

c) Explain vibro flotation techniques **[4]**

OR

Q10)a) Explain R C Diaphragm method **[7]**

b) Explain design Principle of under reamed pile **[6]**

c) Explain any four engineering problem associated with black cotton soil. **[4]**

Q11)a) State the various function of Geosynthetic materials and explain any two function **[7]**

b) Enlist the factors considered while selecting geosynthetics materials **[6]**

c) Explain different types of seismic wave **[4]**

OR

Q12)a) What is strong ground motion? Explain any four characteristics **[7]**

b) What are the advantages and disadvantageous geosynthetics over conventional materials **[6]**

c) What is Liquefaction? Discuss the effect of liquefaction **[4]**

Total No. of Questions : 12]

SEAT No. :

P4266

[Total No. of Pages :7

[5353]-509
T.E. (Civil) (Semester - II)
STRUCTURAL DESIGN - II
(2015 Pattern)

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

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q. 9 or Q.10 and Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***IS 456-2000 and non programmable calculator are allowed in the examination.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Mere reproduction from IS Code as answer, will not be given full credit.***
6) ***If necessary assume suitable data and indicate clearly.***

Q1) A rectangular RC beam 230 mm wide and 420 mm effective depth is reinforced with 4 No. 12 mm diameter bars in tension. Find moment of resistance by WSM approach. If same R. C. C. beam section is used as cantilever beam having effective span as 1.75 m find out the intensity of uniformly distributed load excluding self weight that can be placed on it. Use material M20 grade concrete and Fe 250 grade steel. **[5]**

OR

Q2) Calculate moment of resistance of a doubly reinforced RC beam section 230 mm × 525 mm overall reinforced with 3 bars of 16 mm diameter on tension side and 3 bars of 12 mm diameter on compression side. The effective cover to both tension and compression steel is 30 mm. The grade of concrete is M20 and steel is Fe 250. Use WSM approach. **[5]**

Q3) A simply supported beam over a span of 6 m carries working load of 45 kN/m. The overall depth of beam is restricted to 600 mm for headroom requirement. Design suitable rectangular section for this beam for flexure only. Take grade of concrete as M20 and steel as Fe 415. Assume effective cover as 50mm. Use LSM approach. **[7]**

OR

Q4) Design a corridor slab over a passage of size 15.70 m × 3.20 m at an entrance of a public building. The slab is simply supported by 300 mm wide beams and carries superimposed load 3.25 kN/m^2. Use M20 grade of concrete and Fe 415 grade of steel. Assume mild exposure condition. Show details of reinforcement. **[7]**

P.T.O.

Q5) For an assembly hall of size 16 m × 8.5 m floor beams are spaced @ 4 m c/c and have a simply supported span of 8.5 m. These beams support the floor slab 140 mm thick. The size of beam is 230 mm × 500 mm overall. Design an intermediate beam as T-beam for flexure with following data:

Live load on slab = 4 kN/m^2; Floor finish = 1.5 kN/m^2;

Wall on beam = 230 mm thick brick wall with 3.00 m height;

Concrete Grade = M 20; Steel Grade = Fe 500

Assume effective cover to steel as 50 mm. Use LSM approach. **[8]**

OR

Q6) Figure 1 shows the layout of a typical floor for an office building. The live load and floor finish are 4 kN/m^2 and 1.5 kN/m^2, respectively. Design slab panel S_1 using LSM approach. The grade of concrete is M20 and steel is Fe 250. Show details of reinforcement. **[8]**

Q7) a) A reinforced concrete beam has a support section with a width of 230 mm and effective depth 500 mm. The support section is reinforced with 3 number 20 mm diameter bars on the tension side. 6 mm diameter-2 legged vertical stirrups are provided at a spacing of 150 mm c/c. Using M20 grade concrete, Fe 250 grade steel calculate the shear capacity of the beam section. **[7]**

b) A rectangular RC beam 300 mm × 700 mm overall is subjected to factored sagging bending moment of 175 kNm, factored shear force of 75 kN and factored twisting moment of 20 kNm. Design the reinforcement for given section using M20 grade of concrete and Fe 415 steel. **[10]**

OR

Q8) Using IS code coefficients design a continuous beam B_{17}-B_{21}-B_{25}-B_{29} of a typical floor for an office building shown in figure 1. All slab panels are 150 mm thick. The live load and floor finish for slabs are 4 kN/m^2 and 1.5 kN/m^2, respectively. This continuous beam also supports 230mm thick brick masonry wall of 3.25 m height. Use LSM approach. Show details of tension as well as shear reinforcement. **[17]**

Q9) A rectangular RC beam 300mm × 600 mm overall is fixed at one end and simply supported at the other end. It has a span of 6 m. It carries working superimposed load (exclusive of self weight) of 42 kN/m. Design the reinforcement at fixed support and near mid-span for following two cases:

a) without allowing redistribution of moment; b) allowing 30% redistribution of moments. Use M20 grade of concrete, Fe 415 steel and effective cover of 35 mm. **[16]**

OR

Q10) Design a short RC column and its isolated footing by LSM approach using M20 concrete and Fe 415 steel to carry a working axial load of 750 kN and working moment of 75 kN-m about major axis bisecting the depth of column. The unsupported length of column is 3.00 m and both ends of column are pinned. Take SBC of soil as 225 kN/m^2. Show details of reinforcement in plan and sectional elevation. Use given interaction charts. **[16]**

Q11) Design a short axially loaded column and its isolated footing for carrying a working axial load of 1000 kN. The effective length of column is 3.30m. Use M20 grade of concrete and Fe500 grade of steel. SBC of soil is 200 kN/m^2. **[17]**

OR

Q12) Design a bi-axial rectangular short column by LSM approach with material M20 and Fe 415 steel to carry a working moment load of 900 kN, working moment of 60 kN-m about major axis bisecting the depth of Column and 20 kN-m about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.6 m and 3.2 m; respectively. Also design the footing for this column only for flexure and punching shear. Take SBC of soil as 200 kN/m^2. Show details of reinforcement in plan and sectional elevation. Use given interaction charts. **[17]**

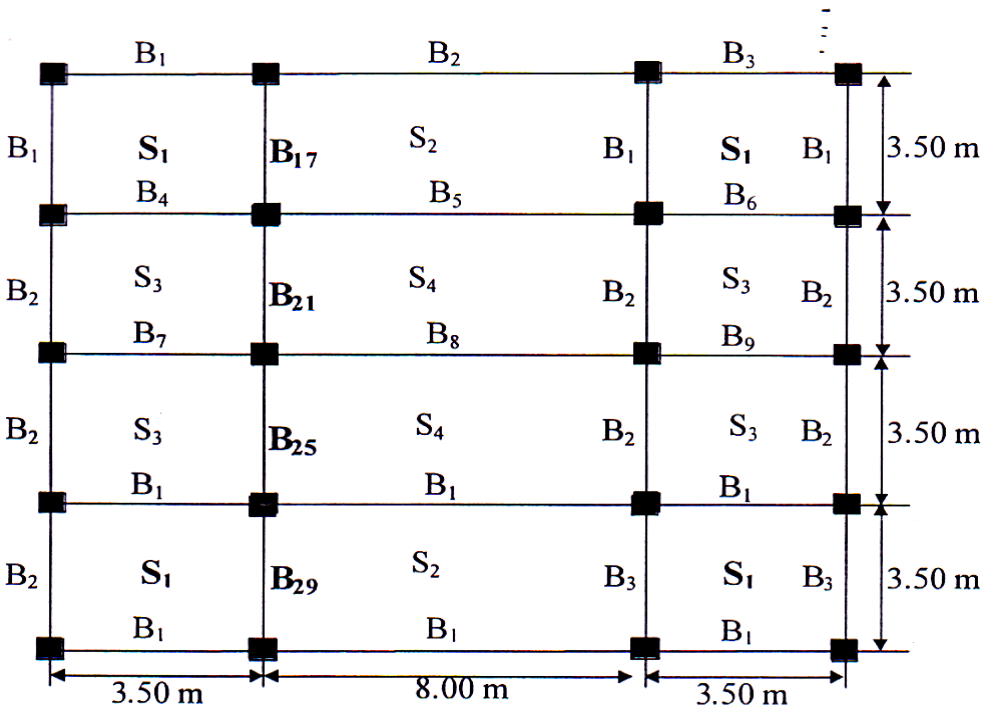


Figure 1: Typical floor plan of office building

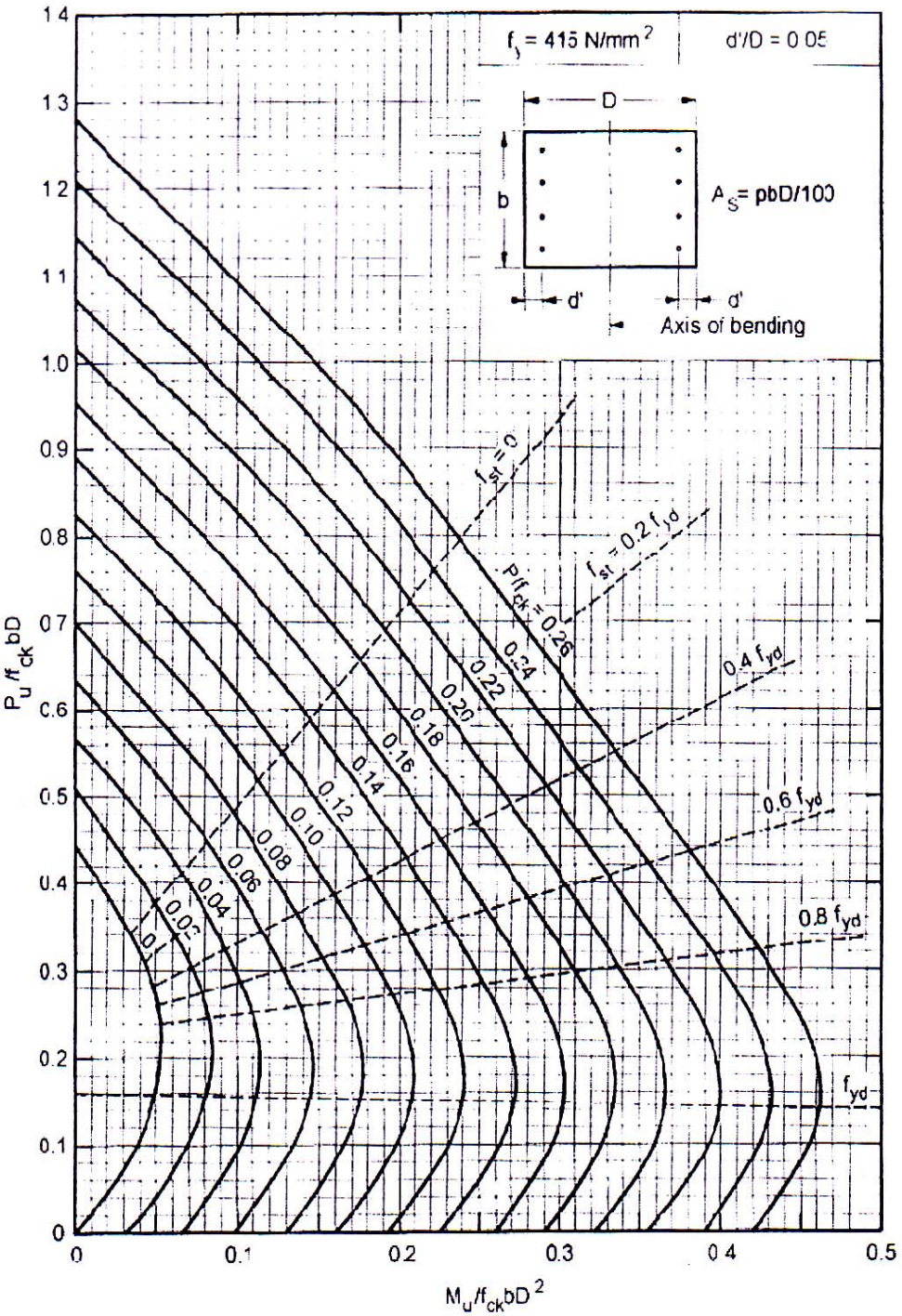


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides

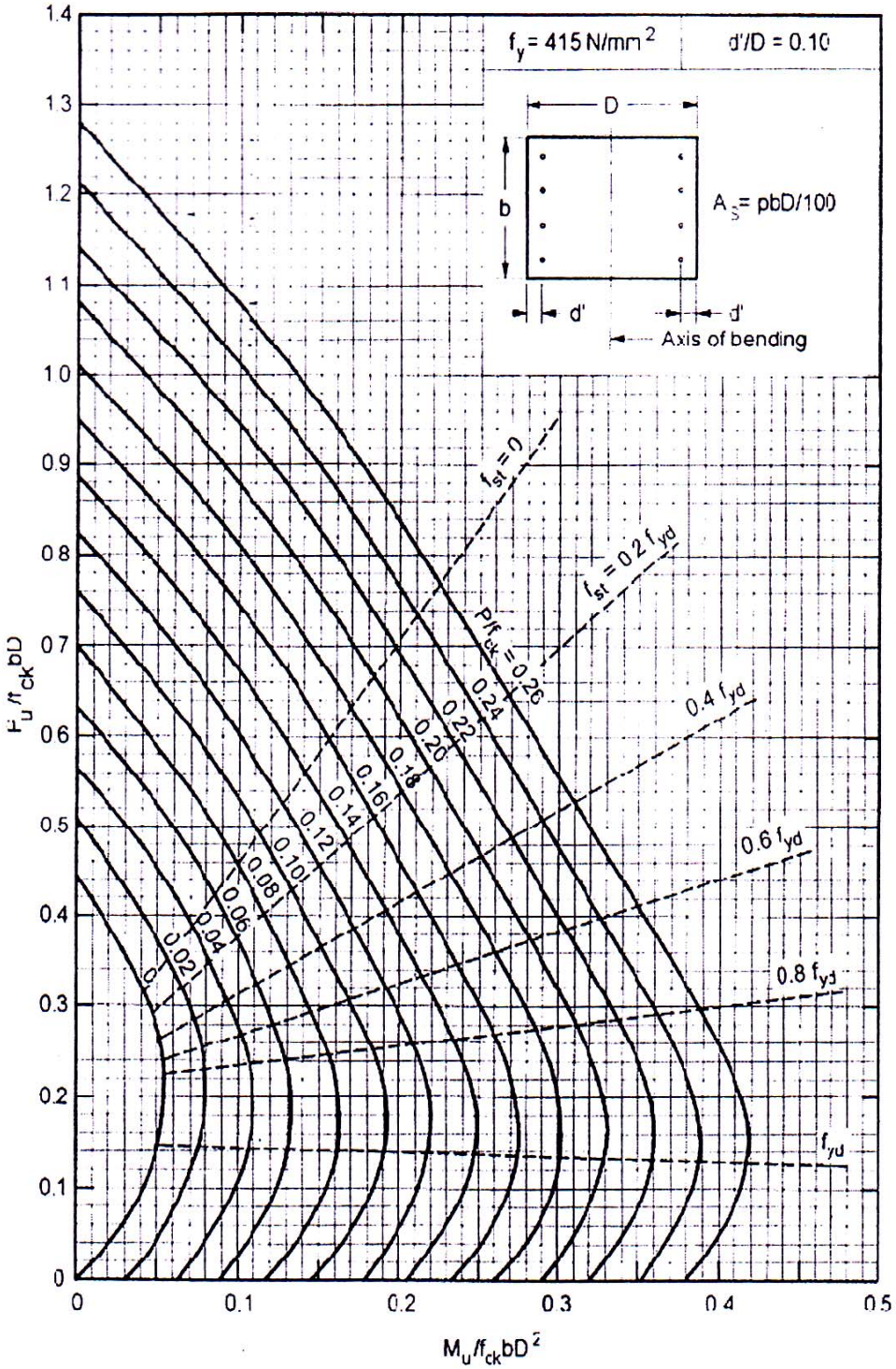


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides

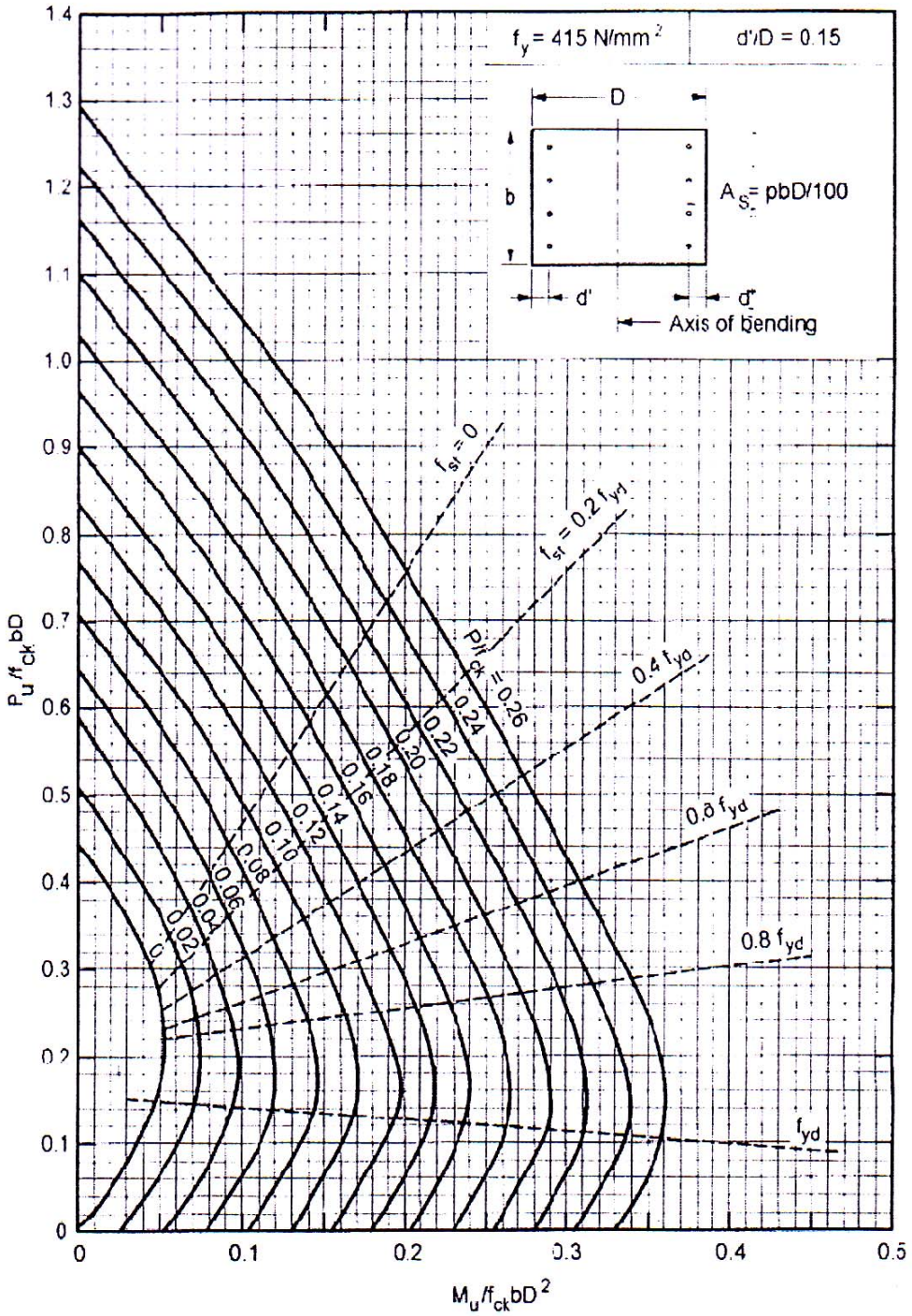


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides

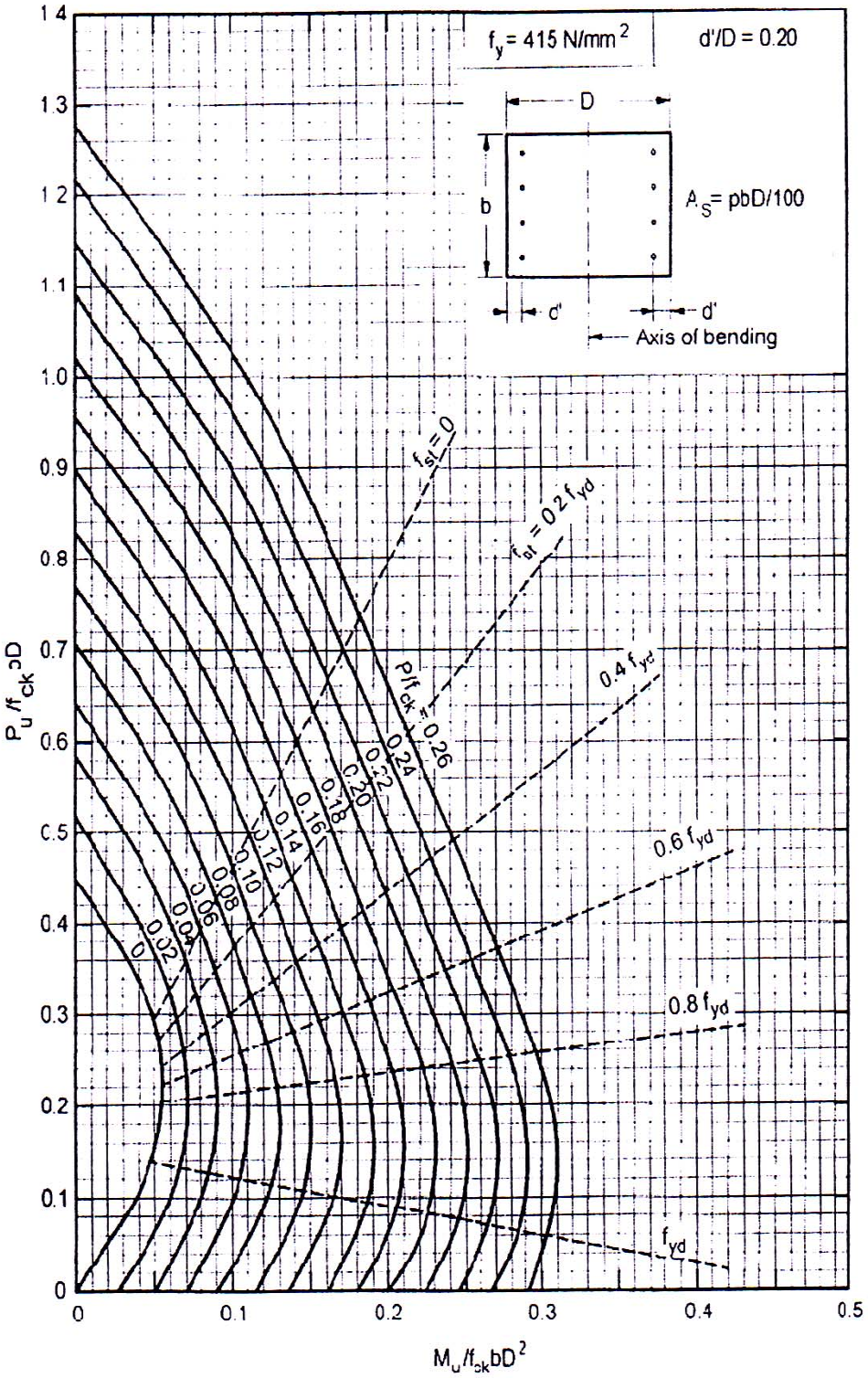


Chart No 4: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite

Total No. of Questions : 10]

SEAT No. :

P4267

[Total No. of Pages : 3

[5353]-510

T.E. (Civil Engineering)

ENVIRONMENTAL ENGINEERING - I

(2015 Pattern) (Semester - II)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or 2, Q3 or 4, Q5 or 6, Q7 or 8 and Q9 or 10.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Find the concentration of the following in $\mu g/m^3$. Consider a sample of air is analyzed at 0°c temperature and one atmospheric pressure. **[6]**

i) CO = 10 ppm

ii) SO_2 = 0.05 ppm

iii) NO_2 = 0.4 ppm

b) Write the ambient quality standards for noise pollution. **[4]**

OR

Q2) a) Enlist the data required for the water supply scheme. Also mention various factors affecting the design period. **[6]**

b) Sate the factors which affect the generation rate of solid waste. **[4]**

Q3) a) Explain in detail domestic and public consumption of water. Give typical values in tabular form. **[6]**

b) What do you know about heavy metals? Give 04 names of heavy metals found in water. **[4]**

OR

Q4) a) Enlist various types of aerators. Draw plan and cross section for circular type cascade aerator. Also mention typical dimensions on it. **[6]**

P.T.O.

b) Find the dimensions of a circular sedimentation tank form the following: **[4]**

i) Detention period = 4 Hrs

ii) Quantity of water to be treated = 3 million liters per day and

iii) Depth of water = 3m.

Q5) a) Design a Flocculator for design flow of 300 m^3/hr from the following data **[10]**

i) Detention period = 20 minutes

ii) Average value of G = 40 second

iii) Speed of paddles = 4.5 rpm

iv) Area of paddles 15 % of c/s area of basin

v) Ratio of length to width of the tank = 2

vi) Depth of tank = 0.4 times of width

vii) Relative Velocity of blade = 0.75 Vp

viii) $\mu = 1.0087 \times 10^{-3}$ N s/m^2

ix) $\rho = 998$ kg/m^3

b) Differentiate between coagulation and flocculation by considering different points. **[6]**

OR

Q6) a) Explain various filter troubles. How are they rectified? **[10]**

b) A filter unit is 4.5m × 9m size. After filteringl000 m^3/day in 24 hours. the filter is run at the rate of 12 liter /second/m^2 for 10 minutes. Compute the average filtration rate, quantity and percentage of treated water required in washing and the rate of wash water flow in 04 troughs used for collecting wash water. **[6]**

Q7) a) Enlist and explain various methods of disinfection. Mention factors affecting the efficiency of disinfection. Also explain the concept of chlorine demand. **[10]**

b) What is residual chlorine? Find the dose of chlorine and chlorine demand for water of 40000 m^3/day. Chlorine used is 15 kg per day and residual chlorine after 10 minutes of contact time is 0.2 mg/l. **[6]**

OR

Q8) a) Explain with necessary chemical reactions the lime soda process for softening of water. Also compare the lime soda process with zeolite process. **[10]**

b) Explain the any two processes for removal of odour and colour. **[6]**

Q9) a) What is service reservoir? Give the importance of distribution system. Draw a near sketch of ESR and show on it all of its component parts and appurtenances. **[9]**

b) A town with a population of two lakh is to be supplied with water daily at 200 liter per head. The pumping is done from 6 am to 6 pm. The variation in demand is as follows : **[9]**

Time of the day	6 am to 9 am	9 am to 12 noon	12 noon to 3 pm	3 pm to 6 pm	6 pm to 9 pm
Demand	40%	10%	10%	15%	25%

Determine the capacity of the service reservoir by MASS CURVE METHOD.

OR

Q10) Write Note on : **[18]**

a) Methods of distribution

b) Packed WTP in township

c) Wastage and leakage of water- its detection and prevention.

Total No. of Questions : 10]

SEAT No. :

P3341

[Total No. of Pages : 4

[5353]-511

T.E. (Mechanical Engineering) (End Semester)

DESIGN OF MACHINE ELEMENTS - I

(2015 Pattern)

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

Instructions to the candidates:

1) ***Answer five questions from the following***
2) ***Draw neat labeled diagrams wherever necessary***
3) ***Figures to right indicate full marks***
4) ***Use of electronic calculator is permitted***
5) ***Use of Programmable calculator is not allowed***
6) ***Assume suitable/standard data if necessary.***

Q1) a) A manufacturer is interested in starting a business with five different models of tractors ranging from 7.5kW to 75kW capacities. Specify power capacities of models. **[6]**

b) What are Renard numbers? Enlist basic five preferred series and explain any one with suitable example. **[4]**

OR

Q2) a) Draw neat labeled sketch of Bush-pin type coupling. **[4]**

b) A flexible coupling is used to transmit 15kW power at 100 rpm. There are six pins and their pitch circle diameter is 200 mm. The effective length of the bush, the gap between two flanges and the length of the pin in contact with the right hand flange are 35, 5 and 23 mm respectively. The permissible shear and bending stresses for the pin are 35 MPa and 152MPa respectively. Calculate a) Pin diameter by shear consideration and b) Pin diameter by bending consideration. **[6]**

Q3) a) Explain equivalent torsional and bending moment. **[4]**

b) A propeller shaft is required to transmit 45kW power at 500 rpm. It is a hollow shaft having inside diameter 0.8 times of outside diameter. It is made of plain carbon steel and the permissible shear stress is 84 N/mm^2. Evaluate the inside and outside diameters of shaft. **[6]**

P.T.O.

OR

Q4) a) Explain with neat sketches any four methods for reduction of stress concentration. **[4]**

b) Explain modified Goodman diagram. Draw neat labeled sketches of Modified Goodman diagram for Axial & Bending stresses and Modified Goodman diagram for Torsional shear stresses. **[6]**

Q5) a) A square threaded screw having 50 mm nominal diameter and 10 mm pitch is used for lifting a load of 20 kN. through a distance of 170 mm. Find the work done in lifting the load and efficiency of screw when: **[12]**

i) The load rotates with the screw and

ii) The load rests on the loose head which does not rotate with the screw.

iii) Stresses in screw.

The external and internal diameter of bearing surface of loose head are 60 mm and 10 mm respectively, while the coefficient of friction of friction bearing surface is 0.08 and for thread friction is 0.12.

b) Explain various thread forms suitable for power transmission. **[4]**

OR

Q6) a) Describe the term 'Virtual coefficient of friction'. **[3]**

b) A single start square threaded screw of a screw press is required to transmit a maximum load of 150 kN at 50rpm. The coefficient of friction for the threads is 0.12. The torque required for collar friction and journal bearing is about 10% of the torque required to drive the load. The maximum permissible compressive stress for the screw is 108.27 MPa. Determine:**[13]**

i) Safe diameter of the screw if allowable shear stress for the screw material is 55 MPa.

ii) Efficiency.

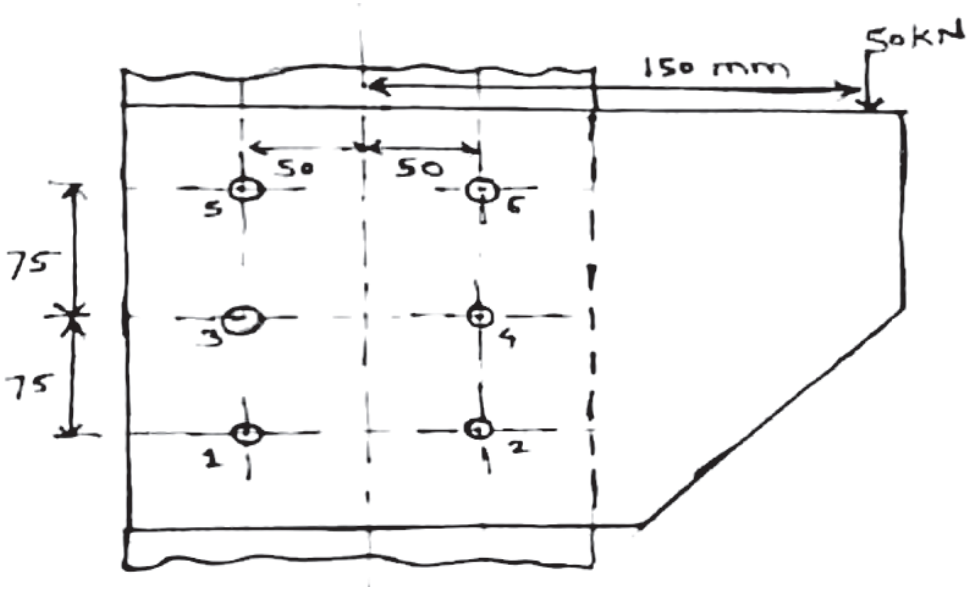
iii) Motor power required to drive the screw.

For the square threads use following standard data.

Sr.No.	Nominal diameter mm	Pitch mm
1	30, 32, 34, 36	6
2	38, 40, 42, 44	7
3	46, 48, 50, 52	8
4	55, 58, 60, 62	9
5	65, 70, 75, 80	10

Q7) a) Determine the method to determine the size of bolt when the bracket carries an eccentric load perpendicular to the axis of bolts. **[6]**

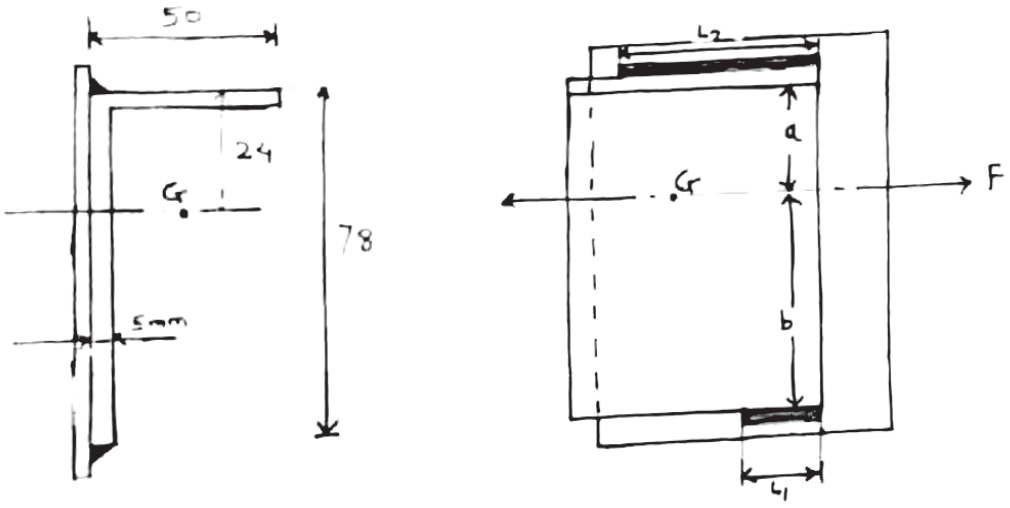
b) A bracket bolted to a column by 6 bolts of equal size as shown in figure. It carries a load of 50KN at a distance of 150mm from the centre of column. If the maximum stress in bolt is to be limited to 150 N/mm^2. Determine Size of bolts. **[12]**



OR

Q8) a) Derive the strength equation for single transverse fillet weld. **[6]**

b) An angle is welded to a steel plate as shown in figure the angle is subjected to an axial load of 50 KN and permissible shear strength of weld is 75Mpa. Determine the weld length L2 and LI at the top and bottom. **[12]**



Q9) a) Explain A M Wahl's factor & state its importance. **[4]**

b) A concentric spring consists of two helical compression springs having the same free length. The composite spring is subjected to a maximum force of 2000 N.The wire diameter and mean coil diameter of inner spring are 8 and 64 mm respectively. Also the wire diameter and mean coil diameter of outer springs are 10 and 80 mm respectively. Assume the same material for two springs and the modulus of rigidity of spring material is 81370 N/mm^2. Calculate: **[12]**

i) The maximum force transmitted by each spring

ii) The maximum deflection of spring

iii) The maximum torsional shear stress induced in each spring

OR

Q10)a) Derive the expression for shear stress induced in helical compression spring. **[6]**

b) It is required to design a helical compression spring subjected to a maximum force of 7.5 KN. the mean coil diameter should be 150 mm from space consideration. The spring rate is 75 N/mm. the spring made of Oil- hardened and tempered steel wire with ultimate tensile strength of 1250 N/mm^2. The permissible shear stress for the spring wire is 30% of ultimate tensile strength($G = 81370\ N/mm^2$) calculate, **[10]**

i) Wire diameter

ii) Number of active coils

Total No. of Questions : 10]

SEAT No. :

P3342

[Total No. of Pages : 4

[5353]-512
T.E. (Mechanical)
HEAT TRANSFER
(2015 Pattern)

Time : 2Hour 30Minutes] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8 and 9 or 10.***
2) ***Draw Neat diagrams wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data where ever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) Write the boundary conditions for insulated surface and convective surface. **[2]**

b) Define thermal diffusivity and its physical significance. **[2]**

c) A hollow cylinder with inner radius 30 mm and outer radius 50 mm is heated at the inner surface at a rate of 105 W/m^2 and dissipated heat by convection from outer surface into a fluid at 80°C with heat transfer coefficient of 400 $W/m^2.K$. There is no energy generation and thermal conductivity of the material is constant at 15 W/m.K. Calculate the temperatures of inside and outside surfaces of the cylinder. **[6]**

OR

Q2) a) Define fin effectiveness and fin efficiency. **[4]**

b) A hollow spherical form is used to determine thermal conductivity of an insulating material. The inner diameter is 50 mm and outer diameter is 100 mm. A 40 W heater is placed inside and under steady state conditions, the temperature at 32 and 40 mm radii were found to be 100°C and 70°C, respectively. Determine the thermal conductivity of the material. Also calculate the outside temperature of sphere. If surrounding air is at 30°C, calculate convection heat transfer coefficient over the surface.**[6]**

P.T.O.

Q3) a) Write brief information and applications of fibrous and cellular insulating materials. **[4]**

b) Derive expressions for temperature distribution and heat transfer rate for an infinite long fin attached to wall at temperature T_0, when general solution to temperature distribution is **[6]**

$$\frac{T(x)-T_\infty}{T_0-T_\infty}=C_1m^{-mx}+C_2e^{mx} \qquad \text{where} \quad m=\sqrt{\frac{hp}{kA_c}}$$

OR

Q4) a) Define time constant of thermocouple. **[2]**

b) A solid steel ball 5 cm in diameter and initially at 450°C is quenched in a controlled environment at 90°C with convection coefficient of 115 W/m^2.K. Determine the time taken by centre to reach a temperature of 150°C. Take thermophysical properties as C = 420 J/kg.K, ρ =8000 kg/m^3, and k = 46 W/m.K. **[6]**

c) Define apparent thermal conductivity. **[2]**

Q5) a) What is physical significance of Reynolds number?

How is it expressed for (i) flow over a flat plate of length L, (ii) flow over a cylinder of diameter D, and (iii) flow through a rectangular tube of cross-section a × b? **[2 + 4]**

b) The velocity profile u(x, y) for a boundary layer flow over a flat plate is given by **[6]**

$$\frac{u(x,y)}{u_\infty}=\frac{3}{2}\frac{y}{\delta}-\frac{1}{2}\left[\frac{y}{\delta}\right]^3$$

where the boundary layer thickness δ(x) is the function of x and is given by

$$\delta(x)=\sqrt{\frac{280vx}{13u_\infty}}$$

Develop an expression for local drag coefficient C_{fx}.

c) Calculate the approximate Grashof number and state if the flow is laminar or turbulent for the following: **[2 + 2]**

i) A central heating radiator, 0.6 m high with a surface temperature of 75°C in a room at 18°C, (ρ = 1.2 kg/m^3, Pr = 0.72, and μ = 1.8 × 10^{-5} kg/ms).

ii) Air at 20°C (ρ = 1.2 kg/m^3, Pr = 0.72 and μ = 1.8 × 10^{-5} kg/ms) adjacent to a 60 mm dia. horizontal light bulb, with a surface temperature of 90°C.

OR

Q6) a) Why the heat transfer coefficient for natural convection is much less than that for forced convection? **[4]**

b) Water at 20°C enters a 2 cm diameter tube with a velocity of 1.5 m/s. The tube is maintained at 100°C. Find the tube length required to heat the water to a temperature of 60°C. Use properties of fluid as

Pr = 4.31, ρ = 992.2 kg/m^3, C_p = 4174 J/kg.K, k_f = 0.634 W/m.K, ν = 0.659 × 10^{-6} m^2/s. **[6]**

c) Establish dimensional analysis for forced convection heat transfer. **[6]**

Q7) a) Define black body radiation, Radiocity and Irradiation with their characteristics. **[6]**

b) Define total emissive power and Intensity of radiation. **[4]**

c) A hot water radiator of overall dimensions 2 × 1× 0.2 m is used to heat the room at 18°C. The surface temperature of radiator is 60°C and its surface is black. The actual surface of the radiator is 2.5 times the area of its envelope for convection for which the convection coefficient is given by hc = 4.51 W/m^2.K .Calculate the rate of heat loss from the radiator by convection and radiation. **[6]**

OR

Q8) a) In what manner Gray body approximation simplifies the radiation problems? **[4]**

b) Explain the superposition or additive rule of radiation view factor. **[4]**

c) A cryogenic fluid flows through a long tube of 20 mm diameter, the outer surface of which is diffuse and gray ($\varepsilon_1 = 0.02$) at 77 K. This tube is concentric with a larger tube of 50 mm diameter, the inner surface of which is diffuse and gray ($\varepsilon_2 = 0.05$) and at 300 K. The space between the surfaces is evacuated. Calculate the heat gain by cryogenic fluid per unit length of tubes. If a thin radiation shield of 35 mm diameter ($\varepsilon_3 = 0.02$) both sides is inserted midway between the inner and outer surfaces, calculate the percentage change in heat gain per unit length of the tube. **[8]**

Q9) a) Differentiate between filmwise and drop wise condensation. Which type of condensation is desirable and which type of condensation occurs in actual? State. **[6]**

b) Write a short notes on Fouling factor. **[4]**

c) A pipe (k = 59 W/m.K) with an inner diameter of 3.75 cm and wall thickness of 0.318 cm is externally heated by steam at a temperature of 180°C. The water flows through the pipe with a velocity of 1.22 m/s.Calculate the length of pipe required to heat water from 30°C to 90°C. Assume the overall heat transfer coefficient based on inner diameter as 3529.4 $W/m^2.K$. **[8]**

OR

Q10)a) Define effectiveness, NTU and capacity ratio of a heat exchanger. **[6]**

b) Cold water at 1495 kg/h enters at 25°C through a parallel flow heat exchanger to cool 605 kg/h of hot water entering at 70°C and leaving at 50°C. Find the area of the heat exchanger. The individual heat transfer coefficients on both sides are 1590 $W/m^2.K$. Find also the exit temperatures of cold and hot fluid streams, if the flow of hot water is doubled. Assume the individual heat transfer coefficients are proportional to 0.8th power of the flow rate. For water C_p = 4180 J/kg.K. **[12]**

Total No. of Questions : 10]

SEAT No. :

P3343

[Total No. of Pages : 4

[5353]-513

T.E. (Mechanical/Automobile)

THEORY OF MACHINE - II

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8 and 9 or 10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

Q1) a) The number of teeth on each of the two equal spur gear in mesh is 42.The teeth have 20° involute profile and the module is 6mm. If the arc of contact is 1.80 times the circular pitch, find the addendum. **[6]**

b) Explain the significance of helix angle and pressure angle in gears. **[4]**

OR

Q2) a) Derive an expression for virtual number of teeth and pitch circle diameter of equivalent spur gear. **[6]**

b) Draw and explain force analysis of spiral gears **[4]**

Q3) a) An internal wheel B with 90 teeth is keyed to a shaft F. The fixed internal wheel C with 94 teeth is concentric with B. A compound wheel D-E gears with two internal wheels. D has 32 teeth and gears with C, while E gears with B. The compound wheel revolves freely on a pin which project from a disc keyed to shaft A, co-axial with shaft F. All the wheels have same module. What will be the speed of shaft F if the shaft A rotates at 900 rpm? If the power supplied at A is 6 kW, what is the holding torque on the internal gear C? **[8]**

b) Write any four types of special bevel gears. **[2]**

OR

P.T.O.

Q4) a) An aircraft engine drives a propeller through a reduction drive as shown in figure.1.The gears 1, 2, 3 and 4 have 48, 27, 45, 120 teeth respectively. Find the propeller speed in magnitude and direction if the engine makes 2500 rpm. **[8]**

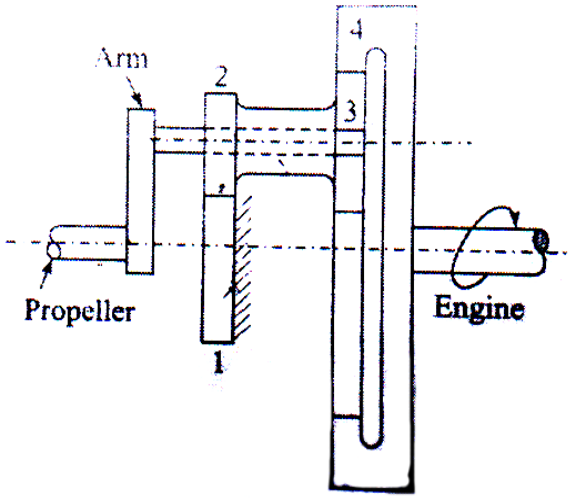


Figure.1

b) Explain the effect of module on size of tooth. **[2]**

Q5) a) Derive an expression for displacement, velocity, acceleration and jerk for 3-4-5 polynomial advanced cam and also sketch the curves. **[10]**

b) An eccentric cam of eccentricity 3.75 cm drives a follower of mass 1.75 kg. The spring holding the follower against the cam has stiffness of 24N/mm and has initial compression of 3.125 cm. Find out the speed of cam in rpm. Also find out maximum usable speed of cam without jump. **[6]**

OR

Q6) The following data is related to a cam profile, in which the follower moves with SHM during the lift and returning it with uniform acceleration and deceleration, acceleration being 0.5 times the deceleration.

Minimum radius of cam = 30mm, Roller radius = 10mm, Lift of follower = 45mm, Angle of Ascent = 70°, Angle of decent = 120°, Angle of dwell between ascent and decent = 45°, Speed of cam = 300 rpm. Draw the cam profile, pitch circle and also determine maximum velocity, maximum acceleration during lift. **[16]**

Q7) a) A four bar mechanism is to be synthesized by using precision points to generate the 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 70° starting and 160° finishing position for output link. Find out values of x, y, θ (input angles) and φ (output angles) corresponding to the 3 precision points with Chebychev spacing. If the length of longest and smallest link is 10 cm and 4 cm respectively. Synthesize the mechanism by using method of inversion. Find the length of remaining links. **[10]**

b) Discuss analytical synthesis using kinematic coefficient in four bar mechanism. **[6]**

OR

Q8) a) Design a four bar linkage is to satisfy the following conditions : **[10]**

Φ, input angle = 60°; $\frac{d\varphi}{dt} = \frac{3°}{\text{sec}}$; $\frac{d^2\varphi}{dt^2} = -1° / \text{sec}$

Ψ, output angle = 90°; $\frac{d\psi}{dt} = \frac{2°}{\text{sec}}$; $\frac{d^2\psi}{dt^2} = 0$

b) Explain the following terms (Any 3) : **[6]**

i) Dimensional Synthesis

ii) Function generation

iii) Body guidance

iv) Structural errors

Q9) a) A ship is propelled by a turbine having a mass of 6000kg and a speed of 2400 rpm. The direction of rotation of rotor is anticlockwise when viewed from the bow end. The radius of gyration of rotor is 450mm.Determine gyroscopic effect when:

i) Ship is steering to the left in a curve of 60m radius at a speed of 18 knots (Take 1knot=1855m/hr).ii) Ship is pitching in SHM with bow descending with maximum velocity. The time period of pitching is 18 seconds and the ship pitches 7.5° above and 7.5° below the normal position. iii) Ship is rolling and at the instant, its angular velocity is 0.035 rad/sec counterclockwise when view from stern end.

iv) Also find the maximum angular acceleration during pitching **[14]**

b) Compare stepped and stepless regulation. **[4]**

OR

Q10)a) A four wheel vehicle of mass 2500kg has a wheel base 2.5m, track width 1.5m and height of centre of gravity 0.6m above the ground level and lies at 1m from the front axle. Each wheel has an effective diameter of 0.8m and a moment of inertia of 0.8 kg-m^2.The drive shaft, engine flywheel and transmission rotating at four times the speed of road wheels, in clockwise direction when view from the front, and is equivalent to mass of 80 kg having a radius of gyration of 100mm.If the wheel is taking a right turn of 60 m radius at 60 kmph, find the load on each wheel. The engine axis is along the longitudinal axis of the vehicle. **[12]**

b) Discuss in brief PIV transmission **[6]**

Total No. of Questions : 10]

SEAT No. :

P3344

[Total No. of Pages : 4

[5353]-514

T.E. (Mechanical Engineering) (Semester - I)

TURBO MACHINE

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Use of steam table is permitted.***
5) ***Assume data whenever necessary.***
6) ***Due credit will be given to neat figures wherever necessary.***

Q1) a) Derive an expression for the force exerted by the jet of water on the fixed curved plate, jet strikes at centre of the curved plate at normally. **[4]**

b) A Pelton turbine develops 3000 kW under the head of 300 m the overall efficiency of the turbine is 83%. If the speed ratio is 0.46 Coefficient of nozzle Cv = 0.98 and specific speed is 16.5 find : i) diameter of the turbine ii) diameter of the jet **[6]**

OR

Q2) a) Define : **[4]**

i) Unit speed

ii) Unit discharge

iii) Unit power

State its significance

b) A Kaplan turbine develops 24647.6 kW power at an average head of 39 m. Assuming the speed ratio of 2, flow ratio 0.6, the diameter of boss equal to 0.35 times the diameter of the runner and an overall efficiency 90% calculate the diameter, speed and specific speed of the runner. **[6]**

P.T.O.

Q3) a) An outward flow reaction turbine has internal and external diameters of runner as 0.6 m and 1.2 m respectively . The guide blade angle is 15° and velocity of flow through runner is constant and equal to 4 m/sec. If the speed of the turbine 200 rpm, head on the turbine is 10 m and discharge at outlet is radial determine **[7]**

i) Runner vane angle at inlet and outlet

ii) Work done by water on runner

iii) Hydraulic efficiency

b) What are the applications of impulse momentum principle? **[3]**

OR

Q4) a) Write a short note on factors influencing performance of turbine. **[4]**

b) Two inward flow turbine runners having same diameter of 0.50 m have the same efficiency, and work under same head. Both the turbines have same velocity of flow of 5.6 m/sec. If one of the runner 'A' runs at 525 RPM and has an inlet blade angle of 65° and the other runner 'B' has inlet blade angle of 110° what should be the speed of the runner 'B'. Both the turbines discharge radially at outlet. **[6]**

Q5) a) Explain the term Reheat Factor in steam turbines. **[6]**

b) In a stage of a Turbine with Parson's blading delivers dry saturated steam at 2.7 bar from the fixed blades at 90 m/sec. The mean Blade height is 40 mm, and the moving blade exit angle is 20°. The axial velocity of steam is 3/4 of the blade velocity at the mean radius. Steam is supplied to the stage at the rate of 9000 kg/hr the effect of the blade tip thickness on the annulus area can be neglected. Calculate **[10]**

i) Wheel speed in RPM

ii) The diagram power

iii) The diagram efficiency

iv) The enthalpy drop of steam in the stage

OR

Q6) a) Explain why subsonic nozzle is convergent while supersonic nozzle is divergent. **[4]**

b) Derive an expression for diagram efficiency of single stage impulse Turbine. Obtain the Condition for Maximum efficiency & its value. **[6]**

c) In a single stage impulse turbine the mean diameter of the blade ring is 1m and the rotational speed is 3000 rpm. The steam is issued from the nozzle at 300 m/see. and nozzle angle is 20°. The blades are equiangular. If the friction loss in the blade channel is 19% of the Kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading when the axial thrust on the blades is 98 N. Solve the problem graphically. **[6]**

Q7) a) What do you mean by cavitation. What are its effects? How we can overcome the cavitation effect in centrifugal pump. Derive relation for maximum suction lift of a centrifugal pump. **[8]**

b) The outer diameter of an impeller of a Centrifugal pump is 400 mm & outlet width is 50 mm. The pump is running at 800 rpm & is working against a total head of 15m. The vanes angle at outlet is 40°& manometric efficiency is 75%. Determine : **[10]**

i) Velocity of flow at outlet,

ii) Velocity of water leaving the vane,

iii) Angle made by the absolute velocity at outlet with the direction of motion at outlet

iv) Discharge

OR

Q8) a) Show that rise in pressure in impeller of a centrifugal pump is expressed as **[6]**

$$\frac{1}{2g}\left(Vf_1^2 + u_2^2 - 2Vf_2^2 \operatorname{Cosec}^2 \phi\right),$$

where all symbols have their usual meanings.

b) A centrifugal pump impeller has an external diameter of 450 mm and discharge area of 0.11 m^2. The vanes are bent backwards at an angle of 35° at outlet. The diameter of the suction and delivery pipes is 300 mm and 230 mm respectively. Pressure gauge at points on suction and delivery pipes close to the pump and each gauge 1.50 m above the level of supply sump showed gauge pressure head of 3.70 m below and 19 m above atmospheric head respectively. When the pump was delivering 200 lit/sec of water at 800 rpm. It requires 70 kW to drive the pump. Find the loss of head in the suction pipe, manometric efficiency and overall efficiency of the pump. **[12]**

Q9) a) What are the various losses in Axial Flow Compressor? **[4]**

b) Write short note on Slip & Slip Factor in compressors. **[4]**

c) A Centrifugal Compressor used as a supercharger for aero engine handles 180 kg/min of air. The suction pressure and temperature are 1 bar and 280 K. The suction velocity is 90 m/sec. After isentropic compression in the impeller conditions are 1.5 bar, 335 K and 230 m/sec. Calculate **[8]**

i) Isentropic efficiency

ii) Power required to drive compressor

iii) Overall efficiency of the unit

Assume that kinetic energy of the air gained in impeller is entirely converted into pressure in diffuser. Take $\gamma = 1.4$ for air.

OR

Q10)a) Derive an expression for the overall pressure ratio developed in the Centrifugal Compressor. **[6]**

b) A centrifugal compressor running at a speed of 15000 rpm admits 25 m^3/sec air at static states 1 bar and 300 K and compresses it adiabatically by the pressure ratio of 2. The air velocity at inlet and the radial velocity at exit is the same as 75 m/sec. The inlet and outlet impeller diameters are 60cm and 80 cm respectively. Considering the inlet to be axial find **[10]**

i) Blade angles at inlet and outlet of impeller

ii) Angle at which air leaves the impeller

iii) Impeller breadth at inlet and exit.

Total No. of Questions : 9]

SEAT No. :

P3345

[Total No. of Pages : 3

[5353]-515

T.E. (Mechanical)

METROLOGY AND QUALITY CONTROL

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

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

b) Draw a neat sketch of micrometer & how to calculate least count of micrometer, give one example. **[5]**

OR

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

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

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

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

OR

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

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

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

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

OR

P.T.O.

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

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

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

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

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

OR

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

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

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

ii) Lot size N = 10000 units

iii) np' = 1.5

iv) Acceptance number c = 1

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

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

a) Kanban

b) Zero defects

c) FMECA

d) TS-16949

e) Quality Audit

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

P3974 **[Total No. of Pages : 3**

[5353]-516

T.E. (Mechanical Sandwich) (Semester - II)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Pattern)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of programmable calculator is not permitted.***
5) ***Assume suitable data, if necessary.***

Q1) Using Newton Raphson method solve the equation $f(x) = e^{(x)}.\cos(x) - 1.4 = 0$ upto accuracy of 0.01.take initial gauss 0.2 **[6]**

OR

Q2) What do you mean by convergence? Explain its importance in brief. **[6]**

Q3) Solve by Jacobi's iteration method, the equations **[6]**

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

$20x + y - 2z = 17;$

$3x + 20y - z = -18$

OR

Q4) Explain advantages of partial pivoting for solving simultaneous equations using Gauss elimination and Gauss Seidal method. **[6]**

Q5) a) Maximize $Z = 2x + 3y$ **[5]**

subjected to the constraints

$x + y \leq 30$

$y \geq 3$

$0 \leq y \leq 12$

$x - y \geq 0$

$0 \leq x \leq 20,$

Use graphical method.

P.T.O.

b) Determine the maximum value of root of equation 0. 51x – sin(x) by Newton's method. Take the initial guess as 2 and do 4 iterations. **[3]**

OR

Q6) Maximize $Z = 6x + 11y$ **[8]**

subjected to the constraints

$2x + y \leq 104$

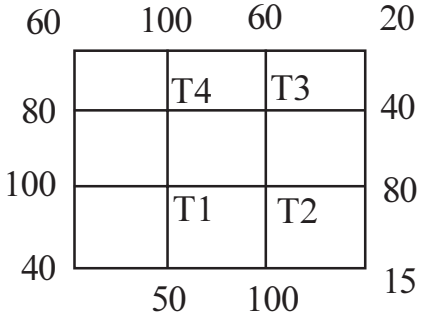
$x + 2y \leq 76$

$x, y \geq 0$

Use Simplex method.

Q7) a) Temperature at one surface of slab of thickness, $x = 20\ cm$ is $T = 500°C$. Find the temperature of the other surface of slab by taking step size in thickness, $\Delta x = 4cm$. Heat flux is 1000 W/m^2. Use the following governing relation of heat flow, $\frac{dT}{dx} = -\frac{q}{A}\left[\frac{1}{0.5(0.01T+1)}\right]$ where q is a heat flow through slab (in Watt) and A is cross-sectional area of slab (m^2). **[8]**

b) Solve the Laplace equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ for the square mesh as shown in diagram below. **[10]**



OR

Q8) a) Draw the flowchart for Simultaneous Equations by RK 2nd order method. **[6]**

b) Solve the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subjected to the condition u(0,t)=u(1,t)=0 and u(x,0)=2x for 0≤ x≤ ½ and u(x,0)=2(1–x) for ½≤x≤1. Take h=1/4 and k=1. **[12]**

Q9) a) Draw the flow chart for $y = ab^x$. **[8]**

b) Find the values of y for x = 0.5 for the following table of x, y values using Newton's forward difference formula. **[8]**

x	0	1	2	3	4
y	1	5	25	100	250

OR

Q10)a) Using the method of least squares, fit the curve $y = ax^2 + \frac{b}{x}$ to the following data: **[10]**

x:	1	2	3	4
y:	–1.51	0.99	3.88	7.66

b) Find the polynomial $f(x)$ by using Lagrange's interpolation formula and hence find $f(3)\,dx$ for the following series : [6]

x	0	1	2	5
y=f(x)	2	3	12	147

Q11)a) Draw the combine flowchart for Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ rule. **[8]**

b) Using Gauss Legendre three point formula, find $\int_0^2 e^x + 4x - 3$. **[8]**

OR

Q12)a) Find the integral $I = \int_0^{\bar{\wedge}} \sin(x).dx$ using Trapezoidal rule. **[8]**

b) Find double integral $f(x, y) = 2x + y + 1$ for $n = 0$ to 2 and $y = 0$ to 2. Use Simpson's $1/3^{rd}$ rule. **[8]**

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

P3975 **[Total No. of Pages : 5**

[5353]-517

T.E. (Mechanical) (End Semester)

DESIGN OF MACHINE (Elements - II)

(2015 Pattern)

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

Instructions to the candidates:

1) ***Answer five questions from the following.***
2) ***Draw neat labeled diagrams wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of electronic calculator is permitted.***
5) ***Use of Programmable calculator is not allowed.***
6) ***Assume suitable/standard data if necessary.***

Q1) a) What is addendum modification in gears? State the advantages and limitations of it. **[4]**

b) A pair of spur gears has a module of 3 mm and face width 27 mm. It is used to connect a prime mover of 3 kW power running at 1440 rpm with a machine requiring a torque of 59.683 N-m. The gears are made of alloy steel with ultimate tensile strength of 720 MPa with a hardness of 350 BHN. Determine the factor of safety based on bending and pitting if the total tooth error is 40 microns and the deformation factor is 11200 N/mm^2. The number of teeth on pinion is 12 and 20° stub involute profile is used for both the gears. Use following data: **[6]**

$$Y = 0.55 - \frac{2.64}{z}$$

Service factor 1.2.

$$P_d = \frac{21v\left(Ceb + P_t\right)}{21v + \sqrt{\left(Ceb + P_t\right)}}$$

P.T.O.

OR

Q2) a) Explain significance of the helix angle on the performance of helical gears. **[4]**

b) A pair of bevel gears is transmitting a power of 5 kW from an electric motor running at 2880 rpm to a machine running at 720 rpm. Use following data: **[6]**

Module 4 mm

Face width is 40 mm.

Number of teeth on pinion 20

Tooth system: 20° full depth involute.

Ultimate tensile strength: 550 MPa

Hardness: 340 BHN

Dynamic tooth load: 1537.2 N

Service factor 1.15

Lewis form factor for pinion: 0.3876

Determine the available factor of safety in bending and pitting.

Q3) a) Explain the terms: **[4]**

i) Dynamic load carrying capacity of a bearing

ii) Bevel factor.

b) A shaft 1000 mm long carrying a spur gear transmitting a power of 3 kW at 1500 rpm is supported by a deep groove ball bearing. The gear is located midway between the bearings with a weight of 2 kg and has a tangential force of 900 N while the radial load is 799 N. If the expected life of this bearing is 2000 hours, determine the dynamic load carrying capacity of the bearing.

If the spur gear is mounted at the one end of shaft and one bearing supports the shaft at the other end, determine the dynamic load carrying capacity of this bearing. **[6]**

OR

Q4) a) Determine dynamic load carrying capacity for a pair of ball bearing for a shaft such that it can be selected from the manufacturer's catalogue. Use following data. **[6]**

- Length of the shaft 1 m,
- Diameter of the shaft 35 mm
- A radial load of 1.45 kN acts on left side bearing, and 1.3 kN on right side bearing.
- An axial load of 300 N acts on right side bearing (away from left side bearing)

- Expected life of the bearing 20,000 hours with a reliability of 95 %.
- Speed of shaft 1000 rpm.
- Take X=1, Y=0.56 and b= 1.17

b) What are various bearing mounting methods? Explain using neat sketches. **[4]**

Q5) a) A pair of worm and worm wheel is designated as 3/60/10/6. The worm is transmitting 5 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.112 and the normal pressure angle is 20°. Determine **[12]**

i) the components of tooth forces acting on the worm and worm wheel.

ii) Also represent the directions of the forces on the drawing if the worm rotates anti-clockwise.

iii) Efficiency of the drive.

b) Discuss the thermal considerations in worm gear drive. **[4]**

OR

Q6) a) Explain force analysis on a worm and worm gear tooth. **[4]**

b) A pair of worm and worm wheel is designated as 1/30/10/10. The speed of worm is 1500 rpm. The worm wheel is made of centrifugally cast phosphor bronze and worm is made of case hardened carbon steel 14C6. Determine the power transmitting capacity of this pair based on **[12]**

i) Strength rating

ii) Wear rating

Use following data

Particulars	Worm	Worm Wheel
Bending stress factor (S_b)	28.2	7
Speed factor for	0.234	0.46

strength (X_b)		
Surface stress factor(S_c)	4.93	1.55
Speed factor for wear(X_c)	0.115	0.25
Zone factor (Y_z)	1.143	

Q7) a) Explain the terms (Any Three): **[6]**

i) Slip and creep

ii) Centrifugal tension

iii) Maximum tension in the belt

iv) Initial tension in the belt

b) A pulley of 1000 mm diameter is driven by an open type flat belt from 20kW, 1440 rpm electric motor. The pulley on the motor shaft is 300 mm in diameter and the centre distance between the two shafts is 2.0 m. 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: **[12]**

i) The thickness of belt

ii) The length of belt and

iii) The initial tension required in the belt.

OR

Q8) a) What are the stresses induced in wire ropes? How the wire ropes are designed for the given applications? **[6]**

b) What are different standard types of chain? Describe with the appropriate sketches. **[12]**

A single v belt is used to transmit power from a grooved pulley of pitch diameter 300 mm running at 1500 rpm to a flat pulley of diameter 600 mm. The centre distance between the pulleys is 1000 mm. The mass of the belt is 0.25 kg per meter. The coefficient of friction between the belt and pulley is 0.25. The v-belt pulley groove angle is 38°. If the allowable tension in the belt is 600 N. Determine.

i) Power transmitting capacity of the belt, and

ii) Initial tension required in the belt.

Q9) a) What are desirable properties for a material of sliding contact bearings? **[4]**

b) A hydrodynamic bearing has a diameter and length of 100 mm. The radial load on the bearing is 20 kN. The journal speed is 1500 rpm and the radial clearance is 60 microns. If the viscosity of the oil is 25 cP, determine. **[12]**

i) Minimum oil film thickness

ii) Probable coefficient of friction

iii) Power lost in friction

iv) Quantity of oil in circulation

v) Side leakage

vi) If the make-up oil is supplied at 30°C, find the average oil temperature.

Assume specific gravity of oil is 0.86 and the specific heat as 2.09 kJ/kg°C. Refer Table 1.

OR

Q10)a) What are different types of lubricants used for sliding contact bearings? **[6]**

b) A Babbit lined steel back bush bearing is used to support a shaft of diameter 50 mm. The radial load on the bearing is 3550 N. The oil filter restricts a clearance at the bearing as 40 microns. The length of the bearing is 50 mm. Shaft rotates at 950 rpm. The oil used as a viscosity of 60 cP at operating temperature. Calculate, **[10]**

i) Coefficient of friction

ii) Minimum oil film thickness

iii) Requirement of oil flow

iv) Power lost in friction

v) Temperature rise, assuming that heat generated is carried away by the total oil flow.

Assume specific gravity of oil as 0.86. Specific heat oil is 1.85 kJ/kg°C. Refer Table 1.

Table 1(Use for Question 9 and 10)

$\frac{l}{d}$	$\frac{h_0}{c}$	S	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\frac{Q_s}{Q}$
1	0.8	0.631	12.8	3.59	0.529
	0.6	0.264	5.79	3.99	0.484
	0.4	0.121	3.22	4.33	0.415

Total No. of Questions : 10]

SEAT No. :

P4268

[Total No. of Pages : 5

[5353]-518

T.E. (Mechanical) (Semester - II)

REFRIGERATION & AIR CONDITIONING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary and mention it clearly.***
4) ***Use of steam table is allowed.***

Q1) a) Explain commercial refrigeration for dairy products. **[6]**

b) Explain chemical properties of refrigerants. **[4]**

OR

Q2) a) Compare vapour compression and vapour absorption refrigeration system. **[4]**

b) A vapour compression refrigerator of 1 TR capacity works between the pressure of 5.3 bar and 2.1 bar. The vapour is superheated by 5°C before entering the compressor and superheated to 37°C at the end of compression. Find the COP of the plant and refrigerant mass flow rate. Take C_p of vapour 0.63 kJ/kgK. **[6]**

Sat. Pressure	Sat. Temp.	h_r	h_{fg}
Bar	°C	kJ/kg	kJ/kg
5.3	15.5	56.15	144.9
2.1	–14	25.12	158.7

Q3) a) Define : EER, SEER, IPLV and NPLV. **[4]**

b) Calculate percentage change in COP of the vapour absorption system when the generator temperature changes from 150°C to 200°C and refrigeration temperature changes from –20°C to –40°C. Condensation temperature remains same as 30°C. **[6]**

P.T.O.

OR

Q4) a) Derive equation of COP for the two stage compression with flash gas removal and liquid intercooler with schematic and P-h diagram. **[8]**

b) Mention any two applications of cryogenics. **[2]**

Q5) a) Explain air washer and possible psychometric processes with it. **[6]**

b) A mixture of dry air and water vapour is at a temperature of 21°C under a total pressure of 736 mm Hg. The dew point temperature is 15°C. Find: **[10]**

i) Partial pressure of water vapour

ii) Relative humidity

iii) Humidity ratio

iv) Enthalpy of air per kg of dry air

v) Specific volume of dry air per kg of dry air.

OR

Q6) a) Explain thermodynamic mechanism of human body. **[6]**

b) A commercial shop has following loads:

Room sensible heat : 58.15 kW

Room latent heat : 14.54 kW

The summer outside and inside design conditions are :

Outside: 40°C DBT, 27°C WBT

Inside: 25°C DBT, 50% RH

70m^3/min of ventilation air is used. Determine the following if the by-pass factor of the cooling coil is 0.15. **[10]**

i) Ventilation load

ii) Grand total heat

iii) Grand sensible heat factor

iv) Effective room sensible heat factor

v) Apparatus dew point

Q7) a) Explain with neat sketch winter air conditioning system. **[6]**

b) Explain with neat sketch air water system. **[6]**

c) Explain with neat sketch working of constant superheat expansion valve. **[6]**

OR

Q8) a) Explain with neat sketch central air conditioning system. **[6]**

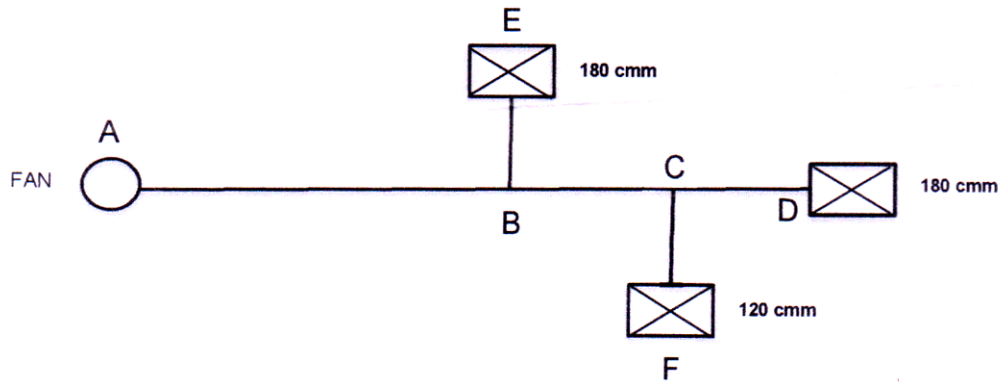
b) Explain with neat sketch working of constant pressure expansion valve. **[6]**

c) Explain with neat sketch scroll compressor. **[6]**

Q9) a) Derive an expression for equivalent diameter of circular duct corresponding to a rectangular duct of side a and b for same pressure loss per unit length when the discharge is same and when velocity is same. **[8]**

b) Using equal Friction method, determine the duct diameter and velocity for section AB, BD and BC.

Assume velocity in the main duct AB = 600m/min. also calculate maximum pressure drop in the duct system. Distance AB = 40m, BE= 10m, CF = 10m, BD = 40m. **[8]**

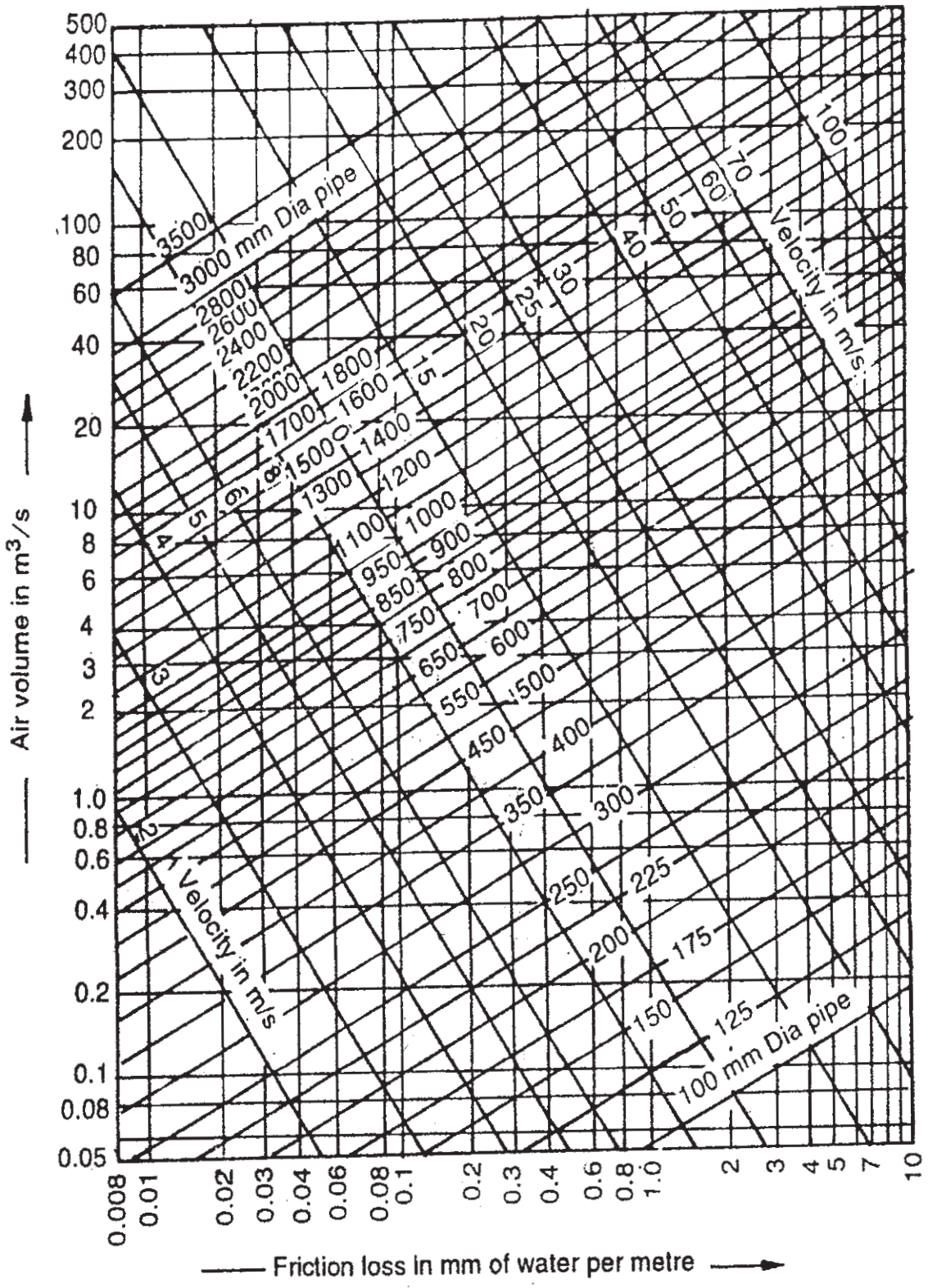


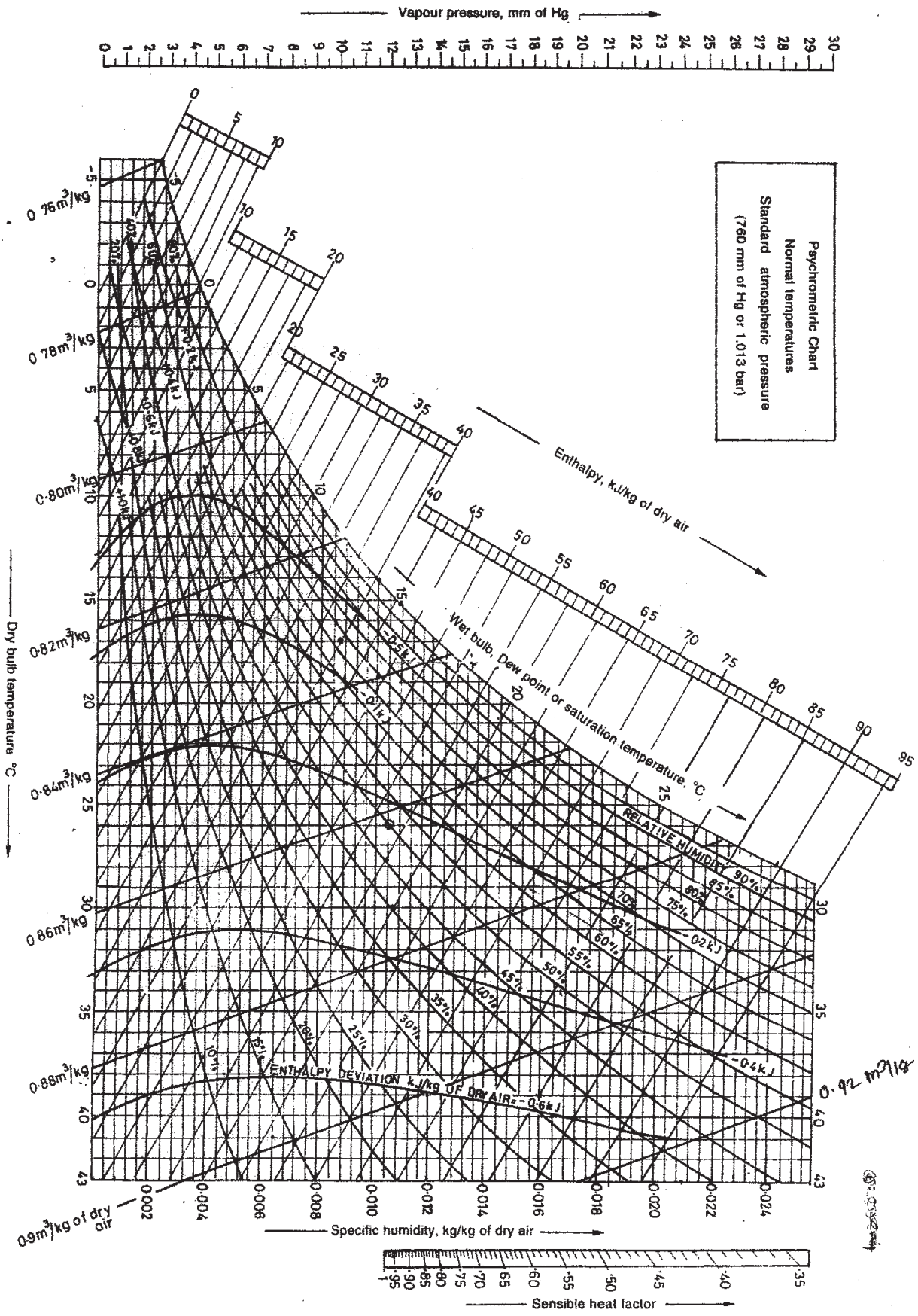
OR

Q10)a) A circular duct diameter 0.3m is 50 long and carries air of density 1.15 kg/m^3. If the flow is 2m^3/s. Find the total pressure at the inlet of the duct. Take f = 0.006. Also find air power. **[6]**

b) Explain static and velocity pressure in a duct. **[4]**

c) Explain types of supply outlets for distribution of air. **[6]**


Air volume in m³/s
Friction loss in mm of water per metre
3500
3000 mm Dia pipe
2800
2600
2400
2200
2000
1800
1700
1600
1500
1400
1300
1200
1100
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
225
200
175
150
125
100 mm Dia pipe
Velocity in m/s
100
70
60
50
40
30
25
20
15
10
8
6
5
4
3
2
1
0.5
500
400
300
200
100
80
60
40
20
10
8
6
4
3
2
1.0
0.8
0.6
0.4
0.2
0.1
0.08
0.05
0.008
0.01
0.02
0.03
0.04
0.06
0.08
0.1
0.2
0.3
0.4
0.6
0.8
1.0
2
3
4
5
7
10


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
Wet bulb, Dew point or saturation temperature, °C
Dry bulb temperature °C
Specific humidity, kg/kg of dry air
Sensible heat factor
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR

Total No. of Questions : 10]

SEAT No. :

P4269

[Total No. of Pages : 3

[5353]-520

T.E. (Mechanical) (Semester - II)

MANUFACTURING PROCESS - II

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Derive an expression for Shear plane angle and shear strain. **[6]**

b) Mention various tool holders used in drilling machine. Explain floating tool holder with a neat sketch. **[6]**

OR

Q2) a) Taylor's tool life equation for machining C-40 steel $VT^n = C$. Feed is 0.2mm/rev. **[6]**

V(m/min)	25	35
T (min)	90	20

Determine 1. n and c 2. Recommend cutting speed for 60 minutes tool life.

b) Explain following milling operations with a neat sketch. **[6]**

i) Straddle Milling

ii) Gang Milling

Q3) a) Determine machining time for rough gridding of 40mm diameter work piece having length 150mm Total stock is 0.20mm. grinding wheel traverse feed is 40mm/rev, depth of cut is 0.020mm, Cutting speed is 15m/min, K=1.2 **[4]**

b) Explain lapping process with a neat sketch. **[4]**

OR

P.T.O.

Q4) a) Explain following grinding wheel nomenclature. **[4]**

S-D-54-L-4-R-12

b) Explain Honing process with a neat sketch. **[4]**

Q5) a) Explain AJM process with its advantages, limitations and applications. **[8]**

b) Explain variable process parameters in USM process with their effect on MRR. **[8]**

OR

Q6) a) Explain with a neat sketch ECM process. **[8]**

b) Explain with a neat sketch LBM process. Also comment on applications and limitations. **[8]**

Q7) a) Differentiate between NC and CNC machines. **[5]**

b) Explain following codes : **[6]**

G02, M02, G84, M06

c) What is Word address Format? Explain with an example. **[5]**

OR

Q8) a) Differentiate between open and closed loop system. **[6]**

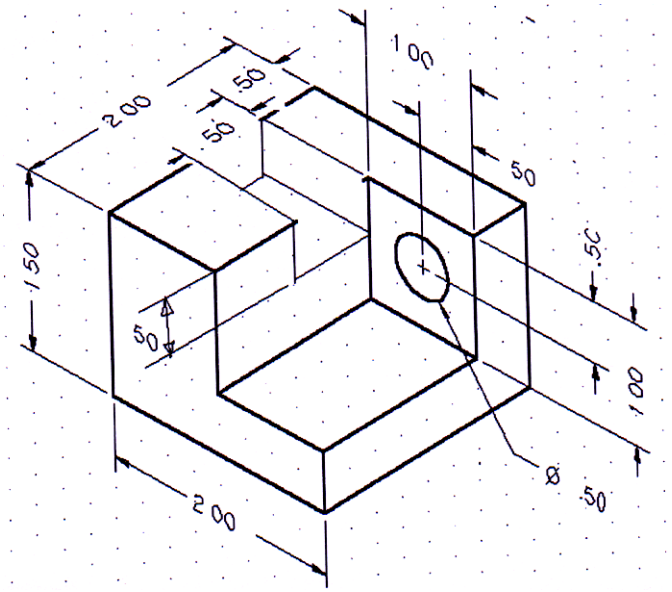
b) Explain DNC with block diagram. **[6]**

c) Explain with a neat sketch Automatic tool Changer. **[4]**

Q9) a) Explain with a neat sketch diamond pin locator **[4]**

b) Explain 3-2-1 principle for location. **[6]**

c) Design and draw a drilling jig to produce 50mm diameter hole in the given component. **[8]**



OR

Q10)a) What is modular fixturing? Explain with advantages **[4]**

b) List various types of clamps and explain any one with a neat sketch. **[6]**

c) Design and draw a milling fixture to create a slot of 50 × 50 × 100mm for the job given in Q.9. **[8]**

Total No. of Questions : 12]

SEAT No. :

P3346

[Total No. of Pages : 4

[5353]-521

T.E. (Mechanical Sandwich) (Semester - I)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full mark.***
4) ***Use of programmable calculator is not permitted.***
5) ***Assume suitable data, if necessary***

-

Q1) Evaluate error in the calculation of volume V of a tank, given by $V = \frac{\pi}{4} d^2 l$ at d = 1m and l = 2m if error in measurement of diameter d and length l is 0.01. **[6]**

OR

Q2) Solve $(x^2 - 3x - 4)^{1/2} = 0$ using successive iteration method. Do 5 iterations. **[6]**

Q3) Draw the flowchart for Gauss Seidal method. **[6]**

OR

Q4) Solve the following equations with Thomas algorithm. **[6]**

$x_1 + 2x_2 = 4$

$-x_1 + x_2 + 2x_3 = 1$

$x_2 + 3x_3 + x_4 = 7$

$2x_3 + 2x_4 = 8$

P.T.O.

Q5) a) An owner of a lodge plans an extension which contains not more than 50 rooms. At least 5 must be executive single rooms. The number of executive double rooms should be at least 3 times the no. of executives single room. He charges Rs. 3000 for executive double room and Rs. 1800 for executive single room per day. Solve the above problem as LPP to maximize the profit. (Use graphical method) **[5]**

b) Write a short note on Genetic Algorithms. **[3]**

OR

Q6) Maximize $z = 1600x + 1500y$

Subject to $5x + 4y \leq 500$

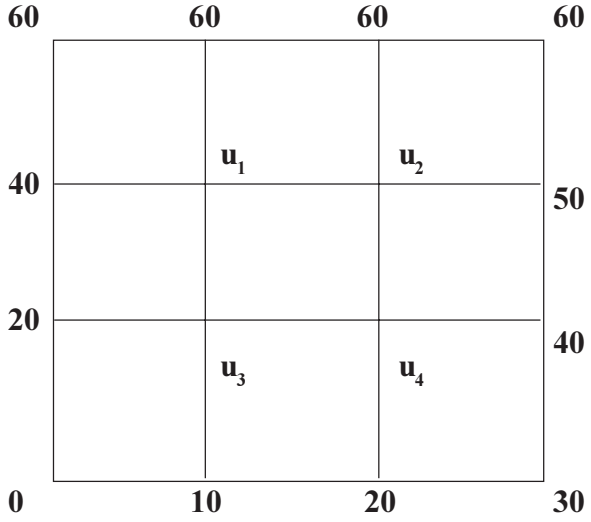
$15x + 16y \leq 1800$

$x \geq 0, y \geq 0$

(Use simplex method) **[8]**

Q7) a) Draw the flowchart for RK4 Method. **[8]**

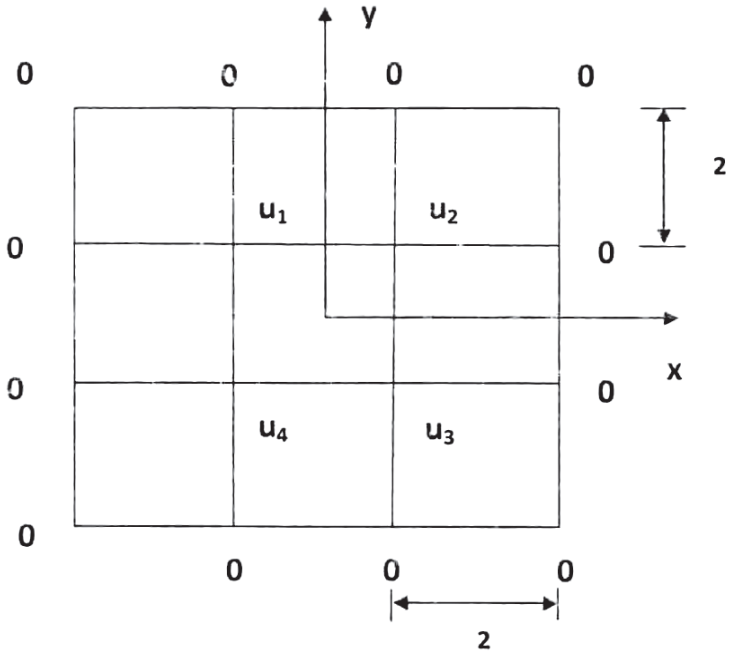
b) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh as shown in diagram below. **[10]**



OR

Q8) a) Use Taylor's series method to solve equation $\frac{dy}{dx}=x^2+y^2$. Given initial conditions are $x = 0, y = 1$ estimate y (0.5) take h = 0.25. **[8]**

b) Solve the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=\frac{1}{xy}$ corresponding to grid shown in following fig **[10]**



Q9) a) The pressure (p) and volume (V) of a gas are related by the equation $PV^{\gamma} = C$, where γ and C being constants. Fit this equation to the following set of observations. **[8]**

P(kg/cm^2)	0.5	1.0	1.5	2.0	2.5	3.0
V(liters)	1.62	1.00	0.75	0.62	0.52	0.46

b) The following are co-ordinates of a set of points. Find x at y=2 **[8]**

x	0	1	2	3
y	0	1	7	25

OR

Q10)a) Using least square criteria , fit a equation $y = ax^2 + bx + C$, to the following data : **[8]**

x	1	2	3	4	5	6	7
y	–5	–2	5	16	31	50	73

b) Draw the flowchart for Newton's forward difference interpolation. **[8]**

Q11)a) Explain Simpson's $1/3$ rule graphically and derive formula for integration of a function. **[8]**

b) Find double integral of $f(x, y) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in.both x and y as 0.5. Applying Simpson's $1/3$ rule. **[8]**

OR

Q12)a) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ Use 3 point Gauss Legendre method. **[8]**

b) Evaluate $\int_0^{\pi} \frac{\sin^2 x}{e^x + \cos x} . dx$ using Simpson's 3/8 rule. Take 6 strips **[8]**

Total No. of Questions : 10]

SEAT No. :

P3347

[Total No. of Pages : 4

[5353]-523

T.E. (Mechanical Sandwich)

APPLIED COMPUTER AIDED ENGINEERING

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Determine the Concatenated transformations matrix to reflect or mirror any entity about the line y = mx + c. **[6]**

b) Define and compare geometrical mapping and geometrical transformations. **[4]**

OR

Q2) Line L1 has end points (1,2,7) and (5,6,1)while line L2 has end points (7,3,4) and (3,9,10) **[10]**

a) Find The Parametric Equation of the lines

b) Find the tangent vectors of the line

c) Are the two lines are Parallel or perpendicular.

d) Are the two lines are intersecting? If yes find the Point of intersection

Q3) a) Explain Various factors to be considered during selection of end effectors. **[6]**

b) Explain the concept of Hybrid Modelling. **[4]**

P.T.O.

OR

Q4) a) Explain following terms with respect to solid Modelling; **[6]**

i) Constructive Solid Geometry

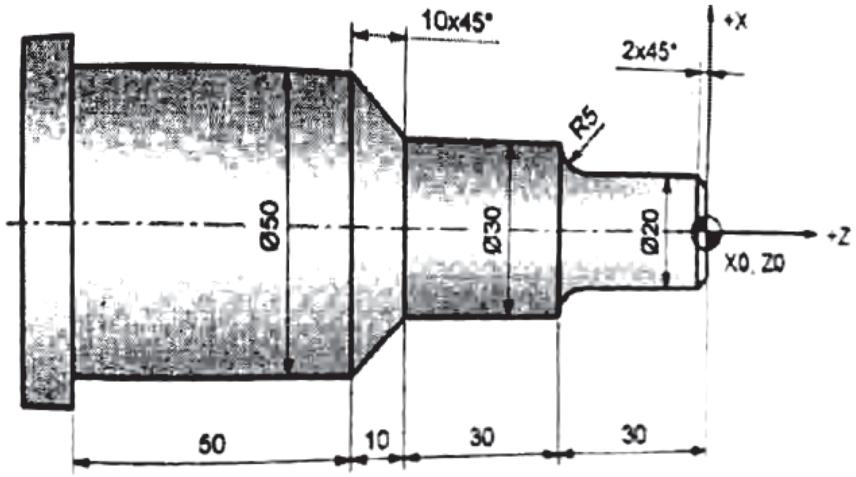
ii) Boundary representation

iii) Constraint Based Modelling

b) How Does Computer Aided Process Planning differs from traditional Process Planning. **[4]**

Q5) a) Explain canned cycle. **[4]**

b) Write a NC part program for the part shown in figure. Take Spindle speed 200 RPM and feed rate 0.25mm/rev. **[12]**



OR

Q6) a) Explain Cutter Radius Compensation with Suitable G Code. **[4]**

b) Explain Multiple Roughing Cycle (G71) and finishing Cycle(G72) with Neat Sketch. **[6]**

c) Explain DNC Machine with Block Diagram. **[6]**

Q7) a) Classify Rapid Prototyping systems explain Laminated Object Manufacturing (LOM) with Neat Sketch. **[10]**

b) Explain Direct and Indirect Benefits of Rapid Prototyping. **[6]**

OR

Q8) a) What is Fused Deposition Modelling (FDM)? Explain it with neat sketch. **[8]**

b) Explain with neat Sketch Three dimensional (3D) Printing. **[8]**

Q9) a) Explain Assemblage of two 1D elements to find global Stiffness Matrix. **[6]**

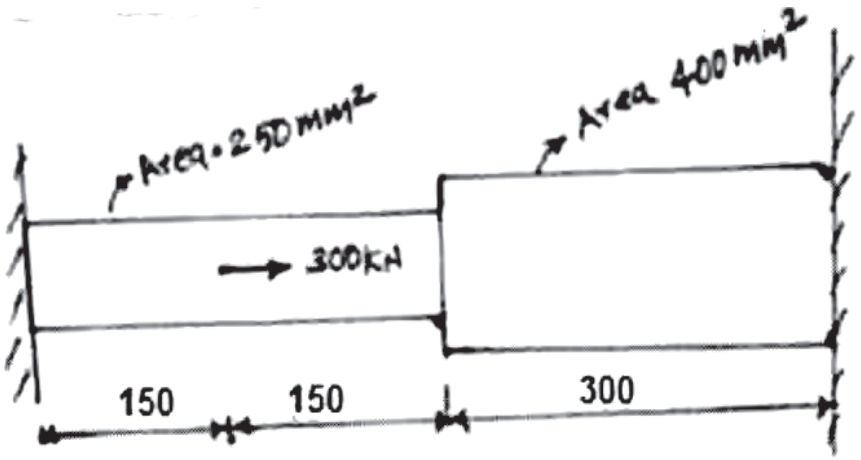
b) The Stepped Steel Bar is subjected to an axial load of 300kN, as shown in figure. Using the finite element method determine; **[12]**

i) The Nodal Displacement

ii) The Stress in each elements

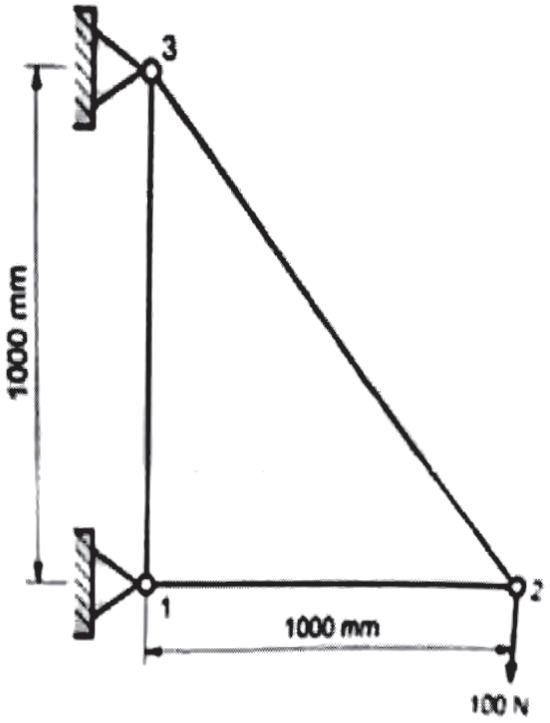
iii) The reaction forces at the supports.

Use minimum number of elements .Modulus of Elasticity is 200×10^3 N/mm^2



OR

Q10)a) Figure Shows Truss consisting of three elements Whose EA/L value is 1000N/mm. Using finite element method, determine the deflection at node2 and Reaction forces at each node. **[10]**



b) Derive the Element Stiffness Matrix and Stress Vector for Truss Element. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3348

[Total No. of Pages : 3

[5353]-524
T.E. (Mechanical Sandwich)
MACHINE DESIGN
(2015 Pattern) (End Semester)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Figure to the right indicates full marks.***

Q1) a) Explain in brief the standards and codes. **[5]**

b) What is stress concentration? What are the causes of stress concentration? Explain any two methods to reduce stress concentration. **[5]**

OR

Q2) a) Draw neat diagram of knuckle joint and explain its construction. **[4]**

b) A 40 mm shaft is made of steel 50C4 (σ_{ut} = 660 MPa) & has a machined surface. The expected reliability is 99%. The theoretical stress concentration factor for the shape of the shaft is 1.6 & the notch sensitivity factor is 0.9. Determine the endurance limit of the shaft Ka = 0.76, Kb = 0.85, Kc = 1, Kg = 0.814. **[6]**

Q3) a) Explain self-locking and Overhauling of power screw. **[5]**

b) Explain design procedure of splines. **[5]**

OR

Q4) a) Explain with neat sketch any four types of screw fastenings. **[4]**

b) A helical spring whose mean diameter of the coil is 8 times that of wire, is to absorb 400 N-m of energy. The initial compression of the spring is 50 mm & compress by additional 70 mm, while absorbing the shock. The maximum allowable stress is 400 MPa and G = 84 GPa. Determine the diameter of wire, and number of active turns. Neglect the effect of stress concentration. **[6]**

P.T.O.

Q5) a) Explain the force analysis of helical gear. **[4]**

b) The following data is given for a steel spur gear pair transmitting 5 kW power from a shaft rotating at 3000 rpm to another parallel shaft rotating at 1500 rpm: module = 4 mm, number of teeth on pinion = 18, allowable bending stress for pinion and gear = 210 MPa, face width = 40 mm, surface hardness = 400 BHN, tooth system = 20° full depth involute, combined teeth error = 15 microns, deformation factor C = 11400 e, N/mm. Assuming the dynamic load is accounted by the Buckingham's equation, calculate: (i) the factor of safety against bending failure; and (ii) factor of safety against pitting failure. **[12]**

OR

Q6) a) For bevel gears, define the following : **[6]**

i) Cone distance;

ii) Pitch angle;

iii) Back cone distance; and

iv) Crown height

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

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

Q7) a) Derive the Petroff's equation for sliding contact bearing. **[6]**

b) A ball bearing is operating on a workcycle consisting of three parts - a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and a radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of bearing is 10,000 hours. Calculate the dynamic load carrying capacity of the bearing. **[10]**

OR

Q8) a) Explain the procedure to select the rolling contact bearing from manufacturer's catalogue. **[6]**

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

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

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

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

OR

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

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

Total No. of Questions : 10]

SEAT No. :

P5233

[Total No. of Pages : 2

[5353]-526
T.E. (Mechanical Sandwich)
INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT
(2015 Pattern) (Semester - II) (Self Study - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Define & explain what do you understand by Industrial Engineering? Explain the F.W. Taylor's contribution towards scientific management. **[6]**

b) Define material handling. List material handling equipment and describe any two of them. **[4]**

OR

Q2) a) Write short note on : **[6]**

i) Organization chart

ii) Responsibility and Authority

b) Explain product layout with advantages and disadvantages. **[4]**

Q3) a) Describe the factors to be considered while finalizing plant location. **[4]**

b) Explain function of production planning and control. **[6]**

OR

Q4) a) Explain push or pull production system. **[4]**

b) Write short note on material requirement planning (MRP). **[6]**

Q5) a) Explain Method study. What are different recording techniques used in method study? **[8]**

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

i) Performance rating

ii) Qualified worker

P.T.O.

OR

Q6) a) Explain two handed process chart with suitable example. **[8]**

b) State various work measurement techniques. Explain any two of them. **[8]**

Q7) a) Explain role of product engineering department. **[8]**

b) What is float in PERT? How is float calculated in Project management? Explain. **[9]**

OR

Q8) a) Write short note on : **[8]**

i) Group technology

ii) Make or buy decision

b) Find critical path and calculate slack time for each event for given data **[9]**

Activity	Normal Time
1 - 2	2
1 - 3	2
1 - 4	1
2 - 6	4
3 - 7	5
3 - 5	8
4 - 5	3
5 - 9	5
6 - 8	1
7 - 8	4
8 - 9	3

Q9) a) Explain evolution and growth of technology. **[8]**

b) Explain role of government in technology development. **[9]**

OR

Q10)a) Explain Process technology and Product technology. **[8]**

b) Explain linkage between technology, development and competition. **[9]**

▽▽▽▽

Total No. of Questions : 10]

SEAT No. :

P3349

[Total No. of Pages : 3

[5353]-531

T.E. (Automobile Engineering)

DESIGN OF MACHINE ELEMENTS

(2015 Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Explain the general design procedure. **[6]**

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

OR

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

b) Write a short note on preferred series. **[4]**

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

b) Derive an expression for torque required to raise the load in power screws. **[8]**

OR

Q4) a) Determine the required length of square key if key and shaft are made up of same material. Take diameter of shaft as 40mm. **[2]**

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

P.T.O.

Q5) a) A hot rolled steel rod is subjected to torsional load varying from -110N-m to 440N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550Mpa, yield shear stress = 235Mpa, yield stress = 470Mpa, fatigue stress concentration factor =1, load factor = 0.7 for axial and 1 for torsion, surface finish factor = 0.89, size factor =1. Calculate the diameter of rod. **[10]**

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

OR

Q6) a) A mass of 500kg is being lowered by means of steel wire rope having cross sectional area 250mm^2. The velocity of weight is 0.5m/sec. When the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take $E = 0.8 \times 10^6$ Mpa. **[6]**

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

Q7) a) Design Spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2$Mpa, BHN = 250 for pinion and $\sigma_d = 47.1$Mpa, BHN = 200 for gear. Check only tangential tooth load. Form factor$Y = \pi (0.154 – 0.912/Z)$, $C_V = 3.05/3.05+V$. **[12]**

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

OR

Q8) a) Derive an expression for formative number of teeth in helical gear. **[6]**

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

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

OR

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

Total No. of Questions : 10]

SEAT No. :

P3350

[Total No. of Pages : 2

[5353]-532

T.E. (Automobile)

AUTOMOTIVE ELECTRICAL AND ELECTRONICS

(2015 Pattern) (Semester - I)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks'.***
4) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Which instrument is used for measuring the Specific Gravity of Lead Acid Battery? With neat sketch explain the procedure of Specific Gravity Test. **[8]**

b) Give the Advantages and Disadvantages of Positive and Negative Earthing? **[4]**

c) Which are the different Battery Failures? Explain any one in brief. **[4]**

OR

Q2) a) Why Spark Advance Mechanism is necessary in an Automotive Engine? What are the ways of advancing Spark? Explain it in detail. **[10]**

b) Explain the Voltage Regulator with neat sketch. **[6]**

Q3) Write down the characteristics of Idle Spark Plug. **[4]**

OR

Q4) With neat sketch explain the Balancing Coil type of Oil Pressure Gauge. **[4]**

Q5) a) Discuss the Sensor Feedback Control within a application in vehicle. **[8]**

b) Explain the motorized actuator in detail. **[8]**

P.T.O.

OR

Q6) a) What is the working principal of Sensors and Actuators used in the vehicle? Enlist the different types of Sensors and Actuators. **[8]**

b) Explain the operation of Angular Position Sensor with its application in a vehicle. **[8]**

Q7) a) Discuss the Open Loop Control System with at least four examples. Also give the advantages and disadvantages of it. **[9]**

b) Write a note on : **[9]**

i) TBI

ii) PFI

iii) MPFI

OR

Q8) a) Explain group and sequential injection techniques. **[9]**

b) Discuss the Closed Loop Control System with at least four examples. Also give the advantages and disadvantages of it. **[9]**

Q9) a) Write a note on. **[8]**

i) Vehicle Security System Alarms

ii) GPS

b) With neat sketch explain the Tire Pressure Monitoring System. **[8]**

OR

Q10)a) Explain Supplementary Restraint System of air bag system with its layout. **[8]**

b) Explain in detail Smart Parking Assist System. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3351

[Total No. of Pages : 4

[5353]-533

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2015 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer Five questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Classify the crankshaft and write the functions of crankshaft. **[4]**

b) The following data is given for a four stroke diesel engine Cylinder bore 250mm, maximum gas pressure 4MPA, Bearing pressure at small end of connecting rod 15MPA. length of piston pin in bush of small end 0.45D. ratio of inner to outer diameter of piston pin 0.6, mean diameter of piston boss = 1.4 × outer dia of piston pin, Allowable bending stress for piston pin 84 N/mm^2 **[6]**

Calculate :

i) Outer diameter of the piston pin

ii) Inner diameter of the piston pin,

iii) Mean diameter of the piston boss.

iv) Check the design for bending stress.

OR

Q2) a) The following data is given for the connecting rod: **[4]**

Engine speed = l800rpm

Length of connecting rod = 350mm

Length of stroke = 175mm,

Density of material = 7800kg/m^3

Thickness of web or flange = 8mm.

Assume I section as cross section. A = $11t^2$, $I_{xx} = (419/12)t^4$, Y = (5t/2)

Calculate whipping stress in connecting rod.

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

P.T.O.

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

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

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

Calculate:

i) diameter of valve port

ii) diameter of valve head

iii) thickness of valve head

iv) diameter of valve stem and

v) maximum lift of valve

OR

Q4) a) Enlist the forces and reactions acting on the crankshaft. **[2]**

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

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

b) A rimmed flywheel made of gray cast iron FG 200 ($\delta = 7100 Kg/m^3$) is required to keep down fluctuations in speed from 200 to 220 rpm. The cyclic fluctuations in energy are 30000 N-m, while the maximum torque during the cycle is 75000 N-m. The outside diameter of flywheel should not exceed 2m.

It can be assumed that there are 6 spokes and the rim contributes 90% of the required inertia. The cross section of the rim is rectangular and the ratio of width to thickness is 2. Determine the diameter of the rim. Assuming suitable cross section for spokes, calculate the stresses in the rim and the spokes using Timoshenko's Expression. **[12]**

OR

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

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

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

b) The following data is given for a rimmed flywheel made of gray cast iron FG 200, **[8]**

Mean redius of rim = 1.5m,

Thickness of rim = 200mm.

Width of rim = 300mm,

Number of spokes = 6,

Cross sectional area of each spoke = 10000 mm^2

speed of rotation = 720 rpm.

Calculate:

i) The tensile stress in rim at $\phi = 30°$ and $\phi = 0°$ and

ii) the axil stress in each spoke.

The mass density of the cast iron FG200 is 7 100kg/m^3

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

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

OR

Q8) a) Differentiate between sliding contact bearing and rolling contact bearings. **[8]**

b) The following data is given for a hydrostatic thrust bearing: **[8]**

Thrust load = 500 N.

Shaft speed = 720 rpm,

Shaft diameter = 500mm,

Recess diameter = 300rpm,

Film thickness 0.15mm,

Viscosity of lubricant = 160 SUS,

Specific gravity = 0.86

Calculate:

i) supply pressure

ii) flow requirement

iii) power loss in pumping

iv) frictional power loss.

Q9) a) Differentiate between SI and CI engines from designer's point of view. **[9]**

b) Write down general selection process of IC engine for any specific vehicle. Give detail engine specification of your favorite car/bike. **[9]**

OR

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

a) Mechanical fuel pump testing

b) Cylinder power balance

c) Oscilloscope engine analyzers

Total No. of Questions : 10]

SEAT No. :

P3999

[Total No. of Pages : 2

[5353]-534

T.E. (Automobile Engg.) (Semester - II)

AUTOMOTIVE TRANSMISSION

(2015 Pattern)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain four wheel drive layout with neat sketch. **[4]**

b) Explain the construction and working of multiplate clutch with neat sketch. **[6]**

OR

Q2) a) What are the Clutch lining materials? List down the desirable properties of the lining materials. **[4]**

b) Explain the construction and working of constant mesh gearbox with neat sketch. **[6]**

Q3) a) Draw and explain the working features universal joint. **[4]**

b) Explain the construction and working Hotchkiss drive with neat sketch. **[6]**

OR

Q4) a) Explain the design features and applications of fully forward chassis. **[4]**

b) Explain the construction and working of overdrive with neat sketch. **[6]**

Q5) a) Describe the construction and working of full floating axle with its neat sketch and list its applications **[8]**

b) Explain the construction and working of conventional type of differential with neat sketch. **[8]**

P.T.O

OR

Q6) a) Describe the construction and working of three quarter floating axle with neat sketch and list its applications. **[8]**

b) What is the function of the rear axle? Explain various loads acting on rear axle. **[8]**

Q7) a) Explain the construction and working of torque convertor with neat sketch. **[8]**

b) Suggest and justify' the various factors affecting on selection of lubrication in final drive. **[8]**

OR

Q8) a) Draw and explain the layout of hydraulic control system in automatic transmission. **[8]**

b) Draw and explain the Construction and working of CVT with its advantages and disadvantages. **[8]**

Q9) a) What is mean by Hydromantic transmission? Explain it in brief **[6]**

b) Differentiate between torque converter & gear box. **[6]**

c) Draw and explain the performance characteristics curve of continues variable transmission. **[6]**

OR

Q10)a) List and explain the properties of working fluid in torque convertor. **[6]**

b) Differentiate between semi automatic and automatic transmission **[6]**

c) List and explain the advantages and disadvantages of automatic transmission. **[6]**

Total No. of Questions : 10]

SEAT No. :

P4270

[Total No. of Pages : 2

[5353]-535

T.E. (Automobile Engineering)

AUTOMOTIVE AERODYNAMICS & BODY ENGINEERING

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or 2, Q3 or 4, Q5 or 6, Q7 or 8, Q9 or 10.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

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

b) Explain the Development of Aerodynamic drag and lift of Aerofoil? **[6]**

OR

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

b) What are advantages of Vehicle aerodynamics? **[4]**

Q3) a) Write a short note on improvement of Roof and spoilers increase aerodynamic performance vehicle? **[6]**

b) Write a short note on Application of CFD in vehicle Aerodynamics. **[4]**

OR

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

b) Calculate aerodynamic drag of car running with 90 km/hr with frontal projected area 2.5m^2. Coefficient of drag for car in 0.4 and density of air is 1.23 kg/m^3. **[4]**

P.T.O.

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

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

OR

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

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

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

a) Flat platform

b) Tipper body

c) Tanker body

d) Fixed side

OR

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

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

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

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

OR

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

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

Total No. of Questions : 8]

SEAT No. :

P3352

[Total No. of Pages : 3

[5353]-541

T.E. (Electronics)

POWER ELECTRONICS & APPLICATIONS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Draw and explain construction & V-I characteristic of IGBT. **[6]**

b) With the help of circuit diagram and waveforms explain the working of Synchronized SCR Triggering using UJT. **[6]**

c) Explain operation of 3-∅ Full converter for RL-load with the help neat circuit diagram and suitable waveforms. **[8]**

OR

Q2) a) Draw and explain switching characteristics of power MOSFET. **[6]**

b) Draw the circuit diagram, waveforms and explain operation of 1-∅ Semi converter for $\alpha = 30°$. **[6]**

c) Discuss following protection circuits used for SCR (in short) : **[8]**

i) di/dt

ii) dv/dt

iii) Overvoltage

iv) Overcurrent

P.T.O.

Q3) a) With neat circuit diagram and waveforms, explain 1∅ full bridge inverter with RL load to generate square wave. **[8]**

b) A single phase full bridge inverter is operated from a 48V battery and supplying power to a resistive load of 10 Ω. Determine : **[8]**

i) The fundamental output rms voltage and first 3 harmonics rms voltages

ii) Output rms power

iii) Output fundamental Power

OR

Q4) a) With neat circuit diagram and waveforms, explain operation of 3∅ bridge inverter with R load for 120° conduction mode. **[8]**

b) With the help of circuit diagram & waveforms, explain the operation of single phase full wave AC voltage controller for R-load using SCRs. **[8]**

Q5) a) Explain different chopper control strategies. **[6]**

b) Explain operation of four quadrant choppers in detail. **[6]**

c) The step-down chopper with resistive load of R=10Ω and i/p voltage 200V. Chopping frequency is 1kHz. If duty cycle is 50%, **[6]**

Determine

i) Average output voltage

ii) RMS output voltage

iii) Chopping efficiency

OR

Q6) a) Explain operation of Step down chopper with R & RL load. Derive expression for Average output voltage. **[8]**

b) Explain different features of standard regulator IC TPS40200. **[4]**

c) Explain operation of SMPS. State its applications. **[6]**

Q7) a) Explain operation of ON-line and OFF line UPS system. **[8]**

b) Write short note on use of Power Electronics for Electric drive applications. **[8]**

OR

Q8) a) Write a short note on: HVDC transmission system. **[8]**

b) Explain use of Power Electronics in Induction heating application. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3353

[Total No. of Pages : 3

[5353]-542

T.E. (Electronics)

INSTRUMENTATION SYSTEMS

(2015 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables Slide Rule, mollier Charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Draw block diagram of basic instrumentation system. Explain each block in detail. **[6]**

b) With the help of neat sketch explain signal conditioning of RTD. **[6]**

c) Explain with neat sketch working principle of rotameter. **[8]**

OR

Q2) a) Define the terms & draw a neat sketch. **[6]**

i) Sensitivity

ii) Linearity

iii) Precision

b) Explain working principle of electronic nose with the help of neat block diagram. **[6]**

c) Explain with neat sketch working principle of pitot static tube. **[8]**

Q3) a) Explain construction & working of LVDT. How LVDT can be used for pressure measurement. **[8]**

P.T.O.

b) Write a short notes on - **[8]**

i) Piezoelectric accelerometer.

ii) Capacitive accelerometer.

OR

Q4) a) Explain with neat sketch, how rotary encoder is used for measurement of speed of shaft in RPM? **[8]**

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

i) CMOS image sensor

ii) Gas flame detector.

Q5) a) Explain working principle of PZT actuator. **[6]**

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

c) Explain with neat diagram working of MEMS hot wire anemometer. **[6]**

OR

Q6) a) What do you mean by SMART sensor? Explain SMART sensor system in detail. **[6]**

b) Explain MEMS absolute pressure sensor. **[6]**

c) What is MRE? Explain it's working & application. **[6]**

Q7) a) Draw control valve characteristics and explain the terms. **[8]**

i) Quick opening

ii) Linear &

iii) Equal percentage

b) Explain control of single acting cylinder using appropriate directional control valve. **[8]**

OR

Q8) a) Write a short notes on : **[8]**

i) Solid state relay

ii) Solenoid actuator

b) Draw a pneumatic circuit symbol and explain with neat diagram working of poppet valve. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3354

[Total No. of Pages : 3

[5353]-543

T.E. (Electronics)

ELECTROMAGNETICS & WAVE PROPAGATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive the expression for Electric Flux Density. **[4]**

b) Two point charges (– 4 μC) and (5 μC) are located at (2,–1,3) and (0,4,–2) respectively find potential at (1,0,1) assuming zero potential at infinity. **[6]**

OR

Q2) a) Explain continuity Equation. **[4]**

b) Planes at Z = 0 and Z = 4 carry current K = (–10 ax) A/m and K = (10 ax) A/m respectively Determine H at A(1,1,1) and B(0,-3,10). **[6]**

Q3) a) Region y < 0 consists of a perfect conductor while region y>0 is dielectric medium $\varepsilon_r = 2$. If there is surface charge of $2nC/m^2$ on the conductor, determine E & D at A(3, –2, 2) and B(–4, 1, 5). **[4]**

b) Derive expression for parallel plate capacitance. **[6]**

OR

Q4) a) Derive Maxwell's equation showing relationship between E & V. **[4]**

b) Derive and expression for force due to magnetic field. **[6]**

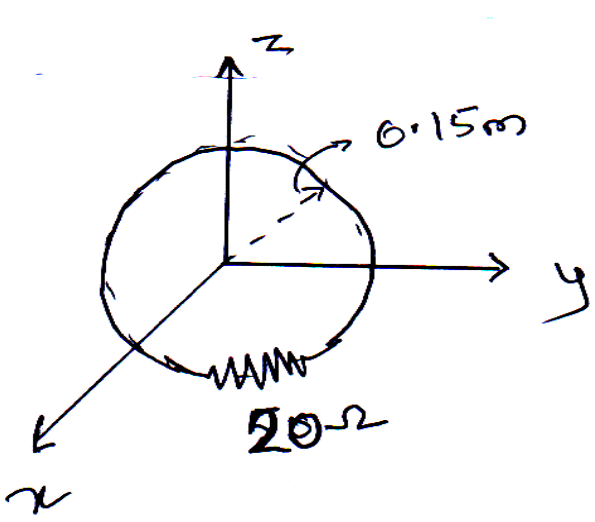
P.T.O.

Q5) a) State Faraday's Law for time varying fields. Derive the expression for emf induced in stationary magnetic field and moving loop. **[8]**

b) If $D = 10\chi\ a_x - 4ya_y + K\ za_z \mu C/m^2$ and $B = 2$ ay Find value of K to satisfy the Maxwell's equation for $\sigma = 0$ and $\rho_v = 0$. **[8]**

OR

Q6) a) A circular loop conductor having a radius of 0.15 m is placed in XY plane. This loop consists of resistance of 20 Ω as shown in figure. If magnetic flux density is $B = 0.5 \sin 10^3 t\ a_z$ then find the current flowing through this loop. **[8]**



b) Derive the expression for time varying potential for static EM field. **[8]**

Q7) a) Derive the expression for plane waves in free space. **[8]**

b) Define polarization? Explain linear, circular and elliptical polarization. **[8]**

OR

Q8) a) Define the terms Skin depth, Skin effect, skin resistance and comment on ratio of ac to dc resistance for plane waves in good conductor. **[8]**

b) In a non-magnetic medium $E = 4 \sin(2*\pi*10^7 t - 0.8x)\ a_z V/m$. Find ε_r, intrinsic impedance & time average power carried by the wave. **[8]**

Q9) a) A transmitter radiates 20 watts of at a wavelength of 4 cm. Calculate the power received by an antenna at a distance of 100Km if the gain of the transmitting and receiving antennas is equal and has a value of 30db. **[10]**

b) Define fading and explain the various types of fading's in radio wave propagation. **[8]**

OR

Q10)a) In Ionospheric propagation, the reflection takes place at a height of 400km and maximum density in the ionosphere corresponds to refractive index of 0.9 at a frequency of 10Mhz. Determine the range for which MUF is 10MHz. **[10]**

b) Write a note on - **[8]**

i) Duct Propagation

ii) Multipath Propagation

Total No. of Questions : 8]

SEAT No. :

P3355

[Total No. of Pages : 2

[5353]-544

T.E. (Electronics)

MICROCONTROLLERS AND APPLICATIONS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Compare microprocessor with microcontroller. **[4]**

b) With the help of neat block diagram explain DSO. **[8]**

c) Draw interfacing diagram for DAC with 8051. Write an assembly language program to generate square **[8]**

OR

Q2) a) Draw and explain port 0 and port 1 structure of 8051 microcontroller. **[8]**

b) Draw interfacing diagram to interfacing LED's with port 1. Write assembly language program to blink LED's. **[8]**

c) Draw and explain interfacing diagram for Opto isolator with 8051. **[4]**

Q3) a) Explain different registers of PlC 18FXXX microcontroller. **[8]**

b) Explain following instructions with example **[8]**

i) ADDWF F, D

ii) DAW

iii) SET F F, a

iv) ANDWF F, d, a

P.T.O.

OR

Q4) a) Define addressing mode. Explain addressing modes of PIC18FXXX microcontroller. **[8]**

b) Explain BOD and power down mode of PIC18FXXX. **[8]**

Q5) a) Explain the process of PWN generation in PIC18FXXX. Write embedded C program to generate 25% duty cycle PWM. **[8]**

b) Draw interfacing of 4×4 matrix keypad with PIC18FXXX. Draw and explain flow chart to detect and display key pressed. **[8]**

OR

Q6) a) Draw and explain structure of port D of PIC18FXXX microcontroller. **[8]**

b) Explain the functions of control pins of LCD, draw and explain 16 × 2 LCD interfacing in 4bit mode and 8 bit mode. **[8]**

Q7) a) Explain SPI serial communication protocol. Explain the different signals used for SPI and how data communication taken place between master and slave. **[10]**

b) Explain UART protocol in detail. **[8]**

OR

Q8) a) Write a short notes on : **[10]**

i) RS232

ii) RS 485

b) Draw and explain interfacing of EEPROM using SPI with PIC18FXXX. Draw flow chart to read and write data into EEPROM. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3356

[Total No. of Pages : 3

[5353] - 545

T.E. (Electronics Engineering)

DATA COMMUNICATION

(2015 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answers the Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10***
2) ***Answer any five questions.***
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 dada if necessary.***

Q1) a) Explain in Detail Hub, Switches and Routers. **[6]**

b) Write a short note on OSI model. **[4]**

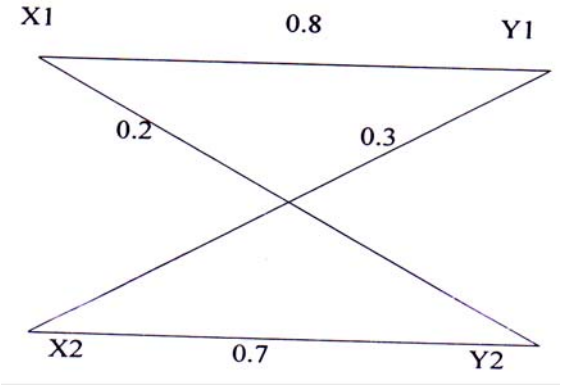
OR

Q2) a) Explain in detail factors to be considered for selection of transmission media. What are the advantages of STP? **[4]**

b) The Generator matrix of a particular (6,3) block code is given below. Find all code vectors of this code **[6]**

$$G = \begin{pmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{pmatrix}$$

Q3) a) Find the channel capacity as shown in Fig. **[6]**



P.T.O.

b) Prove that $H(X,Y) = H(X/Y) + H(Y)$

$$H(X,Y) = H(Y/X) + H(X)$$ **[4]**

OR

Q4) a) Apply Shannon Fano coding procedure to find the coding efficiency for the following Message ensemble.

X1=1/4, X2=1/8, X3=1/16, X4=1/16, X5=1/16, X6=1/4, X7=1/16, X8=1/8
Take M=2 **[6]**

b) State and Explain Shannons therom on channel Capacity. **[4]**

Q5) a) Explain Adaptive Delta Modulation in detail with the help on transmitter and receiver. **[8]**

b) Draw the waveforms for the bit sequence 1101010011 **[8]**

i) RZ unipolar

ii) NRZ polar

iii) AMI

iv) Split phase manchester

OR

Q6) a) Write a short note on Quantization Noise and Non Uniform Quantization. **[8]**

b) ADM system is operating at 3 times the Nyquist rate for a signal with a 3 KHz Bandwidth. The quantizing step size is 250 mV. **[8]**

i) Determine the maximum amplitude of a 1kHz input sinusoid for which the delta Modulator does not show slope overload.

ii) Determine the post filtered output of SNR.

Q7) a) Explain QPSK with its Transmitter and Receiver. **[8]**

b) Compare QPSK, M-ary PSK, M-ary FSK and ASK. **[8]**

OR

Q8) a) Explain M-ary PSK in detail with the help of Transmitter and Receiver. **[8]**

b) Explain with the help of neat block diagram 16 bit QAM transmitter and receiver. **[8]**

Q9) a) Compare FDMA, CDMA, TDMA. **[9]**

b) With the help of mathematical expressions and block diagram explain DS-SS system. **[9]**

OR

Q10)a) Consider a slow hop SS system with binary FSK that transmits two symbols per frequency hop and has a PN generator with K=3. For a binary message sequence [01 10 11 01 10 00]. Draw the spectral output. Determine the processing gain if r_b=3000 and find the bit error probability of white noise if $N_0=10^{-12}$W/Hz, $S_{R=}5.4* 10^{-8}$W. **[9]**

b) Write a short note on **[9]**

i) Pure ALOHA

ii) Slotted ALOHA

iii) CSMA

Total No. of Questions : 10]

SEAT No. :

P3357

[Total No. of Pages : 2

[5353] - 547

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) List features and applications of variants of the MSP430 family MSP430x2x, MSP430x4x, MSP430x5x **[6]**

b) Draw & Explain Programming model of ARM 7. **[4]**

OR

Q2) a) Explain SPI Communication protocol in detail **[6]**

b) Explain the Watchdog timer of MSP 430 microcontroller **[4]**

Q3) a) Explain different types of clock sources and different types of oscillator used in MSP 430 **[6]**

b) What are the Advantages & Suitability of ARM Processor in Embedded application? **[4]**

OR

Q4) a) Explain Timer_A operation with block diagram of MSP 430 microcontroller. **[6]**

b) Draw & Explain CPSR & SPSR register of ARM 7. **[4]**

Q5) a) Draw and explain the block diagram (Architecture) of LPC 2148. **[8]**

b) Explain PINSEL 0, PINSEL I, PINSEL 2 and IODIR registers of LPC 2148. **[8]**

OR

P.T.O.

Q6) a) Interface LED's to P 1.24 to P 1.31 port pins of LPC 2148. Write an embedded C program to blink LED. Also draw the flow chart. **[8]**

b) Explain the PLL and VPB of LPC 2148. Explain the PLL programming. Explain the calculation of values of 'M, multiplier and 'P' divider in PLL. **[8]**

Q7) a) List the features of on chip ADC of LPC 2148. Write an Embedded C program for on chip ADC. **[8]**

b) List Features of UART 0 of LPC 2148. Give the difference between UART 0 and UART 1. List and explain the pins of LPC 2148 used for UART. **[8]**

OR

Q8) a) Draw & Explain Interfacing of GSM to LPC 2148. Also explain any four AT commands **[8]**

b) Draw & Explain Interfacing of I2C EEPROM to LPC 2148. Draw flow chart to write and read data in EEPROM. **[8]**

Q9) a) Draw and explain CMSIS structure of Cortex series. **[6]**

b) What are the improvements of ARM Cortex over classical series ARM controllers. **[6]**

c) What are desired features of Operating System in Embedded system? **[6]**

OR

Q10)a) Draw and explain block diagram of ARM cortex M_3. **[6]**

b) Explain different operating modes of CORTEX M3 with the help of state diagram. **[6]**

c) Compare ARM Cortex M_3 with ARM 7 TDMI. **[6]**

Total No. of Questions : 8]

SEAT No. :

P3358

[Total No. of Pages : 2

[5353] - 548

TE. (Electronics)

BUSINESS MANAGEMENT AND ORGANIZATION

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.***

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

Q1) a) What are positive and negative impacts of Globalization? **[7]**

b) What are the various factors to be considered for starting a new unit? **[7]**

c) Write a short note on service sector. **[6]**

OR

Q2) a) Differentiate between Traditional commerce and E-commerce **[7]**

b) List features, relative merits and demerits of partnership firm. **[7]**

c) Write Business plan in detail. **[6]**

Q3) a) What is Business Ethics? Explain the benefits of Business Ethics. **[8]**

b) Write short note on Techonological Development and social change. **[8]**

OR

Q4) a) What is social Responsibility of Business? Explain in detail. **[8]**

b) What is social Audit of Business? Explain its importance. **[8]**

Q5) a) Describe Management as Art, science and profession. **[8]**

b) Explain the contribution of F.W. Taylor in the evolution of management thought. **[10]**

OR

P.T.O.

Q6) a) Differentiate between management and Administration. **[8]**

b) Discuss Henry fayol's principles of management in detail. **[10]**

Q7) a) Write a short note on importance of Decision making in Business Organization. **[8]**

b) What is the relevance of strategic management? Explain its benefits in an Organization. **[8]**

OR

Q8) a) Write a short note on Environment friendly management. **[8]**

b) What is Total Quality Management? Explain. **[8]**

Total No. of Questions : 10]

SEAT No. :

P 5232

[Total No. of Pages : 3

[5353] - 549

T.E. (Electronics)

Fundamentals of HDL

(2015 Pattern) (End Sem)

Time : 2½ Hour] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q.6, Q.7 or Q.8, and Q.9 or Q.10.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What are the features of VHDL? Write down the structure of VHDL module. **[6]**

b) What is the difference between simulation and Synthesis? **[4]**

OR

Q2) a) Draw Logic Symbol with Excitation Table and write a HDL code for 3 bit Binary Counter with any type of Modeling styles. **[6]**

b) What are the differences between Behavioral and structural Modeling styles of HDL? **[4]**

Q3) a) With illustrations briefly discuss following Statements with relevant examples: **[6]**

i) Wait Statement
ii) Case Statement
iii) Loop Statement

b) Explain the Following terms related to CPLD. **[4]**

i) Functional Blocks/PAL. Blocks
ii) I/O Blocks

OR

Q4) a) With neat Schematic explain the architectural building block of FPGA. **[6]**

b) Write a HDL.description code for SR Flip Flop With Schematic diagram. **[4]**

P.T.O.

Q5) a) Write a HDL description of a Full adder using Procedure and Task. **[8]**

b) What are the difference between procedure and Task? **[5]**

c) Explain Task Syntax with example. **[4]**

OR

Q6) a) Write a HDL Code for MUX 4:1 by using 2:1 MUX use Procedure and Task. **[8]**

b) What are the difference between Task and Function? **[5]**

c) Explain Procedure syntax with example. **[4]**

Q7) a) Explain different Verilog Operators in details with example. **[8]**

b) Explain the following data types in Verilog: **[4]**

i) Net

ii) Parameters

iii) Registers

c) Find the value of Following Expressions IF the two unsigned variables. A = 4 'B 1101 and B' = 4B1001 **[4]**

i) {A&&B}

ii) (A | | B)

iii) {4{A},2{B}

iv) B>>2

OR

Q8) a) Write down the short note on Following-. **[8]**

i) Arrays

ii) Variables & Constants declaration

b) Explain Structure of Verilog Module with an Example **[4]**

c) What is Verilog HDL? What are the Major capabilities of verilog HDL? **[4]**

Q.9) a) Explain the different types of level of abstractions in the Verilog with examples of each. **[8]**

b) Explain following Verilog statement with Syntax and relevant example, **[5]**

i) Case Statement

ii) Loop Statement

c) Write short notes on compiler Directives. **[4]**

OR

Q.10) a) Write the Verilog code for Following: **[8]**

i) 4 bit magnitude comparator

ii) 4 bit ALU

b) Explain the following terms with examples: **[5]**

i) Bit select

ii) Part Select

c) Describe the Behavioral description for D Flip-Flop using always Statement. **[4]**

Total No. of Questions : 10]

SEAT No. :

P3359

[Total No. of Pages : 2

[5353] - 550

T.E. (Electronics Engineering)

PLC and Applications

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q.10***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Conveyor C is to run when any one of four inputs is on. It is stop when any One of other four inputs is ON. Draw Gate Logic Diagram, Relay Ladder and PLC Ladder Diagram. **[6]**

b) Write short note on programming word level logic instruction. **[4]**

OR

Q2) a) A railway station has 3 platforms A, B and C, A train is coming into the Station. It has to be given entry to platform A if A is empty. if both A and B are Occupied then it has to be entry given to platform C. If all the platforms are full then train has to wait. Design necessary PLC ladder logic diagram. **[6]**

b) Write short note on PLC Matrix Function. **[4]**

Q3) a) List different programming Languages used in PLC. Explain any one in detail. **[6]**

b) Differentiate PLC vs. Computer? **[4]**

OR

P.T.O.

Q4) a) List various types of switches and output control devices which are Interface with PLC and explain any one switch and output control device. **[6]**

b) Draw PLC ladder diagram for automatic water sprinkler system for a garden with necessary diagram. **[4]**

Q5) a) Explain leaky inputs and outputs for PLC. **[8]**

b) List various types of operating environment for PLC. Explain any four Types of operating environment. **[9]**

OR

Q6) a) Explain PLC Maintenance in detail. **[8]**

b) Explain various steps for PLC trouble shooting. **[9]**

Q7) a) Explain any four types of processes used in process control Industries. **[8]**

b) Draw block diagram of SCADA and Explain Function of MTU and RTU . **[8]**

OR

Q8) a) Explain on/off control and motion control used in process control. **[8]**

b) Explain Human machine Interface in detail. **[8]**

Q9) a) Explain types of communication interface and types of networking channels in PLC. **[9]**

b) Explain Devicenet and Controlnet in PLC. **[8]**

OR

Q10) a) Explain Fieldbus and Profibus. **[9]**

b) Explain Serial communication and MODBUS communication. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3360

[Total No. of Pages : 3

[5353] - 551

TE. (Electronics Engineering)

DIGITAL COMMUNICATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain T1 Carrier system. **[8]**

b) Derive the expression for signal-to quantization noise ratio for PCM system that employs linear quantization techniques. **[6]**

c) A wide sense stationary process is passed through LTI system with impulse response h(t). Find the relationship between input and output mean value. **[6]**

OR

Q2) a) A linear delta modulator is designed to operate on speech signals limited to 3.6 KHz. The signal is sampled 10 times more than the Nyquist rate. The step size used is 100 mV. If this modulator is tested for 1KHz sinusoidal signal, determine the maximum amplitude of this signal required to avoid slope overload **[8]**

b) Explain any three properties of line codes. **[6]**

c) Explain properties of power spectrul density. **[6]**

Q3) a) A polar binary signal with amplitude ±1V is transmitted through a channel in which AWGN with PSD $\frac{No}{2}=10^{-5}$watt/Hz is added. Determine the maximum bit rate that can be sent with BER$\leq 10^{-4}$.

Given Q(3.71) = 10^{-4}. **[8]**

P.T.O.

b) What is optimum filter (receiver) ? What is the decision threshold in optimum filter. **[10]**

OR

Q4) a) What is correlator? Show that the output of correlator & matched filter are identical. **[10]**

b) A binary baseband system consists of two signals $s_1(t)$ & $s_2(t)$ with amplitudes + A and –A. Both signals are equiprobable. The receiver uses integrate and dump filter for detection. If noise PSD $\frac{No}{2} = 10^{-9}\ watt/Hz, A = 10mV$ and data rate is 10^4 bits/sec then

i) find error probability.

ii) If bit rate is increased to 10^5 bits/sec what value of A is needed to achieve same P_e (BER). **[8]**

Given $Q\left(\sqrt{10}\right) = 7.8\times10^{-4}$

Q5) a) In a digital communication system, NRZ data stream with 1 mbps and carrier frequency of 100 MHz is used. Find the symbol rate and transmission bandwidth requirement for **[6]**

i) BPSK

ii) QPSK

iii) 16-PSK

b) Explain generation & reception of BFSK **[6]**

c) Compare PSK and DPSK **[4]**

OR

Q6) a) Write the signal representation of M-QAM. Draw the signal constellation & find bandwidth requirement of M-QAM **[6]**

b) Explain non-coherent & Binary FSK **[6]**

c) Compare BPSK and QPSK **[4]**

Q7) a) Compare DSSS and FHSS **[6]**

b) The information bit duration in DS-BPSK spread spectrum communication system is 5ms while the chipping rate is 1MHz. Assuming an average error probability of 10^{-5} for proper detection of message signal, calculate Jamning margin. Given $Q(4.25) = 10^{-5}$ **[6]**

c) Write advantages & Disadvantages of FHSS **[4]**

OR

Q8) a) Represent variation of frequency of fast hop FHSS with binary FSK having following parameters

i) No. of bits per MFSK symbol K = 2

ii) No. of MFSK tones $M = 2^K = 4$

iii) Length of PN segment per hop = 3

iv) Total number of frequency hops = 8 Generate PN sequence with initial shift register contents 1100

Represent variation of frequency for binary dada 01111100 **[8]**

b) Explain DSSS transmitter & receiver with neat waveforms (Time domain & frequency domain) **[8]**

Total No. of Questions : 10]

SEAT No. :

P3361

[Total No. of Pages : 3

[5353] - 552

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) A contineous time signal x(t) with fundamental period T = 1/F is sampled at rate $F_s = 1/T_s$ to produce discrete time sinusoid $x(n) = x(nT_s)$. Show that x(n) is periodic if

$$\frac{T_s}{T} = \frac{K}{N}$$

where K and N are integers. **[5]**

b) Define Z transform & ROC. Hence clearly mention & draw ROCs for causal, non-causal, finite and infinite duration sequences. **[5]**

OR

Q2) a) The impulse response of a system is given by $h(n) = 2(0.5)^n u(n)$. Find the system function H(z) and the difference equation for y(n). Compute y(n) when $x(n) = (¼)^n u(n)$ using Z.T. **[5]**

b) Derive the relationship between Fourier transform and Z-transform. **[5]**

P.T.O.

Q3) a) Define DFT and IDFT. Hence using the frequency shift property show that DFT $\left\{x(n)\cos\frac{2\pi nk}{N}\right\} = \frac{1}{2}\left[X(m-k)+X(m+k)\right]$ **[5]**

b) Find the causal sequence x(n) for

$$X(Z)=[6+Z^{-1}]/[(1+0.25Z^{-1})(1+0.5Z^{-1})]$$ **[5]**

OR

Q4) a) An analog signal **[5]**

$x_a(t) = \sin(480\pi t) + 3\sin(720\pi t)$ is sampled at the rate 600 samples per sec.

i) Determine Nyquist rate

ii) Determine folding freq^n

iii) Find x(n)

iv) What the freq^n in rad in x(n)

b) State & prove periodicity & time shift property of DFT. **[5]**

Q5) a) Explain step by step the Impulse Invariance transformation, its use to design IIRfilter and its drawback. **[8]**

b) Why the transformations are used to convert analog filter into digital filter. Hence convert the analog filter with system function

$$H_a(s)=\frac{2}{(s+1)(s+2)}$$

into digital filter by means of

i) Impulse Invariance Transformation.

ii) Bilinear Transformation with T = 1. **[10]**

OR

Q6) a) Implement the second order digital filter using Direct form I & Direct form II for the following difference equation. **[8]**

$$y(n) = 2r\cos(w_o n)\, y(n-1) - r^2 y(n-2) + x(n) - r\cos(w_o n)\, x(n-1)$$

b) Design a digital IIR filter with following specifications. **[10]**

$$0.6 \leq |H(e^{jw})| \leq 1 \qquad 0 \leq w \leq 0.35\pi$$
$$|H(e^{jw})| \leq 0.1 \qquad 0.7\pi \leq w \leq \pi$$

with T = 0.1 sec. and using BLT.

Q7) a) Design a low pass filter with $H_d(w)$ as

$$H_d(w) = \begin{cases} e^{-j2w} & |w| \leq \pi \,|\, 4 \\ 0 & \frac{\pi}{4} \leq w \leq \pi \end{cases}$$ **[10]**

with Hann window , with N = 5 find H(w) equation.

b) What are the characteristics of FIR filter. Hence prove that FIR filter are inherently stable filter. **[6]**

OR

Q8) a) Draw & explain the characteristics of ideal filters & its requirements. Why the ideal filters are not realizable. Explain the Gibbs phenomenon & why it occurs? **[10]**

b) What is Finite word length effect & how it affects the FIR filter performance. **[6]**

Q9) a) Explain the application of DSP in compact Disc recording system. **[8]**

b) Explain real time application of DSP in medical field. **[8]**

OR

Q10)a) How the DSP is useful in speech processing. Explain any application of speech processing using DSP. **[8]**

b) How the mechanical industry is benefited with DSP algorithm, explain with example. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3362

[Total No. of Pages : 3

[5353] - 553

TE. (Electronics and Telecommunication)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic packet calculator and smith chart is allowed.***
5) ***Assume suitable dada if necessary.***

Q1) a) Derive expression for $\bar{E}$ due to infinite line charge. **[8]**

b) Determine electric flux density at (4, 0, 3) if there is a point charge -5πmC at (4, 0, 0) and line charge 3π mC/m along the y-axis. **[8]**

c) Derive the relation between $\bar{E}$ and V. **[4]**

OR

Q2) a) Derive expression of $\bar{H}$ due to finite current carrying conductor. Also modify the expression for infinite conductor. **[8]**

b) Explain concept of Dielectric Polarization in detail. **[6]**

c) Derive expression for capacitance of spherical plate capacitor. **[6]**

Q3) a) State and prove Poynting theorem. Also explain significance of each term in it. **[8]**

b) Determine K so that each of the following pairs of field satisfies following Maxwell's equations : **[8]**

i) $\bar{D} = 6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z \, nC/m^2$

$\bar{H} = Kx\hat{a}_x - 10y\hat{a}_y - 25z\hat{a}_z \, A/m$

ii) $\bar{E} = (20y - Kt)\hat{a}_x \, V/m$

$\bar{H} = (y + 2\times10^6 t)\,\hat{a}_z \, A/m.$

P.T.O.

OR

Q4) a) State and explain Maxwell's equations for time varying field in detail. Also modify it for static fields. **[8]**

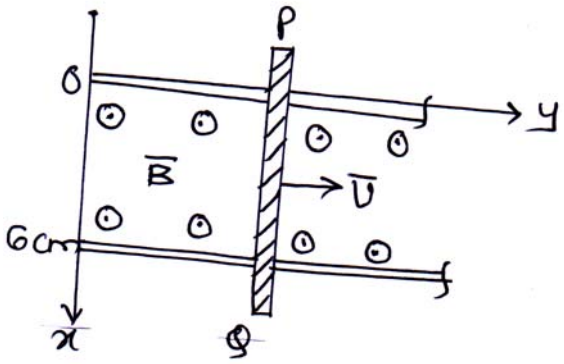
b) A conducting bar can slide freely over two conducting rails as shown in figure below. Calculate the induced voltage in the bar **[8]**

i) If the bar is stationed at y = 8cm and $\bar{B} = 4\cos 10^6 t\, \hat{a}_z\, mWb/m^2$

ii) If the bar slides at a velocity $\bar{V} = 20\hat{a}_y\, m/s$ *and* $\bar{B} = 4\hat{a}_z\, mWb/m^2$

iii) If the bar slides at a velocity $\bar{V} = 20\hat{a}_y\, m/s$ *and*

$\bar{B} = 4\cos(10^6 t - y)\hat{a}_z\, mWb/m^2$



Q5) a) State primary and secondary constants of transmission line. Also derive relationship Z_0 and γ in terms of primary constants. **[8]**

b) A transmission line has a characteristic impedance of 300 Ω and terminated in a load (150 + j150)Ω. Find following using Smith chart. **[8]**

i) VSWR,

ii) Reflection Coefficient,

iii) Input impedance at distance 0.1λ from the load,

iv) Input admittance from 0.1λ from the load.

OR

Q6) a) Derive general solution of transmission line. Also explain its physical significance. **[8]**

b) A generator of 1 v, 1 KHz supplies power to a 100 Km open wire transmission line terminated in Z_0. The line parameters are, **[8]**

$R = 10.4\ \Omega/Km$, $L = 0.00367$ H/Km, $G = 0.8 \times 10^{-6}$ mho/Km, $C = 0.00835 \times 10^{-6}$ F/Km.

Calculate Z_0, α, β, λ, velocity (V), received current, voltage and power.

Q7) a) Derive expression of electromagnetic wave equation in phasor form.Also derive expression of α and β from it. **[8]**

b) Determine the amplitude of the reflected and transmitted E and H at the interface of two media with the following properties. **[10]**

Medium 1 : $\xi_r = 8.5$, $\mu_r = 1$, $\sigma = 0$, Medium 2 : Free Space.

Assume normal incidence and the amplitude of E in medium 1 at the interface is 1.5 mV/m.

OR

Q8) a) Explain the concept of UPW. Also explain polarization of UPW along with its different types. (UPW = Uniform Plane Waves) **[10]**

b) Explain in detail the concept of depth of penetration. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3363

[Total No. of Pages : 2

[5353] - 554

TE. (E & TC) (Semester - I)

MICROCONTROLLER

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Draw and explain the internal memory organization of 8051 in detail **[6]**

b) Draw an interfacing diagram of ADC 0809 with 8051 and write an ALP to accept data from sensor connected to channel 5 and store current reading in register B. **[7]**

c) Draw an interfacing diagram of DAC to generate the square wave of 5KHz (Use Timerl, mode 2) **[7]**

OR

Q2) a) Draw and explain port structure of 8051 microcontroller **[6]**

b) With the help of neat block diagram explain the operation of Logic analyzer **[7]**

c) Design a DAS for accepting digital input from 4×4 keypad and display the state of key pressed by glowing lamp connected with Opto-Isolator and LED connected to relay at P1.1, Draw flow chart. **[7]**

Q3) a) State features of PIC and explain with example functioning of ALU in PIC18 for transfer of data **[8]**

b) Explain the power down modes of PlC **[8]**

P.T.O.

OR

Q4) a) Draw and explain the RESET functional diagram with causes **[8]**

b) Write a C18 program to toggle all bits of Port B continuously with delay of 10 ms using Timer 0, 16 bit and no presclar XTAL=l0 MHz **[8]**

Q5) a) Draw and explain the Legacy and Priority mode of PlC interrupts **[8]**

b) Draw an interfacing diagram to interface the DC motor with PIC 18FXXX for speed control using PWM with 5KHz, 40% Duty cycle,N=4, Also write an embedded C program **[8]**

OR

Q6) a) Draw interfacing diagram of LCD with PIC 18FXXXX, and write an C program to display 'SPPU on first line with offset of 6 **[8]**

b) Explain in detail with block schematic of Compare mode of CCP module. **[8]**

Q7) a) Draw and explain the 12C mode of the MSSP structure in detail **[8]**

b) State features of RTC and draw an interfacing diagram with PlC, write an initialization program **[10]**

OR

Q8) a) Explain the use of BRG register for calculation of baud rate with UART block diagram **[8]**

b) Design a Home alarm system considering the parameters of door safety using sensors for detection of person and its movements, Display warning on LCD and LED, light the Lamp connected with Opto-oscillator, Draw the Flowchart with initialization program **[10]**

Total No. of Questions : 8]

SEAT No. :

P3364

[Total No. of Pages : 3

[5353] - 555

T.E. (E & TC) (Semester - I)

MECHATRONICS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

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

Q1) a) With the help of a block diagram explain servomechanism. State its applications. **[6]**

b) What are rotary encoders? Explain how angular displacement can be measured using optical rotary encoders. **[8]**

c) Explain the hydraulic system and state the use of Accumulator in a Hydraulic system. **[6]**

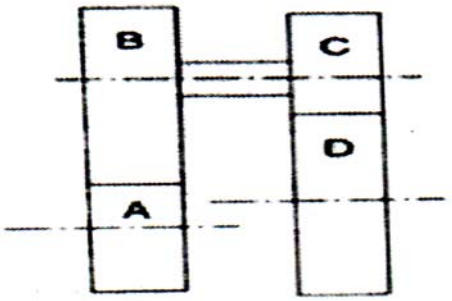
OR

Q2) a) What is the use of Pump in a hydraulic system? Compare positive displacement (Hydro static) type and Non- Positive Displacement (Hydrodynamic) type of Pumps. **[8]**

b) Write a short note on load cell. Discuss its use to measure force, signal conditioning requirement and its applications. **[6]**

c) In the double reduction gear train shown in the following, figure, B & C from a compound wheel free to rotate on the lay shaft. The speed of D is to be one-tenth of the speed of A. For A the number of teeth are 80, for C they are 80 & for D they are 160. Find the suitable mumber of teeth for wheel B. **[6]**

P.T.O.



Q3) a) Explain the working of Adsorption and Absorption type of Dryers. State its advantages and disadvantages. **[8]**

b) Elaborate on Air treatment stages in a Pneumatic System. **[8]**

OR

Q4) a) Explain with the help of diagram working of Pick and Place Robot. **[8]**

b) Draw a neat labeled diagram to explain the working of a lubricator in a Pneumatic System. **[6]**

c) Draw symbol of 4/3 solenoid type and push button type DCV. **[2]**

Q5) a) Represent 4/2 and 5/3 DCV symbolically.

With the help of a diagram explain the actuation of a double acting cylinder using 4/3 DCV in a Pneumatic system. Explain every component used in the system. **[10]**

b) What is a stepper motor? With the help of a diagram explain its working. **[4]**

c) A four stack variable reluctance motor has a step angle of 1.8°, find number of its rotor and stator teeth **[4]**

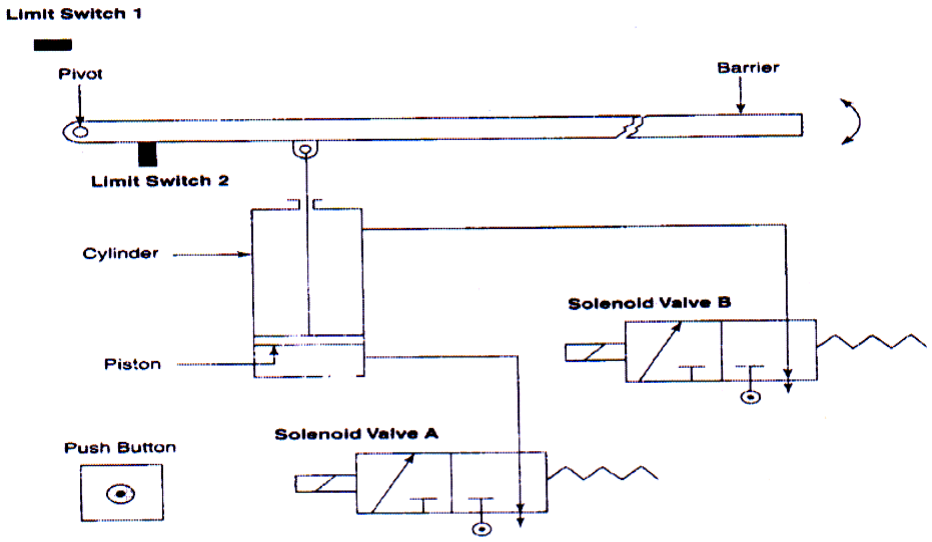
OR

Q6) a) State different types of Control Valves. Explain working and the selection of a solenoid valve. **[6]**

b) What are Electro mechanical relays? State its use. **[6]**

c) State and compare different types of Actuators, state their advantages and disadvantages. **[6]**

Q7) a) The figure below shows the entry of the car Parking system. Consider appropriate inputs and outputs and explain the working of the same using PLC ladder diagram or any other approach. **[8]**



b) What is an Engine Management System (EMS)? State its main components and explain the various sensors used in an EMS with the help of a schematic. **[8]**

OR

Q8) a) What are the main components of a Computer Numerical Control (CNC) Machine? Explain the functionality of each component with the help of neat block diagram. Compare the conventional NC with CNC machine. **[10]**

b) With the help of a block diagram explain the Anti Lock Braking system. State its significance in a vehicle. **[6]**

Total No. of Questions : 8]

SEAT No. :

P3365

[Total No. of Pages : 2

[5353] - 556

T.E. (E & TC)

POWER ELECTRONICS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Draw the construction of SCR and explain the operation using two transistor analogy with expression of anode current. **[7]**

b) Discuss the needs of series operation of SCR and explain the static and dynamic equalizing circuit. State its advantages and limitations. **[7]**

c) What are voltage control methods of Inverter? Explain any one technique. **[6]**

OR

Q2) a) Draw steady state I-V characteristics of SCR. Explain the parameters I_L,I_H,V_{BO},V_{BR} & show them on the characteristics. **[7]**

b) Draw the construction of Power MOSFET and explain I-V steady state characteristics of Power MOSFET. Compare & contrast with SCR.**[7]**

c) Draw and explain single phase full converter with highly inductive load with input and output waveforms at 60 degC & 120 degC? **[6]**

Q3) a) In DC chopper, average load current is 25 A, chopping frequency is 1kHz, $Vs = 220V$, Calculate ON and OFF period of chopper & duty cycle, if load resistance is 2 ohms, Draw waveforms with values of voltage, current & time? **[8]**

b) Draw and Explain Step Up chopper with circuit diagram and waveforms? Derive the expression of its output voltage? **[8]**

P.T.O.

OR

Q4) a) Draw the circuit diagram & Explain working of single phase full wave ac voltage controller using IGBT with R load, Derive equation for rms output voltage? **[8]**

b) Draw the diagram & Explain the operation of step down SMPS? Draw the diagram showing implementation of this SMPS using PWM IC LM 3524? **[8]**

Q5) a) What are resonant converters? Explain necessity of resonant converters. State its advantages. **[8]**

b) With the help of circuit diagram, Explain how overvoltage protection is achieved using Selenium diode and Metal oxide varistor? **[10]**

OR

Q6) a) Explain with the neat diagram & waveforms L-type ZCS resonant converters? **[10]**

b) Explain need of heat sink & its design considerations to protect the power devices. A power device has a thermal resistance of 200°C/W. Calculate the maximum permissible power dissipation ,when the T_{jmax} = 90 *degC* & T_A = 25 *degC*. **[8]**

Q7) a) With the help of block diagram, Explain the working of LED lamp driver circuit used for domestic lighting applications. **[8]**

b) What are the various types of UPS systems? With the help of block diagram, explain function of each block of on line UPS system. **[8]**

OR

Q8) a) Calculate the back-up time in hour for a UPS with battery rating of 12 V, 150 AH capacity, Maximum input power rating is 800VA, actual power consumed by intercom system load is 300 watts at lagging power factor of 0.9. Assume efficiency of UPS is 85%. **[8]**

b) Draw and explain the operation fan regulator circuit using Triac with neat waveforms at various points? **[8]**

Total No. of Questions : 8]

SEAT No. :

P3366

[Total No. of Pages : 3

[5353] - 557

T.E. (E & TC)

INFORMATION THEORY,CODING AND COMMUNICATION NETWORKS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) A source emits 1000 symbols per second from a range of 5 symbols, with probabilities $\left[\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}\right]$ Find entropy and information rate. **[6]**

b) For a systematic (6,3) LBC, the parity matrix is given by **[7]**

$$P = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

i) Find all possible code voctors

ii) Find error detecting & correcting capabilities.

c) Obtain generator matrix and parity check matrix for (7,4) cyclic code using generator polynomial $g(x) = x^3 + x + 1$ **[7]**

OR

Q2) a) What is mutual information? Calculate all the entropies & mutual information for the channel with channel matrix given as P[y/x] = [0.9,0.1,0;0,0.8,0.2;0,0.3,0.7]

Given $P(x_2) = 0.3$ and $p(x_2) = 0.25$

$P(x_3) = 0.45$ **[7]**

P.T.O.

b) State & Explain **[6]**

i) Shannon's channel coding theorem

ii) Shannon's Information capacity theorem

c) Explain the cyclic property of cyclic code. Generate a systematic (7,4) cyclic code for the messages **[7]**

i) 1010

ii) 1000

Q3) a) For a 1/3 rate conrolutional encoder using three generators **[10]**

$g_1 = [1\ \ 0\ \ 0]$

$g_2 = [1\ \ 0\ \ 1]$

$g_3 = [1\ \ 1\ \ 1]$

i) Sketch the encoder configuration.

ii) Draw state and Terllies diagram

iii) Find output code sequence for the input sequence 10110

b) Find the generator polynomial for the BCH code with block length n = 15, for error correcting capability tc = 2. USE primitive polynomial $p(x) = x^4 + x + 1$, over GF (2^4) **[8]**

OR

Q4) a) Design (7,3) RS double error correcting code. Use primitive polynomial over GF (2^3), $x^3 + x + 1$.

Find systematic RS code for the message $\{\alpha, \alpha^3, \alpha^5\}$ **[10]**

b) Define the following terms xlated to convolutional code with example

i) Constraint lergth

ii) Code rate

iii) Free length

iv) Coding gain **[8]**

Q5) a) Draw & Explain OSI network model. What is peer to peer process? **[8]**

b) What is network? Explain different types of network topologies. **[8]**

OR

Q6) a) Draw & explain TCP/IP reference model.Explain functionalityof each layer. **[8]**

b) Compore coaxial cable, Twisted pain cable and fibre optic cable. **[8]**

Q7) a) Draw the HDLC frome format. Explain the control field used in HDLC for different frame types. **[8]**

b) Explain functions of data Link layor. **[8]**

OR

Q8) a) List different framing methods. Explain character stuffing and bit stuffing in DLL **[8]**

b) What is ARQ ? Explain Go back N and selective repeat ARQ protocols. **[8]**

Total No. of Questions : 8] **SEAT No. :**

P3977 **[Total No. of Pages : 2**

[5353]-558

T.E. (Electronics & Telecommunication Engineering)

BUSINESS MANAGEMENT

(2015 Pattern) (End Semester)

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

Instructions to the candidates:

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

Q1) a) Draw levels of management. Explain each level in detail. **[8]**

b) Write a note on Quality Circles with its Objectives, Benefits and Functions. **[6]**

c) A company producing soap, which selling price is Rs. 18/- per soap has a fixed cost of Rs.75, 000 and variable cost is Rs.8/- per soap. Calculate **[6]**

i) Break-even point quantity

ii) Production in number of soaps required to earn a profit of Rs.15,000. Profit, if 40,000 soaps are produced.

OR

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

i) Ishikawa diagram.

ii) Pareto Analysis.

b) State the advantages and Disadvantages of Kaizen's Philosophy. **[6]**

c) Describe characteristics of an organization. **[6]**

Q3) a) What is HR Management? Explain Significance of HR Management at all Levels. **[8]**

b) Write Talent Acquisition Process Mapping. **[8]**

P.T.O.

OR

Q4) a) Define Recruitment in HRD and explain sources of Recruitment? **[8]**

b) Explain training process of HRD and its objectives. **[8]**

Q5) a) What is Business plan? State the reasons for preparing a Business plan. **[8]**

b) Write notes on: **[8]**

i) Women Entrepreneurship.

ii) Business Organization.

OR

Q6) a) What is Entrepreneurship? Explain the function of Entrepreneur in detail. **[8]**

b) Compare **[8]**

i) MOA & AOA.

ii) Proprietorship & Partnership

Q7) a) What is Marketing Environment? State the macro environmental factors of marketing. **[10]**

b) What is Google Analytics? State the objectives of Google Analytics. **[8]**

OR

Q8) a) Why is it necessary to conduct a market research? Briefly state the salient features of market research. **[8]**

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

i) Supply Chain management.

ii) Customer Relationship Management.

Total No. of Questions : 8]

SEAT No. :

P4272

[Total No. of Pages : 2

[5353] - 559
T.E. (E & TC)
ADVANCED PROCESSORS
(2015 Pattern) (Semester - II)

Time :2½ hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What is TDMI? Draw and explain data flow model of ARM7 in detail. **[6]**

b) Write an ARM based ALP to find the count of Negative numbers from series of 10, 32 bit numbers and store count in r1. **[7]**

c) Draw an interfacing diagram for GLCD with data pins from port 0 and control pins from port 1 of LPC2148 and write an embedded C program to display "square wave" starting at x = y = 16. **[7]**

OR

Q2) a) Draw and explain the complete ARM register set with concept of changing mode on exception. **[6]**

b) State features of LPC2148. Explain the function of PIN connect block, how ports are selected for I/O functions using same. **[7]**

c) Write an embedded C program to generate the delay of 100 msec using Timer of LPC 2148 with CCLK = 20 MHz and VPBDIV = 0 × 00. **[7]**

Q3) a) Draw an Interfacing diagram of GSM module with LPC2148 and write an initialization program to send a message. **[8]**

b) State features of ADC in LPC2148, draw an interfacing diagram to display the sensed temp on LCD with initialization program. **[8]**

P.T.O.

OR

Q4) a) Draw an interfacing diagram of EEPROM using I 2C with LPC2148 and write an initialization code. **[8]**

b) Draw the interfacing diagram of SD card with LPC2148, explain the step to switch from SD bus mode to SPI bus mode. **[8]**

Q5) a) Draw and explain the computer hardware architecture for Digital Signal Processing with concept of Parallelism having more focus on Pipelining.**[8]**

b) Explain the concept of pairing general purpose register files of TMS320C67X processor with example. **[8]**

OR

Q6) a) State features of TMS320C67X processor? Draw and explain architecture of TMS320C67X processor. **[8]**

b) Explain the concept of Extended Parallelism with detailed explanation on SIMD. **[8]**

Q7) a) Explain function of different functional units of TMS320C67X processor with two instructions of each. **[8]**

b) Enlist the On – Chip peripherals of TMS320C67X processor and explain any two in details. **[10]**

OR

Q8) a) Draw and explain the internal memory architecture of TMS320C67X processor. **[8]**

b) Explain the concept of Pipeline Operation in TMS320C67 processor for improving performance with different phases. **[10]**

Total No. of Questions : 8]

SEAT No. :

P3997

[Total No. of Pages : 4

[5353]-560

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

SYSTEM PROGRAMMING AND OPERATING SYSTEM

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 OR Q2 and Q3 OR Q4 and Q5 OR Q6 and Q7 OR Q8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Consider the following process where the arrival and burst time as shown below calculate average waiting time and turnaround time using SJF algorithm **[7]**

	Burst time	Arrival time
P1	4	0
P2	7	2
P3	2	3
P4	2	3

b) Explain phases of compiler with one example **[7]**

c) Explain the following terms **[6]**

i) Macro definition

ii) Macro Call

iii) Nested Macro Call

Q2) a) Explain in brief what is mean by **[7]**

i) Imperative statements

ii) Declarative statement

iii) Assembler directive statements

P.T.O

b) Consider the following process where the arrival and burst time as shown below. If the quantum slice time is 5 calculate average waiting time and turnaround time using Round Robin algorithm. **[7]**

	Burst time	Arrival time
A	10	00
B	06	00
C	07	01
D	04	01
E	05	02

c) Explain code optimization with suitable example **[6]**

Q3) a) Write a note on **[6]**

i) Dinning philosopher problem

ii) Producer consumer problem

iii) With respect to concurrency control mechanism

b) Explain inter process communication in detail **[6]**

c) Find out the safe sequence for the execution of the following processes using bankers algorithm. **[6]**

Maximum resources R1=13 , R2=7, R3=10 units

	Allocation Matrix			Maximum Required			
	R1	R2	R3		R1	R2	R3
P1	2	1	1	P1	4	3	3
P2	7	2	3	P2	7	2	4
P3	3	2	2	P3	4	2	5
P4	1	1	3	P4	5	3	3

Q4) a) Write necessary conditions for deadlock **[6]**

b) Write a short note on semaphore with one example **[6]**

c) Find out the safe sequence for the execution of the following processes using bankers algorithm. **[6]**

Maximum resources R1=15, R2 = 8

Allocation Matrix

	R1	R2
P1	2	1
P2	3	2
P3	3	0

Maximum Required

	R1	R2
P1	5	6
P2	8	5
P3	4	8

Q5) a) Consider the following page reference string **[6]**

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

Number of page frames = 3

Calculate page fault and Hit ratio using FIFO page replacement algorithm

b) Consider memory partitions as **[6]**

100k,500k,200k,300k,and 600k in order. how would each of the first fit placement algorithm & best fit placement algorithm will place the processes of 212k,417k,112k,426k

Comment on the algorithm which makes the most efficient use of memory

c) What are types of memory fragmentations .Differentiate them on following points **[4]**

i) defination

ii) occurence

iii) solution

Q6) a) Consider the following page reference string **[6]**

1,2,3,1,4,5,6,2,1,3,2,7,6,3,4,1,2,6

Number of page frames = 6

Calculate page fault and Hit ratio using LRU page replacement algorithm

b) Calculate the number of pages and number of frames in the system representing following specifications of addresses **[6]**

Logical address = 33 bits Physical address = 24 bits

Page size is 2Kbyte

c) Write a note on segmentation and its advantages **[4]**

Q7) a) Give classification of I/O devices. Hence explain any four properties of classification used for I/O devices **[6]**

b) Explain any two file organization techniques **[6]**

c) Calculate seek length with the help of FCFS disk scheduling algorithm for the following track sequence **[4]**

55,68,30,18,90,180,150,38,184

Current location of head is 140

Q8) a) What is buffering? Explain three types of buffering techniques **[6]**

b) Write a short note on RAID disc **[6]**

c) Give difference between memory mapped I/O and I/O mapped I/O **[4]**

Total No. of Questions : 10]

SEAT No. :

P3367

[Total No. of Pages : 3

[5353] - 561

TE. (Electrical)

Advanced Microcontroller and its Applications

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q10.***

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

Q1) a) Write an assembly language program for PIC 18 microcontroller to add contents of location 0 × 200 and 0 × 300 in internal data memory and store the result in internal data memory location 0 × 400. **[6]**

b) Draw the status register for the PIC microcontroller and explain the function of Digit Carry flag. **[4]**

OR

Q2) a) Explain the following instructions **[6]**

i) MOVF 0 × 04,0,1

ii) MOVFF fs,fd

iii) BSF PORTD,0

b) Write a program in C language to configure bits RD0 and RB0 as input bits. **[4]**

Q3) a) Explain any three addressing modes used in PIC 18 microcontroller. **[6]**

b) With reference timers explain the terms pre scalar and post scalar. **[4]**

OR

P.T.O.

Q4) a) Draw T0CON register and explain function of individual bits of T0CON register. **[6]**

b) Find timer clock frequency and timer period for a PIC 18 microcontroller with a crystal frequency of 16MHz. Assume a pre scalar of 64 is used. **[4]**

Q5) a) Using PWM mode of CCP module, write a program in C language for PIC18 microcontroller to create a 2.5kHz PWM wave form with a duty cycle of 75% on CCP1 pin. **[8]**

b) Draw CCP1CON and list the steps involved in programming PIC microcontroller in Compare mode. **[8]**

OR

Q6) a) Using compare mode, write program in C language to generate a square waveform with 40 ms time period and 50% duty cycle on CCP1 pin using compare mode. **[8]**

b) Draw CCP1CON and list the steps involved in programming PIC microcontroller in capture mode. **[8]**

Q7) a) List the steps for reading Busy flag and explain following pins of LCD (16 × 2) **[8]**

i) Register select (RS)

ii) Enable (E)

b) Using interrupt programming method write a program in C language to toggle an LED connected to pin RB7 on occurrence of an interrupt INT0. **[9]**

OR

Q8) a) Explain in detail the functions of following flags related to onboard ADC of PIC microcontroller **[8]**

i) ADIF

ii) Go/Done

iii) ADFM

iv) ADON

b) Write a program for PIC 18 microcontroller to transfer a letter 'T' serially and continuously at a baud rate of 9600. Use BRGH = 0. Assume crystal frequency =10MHz. **[9]**

Q9) a) With the help on interfacing diagram and flowchart explain how PIC18 microcontroller can be used to measure temperature using LM35 sensor.**[8]**

b) Explain with a neat diagram, interfacing of DAC 0808 with PIC microcontroller and write a program in C language for generation of Square waveform using DAC interfaced with PIC microcontroller through Port B. Use suitable delay. Assume the crystal frequency to be 10MHz.**[9]**

OR

Q10)a) With the help of a neat interfacing diagram explain interfacing of an opto isolator with a PIC 18 microcontroller. **[8]**

b) Using interrupt programming method write a program in C to read value from channel 0 (RA0) of ADC and display the result on PORT C and PORT D. **[9]**

Total No. of Questions : 10]

SEAT No. :

P3368

[Total No. of Pages : 3

[5353] - 562

TE. (Electrical)

ELECTRICAL MACHINES - II

(2015 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q10.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain advantages of Rotating field type system over rotating armature system in case of synchronous generator. **[4]**

b) A 4 pole, 50 Hz star connected alternater has flux per pole of 0.12 wb. It has 4 slots per pole per phase. The conductors per slot are 4. If the winding coil span is 150°. Calculate phase value of induced emf. **[6]**

OR

Q2) a) Draw per phase equivalent circuit of alternater and mark all parameters in it. **[2]**

b) Slip test is conducted on 3 KVA, 415V, 3 phase star connected alternater. Calculate voltage regulation of alternater at full load 0.8 p.f. lag. The observation table is as given below. Take Ra = $5\Omega/p^h$ **[8]**

V_{min} (line)	V_{max} (line)	I_{max}	I_{min}
39.9V	44.3V	1.1A	0.8A

Q3) a) Write a short note on 'synchroscope' **[4]**

b) With neat diagram, explain working of 3 phase synchronous Induction motor. **[6]**

OR

P.T.O.

Q4) a) Draw V curve and A curve of 3 phase synchronous motor. **[2]**

b) The o.c. & s.c. test results of a 3 phase, 3kvA, 415V, 4.2 amp star connected alternater are given below **[8]**

O.C. Test results

If (A)	0	0.1	0.14	0.2	0.23	0.28	0.36	0.44	0.58	0.67
Voc(l) volts	0	120	160	200	240	280	320	360	400	420

S.C. Test Results

If (A)	0.08	0.12	0.18	0.23	0.28	0.32	0.37	0.4
$I_a$sc (A)	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.2

Using must method calculate voltage regulation of alternater at full lead 0.8 pf lead.

Q5) a) Explain the operation of 3 phase Induction motor as induction generator. State advantages of induction generator. **[8]**

b) With neat diagram explain Construction & working of linear Induction motor. **[8]**

OR

Q6) a) Write a short note on 'Energy efficient 3 phase Induction motors. **[8]**

b) State different methods of controlling speed of 3 phase Induction motor. With neat diagram explain roter resistance control. Draw its speed torque characteristics for different values of roter resistances. **[8]**

Q7) a) Explain how unidirectional torque is produced when d.c. series motor is connected to A.C. supply. What are the problems associated with a.c.operation. **[8]**

b) With neat diagram explain **[8]**

i) Conductively compensated series motor

ii) Inductively compensated series motor

OR

Q8) a) A blocked roter test is conducted on single phase 50Hz, 230V, 6.2 A 6000 rpm series motor. The test results are as below.

Vsc	Isc	Wsc
130V	4 A	160 w

Taking voltage scale of lcm = 20V Draw circle diagram. Determine full load efficiency? Full load power factor **[10]**

b) Explain modifications necessary in the construction of d.c series motor to operate it satisfactorily on a.c. supply. **[6]**

Q9) a) With neat diagram explain the construction & working of capacitor start Induction motor. Draw the phase diagram &torque speed characterstics of this motor. **[10]**

b) Explain double revolving field theory in case of single phase induction motor. Hence draw its torque-speed characteristics. **[8]**

OR

Q10)a) A 220 v, 50 Hz single phase induction motor has following parameters. **[10]**

R_1= 11.4Ω, R_2^1= 13.8Ω, X_1=14.3Ω

X_2^1=14.3, X_m=275Ω R_m=0Ω

Calculate current, power factor, input power, efficiency Given-friction & windage losses =30.2 watts

b) With neat diagram explain construction &working of shaded pole Induction motor . **[8]**

Total No. of Questions : 10]

SEAT No. :

P3369

[Total No. of Pages : 3

[5353] - 563

TE. (Electrical)

POWER ELECTRONICS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q.10***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary..***
4) ***Figures to the right indicate full marks.***

Q1) a) Explain the triggering of SCR using UJT relaxation oscillator. **[5]**

b) Draw neat circuit diagram and explain working of single phase fully controlled bridge converter feeding RL load with freewheeling diode. **[5]**

OR

Q2) a) Draw the circuit symbol and VI characteristics of GTO **[4]**

b) Draw neat circuit diagram of a 1 phase semi controlled converter feeding R-L load at $\alpha = 90°$. Draw output voltage waveform showing devices conducting during one cycle of input ac voltage **[6]**

Q3) a) Describe the principle of step up chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle. State the assumptions made. **[6]**

b) Compare between MOSFET and BJT. **[4]**

OR

Q4) a) A step up chopper with a pulse width of 100 μs is operating from 230 V DC Supply. Compute the average value of load voltage for a chopping frequency of 2000 Hz. **[4]**

P.T.O.

b) For a single phase fully controlled bridge converter with R load

i) Draw circuit diagram **[2]**

ii) Draw output voltage waveform at firing angle 60 ° **[3]**

iii) Write formula for average DC voltage **[1]**

Q5) a) For a 3 phase fully controlled bridge converter feeding resistive load

i) Draw neat circuit diagram **[2]**

ii) Draw output voltage and current waveforms at $\alpha = 30°$ **[4]**

iii) Write the switching sequence of SCRS clearly **[2]**

iv) Derive expression for average output voltage **[2]**

b) Explain triggering of TRAIC using DIAC with neat circuit diagram **[6]**

OR

Q6) a) For a 3 phase fully controlled bridge converter feeding RL load

i) Draw neat circuit diagram **[2]**

ii) Draw output voltage waveform at $\alpha=90°$ **[4]**

iii) Write the switching sequence of SCRS clearly **[2]**

b) Explain working of single phase AC voltage regulator with R Load . Draw output voltage and current waveforms. **[8]**

Q7) a) Explain with neat circuit diagram and waveforms single phase full bridge voltage source inverter with R load. **[8]**

b) Compare Current Source Inverter and Voltage Source Inverter. **[8]**

OR

Q8) a) Explain sinusoidal pulse PWM technique with waveforms **[8]**

b) Explain working of Current source inverter with ideal switches **[8]**

Q9) a) Explain working of three phase inverter in 180° mode of operation. For star connected load, draw output line and phase voltage waveforms. Show devices conducting in each step. **[10]**

b) Draw neat diagram for Diode Clamped multilevel converter and explain its working with the help of Switching states of devices. Draw Output Phase voltage waveform. **[8]**

OR

Q10)a) State the methods for voltage control of inverters and explain any one method in detail. **[8]**

b) Draw circuit diagram for three level Flying capacitor Converter and explain its principal of operation. Comment on voltage balancing of capacitors. **[10]**

Total No. of Questions : 8]

SEAT No. :

P3370

[Total No. of Pages : 2

[5353] - 564

T.E. (Electrical)

ELECTRICAL INSTALLATION MAINTENANCE & TESTING

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

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

Q1) a) State and Explain Kelvins law with its Limitations. **[6]**

b) Explain Touch Potential and Step Potential **[6]**

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

i) Dielectric Absorption Ratio

ii) Polarization Index

OR

Q2) a) A single phase one km long distributor having sending end A and far end B has total(to and return) conductor resistance and reactance conductor of 0.2 Ω and 0.3 Ω respectively. At the far end, the voltage V_B is 200 V and the current is 100A at p.f.0.6 lagging with reference to the voltage V_B. At the mid-point M of the distributor, a current of 100 A is tapped at a p.f. of 0.6 lagging with reference to the voltage V_M at mid-point. Calculate Voltage at Mid-point (V_M). **[8]**

b) State the Objectives of Neutral Earthing. **[6]**

c) Explain Breakdown Maintenance? Give one Example? **[6]**

Q3) a) Explain Dissolved Gas Analysis (DGA). **[6]**

b) What is Signature Analysis? How it is used for condition monitoring of Induction Motor? **[8]**

c) Which are the causes of failure of on line Tap Changer? **[4]**

P.T.O.

OR

Q4) a) Explain Degree of Polymerization. **[6]**

b) Enlist the methods of locating cable fault. Explain any one. **[8]**

c) State various failure modes of transformer? **[4]**

Q5) a) Explain Different Types of Wires generally used for Residential Wiring. **[6]**

b) Write Down various steps in Estimation of 11kV pole mounted substation. **[6]**

c) Write down the General Rules for Residential Wiring Work. **[4]**

OR

Q6) a) Write short notes on the following: **[9]**

i) Schedule of Failure rate

ii) Current Carrying Capacity

iii) Voltage Drop

b) Explain the procedure of estimation of underground LT service lines. **[7]**

Q7) a) Classify Different Hazard Areas and its effect on Human Body. **[6]**

b) Write any Objectives of Electrical Safety. **[5]**

c) Enumerate the dangers arising out of faulty equipment with an example. **[5]**

OR

Q8) a) Explain IE Act and Statutory Regulations for Electrical safety. **[8]**

b) Describe how electric Accidents can be prevented. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3371

[Total No. of Pages : 2

[5353]-565

TE. (Electrical)) (End Semester)

INDUSTRIAL & TECHNOLOGY MANAGEMENT

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8.***
2) ***figures to the right side indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) What are the different types of organization ? Explain functional organization. **[6]**

b) Explain the concept of supply and elasticity of supply. **[7]**

c) Explain Environmental Management System Standard in details. **[7]**

OR

Q2) a) Explain Management and its relation with society. **[6]**

b) Explain Pokka Yoke (Mistake Proofing) quality circles. **[7]**

c) Write a short note on Ethics of Technology Management. **[7]**

Q3) a) Explain in details Marketing and selling. **[6]**

b) Explain online marketing. Write its advantages and disadvantages. **[10]**

OR

Q4) a) What is Financial Management? Explain in details. **[6]**

b) What are the methods of costing. Explain in detail. **[10]**

P.T.O.

Q5) a) Explain Group dynamics in details. What are the types of group dynamics? Explain. **[10]**

b) Explain Herzberg's two factor theory in details. **[7]**

OR

Q6) a) Write a short note on HR Planning and Recruitment. **[10]**

b) What are the qualities of Good Leadership? Explain in details. **[7]**

Q7) a) State the criteria for securing Patents. What are the guidelines of the common IPR policy on patents? **[10]**

b) What are the Importance and limitations of rational decision making? **[7]**

OR

Q8) a) What is the Intellectual Property Rights (IPR)? Explain all its types. **[10]**

b) State the Patent Laws, Trade mark and Copy Right Laws. **[7]**

Total No. of Questions :10]

SEAT No. :

P3372

[Total No. of Pages : 4

[5353]-566

T.E. (Electrical) (Semester - II)

POWER SYSTEM - II

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Prove that active power at receiving end is given by **[7]**

$$P_R = \frac{|V_S||V_R|}{|B|}\cos(\beta-\delta) - \frac{|A|}{|B|}|V_R|^2\cos(\beta-\alpha)$$

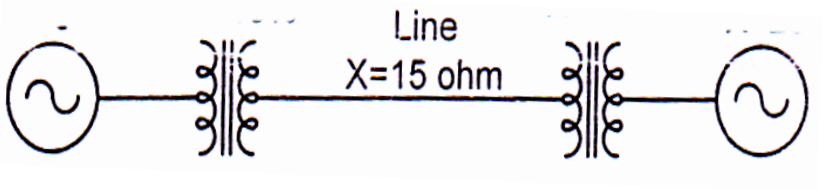
$$where\ \bar{V}_R = |V_R|\angle 0, \bar{V}_S = |V_S|\angle\delta, \bar{A} = |A|\angle\alpha\ and\ \bar{B} = |B|\angle\beta$$

b) Compare EHVAC and HVDC transmisssion system. **[3]**

OR

Q2) a) Take base MVA=25MVA and base kV=69kV on transmission network and draw per unit diagram to these base values. **[7]**

G	T1	T2	M
25MVA	22MVA	20MVA	20MVA
11kV	11.5/69kV	69/6.9kV	6kV
X=20%	X=10%	X=10%	X=20%



P.T.O.

b) What are the method to improve surge impedance loading? **[3]**

Q3) a) A power of 12000MW is required to be transmitted over a distance of 1000km. At voltage level of 750kV and 1200kV at 50Hz. The average values of line parameters are as given below: **[7]**

System voltage(kV)	750	1200
r(Ω/phase/km)	0.0136	0.0027
x(Ω/phase/km)	0.272	0.231

Determine

i) Possible number of circuits required with equal magnitude of sending and receiving end voltages with 30 degree phase difference.

ii) The current transmitted per phase

iii) Total line losses in percentage of power handling capacity.

b) State the advantages of per unit system in power system analysis. **[3]**

OR

Q4) a) Determine the unknown elements from following Y_{Bus} matrix **[7]**

$$Y_{BUS} = \begin{vmatrix} ? & ? & ? & ? \\ -j2 & ? & -j5 & ? \\ -j4 & ? & ? & -j4 \\ 0 & -j7 & ? & ? \end{vmatrix}$$

b) What are the factors affecting corona? **[3]**

Q5) a) Two 11kV, three phase 3MVA generators having sub-transient reactance of 15% operates in parallel. The generator is connected to transmission line (which is open at another end) through a transformer of 6MVA 11/22kV with leakage reactance of 5%. Choose the base MVA=6MVA and base kV = 11kV on generator, convert circuit into per unit diagram. Determine fault MVA and fault current in kA, if the three phase fault is on i) HT side ii) LTside of transformer. **[9]**

b) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. **[8]**

OR

Q6) a) The short circuit MVA of 11kV generator-1 is 1000MVA and the short circuit MVA of 11kV generator-2 is 670MVA, when both are operating independently. If these two generators are connected by a tie line with impedance of 0.4 ohm/phase. Determine short circuit MVA at the terminal of each generator. (Hint Take base MVA=1000MVA and base kV=11kV and determine impedance of each generator) **[9]**

b) State whether following statements are true or false with justification **[8]**

i) In case of three phase fault at the terminal of an unloaded alternator, the sub transient state current is smaller than transient & steady state current.

ii) In case of three phase fault at the terminal of an unloaded alternator, the sub transient time constant is smaller than transient and steady state time constant.

Q7) a) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjected to a line to ground fault. The sequence reactance are x_1=j0. 3pu,x_2=j0.1pu and x_0=j0.05pu. If the generator neutral is grounded through a reactance of x_n = j0.05pu, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. **[9]**

b) In three phase transmission line, show that positive, negative and zero sequence impedance $Z_1 = Z_2 = Z_s - Z_m$ and $Z_0 = Z_s + 2Z_m$ **[8]**

where Z_s is self impedance and Z_m is mutual impedance of lines.

OR

Q8) a) Across a star connected symmetrical impedance load of 10Ω and a neutral impedance of (10/3)Ω, an unbalanced three phase supply with $V_a = 220\angle 0^0$ volts, $V_b = 200\angle -110^0$ volts and $V_c = 180\angle 110^0$ volts is applied. Determine the line currents using symmetrical components. **[9]**

b) In case of LLG fault, show that fault current **[8]**

$$I_f = \frac{-3E_{a1}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

Q9) a) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. **[8]**

b) What are different control strategies used in HVDC transmissions? Elaborate any two in detail. **[8]**

OR

Q10)a) What are different types of HVDC link? With neat diagram, elaborate each type in details. **[8]**

b) Compare HVDC and EHVAC transmission system based on following points with due justification **[8]**

i) Insulation requirement

ii) Power transfer capability

iii) Conductor size

iv) Short circuit fault level

Total No. of Questions : 8]

SEAT No. :

P3373

[Total No. of Pages : 3

[5353] - 567

T.E. (Electrical) (Semester - II)

CONTROL SYSTEM - I

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Find the transfer function $V_o(s)/V_i(s)$ of the circuit shown in fig.1- a if L=1 H and C =1F **[7]**

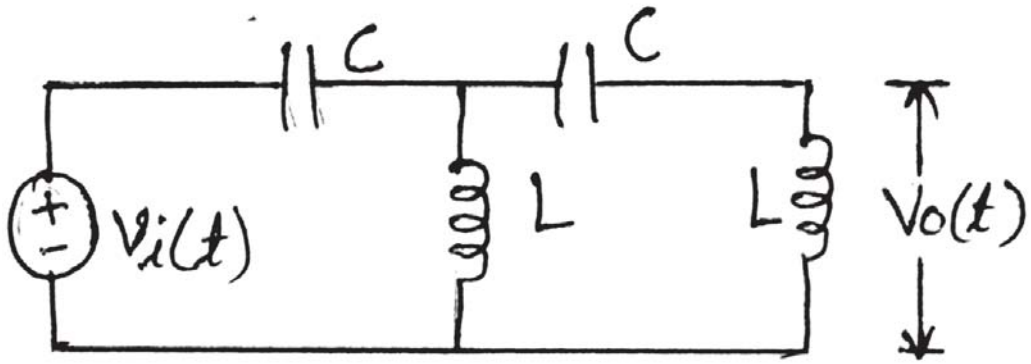


Fig. 1-a

b) Draw standard test signals. write expressions of standard test signals in time domain and write their laplace transform. for what purpose these signals are used? **[6]**

c) By means of Routh criterion, determine the stability of the system represented by the following characteristic equation $s^6+2s^5+8s^4+12\ s^3+20s^2+16s+16=0$ **[7]**

OR

P.T.O.

Q2) a) Using Mason's rule, find the transfer function T(s)= C(s) / R(s) for the system represented in the Fig. 2-a **[7]**

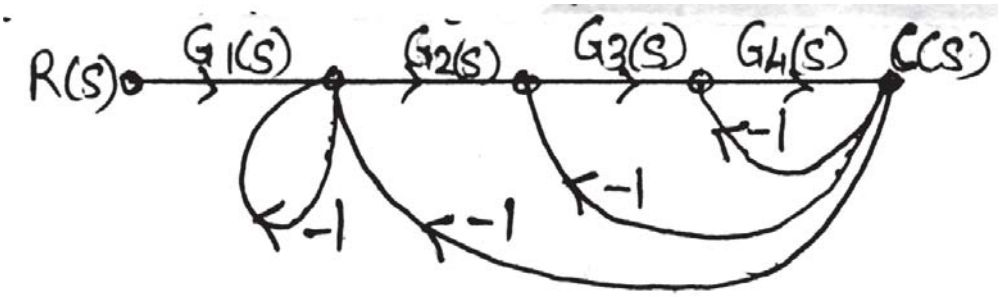


Fig.2-a

b) Derive expression for rise time and peak overshoot for a second order underdamped system for unit step input. **[6]**

c) Sketch the root locus of the unity feedback system having $G(S) = \frac{k}{s(s+2)(s+4)}$ where k is varied from 0 to ∞. Hence obtain the value of k for which the system is unstable. **[7]**

Q3) a) Draw polar plot of the given system **[10]**

$$G(s)\,H(s) = \frac{60}{(s+1)(s+2)(s+5)}$$

Find the frequency and the magnitude of G(s)H(s)

i) at which the plot intersects y axis

ii) at which the plot intersects x axis

b) Explain with sketch the contour which encloses entire right half of S-plane and State Nyquist stability criteria. **[6]**

OR

Q4) a) Consider the following open loop system **[8]**

$$G(s)\,H(s) = \frac{s+2}{(s+1)(s-1)}$$

Draw Nyquist plot and comment on the stability of closed loop system

b) Draw a typical frequency response magnitude characteristics and explain frequency response specifications. And also write relation between time and frequency response for second order system. **[8]**

Q5) a) The open loop unity feedback system is **[12]**

$G(s) = \dfrac{2000}{s(s+1)(s+100)}$ Draw Bode plot, determine the following and comment on the stability

i) Gain cross over frequency

ii) Phase cross over frequency

iii) Gain margin

iv) Phase margin

b) Explain how to draw the Bode magnitude and phase angle plots of a quadratic pole **[6]**

OR

Q6) a) The open loop unity feedback system is **[12]**

$G(s) = \dfrac{k}{s(s+1)(s+10)}$

Draw Bode plot and determine

i) The value of k for gain margin of 7 db.

ii) The value of k for phase margin of 40°.

b) Explain the concept of gain margin and phase margin. Explain how these values help in studying relative stability. Mark phase and gain margin on Bode plots for an unstable system **[6]**

Q7) a) Design PID controller for unity feedback system given below using Zeigler-Nichols tuning method **[8]**

$G(s) = \dfrac{1}{s(s+1)(s+3)}$

b) Derive the transfer function of armature control D.C. servo motor. **[8]**

OR

Q8) a) Draw block diagram of PID controller and write the expression for output signal from PID controller in time domain. Explain effect of Proportional, integral and derivative control on rise time, peak overshoot, setting time and steady state error **[8]**

b) Draw the circuit diagram of lead compensator network and derive transfer function also plot pole zero locations in S- plane **[8]**

Total No. of Questions : 8] **SEAT No. :**

P3978 **[Total No. of Pages : 2**

[5353]-568
T.E. (Electrical) (Semester - II)
UTILIZATION OF ELECTRICAL ENERGY
(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain Modes of Heat Transfer with mathematical expression. **[6]**

b) Write a note on anoidizing and state its applications. **[6]**

c) Estimate the number and wattage of lamps which would be required to illuminate a workshop space 60 × 15 meter by means of lamps mounted 5 meters above the working plane. The average illumination required is 100 lux, coefficient of utilization = 0.4, luminious efficiency = 16 lumens per watt. Assume space height ratio of unity and a candle power depression of 20 %. **[8]**

OR

Q2) a) An electric furnace consuming 5 KW takes 15 minutes to just melt 4 lbs of Aluminium, the initial temperature being 15° C. Find the efficiency of the furnace. Specific heat of Aluminium = 0.212, melting point = 658° C and latent heat of fusion 76.8 cal per gram, 860 Kcal = 1 kwh. **[6]**

b) Explain with neat diagram electric circuit used in Refrigerator. **[6]**

c) Define: **[8]**

i) Illumination

ii) Luminous Intensity

iii) Solid Angle

iv) Coefficient of Utilization

Q3) a) Explain function of Interrupter and Circuit breaker used in traction substation. **[8]**

b) Compare Steam engine drive with Electric drive. **[8]**

OR

P.T.O.

Q4) a) Draw and explain layout of traction substation. **[8]**

b) Explain following systems of track electrification **[8]**

i) Single phase low frequency AC system

ii) Kando System

Q5) a) Define: **[8]**

i) Average Speed

ii) Schedule speed

iii) Coefficient of adhesion

iv) Tractive effort

b) An electric train has an average speed of 48 kmph on a level track between stops 1500 m apart. It is accelerated at 2 kmphps and is braked at 3 kmphps. Estimate the energy consumption at the axle of the train per tonne km. Take tractive resistance as 50 N/ tonne and allow 10% for rotational inertia. **[8]**

OR

Q6) a) The speed time curve of a train consists of uniform acceleration of 4 kmphps for 30 sec, free running for 10 minutes, uniform deceleration of 6 kmphps and a stop of 6 minutes. Find the distance between stations, average speed, schedule speed. **[8]**

b) Elaborate the parts of total tractive effort with usual notations. **[8]**

Q7) a) State desirable requirements of traction motor. **[4]**

b) Write a note on Anti - collision system. **[6]**

c) Obtain efficiency for Series parallel starting of two motors. **[8]**

OR

Q8) a) Explain sutaibility of D.C. series motor for traction purpose. **[4]**

b) Explain open, shunt and bridge transition with neat diagram. **[6]**

c) A train weighing 300 tonne has speed reduced from 80 kmph to 30 kmph while going down an incline of 1 in 100 through a distance of 3 km by employing regenerative braking. Calculate the electrical energy returned to the line assuming overall efficiency of 75 %. Tractive resistanceis 4 kg per tonne and allow rotational inertia of 8%. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3374

[Total No. of Pages : 3

[5353] - 569

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2015 Pattern) (Semester - VI)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.***
2) ***Assume suitable data, if wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable scientific calculator is permitted.***
5) ***Neat figures must be drawn wherever necessary.***

Q1) a) Write down in detail the steps to calculate the number of tubes for cooling in an oil immersed transformer. **[6]**

b) Discuss with neat sketches various types of oil cooled transformers. **[6]**

c) Write short notes on cross over and disc windings used in transformer. **[8]**

OR

Q2) a) Derive expression for the condition of transformer design for minimum cost in terms of total cost of iron and total cost of copper for a three phase transformer. **[6]**

b) What types of forces developed in transformer winding under short circuit condition? With a neat diagram explain any one in detail. **[6]**

c) A 125kVA, 2000/415V, 50Hz, single phase shell type transformer has sandwiched coils. There are two full HV coils, one full LV coil and two half LV coils. Calculate the leakage reactance referred to HV side. Also calculate per unit leakage reactance from the following data: **[8]**

i) Depth of HV coil = 0.038m

ii) Depth of LV coil = 0.036m

iii) Number of primary turns = 200

iv) Width of winding = 0.12m

v) Depth of duct = 16mm

vi) Length of mean turn = 1.5m

P.T.O.

Q3) a) Discuss various factors considered for choice of specific electrical and specific magnetic loading of three phase induction motor? **[8]**

b) Design a full pitch, lap winding for the stator of three phase induction motor having 4 poles and 24 slots. There are two coils sides per slot. Draw the layout of phase R only. **[10]**

OR

Q4) a) Derive output equation of three phase induction motor. **[8]**

b) Estimate the main dimensions, number of stator slots, stator turns per phase and cross sectional area of stator conductor, conductors per slot, for a three phase, 20 h.p., 400 V, 6 pole, 50Hz, 970 rpm induction motor suitable for star-delta starting. The specific electric and magnetic loadings are 23000 A/m and 0.45 Wb/m^2 respectively, the ratio of core length to pole pitch is 0.85. Full load efficiency and power factor is 0.88 and 0.89 respectively, assume winding factor of 0.955m and slots/pole/phase of 3. **[10]**

Q5) a) What are the factors considered when estimating the length of the air gap of Induction motor? Why the length of the air gap should be as small as possible. **[8]**

b) A 12 kW, three phase, 6 pole, 50Hz, 220V and star connected induction motor with 72 slots having 9 conductors per slot. Calculate the value of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.9. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the area of each bar and area of each end ring if the current density is $6A/mm^2$. **[8]**

OR

Q6) a) State any four rules for selecting the number of rotor slots of three phase squirrel cage induction motor. **[4]**

b) During the stator design of a 3 phase, 30 kW, 400volts, 6 pole, 50Hz, delta connected squirrel cage induction motor following data has been obtained. Gross length of the stator = 0.17 m, Internal diameter of stator = 0.33 m, Number of stator slots = 45, Number of conductors per slot = 12. Based on the above design data design a suitable rotor with following assumptions: length of air gap= 0.67mm, rotor slots = 42, $K_W = 0.955$, current density = $6A/mm^2$, full load efficiency and power factor 0.88 & 0.86 respectively. **[12]**

Q7) a) Define and explain short time rating. **[6]**

b) How stator and rotor resistances are calculated in three phase squirrel cage induction motor. **[6]**

c) What is the effect of ducts on the calculation of magnetizing current? **[4]**

OR

Q8) a) Step by step write down the procedure to calculate the magnetizing component of no load current of three phase induction motor. **[8]**

b) A 20 kW, three phase, 50Hz, 6 pole, 400V, star connected induction motor has magnetizing current of 20% of full load current. Calculate the value of stator turns per phase, if the mmf required for the flux density at 60° from pole axis is 750A. Assume full load efficiency and full load power factor of 0.9 each. Assume winding factor of 0.96. **[8]**

Total No. of Questions : 11] **SEAT No. :**

P3979 **[Total No. of Pages : 3**

[5353]-570
T.E. (Electrical)
ENERGY AUDIT AND MANAGEMENT
(2015 Pattern)

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

Instructions to the candidates:

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

Q1) Give highlights of Energy Conservation Building Codes (ECBC). **[6]**

OR

Q2) Discuss energy sector reforms for securing future energy demands. **[6]**

Q3) What are the principles of successful energy management? **[7]**

OR

Q4) What is force field analysis? How this is useful in energy management? Explain with example. **[7]**

Q5) Explain steps in implementation of demand side management. **[7]**

OR

Q6) What are the hurdles in implementation of DSM. **[7]**

Q7) a) What is the importance of energy audit? Explain steps involved in detailed energy audit. **[10]**

b) In a canning plant the monthly production related energy consumption was 1.95 times the production and non-production related energy consumption was 17,500 kWh per month up to May 2017. In the month of June 2017 a series of energy conservation measures were implemented.

P.T.O.

Use CUMSUM technique to develop a table and calculate energy savings for the subsequent 6 months period from the data given below. Also plot CuSuM graph. **[8]**

Month	**Production (kg)**	**Actual Energy Consumption (kWh)**
Jul'17	62000	113600
Aug' 17	71000	139000
Sep' 17	75000	158000
Oct' 17	90000	119300
Nov' 17	62000	123700
Dec' 17	73000	143600

OR

Q8) a) Are current tariff structures favouring energy management? Explain different tariff strategies which supports energy management and conversion. **[9]**

b) In data analysis following data points of specific energy consumption and production are obtained. By using least square method find liner straight line fit for following data points. (0, 3); (2, 1); (3, –1) and (5, –2) **[9]**

Q9) Attempt any two of the following **[16]**

a) What are commercially available air conditioning systems? Also discuss important points to considered in energy savings in air conditioning system.

b) Energy saving opportunities in furnace and rolling mill.

c) With neat diagram explain topping and bottoming cycle cogeneration systems.

Q10)a) The energy manager of company wants to replace 15HP induction motor with energy efficient motor for energy saving. On the basis on following data calculate payback period for replacement of old motor with energy

efficient motor. Take cost of electricity is Rs 5/kWh. The demand charges Rs. 310/kVA per month. **[8]**

Description	Old motor	Energy Efficiency Motors
Rating of machine	15HP	15HP
Loading percentage	80%	80%
Operating hours per annum	6500	6500
Efficiency near full load	85%	93%
Power factor near full load	0.85 lag	0.89 lag
Capital cost	--	Rs. 50000/-
Scrap value	Rs. 5000/-	--

b) Discuss the financial appraisal criteria. **[8]**

OR

Q11)a) Calculate net present value for an investment of Rs. 1000000 for retrofit. The energy savings realised for five years are Rs. 150000, Rs. 200000, Rs. 250000, Rs. 300000 and Rs. 250000/- With discounting factor is 12% judge the economic feasibility of the project. **[8]**

b) Explain with suitable example break even analysis. How it is different from others? **[8]**

Total No. of Questions : 10]

SEAT No. :

P3375

[Total No. of Pages : 3

[5353] - 571

TE. (Instrumentation and Control) (Semester - I)

EMBEDDED SYSTEM DESIGN

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q10***
2) ***Figures to the right side indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Calculate the count required to be loaded in the following delay subroutine if f_{osc} = 12 MHz and delay required is 1 milli second. **[6]**

```
        MOV R6,#countl
LOOP:   MOV R7,#count2
LOOP1:  DJNZ R7, LOOP 1
        DJNZ R6, LOOP
        RET
```

Show all the calculations in detail.

b) Explain the use of pins XTAL1 and XTAL2 of 8051. Also show the connections done to these two pins. **[4]**

OR

Q2) a) What is Mode 2 of timers in 8051? Explain with example. **[6]**

b) Explain the following instructions of 8051. **[4]**

i) RRC A

ii) MOVX @DPTR,A

iii) XCH A, @R0

iv) POP 25h

P.T.O.

Q3) The frequency of a signal is to be measured by the microcontroller. Program the microcontroller 8051 in assembly or C to do the same. The output should be available on the ports in binary format. Draw the connection diagram and also mention the maximum frequency that can be measured by this arrangement.

Assume Fosc = 12 MHz. **[10]**

OR

Q4) a) With a neat sketch explain the interfacing of 16 X 2 LCD display to 8051. **[6]**

b) Draw and explain the bits of the TMOD register of 8051. **[4]**

Q5) Design a traffic light control system based on the 8051 microcontroller.

Discuss the following points of the system:

a) Block Diagram and description **[5]**

b) Circuit explanation **[5]**

c) Logic of the system with help of flowchart or algorithm **[6]**

OR

Q6) a) With a neat diagram explain the interfacing of stepper motor to the 8051 microcontroller. **[8]**

b) With a neat diagram explain the interfacing of RTC to the 8051 microcontroller. **[8]**

Q7) a) With a neat diagram, explain the memory organization of ATMega 8535 microcontroller. **[8]**

b) With a neat diagram, explain the reset sources of ATMega 8535 microcontroller. **[8]**

OR

Q8) a) Explain the following instructions of AVR microcontrollers: **[8]**

i) LDI Rd, Rs

ii) OUT Rd

iii) SBI Rd,Y+

iv) SLEEP

b) List any 6 sources of interrupts of ATMega 8535 microcontroller. Explain the role of global interrupt bit 'I' in the SREG. **[8]**

Q9) a) With a neat diagram, explain the various clock sources of the ATMega 8535 microcontroller. **[10]**

b) With a neat diagram explain the normal mode of operation of timer 0 of the ATMega 8535 microcontroller. **[8]**

OR

Q10) An analog voltage signal in the range of 0 to 5 V is connected to the channel 0 of ADC of the of ATMega 8535 microcontroller. Write a program for AVR ATMega8535, in assembly or C to convert analog value using on chip ADC and make the 10 bit digital value available on the Port B and Port D of ATMega 8535 microcontroller. Assume internal clock of 1 MHz. Explain the calculations in detail if any. Explain the configuration of all SFRs used. **[18]**

Total No. of Questions : 10]

SEAT No. :

P3376

[Total No. of Pages : 2

[5353] - 572

T.E. (Instrumentation and Control)

Instrumental Methods For Chemical Analysis

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

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

Q1) a) Compare Classical and Instrumental Method of Chemical Analysis in terms of Advantages and Disadvantages. **[4]**

b) Explain the principal and setup of Coulometry. **[6]**

OR

Q2) a) List out the Electrodes used in Electro analytical Methods. **[4]**

b) Explain the principal and setup of Voltametry. **[6]**

Q3) a) State the main reason for Background absorption. Explain with diagram the working of Background correction. **[4]**

b) Explain with neat sketch single beam filter photometer. **[6]**

OR

Q4) a) State the Laws of Photometry. **[4]**

b) Explain the sputtering process in Hallow Cathode Lamp. **[6]**

Q5) a) What is Fluorescence? Explain the working of double beam flouriometer. **[8]**

b) Differentiate between Nuclear Magnetic Resonance spectroscopy (NMR) and Fourier Transform Nuclear Magnetic Resonance spectroscopy (FT-NMR) **[8]**

P.T.O.

OR

Q6) a) List out the various Gas Analysers and Explain any one with neat sketch. **[8]**

b) Explain the Principle and working of Raman Spectrometer with the help of suitable block diagram. **[8]**

Q7) a) List out various types of Mass analysers. Explain any one with neat sketch **[8]**

b) Define the term Chromatography. Explain Gas chromatography with the help of suitable block diagram. **[8]**

OR

Q8) a) List out the detectors used in Mass Spectrometer(MS) and explain any one with neat sketch. **[8]**

b) Explain High Predominance Liquid chromatography with the help of suitable block diagram. **[8]**

Q9) a) Draw and explain the Instrumentation for X-ray spectrometry. List of the application of Xray spectrometry. **[9]**

b) Write a short note on: l) Auger Emission Spectroscopy. **[9]**

OR

Q10)a) State the Bragg's Law. Explain with the help of suitable block diagram X-ray diffractometer. **[9]**

b) Write a short note on:

i) Geiger-Muller counter **[9]**

Total No. of Questions : 10]

SEAT No. :

P3377

[Total No. of Pages : 2

[5353] - 573

TE. (Instrumentation and control) (End Semester)

CONTROL SYSTEM COMPONENTS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Students have to answer 5 questions.***
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***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain with the help of neat figure working of Temperature switch **[5]**

b) List different types of special pneumatic cylinders. Explain any one type. **[5]**

OR

Q2) a) State the advantages and limitations of Electromechanical Relay. **[6]**

b) Explain the role of the following in a pneumatic supply

i) Air receiver

ii) Air cooler **[4]**

Q3) a) Explain the necessity of a starter and the concept of star delta starter **[4]**

b) Draw using standard symbols pneumatic circuit for the following A piston rod of a double acting cylinder is to extend when one or both of the two push button operated valves are activated. If both push buttons are released the cylinder has to retract. **[6]**

OR

Q4) a) Draw electrical wiring diagram for reversal of direction of 3 phase induction motor **[6]**

P.T.O.

b) What purpose does the following components serve in a pneumatic system

i) Quick exhaust valve

ii) 3/2 direction control valve **[4]**

Q5) a) Compare hydraulic systems with electrical systems **[8]**

b) Draw with the help of standard symbols hydraulic circuit for sequential operation of double acting cylinder followed by hydraulic motor **[10]**

OR

Q6) a) Give the classification of hydraulic pumps and explain any one type. **[10]**

b) Draw with the help of standard symbols hydraulic regenerative circuit. **[8]**

Q7) a) Explain with the help of neat figure the construction, working and application of synchros. **[8]**

b) List and define important specifications of a fuse. **[8]**

OR

Q8) a) Explain the front panel of an alarm annuciator **[8]**

b) Compare a fuse with a circuit breaker **[8]**

Q9) a) Explain different types of purging **[8]**

b) Explain the working of any two fluidic gates **[8]**

OR

Q10)a) Explain the use of fluidic elements as sensors **[8]**

b) Compare intrinsic safety and explosion proof protection method **[8]**

Total No. of Questions : 10]

SEAT No. : ____

P3378

[Total No. of Pages : 3

[5353]-574

T.E. (Instrumentation)

CONTROL SYSTEM DESIGN

(2015 Pattern)

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

Instructions to candidates:

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

Q1) Design a phase lead compensator if the open loop transfer function is given by **[10]**

$$G(s)H(s) = \frac{K}{s(s+5)}$$

if % overshoot required is 15%, natural frequency ω=10rad/sec velocity error constant is ≥10.

OR

Q2) a) If compensator transfer function is given by $G_c(s) = \frac{(10(s+0.1))}{(s+0.01)}$ design electronic compensator network. **[6]**

b) If required damping factor is 0.75 and natural frequency of oscillation is 10 radian /sec determine dominant poles. **[4]**

Q3) a) Find controller if system is given by $G_c(s) = \frac{5}{(6s+1)}$ and the desired system response is given by $Q(s) = \frac{2}{4s+1}$. **[6]**

P.T.O.

b) Compare frequency response of lead and lag compensator. **[4]**

OR

Q4) If open loop transfer function is given by $G(s) = \frac{k}{s^4 + 5s^3 + 20s^2 + 35}$. Find tuning parameters of P, PI and PID controller and write equations for same. **[10]**

Q5) a) Design a PD controller for a open loop transfer function $G(s) = \frac{20}{(s(s+1)(2s+1))}$ so that PM=30° at w = 3rad/sec. **[8]**

b) Design a PID controller for a system given by $G(s) = \frac{400}{(s(s+48.5))}$ so that peak overshoot will be less than 3% and settling time will be less than 3 seconds. Also the seady state error for parabolic input should be less than 2%. **[8]**

OR

Q6) a) A unity feedback system has open loop transfer function $G_c(s) = \frac{5}{(6s+1)}$. Determine its natural frequency, damping ratio and settling time. Now a PD control having transfer function $G_c(s) = 0.5 + 0.25s$ is introduced in the control system. Calculate natural frequency, damping ration and settling time of the system. **[8]**

b) Design a PD controller for unity feedback system having open loop transfer function $G(s) = \frac{10}{s(s+1)}$ so that phase margin will be 50 degree at 1.5 rad/sec. **[8]**

Q7) a) State matrix is given by $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix}$ determine state transition matirx by similarity transformation. **[10]**

b) The state space system is represented by

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -4 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u,\ y=[0\ 1\ 2]\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

determine whether system is controllable and observable or not **[8]**

OR

Q8) a) If state matrix is given by $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -6 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$ determine state transition matrix using Caley Hamilton Theorem. **[8]**

b) A system is given by following representation. Determine response of system if no input is applied and initial condition is given by $x_0=\begin{bmatrix}1\\ 2\end{bmatrix}$ **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$$

$$y=\begin{bmatrix}1,1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Q9) Determine feedback gain matrix so that poles of given system should placed to

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -24 & -26 & -9\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$

$$y=\begin{bmatrix}1 & 1 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+4u$$

so that desired poles can be placed at –1,–4,–5 **[16]**

OR

Q10)Design a full state observer for a system given so that desired poles are –2, –4,–5. **[16]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -18 & -27 & -10\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u\quad,\quad y=[1\ 3\ 4]\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+6u$$

Total No. of Questions : 10]

SEAT No. :

P3379

[Total No. of Pages : 2

[5353] - 575

TE. (Instrumentation and Control Engineering)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(2015 Pattern) (End - Sem)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q10***
2) ***Neat diagrams should be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) State different levels of management, their responsibilities. Give two designations of each level. **[5]**

b) Write the general purchase procedure. **[5]**

OR

Q2) a) How the industries should reduce the environmental pollution. **[5]**

b) With appropriate diagram, explain BCG matrix. **[5]**

Q3) a) What is quality forum? Who are the key people and their duties? **[5]**

b) Write a note on material handling and storage. **[5]**

OR

Q4) a) Annual consumption of a certain item in a manufacturing industry is 40000 units. Rate per unit is Rs. 2.50. The cost of placing the order is Rs. 40. If the carrying cost is 8% of the average inventory calculate the EOQ. **[4]**

b) Enlist the different functions of management. **[3]**

c) What do you mean by control chart? State its use. **[3]**

P.T.O.

Q5) Write short notes on **[18]**

i) Job description and its uses

ii) Motivation & its need for the growth of the industry

iii) Leadership and its styles

OR

Q6) a) What is manpower planning? Why and when it is necessary? Write the general process of the same. **[9]**

b) Explain the different functions of human resource management. **[9]**

Q7) a) What is balance sheet? What may be the contents of it? What are the uses of it? **[8]**

b) Write a note on capital budget. **[8]**

OR

Q8) a) Explain: **[8]**

i) Net present value

ii) Payback period

iii) Shares

iv) Debentures

b) Write a note on Capital, its types and sources of finance. **[8]**

Q9) Write notes on: **[16]**

a) ERP — need for a manufacturing industry

b) MIS — Management Information System

OR

Q10)a) Explain the use & importance of information technology in modern business organizations. **[8]**

b) Write a note on "Business Ethics and Professional Ethics". **[8]**

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

P3980 **[Total No. of Pages : 3**

[5353]-576

T.E. (Instrumentation and Control Engg.) (Semester - II)

DIGITAL SIGNAL PROCESSING

(2015 Pattern)

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

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculators/Log table is allowed.***

Q1) a) Determine and sketch the Auto-correlation of the following sequence, comment on your result. $x(n)=\{\underset{\uparrow}{2},1,3\}$ **[6]**

b) Explain the basic operations performed on signals. **[4]**

OR

Q2) a) Consider a discrete-time system with input $x(n)$ and output $y(n)$ related by $y(n) = \cos[x(n)]$ **[6]**

i) Is this system is causal or non-causal?

ii) Is the system is static or dynamic?

iii) Is this system is linear or non-linear?

b) Enlist the properties of linear convolution. **[4]**

Q3) a) Determine the initial value of the system described by **[4]**

$$H(z)=\frac{\left(2+z^{-1}\right)}{\left(1-z^{-1}\right)\left(1+0.5z^{-1}\right)}$$

P.T.O.

b) The discrete-time system is described by the following difference equation

$$y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)$$ **[6]**

Determine

i) Transfer function

ii) Step response of the system

OR

Q4) a) Prove the following properties of the Discrete Time Fourier Transform **[4]**

i) Frequency shifting

ii) Differentiation in frequency domain

b) Plot & comment on the magnitude response of the system with $h(n)=(0.9)^n u(n)$, if $\omega = 0 : \pi / 4 : \pi$ **[6]**

Q5) a) Compute the 8-point DFT of the sequence $x(n) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ using radix-2 decimation- in-time (DIT) FFT algorithm. **[12]**

b) Distinguish between DIT-FFT and DIF-FFT algorithms. **[6]**

OR

Q6) a) Perform the circular convolution between the following sequences using analytical method $x_1(n)=\left\{\underset{\uparrow}{4},1,0,2\right\}$ and $x_2(n)=\left\{\underset{\uparrow}{5},7,3,1\right\}$ **[12]**

b) Compute & Sketch the Magnitude and Phase of the 4-point DFT of the sequence $x(n)=\left\{\underset{\uparrow}{0},1,2,3\right\}$. **[6]**

Q7) a) Transform the analog filter transfer function $H_a(S)=\frac{1}{s^2+\sqrt{2}s+1}$ into a digital filter H(z) using bilinear transformation. **[6]**

b) Design a digital low-pass Butterworth filter that satisfies the following, **[10]**

Pass-band cut-off: $\Omega_p = 0.2\pi$

Pass-band attenuation: $A_p = 7$dB

Stop-band cut-off: $\Omega_s = 0.3\pi$

Stop-band attenuation: $A_s = 16$dB use bilinear transformation method. Assume $T = 1$ Sec.

OR

Q8) a) A digital Butterworth filter has to be designed using bilinear transformation. The filter specifications are as follows: **[6]**

$$0.9 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \qquad for\ 0 \le \omega \le 0.5\pi$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \qquad for\ 0.75\pi \le \omega \le \pi$$

Find the filter order *N* and the cut-off frequency Ω_C.

b) Design a Chebyshev digital IIR LPF using bilinear transformation to satisfy the following specifications: **[10]**

$$Passband: 0.8 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \qquad for\ \left|\omega\right| \le 0.2\pi$$

$$Stopband: \left|H\left(e^{j\omega}\right)\right| \le 0.2 \qquad for\ 0.32\pi \le \left|\omega\right| \le \pi$$

Assume T = 1 sec.

Q9) a) Distinguish between FIR and IIR filter. **[6]**

b) Design an linear-phase FIR HPF with the following desired frequency response

$$H_d\left(e^{j\omega}\right) = \begin{cases} e^{-j3\omega} & \omega_c \le \left|\omega\right| \le \pi \\ 0 & \left|\omega\right| < \omega_c \end{cases}$$

Use a Hamming window for $M = 7$ and $\omega_c = 2$ *rad/sample*. **[10]**

OR

Q10) a) Explain the windowing method & enlist the different window functions.**[6]**

b) Design an ideal FIR LPF of length M = 11 with a frequency response**[10]**

$$H_d\left(e^{j\omega}\right) = \begin{cases} 1 & \left|\omega\right| \le \dfrac{\pi}{2} \\ 0 & \dfrac{\pi}{2} < \left|\omega\right| \le \pi \end{cases}$$

Using Fourier series method.

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

P3981 **[Total No. of Pages : 3**

[5353]-577

T.E. (Instrumentation and Control) (Semester - II)

PROCESS LOOP COMPONENTS

(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Draw and explain level control loop using standard P & 1D symbols. **[6]**

b) Explain the term "Three Valve Manifold" with neat sketch. **[4]**

OR

Q2) a) Explain control system parameters with respect to : **[6]**

i) Error

ii) Variable range

iii) Direct / Reverse action

b) Explain wireless transmitter in detail. **[4]**

Q3) a) Consider the proportional mode level control system as shown in figure1 Valve A is linear with a flow scale factor of $10m^3/h$ per percent controller output. The controller output is nominally 50% with a constant of Kp=10% per %. A local change occurs when flow through valve B changes from $500m^3/h$ to $600m^3/h$. Calculate the new controller output and offset error. **[4]**

P.T.O.

b) Draw and explain pressure to current converter. **[6]**

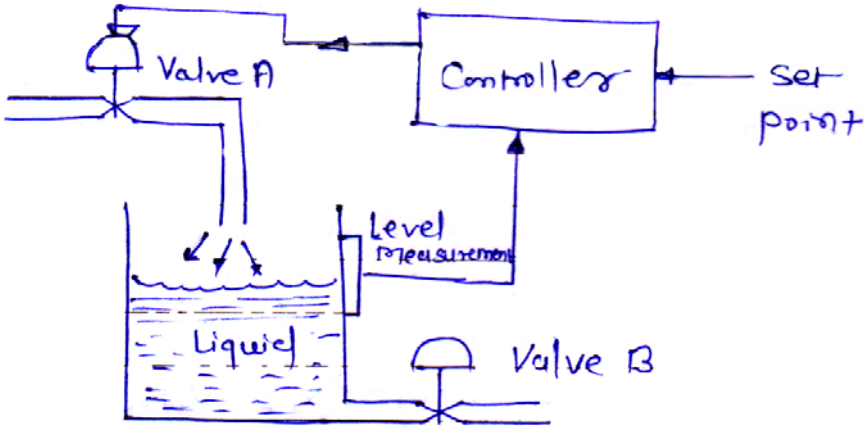


Fig. 1 Level Control System

OR

Q4) a) An integral controller is used for speed control with a setpoint of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The constant K_I = – 0.15% controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2s for a constant ep. **[7]**

b) Explain tuning of controller? List the various methods of tuning. **[3]**

Q5) a) Explain the following terms w.r.t. PLC : **[8]**

i) Scan time

ii) ON Delay timer

iii) Counter

iv) Rack and Slot

b) Draw a ladder diagram for a two motor system with the following conditions. The start switch starts motor 1; and 10 seconds later motor 2 starts; the stop switch stope motor 1 and 15 seconds later motor 2 stops. **[8]**

OR

Q6) a) List different manufacturer and programming languages of PLC. **[6]**

b) List out the different Input and output field devices used in PLC. **[4]**

c) Develop the ladder diagram for : Flashing a Light for 10 sec. and it should go off after 10 sec. of flashing. **[6]**

Q7) a) Explain the following parts of control value **[8]**

i) Rangeability

ii) Turndown

iii) Viscosity index

iv) Control valve coefficient

b) Explain the control valve accessories **[8]**

i) Positioner

ii) Solenoid valve

OR

Q8) a) What are the different characteristics of control valve. Explain any one in detail. **[6]**

b) Explain the following terms w.r.t. control valve : **[10]**

i) Fail safe action with suitable example

ii) Application of globe valve.

iii) Butterfly valve uses in industries

iv) Travel indicator

v) Yoke

Q9) a) Explain control valve sizing. Write the equations for liquids, gases & vapors for finding control valve coefficients. **[8]**

b) A steam valve regulates the flow of saturated steam in a 10 inch header to a process. The maximum flow rate is 30,000 pounds per hour and the minimum is 7,200 pounds per hour.

At maximum flow, the upstream pressure is 20 psi and the downstream pressure is 15 psi.

At minimum flow the upstream is 25 psi and downstream is 15 psi.

Determine the control valve coefficient for both maximum and minimum flow rate. Also determine the rangeability. ($v = 13.744$) **[10]**

OR

Q10) a) What do you mean by cavitation and flashing. List various techniques to reduce it. **[8]**

b) Write notes on : **[10]**

i) Control valve noise

ii) High temperature service valves

Total No. of Questions : 12]

SEAT No. :

P3380

[Total No. of Pages : 3

[5353]-578

T.E. (Instrumentation and Control)

UNIT OPERATIONS AND POWER PLANT INSTRUMENTATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) What is drying? Describe any two applications of it. **[6]**

OR

Q2) Explain the need of the FD fan and ID fan in power plants and show their locations with the help of block diagram of the boiler system. **[6]**

Q3) What is LMTD? Derive LMTD equation for counter current type of heat exchanger. **[8]**

OR

Q4) Discuss McCabe Thiele method in detail? **[8]**

Q5) Draw and explain complete wind power generation system? What is the pitch angle control? **[6]**

OR

Q6) What are solar concentrators? Explain working of cylindrical parabolic concentrating solar collector with diagram? **[6]**

P.T.O.

Q7) a) Explain with schematic diagram working and instrumentation used for following systems of boiler. **[5 + 5]**

i) Three element feed water control system for drum level control

ii) Air to fuel ratio control

b) Write a short note on Air Preheaters used in the boiler system. **[6]**

OR

Q8) a) Explain combustion process in combustion chamber along with instrumentation? How do burner management systems work? **[10]**

b) What are the interlocks? Explain any two interlocks in the boiler system. **[6]**

Q9) a) Explain in detail the condition monitoring system used in turbine instrumentation? **[8]**

b) How the optimization of boiler is achieved? Enlist factors responsible and explain them? **[8]**

OR

Q10)a) Explain how thermal stress is measured and controlled of the turbine? **[8]**

b) Explain the causes of turbine vibrations? How it affects the turbine performance over a period of time? **[8]**

Q11)a) Compare the nuclear power plant with thermal power plant on the basis of Performance, Site selection, Economics-capital, and Pollution. **[8]**

b) Write short notes on following systems of thermal power plant **[5 + 5]**

i) Pollution monitoring.

ii) Effluent management and handling.

OR

Q12)a) Compare hydroelectric power plant with solar power plant on the basis of Performance, Site selection, Economics-capital and Pollution **[8]**

b) Write short notes on

i) Power plant safety

ii) Site selection and Pollution Control aspects of Nuclear Power Plant.

[5 + 5]

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

P5231 **[Total No. of Pages : 2**

[5353]-579
T.E. (Instrumentation & Control)
INSTRUMENT AND SYSTEM DESIGN
(2015 Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Define Noise. Explain any two types of noise in detail. **[5]**

b) Explain use of IC AD594/595 as Set Point Controller. **[5]**

OR

Q2) a) Classify Grounds. Explain Hybrid Ground. **[5]**

b) Explain Prototyping & Testing. **[5]**

Q3) a) Compare IP and NEMA standards with reference to packaging standards. **[4]**

b) Explain various methods to provide ESD Protection in Equipment Design. **[6]**

OR

Q4) a) Explain any one application of IC AD620 with help of a neat diagram. **[5]**

b) Explain how LED output is linearized in IC HCNR 201. **[5]**

Q5) a) Explain how IC CD4046 is used as frequency multiplier. **[8]**

b) Enlist features of IC ICM7217. Explain functions of following pins : **[10]**

i) CARRY/BORROW

ii) Zero

iii) UP/DOWN

iv) Scan

OR

P.T.O.

Q6) a) A Stepper Motor is to be driven by a microcontroller. Suggest a suitable IC. Draw the interfacing diagram and explain its working in detail. Explain the need of free wheeling diodes while interfacing motors. **[10]**

b) Design a circuit to drive a 5V, 100 Ω relay using IC MCT2E with 3V input. CTR of IC MCT2E is 0.6. **[8]**

Q7) a) Enlist various types of PBCs. Explain the factors to be considered while selecting size of a PCB. **[8]**

b) Explain design rules to be considered for digital PCBs. **[8]**

OR

Q8) a) Explain design rules to be considered for analog PCBs. **[8]**

b) Explain drag soldering and wave soldering. **[8]**

Q9) a) Explain the terms : Availability and Maintainability. **[8]**

b) Explain the bath tub curve in detail. **[8]**

OR

Q10) a) Define Reliability. Explain Exponential, Weibull and Gamma distribution. **[8]**

b) Explain importance of documentation in system design. **[8]**

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

P3982 **[Total No. of Pages : 2**

[5353]-580

T.E. (Instrumentation & Control Engineering) (Semester - II)

BIOMEDICAL INSTRUMENTATION

(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain the Motion artifact? How to remove the Motion artifact. **[5]**

b) Why silver chloride electrode is suitable in biomedical applications? **[5]**

OR

Q2) a) Explain the ECG lead Configuration. **[6]**

b) Explain the Cardiac Cycle. **[4]**

Q3) a) Explain the Direct Blood Pressure measurement Technique **[5]**

b) Explain the Photoplethysmography. **[5]**

OR

Q4) a) Explain Phono cardiography. **[5]**

b) Explain cardiac output measurement using dye dilution technique. **[5]**

Q5) a) What is EEG? State the recording modes of EEG? **[8]**

b) Explain the structure of neuron. **[8]**

OR

Q6) a) Explain the recording system to record EMG. **[8]**

b) List out the various waveforms generated during the EEG along with the frequency range,amplitude. State the significance of each waveform. **[8]**

P.T.O.

Q7) a) What is hearing Aid and explain its types. **[8]**

b) Explain the various errors in Vision & their method of correction with neat sketch. **[8]**

OR

Q8) a) Define a hearing Threshold. Explain the Pure Tone Audiometer with neat diagram. **[8]**

b) Describe the working of Evoked Response Audiometry system with neat diagram. **[8]**

Q9) a) Explain the natural process of breathing, O_2 and CO_2 transport and regulation of breathing. **[10]**

b) Draw & Explain the working of infrared Gas Analyzer. **[8]**

OR

Q10)a) What is Oxygenator? Explain the principle & working of Bubble type Oxygenator. **[10]**

b) Explain the following terms with respect to Respiration Measurements: **[8]**

i) VC

ii) TLC

iii) TV

iv) ERV

Total No. of Questions : 8]

SEAT No. :

P3381

[Total No. of Pages : 3

[5353] - 581

TE. (Computer Engineering)

THEORY OF COMPUTATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, and Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Construct DFA for language defined by Σ= {a,b } where **[6]**

S = (strings containing only a's)

S = (strings containing only b's)

S = {strings containing only a's or b's)

b) Explain the application of Regular expressions in Text Search and Replace **[6]**

c) Write short notes on **[8]**

i) Chomsky Normal Form

ii) Greibach Normal Form

OR

Q2) a) Design a FA which checks the divisibility by 3 for a binary number input. **[6]**

b) With Respect to properties of regular languages explain what is pumping lemma and closure properties of regular languages. **[6]**

c) State significance of normalization process for grammar. **[8]**

Let G be a CFG with productions

S-> AB I ∈

A->a

B ->b

Convert G in CNF.

P.T.O.

Q3) a) Define Turing machine. Explain recursively enumerable sets. **[4]**

b) Write short notes on - **[6]**

i) Non Deterministic TM

ii) Composite TM

iii) Halting problem of TM

c) Obtain a Turing Machine to accept a language **[8]**

$L=\{0^n1^n.n \geq 1\}$.

OR

Q4) a) Explain the representation of TM. **[4]**

b) Construct TM for 1's complement of binary number. **[6]**

c) Design a Turing Machine to accept the language **[8]**

$L = \{w / w \in (0+1)^*\}$ containing the substring 001.

Q5) a) Define PDA. What are different types of PDA? **[4]**

b) Design a PDA that accepts $\{a^n b^n | \ n \geq 0\}$ **[6]**

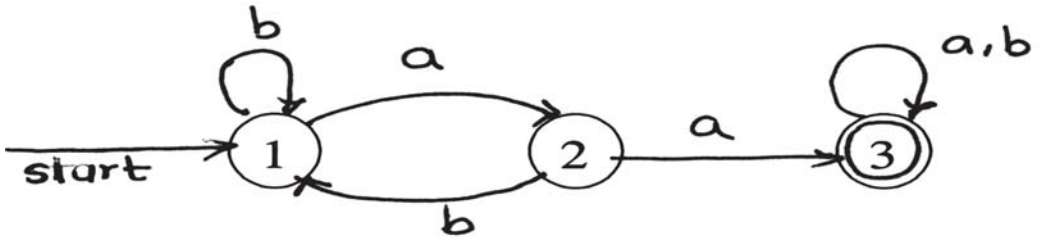
c) Construct a PDA that accepts all palindrome strings over **[6]**

$\Sigma = \{a, b\}$. Specify simulation for string 'aba'.

OR

Q6) a) Explain the working of Top-Down parser with example. **[4]**

b) Construct a PDA that recognizes the language accepted by following DFA. **[6]**



c) Construct a NPDA that accepts the language $L = \{a^{2n} | \ n > 0\}$ **[6]**

OR

Q7) a) What do you mean by NP- problems? Justify that Travelling Salesman problem is NP problem. **[8]**

b) Explain the vertex cover problem in the context of polynomial time reduction. Justify with suitable example. **[8]**

OR

Q8) a) Write short notes on **[8]**

i) Undecidability

ii) Post Correspondence Problem

b) What is Universal Turing Machine? Comment on stored program concept with reference to the same. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3382

[Total No. of Pages : 3

[5353] - 582

T.E. (Computer Engineering)

DATABASE MANAGEMENT SYSTEM

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the concepts of Referential Integrity Constraint and Entity Integrity Constraint with example. **[5]**

b) Write the PL/SQL block of code to calculate the factorial value of a number. **[5]**

OR

Q2) a) Draw the ER diagram for the College ERP system. **[5]**

b) Write a trigger for overdraft withdrawal from account: **[5]**

Instead of allowing negative account balances, the bank deals with overdrafts by creating a loan in the amount of the overdraft giving this loan a loan number identical to the account number of the overdrawn account setting the account balance to zero. The condition for executing the trigger is an update to the account relation that results in a negative balance value.

Q3) a) Schema definition for supplier-and-parts database. Keys are underlined.**[5]**

Supplier = (supplier_number , supplier_name, status, city)

Parts = (part_number, part_name, color, weight, city)

Shipments=(supplier_number, part_number, quantity)

write SQL query for following requirements (any 2):

P.T.O.

i) Find shipment information (supplier_number, supplier_name, part_number, part_name, quantity) for those having quantity less than150.

ii) List supplier_number, supplier_name, part_number, part_name for those suppliers who made shipment of parts whose quantity is larger than the average quantity.

iii) Find aggregate quantity of part_number 'A692' of color 'GREEN' for which shipment made by supplier_number who reside in 'MUMBAI'

b) Explain 3NF and BCNF. Also enlist their differences. **[5]**

OR

Q4) a) Draw and explain overall structure of Database System. **[5]**

b) What is the impact of insert, update & delete anomaly on overall design of database? How normalization is used to remove these anomalies? **[5]**

Q5) a) Explain the Concept of Conflict Serializability. Decide whether following schedule is conflict serializable or not. Justify your answer. **[9]**

T_1	T_2
read (A)	
write (A)	
	read (A)
	write (A)
read (B)	
write (B)	
	read (B)
	write (B)

b) Explain the Two Phase lock Protocol for concurrency control. Also explain its two versions: strict two phase lock protocol and rigorous two phase lock protocol. **[8]**

OR

Q6) a) State and explain in brief the ACID Properties. During execution of transaction, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain why each state transition occurs. **[9]**

b) To ensure atomicity despite failures we uses Recovery Methods. Explain in detail Log-Based Recovery method. **[8]**

Q7) a) Explain in details two important issues Speedup and Scaleup in Parallel Databases. Also explain which factors work against efficient parallel operation and can diminish both speedup and scaleup. **[9]**

b) Explain Data Replication and Data Fragmentation in Distributed Data Storage. **[8]**

OR

Q8) a) Describe Two phase Commit (2PC) Protocol. Explain how 2PC protocol responds in different ways to various types of failures. **[9]**

b) What are the different Parallel Database Architectures? Explain with their advantages and disadvantages. **[8]**

Q9) a) Explain the difference SQL Vs NoSQL. **[4]**

b) Enlist and explain any three NoSQL Database types. **[6]**

c) Explain the HDFS and MapReduce in HADOOP. **[6]**

OR

Q10)a) Explain the concept of NoSQL Database and state its advantages over RDBMS. **[4]**

b) State and Explain: **[6]**

i) CAP Theorem

ii) BASE properties

c) Analyze the use of NoSQL databases in current social networking environment also explain need of NoSQL databases in social networking environment over RDBMS. **[6]**

Total No. of Questions : 10]

SEAT No. :

P3383

[Total No. of Pages : 2

[5353] - 583

TE. (Computer Engineering)

Software Engineering And Project Management

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt questions Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q8, and Q.9 or Q10***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) What are the reasons to have a Software Process? What are the issues addressed by Umbrella Activities in layered Model of software engineering? **[5]**

b) Explain how extreme programming process supports agility with its framework activities? **[5]**

OR

Q2) a) Explain with neat diagram incremental model and state its advantages and disadvantages. **[6]**

b) Identify and briefly describe four types of requirements that may be defined for computer system. **[4]**

Q3) a) Explain the tasks done during Elicitation and Requirement Management. **[5]**

b) Explain in detail Data-Centered Architectural Style. **[5]**

OR

Q4) a) Explain the user interface design issues. **[4]**

b) Explain Object-Oriented view of component level design with suitable example. **[6]**

P.T.O.

Q5) a) What is project decomposition? What are the work tasks for communication. process using process decomposition? **[6]**

b) Explain the FP based estimation technique. **[6]**

c) Explain earned value analysis in project scheduling. **[5]**

OR

Q6) a) What is need of project estimation? What are the steps while estimation of software? **[6]**

b) What is time line chart? Explain with a suitable example. **[6]**

c) Explain W5HH Principle in detail. **[5]**

Q7) a) Explain the SCM repository in detail. What are advantages of SCM repository? **[6]**

b) Explain RMMM Plan with suitable example. **[6]**

c) Explain Business Process Reengineering model? **[4]**

OR

Q8) a) Which are the layers of SCM process? Explain each in detail. **[6]**

b) What is Risk Identification? What are the different categories of risks? **[6]**

c) Differentiate between Software Reengineering & Restructuring? **[4]**

Q9) a) What is software testing? Explain the software testing strategies for software development? **[7]**

b) What are the debugging tactics? How Bug Reporting is done? **[6]**

c) Differentiate between verification & validation in detail. **[4]**

OR

Q10)a) Draw the flow graph for finding minimum of five numbers and derive the test cases using cyclomatic complexity. **[8]**

b) Write a short note on Test Management and Automation. **[4]**

c) What is GUI testing? Explain in detail. **[5]**

Total No. of Questions : 10]

SEAT No. :

P3384

[Total No. of Pages : 3

[5353] - 584

TE. (Computer Engineering)

Information Systems And Engineering Economics

(2015 Course) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 Q.6, Q.7 or Q8, Q.9 or Q10***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of scientific calculator is permitted.***

Q1) a) Explain various factors that influence technology selection for an Information System. **[5]**

b) Describe the difference between the centralized versus decentralized management of IT. **[5]**

OR

Q2) a) Describe technologies used for handling security of an Information System. **[5]**

b) How is an secure environment created for using an Information System. **[5]**

Q3) a) Explain different challenges of data management. **[5]**

b) Explain characteristics of Supply Chain Management Systems. **[5]**

OR

Q4) a) Give examples of ICT solutions used for development projects. **[5]**

b) What are the main challenges of designing e-governance systems? **[5]**

P.T.O.

Q5) a) How are Cash-Flow based Capital Expenditure decisions taken in a Company? **[8]**

b) State and explain in short the five main types of engineering economic decisions. **[8]**

OR

Q6) a) State and explain in short the four fundamental principles that are followed in any engineering economic decision? **[8]**

b) Explain Economic Equivalence. **[8]**

Given the following two offers that are at hand,

i) Two payments of Rs. 20,000 now with i = 9%, and Rs. 50,000 at the end of 10 years.

ii) 10 equal annual payments of Rs. 8,000 each.

Using Cash-Flow diagrams depict and explain the economical equivalence of the two offers. Are they same, if yes, how, if they are not similar, which offer is better and why?

Q7) a) Explain Present worth and Future worth. **[8]**

For a company the incoming cash flows are as follows,

Start-up capital — 100 Lakhs, year one 80 Lakhs, year two 120 Lakhs, year three 150 Lakhs, year four 200 Lakhs, year five 100 Lakhs.

Compute the equivalent worth at year three if the annual interest rate is at 10%.

b) Explain various types of Cash Flows with proper examples. **[8]**

OR

Q8) a) Explain Capital Expenditures (CapEx) and Operating Expenses (OpEx) with proper examples. **[8]**

b) A company can earn 10% on a lump sum deposited now, and it wishes to withdraw the money in the following way,

Year 1: Rs. 25,000 to purchase a computer,

Year 2: Rs. 3,000 to purchase additional hardware,

Year 3: No expenses,

Year 4: Rs. 5,000 to purchase software upgrades.

How much money must be deposited now-in order to cover the anticipated payments over the next four years? **[8]**

Q9) a) Explain various financial statements with their needs. **[8]**

b) List various financial statements? What points do they depict. **[10]**

OR

Q10)a) Explain various patterns of cash-flows with correct examples. What are Positive and Negative cash flows. **[8]**

b) Suppose you deposit Rs. 5,000 in a banks savings account at the end of each year for the next 5 years, The back pays interest at a rate of 6% per year. Assume that you don't withdraw the interest earned. How much can be withdrawn at the end of five years? Depict the necessary cash flow diagram. Show ending balances after each year in a proper tabulated manner. **[10]**

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

P3983 **[Total No. of Pages : 3**

[5353]-585
T.E. (Computer) (End Semester)
COMPUTER NETWORKS
(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Define TCP/IP reference model. **[4]**

b) A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000khz. What is the maximum data rate supported by this line. **[3]**

c) Write a short note on CSMA/CD. **[3]**

OR

Q2) a) Explain in brief: FHSS and DHSS. **[6]**

b) Explain PPP frame format. **[4]**

Q3) a) Explain control field of HDLC w.r.t I-frame, S-frame and U-frame. **[6]**

b) Calculate the throughput for stop-and wait protocol,if the frame size is 4800 bits,bit rate is 9600 bps,within distance 2000 km with speed of propagation 200000 km/s. **[4]**

OR

Q4) a) Explain GO Back N ARQ in detail. **[5]**

b) Explain Bluetooth 802.15 frame format in detail. **[5]**

P.T.O.

Q5) a) A small organization is given a block with the beginning address and the prefix length 205.16.37.24/29 (in slash notation). What is the range of the block. **[4]**

b) What are general techniques to improve quality of service ? Explain any one in detail. **[8]**

c) Draw and Explain IPV4 header. **[4]**

OR

Q6) a) Write a short note on **[12]**

i) Address Resolution Protocol (ARP)

ii) Network Address Translation (NAT)

iii) Internet Control Message Protocol (ICMP)

b) Explain Link State Routing Algorithm with example? **[4]**

Q7) a) What causes Silly Window syndrome? How it is avoided? **[6]**

b) In a Stop-and-Wait system, the bandwidth of the line is 2 Mbps, and 1 bit takes 20 milliseconds to make a round trip. What is the bandwidth-delay product? If the system data packets are 2,000 bits in length, what is the utilization percentage of the link? **[6]**

c) Explain TCP header in detail. **[6]**

OR

Q8) a) What are the types of socket? Explain various socket primitives used in connection oriented client server approach. **[10]**

b) Explain UDP Header ?Below is an Hexadecimal dump of an UDP datagram captured. **[8]**

06 32 00 0D 00 1C E2 17

i) What is source port number?

ii) What is destination port number?

iii) What is the length of the data?

iv) Is packet directed from a client to server or vice versa?

Q9) a) Explain HTTP request and reply message format with example. **[6]**

b) Write short notes on **[6]**

i) DHCP

ii) SMTP

c) Explain DNS message format? **[4]**

OR

Q10) a) Explain FTP in detail? Explain any four FTP commands. **[8]**

b) Browsers have a in-built caching mechanism for a better user experience. How do websites indicate if a web resource needs to be cached or not? Show HTTP messages in transit for both scenarios. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3385

[Total No. of Pages : 2

[5353] - 586

TE. (Computer Engineering)

DESIGN AND ANALYSIS OF ALGORITHMS

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q4, Q.5 Q.6, Q.7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumptions whenever necessary.***

Q1) a) Explain the concept of Principle of Mathematical Induction and prove the correctness of an algorithm to find factorial of a number. **[6]**

b) How does Fractional greedy algorithm solves the following knapsack problem with capacity 20, P= (25, 24, 15) and W = (18, 15, 10). **[6]**

c) Explain the need of Divide and conquer strategy. Enlist few applications which can be solved by this strategy. Write a control abstraction for divide and conquer strategy. **[8]**

OR

Q2) a) Compare and contrast between iterative and recursive process with an example. **[6]**

b) Differentiate between functions and procedures with example. **[6]**

c) Write short notes on (Any Two): **[8]**

i) Evolutionary Computing

ii) Stimulated Annealing

iii) Artificial Neural Network

Q3) a) Explain Asymptotic notations with example. **[8]**

P.T.O.

b) Write a short note on NP completeness of algorithm and NP Hard. **[8]**

OR

Q4) a) What is SAT AND 3-SAT problem? Prove that 3-SAT problem is NP complete. **[8]**

b) Explain Polynomial and non-polynomial problems. Explain its Computational complexity. **[8]**

Q5) a) State and explain Fibonacci Heaps in detail. Enlist its applications. **[8]**

b) Explain Tractable and non-tractable problems with example. **[8]**

OR

Q6) a) What is Embedded System? Explain embedded sorting algorithm. **[8]**

b) Explain amortized analysis. Find the amortized cost with respect to stack operations. **[8]**

Q7) a) Write and Explain Multithreaded Merge Sort Algorithm. **[9]**

b) Define performance measure of miultithreaded algorithms. Write a multithreaded algorithm for Fibonacci Series and explain performance measure of Fibonacci (6) execution with suitable diagram. **[9]**

OR

Q8) a) What is Distributed algorithm? Explain distributed Breadth First Search algorithm with example. **[9]**

b) Compare and contrast String matching algorithms. Explain any one algorithm with example. **[9]**

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

P3984 [Total No. of Pages : 3

[5353]-587

T.E. (Computer Engineering) (Semester - II)

SYSTEM PROGRAMMING AND OPERATING SYSTEM

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Write algorithm of pass I of two pass assembler. **[5]**

b) What is Compiler? Explain any two phases of compiler with suitable diagram? **[5]**

OR

Q2) a) Explain in brief imperative statements, declaration statements and assembler directives with examples for assembly language programming. **[5]**

b) Explain pass - 1 of direct linking loader with flowchart. **[5]**

Q3) a) What are the data structures used in the design of macro processor? **[6]**

b) Explain macro expansion with relevant example. **[4]**

OR

Q4) a) Enlist the different types of errors that are handled by PASS I & PASS II of assembler. **[5]**

b) What is LEX? Explain working of LEX. **[5]**

P.T.O.

Q5) a) Explain the following types of Schedulers. **[6]**

i) Short Term

ii) Long Term

iii) Medium Term

b) Draw and explain process state transition diagram. **[6]**

c) What is process? What is thread? List down benefits of using thread. **[6]**

OR

Q6) a) What is deadlock? State and explain the conditions for deadlock. **[8]**

b) Explain process control block with suitable diagram. **[6]**

c) Explain interprocess communication. **[4]**

Q7) a) Explain the following terms in brief **[8]**

i) Virtual Memory

ii) Compaction

iii) Belady's Anomaly

iv) Thrashing

b) Explain contiguous and non-contiguous memory allocation policies with suitable example. **[8]**

OR

Q8) a) Consider page sequence 2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2 and discuss working of following page replacement policies. Also count page faults. (use no. of Frames = 3) **[9]**

i) FIFO

ii) LRU

iii) Optimal

b) Differentiate internal and external fragmentation. **[4]**

c) What is thrashing? **[3]**

Q9) a) Compare the performance of given scheduling policies like FCFS. SSTF, SCAN C-SCAN considering contents of queue as

Queue : 98, 183, 37, 122, 14, 124, 65, 67. Head starts at 53. **[12]**

b) List the methods of allocating disk space. Explain any one of these methods. **[4]**

OR

Q10) a) What information is present in Directories? Explain the structure of Directory in detail. **[8]**

b) Explain file management under UNIX. **[4]**

c) Describe any four types of file organizations. **[4]**

Total No. of Questions : 10]

SEAT No. :

P3998

[Total No. of Pages : 3

[5353]-588

T.E. (Computer Engineering) (Semester - II)

EMBEDDED SYSTEM & INTERNET OF THINGS

(2015 Pattern)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer any five questions Q1 or Q2, Q3 or Q4,Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Assume Suitable data wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat & labelled diagram wherever necessary.***

Q1) a) What are the different characteristics that an embedded system should possess? **[5]**

b) Compare REST-based communication and WebSocket communication API **[5]**

OR

Q2) a) Explain the steps involved in the loT system design methodology. **[4]**

b) Why do loT systems have to be self-adapting and self-configuring? **[2]**

c) Explain WSN (the internet of transducers) pillar of loT. **[4]**

Q3) a) What is SCADA ? What are the different blocks of SCADA **[5]**

b) Explain Functional view specification step of loT system design methodology, consider smart loT-based home automation system as an example. **[5]**

OR

Q4) a) With the help of appropriate diagram explain WebSocket-based communication APIs **[3]**

b) Draw and explain block diagram of an loT device. **[4]**

c) What is Raspberry Pi? Explain 4 features of it **[3]**

P.T.O

Q5) a) What are the different topology of 802.15.4? Explain with suitable diagram. **[6]**

b) What is BACnet? Explain the different layers function **[6]**

c) What are the challenges for securing IoT **[4]**

OR

Q6) a) Explain the Zigbee architecture with suitable diagram **[6]**

b) What are the issues with loT Standardization, **[4]**

c) What is KNX? Explain KNX-TP features, its Telegram **[6]**

Q7) a) What is Web of Things (WOT) ? What are the two pillars of the web? Explain in brief. **[6]**

b) Explain the key elements of the ETSI M2M architecture. **[6]**

c) Explain Cloud of Things Architecture. **[5]**

OR

Q8) a) Explain Cloud Middleware Architecture. **[6]**

b) Explain RFID middleware standards? **[6]**

c) Explain unified multitier WOT Architecture in details. **[5]**

Q9) a) Design Weather Monitoring system, what are the different components required? draw deployment design for this system **[6]**

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

i) Amazon Auto Scaling

ii) Xively Cloud for IoT

c) Explain python web application framework - Django. **[5]**

OR

Q10)a) Explain WAMP and its key concepts with diagram. **[5]**

b) Explain in brief Model, Template and View in Django architecture **[6]**

c) Design Air Pollution Monitoring(APM) based on followings **[6]**

i) Define process specification for APM IoT system

ii) Domain model of APM IoT system

iii) Information model of APM IoT system

iv) Controller service of APM IoT system

Total No. of Questions : 10]

SEAT No. :

P3386

[Total No. of Pages : 2

[5353] - 589

T.E. (Computer Engineering)

SOFTWARE MODELLING AND DESIGN

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) State and explain how UML supports requirements modeling? **[5]**

b) Explain the elements of a class diagram with an example. **[5]**

OR

Q2) a) Explain the application of composite structure diagram. **[5]**

b) Explain Orthogonal State with a suitable diagram. **[5]**

Q3) a) Explain any two operators used in sequence diagram with an example. **[5]**

b) Explain the difference between component diagram and deployment diagram in UML. **[5]**

OR

Q4) a) Explain with an example the difference between aggregation and composition. **[5]**

b) Draw an activity diagram for the functionality : credit card validation. **[5]**

P.T.O.

Q5) a) Explain Client Server architecture for Software Design. **[8]**

b) Explain the importance of Object oriented software architecture and its applicability in software development. **[8]**

OR

Q6) a) Explain the broker pattern for design of service oriented architecture. **[8]**

b) Explain the real time software architecture with a suitable example. **[8]**

Q7) a) Explain factory pattern. Describe its intent, motivation and implementation with suitable example. **[8]**

b) What are design pattern and explain its significance in modern software development. **[8]**

OR

Q8) a) Draw the structure of observer pattern with suitable class diagram including subject and observer. **[8]**

b) What is singleton pattern? Explain one example scenario where you will singleton pattern to get applied. **[8]**

Q9) a) Define test case? Why is it necessary to develop test cases for both valid and invalid input condition? **[6]**

b) Define error, fault and failure with a suitable example. **[6]**

c) Explain the types of Integration testing. **[6]**

OR

Q10) Write a short note on (Any 3): **[18]**

a) Scenario testing.

b) Integration testing.

c) Performance testing.

d) Acceptance testing.

Total No. of Questions : 10]

SEAT No. :

P3387

[Total No. of Pages : 3

[5353] - 590
T.E. (Computer Engineering)
WEB TECHNOLOGY
(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) What are the DTDs? Explain how do they work? **[5]**

b) Explain how to create and read array elements in java script. **[5]**

OR

Q2) a) List and discuss any three HTTP commands. **[5]**

b) Write a program of your choice that demonstrate use of properties of DOM. **[5]**

Q3) a) What is use of ThreadSafe in JSP? Also Explain Single Thread Model in JSP. **[5]**

b) List and elaborate any five JSP implicit objects with examples. **[5]**

OR

Q4) a) Explain the different Data Types available in JavaScript. **[5]**

b) What is use of JSP action tags? Discuss in details jsp:useBean action tag. **[5]**

P.T.O.

Q5) a) Draw and explain how AJAX works with the help of suitable example. **[6]**

b) What is use of XMLHttpRequest Object? Explain its use with the help of simple javascript code. **[6]**

c) Classify data type of PHP and describe various data types in each type. **[4]**

OR

Q6) a) What is an associate arrays in PHP? Explain it with the help of simple PHP code. **[6]**

b) Identify and explain steps involved in connecting to MySQL with PHP. **[6]**

c) Write different applications without AJAX and with AJAX. **[4]**

Q7) a) Does Angular JSsupports Single Page Application via multiple views on a single page? Justify your answer. **[6]**

b) Draw and explain neat diagram which depicts MVC to the struts architecture. **[6]**

c) List and explain events supported by AngularJS to enrich form filling and validation. **[4]**

OR

Q8) a) How to use interceptors in struts 2? List and describe important interceptors provided by struts 2 framework. **[6]**

b) What are different ways to create service in AngularJS? Explain Separation of concern in AngularJS. **[6]**

c) Write short note on NodeJS. **[4]**

Q9) a) What is Enterprise Java Bean? Draw and explain main components of EJB architecture. **[8]**

b) Identify and justify the benefits of using web services. **[6]**

c) Write a short note on Spring. **[4]**

OR

Q10) a) Decide and explain various aspects while deciding between local and remote interface can be considered. **[8]**

b) Draw and explain the role of EJB container in Enterprise applications. **[6]**

c) Write a short note on Bootstrap. **[4]**

Total No. of Questions : 10]

SEAT No. :

P3388

[Total No. of Pages : 3

[5353] - 591

T.E. (IT)

THEORY OF COMPUTATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Define pumping lemma. Prove that the language $L=\{a^n b^{n+1} | n>0\}$ is non regular. **[6]**

b) Construct FSM for divisibility by 3 tester for binary number. **[4]**

OR

Q2) a) Construct the Mealy machine to accept strings ending with '00' or '11' over $\sum=\{0,1\}$. Convert Mealy Machine into equivalent Moore machine. **[8]**

b) If $L(r)=\{\in, x, xx, xxx, xxxx, xxxxx\}$ What is *r*? **[2]**

Q3) a) Simplify the following grammar **[5]**

$S \rightarrow a|Xb|aYa$

$X \rightarrow Y|\in$

$Y \rightarrow b|X$

b) Write an equivalent left-linear grammar for the right-linear grammar which is defined as : **[5]**

$S \rightarrow 0A|1B$

$A \rightarrow 0C|1A|0$

$B \rightarrow 1B|1A|1$

$C \rightarrow 0|0A$

P.T.O.

OR

Q4) a) Check whether or not the following grammar is ambiguous : if it is ambiguous, remove the ambiguity and write an equivalent unambiguous grammar $E \rightarrow E+E|E-E|E*E|E|E|(E)|id$ **[6]**

b) Convert the given CFG $G=(\{s\},\{a\},p,s)$ into CNF. **[4]**

$S \rightarrow aaaaaS|aaa$

Q5) a) Construct PDA to accept the strings containing equal no. of *a*'s & *b*'s over $\sum=\{a,b\}$ **[8]**

Write ID for

i) *abbaab*.

ii) *aabb*.

b) Design a PM that checks if the given string contains well-formed parenthesis. **[8]**

Simulate for

$(()())$

OR

Q6) a) Construct a PDA that accepts the language $L=\{a^n b^m a^n | m,n \geq 1\}$. **[8]**

Write ID for

i) *aabbaa*.

ii) *abbba*

b) Construct PDA for the following language **[8]**

$L=\{a^{2n} b^n | n \geq 1\}$

Q7) a) Design a TM which compares two positive integers m & n and produces output Gt if $m > n$; Lt if $m < n$; and Eq if $m = n$; **[12]**

Write simulation for the input

i) $m = 1, n = 2$.

ii) $m = n = 2$.

b) Write short note on UTM. **[6]**

OR

Q8) a) Construct TM for the language L = $\{a^n b^n c^n \mid n > 0\}$. **[10]**

b) Design a TM to find the value of $\log_2(n)$ where n is any binary number & a perfect power of 2. **[8]**

Q9) a) Prove that following are decidable languages. **[10]**

i) $A_{CFG} = \{\langle G,W\rangle | G \text{ is a CFG that generates string } W\}$.

ii) $E_{CFG} = \{\langle G,W\rangle | G \text{ is CFG \& } L(G) = \phi\}$.

b) Define the class P & Class NP problems with example. **[6]**

OR

Q10) a) Prove that **[8]**

$PCP = \{\langle P\rangle | P$ is an instance of the post correspondence problem with a match$\}$

is undecidable

b) Explain Turing Reduciability with example. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3389

[Total No. of Pages : 2

[5353] - 592

T.E. (IT)

DATABASE MANAGEMENT SYSTEM

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) State & explain the disadvantages of File Processing System. **[5]**

b) Define entity & entity-set. What is E-R model? **[5]**

OR

Q2) a) What is query? What do you mean by correlated subquery? **[4]**

b) List the properties of decomposition. Explain loss less join with example. **[6]**

Q3) a) What are the steps followed in executing write (X) command in transaction? **[5]**

b) Define query processing. What are the steps involved in query processing? **[5]**

OR

Q4) a) When are two schedules said to be view equivalent? **[6]**

b) Why are cursors necessary in Embedded SQL? **[4]**

Q5) a) What is a checkpoint? Explain the operations performed by a system during checkpoint. Explain the recovery mechanism during system crash. **[8]**

b) What are the design considerations for distributed database? **[8]**

OR

P.T.O.

Q6) a) What are the key elements of Parallel DB processing? Explain. **[8]**

b) Explain Time-Stamp ordering protocol. **[8]**

Q7) a) Draw & explain HBase data model. **[6]**

b) Compare JSON & XML with example. **[6]**

c) Explain NoSQL concept with MongoDB example. **[6]**

OR

Q8) a) Write a short note on (any 3) : **[12]**

i) SQLite database.

ii) Mobile database.

iii) Internet database.

iv) Cloud database.

b) How data validation is done in XML? **[6]**

Q9) a) What is data warehousing? Write the benefits & limitations of data warehousing. **[8]**

b) Explain the process of knowledge discovery with diagram. **[8]**

OR

Q10) a) Write a short note on : **[8]**

i) Machine learning for Big data.

ii) Business Intelligence.

b) Explain classification in detail with example. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3390

[Total No. of Pages : 2

[5353] - 593

T.E. (IT)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Draw neat diagrams and assume suitable data wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain any 5 types of software along with an example. **[5]**

b) What is data modeling? Explain following terms in data modeling : **[5]**

- Data objects.
- Data attributes.
- Relationships.

OR

Q2) a) What are different processes in project time management? **[5]**

b) How to prioritize software requirements based on Kano Analysis? **[5]**

Q3) a) What is meant by network diagram? What are different ways of drawing the network diagram. **[5]**

b) Explain spiral model in detail. **[5]**

OR

Q4) a) Explain in detail following UML diagrams stating purpose and applicability **[6]**

i) Use case diagram.

ii) Activity diagram.

b) Discuss software myths and realities in customer perspective. **[4]**

P.T.O.

Q5) a) Draw and explain concept of SCRUM. **[8]**

b) Explain concept of burn-down chart with a diagram. **[8]**

OR

Q6) a) Explain Pair Programming and its benefits. **[8]**

b) Explain Agile manifesto and agility principles. **[8]**

Q7) a) What is Software Risk Management? What are the risks associated with software projects? How do project managers manage such risks. **[10]**

b) Differentiate between Software Quality Assurance & Software Quality Control. **[8]**

OR

Q8) a) Define and explain importance of Software Quality Assurance. Explain various factors that affect Software Quality. **[10]**

b) Explain different statistical tools used quality control. **[8]**

Q9) a) What is the goal of cleanroom testing? Discuss in brief statistical use testing. How do we certify a software component in cleanroom testing? **[8]**

b) What is configuration management repository? Discuss role and features of SCM repository. **[8]**

OR

Q10) a) What are the challenges of global software development? **[8]**

b) Explain in detail ERP implementation life cycle. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3391

[Total No. of Pages : 3

[5353] - 594

T.E. (Information Technology) (Semester - I)

OPERATING SYSTEM

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain the significance of following shell commands **[5]**

i) in

ii) wc

iii) umask

iv) cut

v) grep

b) Explain different types of schedulers in operating system. **[5]**

OR

Q2) a) Draw and explain process state diagram. **[5]**

b) Explain the following functions with reference to 'C' **[5]**

i) pthread_create()

ii) pthread_join()

Q3) a) Enlist and explain different IPC mechanisms. **[5]**

b) Explain monitors in brief. **[5]**

OR

P.T.O.

Q4) a) Write a semaphore solution for readers-writers problem. **[5]**

b) Explain with an appropriate example, how resource allocation graph determines a deadlock. **[5]**

Q5) a) For the following reference string. **[12]**

5, 6, 7, 8, 5, 6, 9, 5, 6, 7, 8, 9, 6, 7, 4, 9, 8

Count the number of page faults that occur with 3 frames using FIFO, Optimal and LRU page replacement methods. Discuss the result.

b) Explain different ways to remove external fragmentation. **[6]**

OR

Q6) a) Free memory holes of sizes 15K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K, are to be allocated. How processes are placed using first fit, best fit and worst fit partitioning algorithm. Calculate internal and external fragmentation. **[10]**

b) Explain the address translation mechanism in paging and segmentation with proper example. **[8]**

Q7) a) A disk drive has 200 cylinders, numbered 0-199. The drive is currently serving the request at cylinder 63. The queue of pending requests in FIFO order is 27, 129, 110, 186, 147, 41, 10, 64, 120. Starting from the current head position what is the total distance that disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms. **[12]**

i) FCFS.

ii) C-SCAN.

iii) C-LOOK.

iv) SSTF.

b) Explain I/O buffering mechanism. **[4]**

OR

Q8) a) Write a short note on the following : **[8]**

i) Directory Structure.

ii) File sharing.

b) Explain free space management technique. **[8]**

Q9) a) Explain in detail Linux Booting process. **[8]**

b) List and explain different inter-process communication mechanisms in Linux operating system. **[8]**

OR

Q10) Write short note on following : **[16]**

a) Memory management in Linux.

b) Linux file system.

c) Linux IPC mechanisms.

d) Process management in Linux.

Total No. of Questions : 10]

SEAT No. :

P3392

[Total No. of Pages : 4

[5353] - 595

T.E. (IT)

HUMAN COMPUTER INTERACTION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Understanding users and their behavior is an important factor influencing user-interface design. An automatic syringe is designed to administer proper dose of medicine to the patient. Create a prototype user interface for the same that can set the dose (4 digit numeric) with minimal human error while setting the dose. Justify your design. **[5]**

b) Create a prototype user-interface for a digital wrist watch. How will you make sure that users using analogue wrist watch will have no problem using the new design? **[5]**

OR

Q2) a) Discuss the ways in which a full-page word processor is or is not a direct manipulation interface for editing a document using Shneiderman's criteria. **[5]**

b) What are differences between menu-bar & a tool-bar? Many times users face problems in understanding/learning toolbar icons. How to resolve this issue? **[5]**

Q3) a) There are four main translations involved in the interaction framework viz. articulation, performance, presentation and observation. **[5]**

i) The compact disk player has a button for power off. However its remote control does not have a power off button.

ii) It is difficult in a command line interface to determine the result of copying and moving files in a hierarchical file system.

P.T.O.

iii) User is unable to figure out which switches from the bank to turn on to lit the front portion of a classroom.

iv) The user is unable to know whether the voice recorder is in playing or recording state.

Specify in each of the above four cases which of the interaction framework translations are in effective.

b) When systems are not designed to match the way people actually work, then users end up having to do 'work arounds'. Discuss. **[5]**

OR

Q4) a) What influence does the social environment in which you work have on your interaction with the computer? What effect does the organization (commercial or academic) to which you belong have on the interaction? **[5]**

b) How does making a call differs when using **[5]**

i) Cell phone.

ii) Smart phone?

Consider the kinds of user, type of activity and context of use.

Q5) a) How to get to know the system users? Explain various methods adopted in user-centered design. What are the people directly or indirectly affected by a student registration system. **[8]**

b) What is design? What is the golden rule of design? Illustrate the process of interaction design. **[8]**

OR

Q6) a) What is a prototype? Explain different types of rapid prototyping techniques. **[8]**

b) A scenario is an idealized but detailed description of a specific instance of human-computer interaction (HCI). Scenarios specify how users carry out their tasks in a specified context. Write scenarios for purchasing an airline ticket. **[8]**

Note - Generate scenarios to cover a wide range of situations, not just the most common ones. Include problem situations that will test the system concept, not just straight forward scenarios.

Q7) a) What is the definition of usability as per ISO 9241 standard? Effective applications are both consistent within themselves and consistent with one another. Discuss this in context of Microsoft Office products. **[8]**

b) Explain Nielsen's ten heuristics. **[8]**

OR

Q8) a) The cognitive walkthrough is a formalized way of imagining people's thoughts and actions when they use an interface for the first time. During a cognitive walkthrough the evaluator needs to ask four questions as below **[8]**

i) Is the effect of the action the same as the user's goal at that point?

ii) Will users see that the action is available?

iii) Once users have found the correct action, will they know it is the one they need?

iv) After the action is taken, will users understand the feedback they get?

Given below is an action sequence for creating a customized voicemail message on an iPhone.

1) Tap Voicemail.

2) Tap Greeting.

3) Tap Custom.

4) Tap Record and speak your greeting.

5) When you finish, tap Stop.

6) To listen to your greeting, tap Play.

7) To re-record, repeat steps 4 and 5.

8) Tap Save.

Imagine an iPhone interface and create a report of the cognitive walkthrough for the above mentioned task in context with the review questions.

b) Design an experiment to test whether adding color coding to an interface will improve accuracy. Identify your hypothesis, participant group, dependent and independent variables, experimental design, task and analysis approach. **[8]**

Q9) a) KLM (key-store-level) model predicts expert error-free task completion time (human performance) with interactive computing systems. Total predicted time for a task is given by the equation. **[9]**

$$t_{EXECUTE} = t_K + t_P + t_H + t_D + t_M + t_R$$

What does each of the above timing represent?

Develop a KLM model and predict time for the completion of the task "**Change font and style for the word** "**KLM**" **to bold**, **Arial**" using mouse only.

b) Discuss applications meant for computer-mediated communication. **[9]**

OR

Q10) a) Create a GOMS description of the task of photocopying a paper from a Journal. Discuss the issue of closure in terms of your GOMS description. **[9]**

b) Consider the activity of making a telephone call. Record the actions in an HTA diagram or textually. Start off simply, assuming you know the number to dial, but then add more complicated situations : finding the number in an address book, or what to do when the number is engaged. **[9]**

Total No. of Questions : 10]

SEAT No. :

P3393

[Total No. of Pages : 2

[5353] - 596

T.E. (Information Technology) (Semester - II)

COMPUTER NETWORK TECHNOLOGY

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) What is DHCP? What is its advantage? Explain various messages used in DHCP. **[6]**

b) Explain different timers used in TCP. **[4]**

OR

Q2) a) What is DNS? What is server hierarchy? Explain domain name resolution process. **[6]**

b) Explain the operation of NAT with suitable example. **[4]**

Q3) a) Explain Leaky bucket and Token bucket algorithm. **[6]**

b) Explain in brief SMTP protocol. **[4]**

OR

Q4) a) Explain with neat diagram OSPF routing protocol. **[6]**

b) Write a short note on Quality of Service parameter in Transport Layer. **[4]**

P.T.O.

Q5) a) Explain the basic architecture of WLAN and discuss various components in it. **[8]**

b) Compare Bluetooth and 802.11. What are the limitations of Bluetooth? **[8]**

OR

Q6) a) What are hidden station and exposed station problem in WLAN. **[8]**

b) Describe MAC layer mechanism of IEEE 802.11. **[8]**

Q7) a) Differentiate between infrastructure network and infrastructure less network and What are issues in Adhoc wireless network? **[8]**

b) Explain routing protocols in detail. **[8]**

OR

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

b) Explain operation of TCP-F. **[8]**

Q9) a) Describe each component in sensor node architecture. **[10]**

b) Short note on : **[8]**

i) IOT.

ii) Wireless Sensor Network.

OR

Q10) a) Explain in detail LEACH algorithm. **[10]**

b) Short note on SDN and Satellite. **[8]**

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

P3985 **[Total No. of Pages : 5**

[5353]-597
T.E. (IT) (Semester - II)
SYSTEMS PROGRAMMING
(2015 Pattern)

Time : 2.30 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

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

Q1) a) Explain with example the need of pool table in assembler. **[4]**

b) With a neat diagram explain how any input string is processed by LEX n YACC. **[6]**

OR

Q2) a) Explain with example need of TII in single pass assembler. **[4]**

b) Explain different parameter passing methods used in macroprocessors. **[6]**

Q3) For the following assembly language program show MNT, MDT, stack organization and the expanded code for the given assembly language program **[10]**

```
    MACRO
    XYZ     &A
    MOVER AREG,&A
    MEND
    MACRO
    MIT     &Z
    MACRO
    &Z&W
    ADD BREG,&W
    XYZ ALL
    MEND
    MOVER &Z,ALL
    MEND
    START
    MIT HELLO
    ADD AREG, BREG
    HELLO YALE
    YALE EQUS
ALL DC 3
    END
```

P.T.O.

OR

Q4) Program deck for PGA: ESD cards

TXT cards: [10]

Card Ref. No.	Name	Id	Type	Rel. Addr	Length
1	PGA	01	SD	0	38
2	PGA1	-	LD	34	--
3	PGB	02	ER	--	--
3	PGC	03	ER	--	--
3	PGC2	04	ER	--	--

Card Ref. No.	Relative Address	Contents
4	30-33	0, 0+4
5	34-37	34, 0

RLD cards:

Card Ref. No.	ESD ID	length	Flag	Relative address
4	1	4	+	30
4	2	4	+	30
5	4	4	+	34
5	3	4	-	34

Program deck for PGB: ESD cards

Card Ref. No.	Name	Id	Type	Rel. Addr	Length
7	PGB	01	SD	0	26
8	PGB1	-	LD	14	--
9	PGA	02	ER	--	--
9	PGC1	03	ER	--	--

TXT cards:

Card Ref. No.	Relative Address	Contents
10	14-17	-4, 14
11	18-21	4, 14
12	22-25	-16

RLD cards:

Card Ref. No.	ESD ID	length	Flag	Relative address
10	3	4	+	14
10	1	4	+	14
11	1	4	+	18
11	1	4	+	18
11	1	4	-	18
12	3	4	+	22
12	1	4	+	22
12	2	4	-	22

Program deck for PGC: ESD cards

Card Ref. No.	Name	Id	Type	Rel. Addr	Length
14	PGC	1	SD	0	20
15	PGC1	--	LD	12	--
15	PGC2	--	LD	16	--

TXT cards:

CR no.	Rel. Addr.	Contents
16	8-11	16,16
17	12-15	8.16
18	16-19	4

RLD cards:

Card Ref. No.	ESD ID	length	Flag	Relative address
17	1	4	+	12
17	1	4	+	12
18	1	4	+	16
18	1	4	+	16
18	1	4	-	16

For the given card information for program segments PGA, PGB and PGC generate GEST, LESA and final code allocation in main memory using DLL.

Q5) a) $S \rightarrow S + S / S\text{-}S / (S) / S*S / a$ **[6]**

Remove ambiguity and left recursion from the given grammar.

b) Check whether the unambiguous grammar generated from the grammar in Q5a) is LL? **[6]**

c) Explain YACC file structure. **[6]**

OR

Q6) a) Consider the following grammar **[10]**

$S \rightarrow L=R/R$

$L \rightarrow *R / id$

$R \rightarrow L$

Construct LALR parser and parse for the string "id = *id".

b) Write a short note on Recursive Descent Parser. **[4]**

c) Differentiate between SLR and CLR parsers. **[4]**

Q7) a) Construct syntax tree and DAG for the given expression: **[4]**

X=(b*–c)+y+(b*–c) / z

b) Define the following: **[8]**

i) Syntax Directed Definition

ii) Syntax Directed Translation

iii) Synthesized Attributes

iv) Inherited Attributes

c) Generate three address code for **[4]**

```
For(i=0;i<=10;i++)

x=y+z;
```

OR

Q8) a) Explain stack and heap storage allocation strategies. **[6]**

b) Translate the following C code fragment into three address code (TAC). Assume integer size of 4 bytes; **[8]**

```
int   sum=0,i,j;

int   A[10][10],B[10][10],C[10][10],X[10];

 i=1;

j=1;

while (i<10 &&j<=20)

{

      Sum += X[i];

      C[i][i] = A[i][j]+B[i][j];

            i++;

            j++;

}
```

c) Explain implicit and explicit type conversion. **[2]**

Q9) a) Explain the need of Flow graph and show the same for the example in Q10a. **[4]**

b) Compare machine dependent and independent optimization. **[8]**

c) Discuss machine dependent issues for code generation. **[4]**

OR

Q10) a) Optimize the given quick sort code using peephole optimization techniques. **[8]**

```
i = m – 1
j = n
t1 =4 *  n
v = a[t1]
i = i  + 1
t2 = 4 * I
t3 = a[t2]
if t3 < v goto (5)
j = j – 1
t4 = 4 *  j
t5 = a[t4]
if t5 > v goto (9)
if i >= j goto (23)
t6  = 4 * I
x = a[t6]
t7 = 4 * I
t8 = 4 * j
t9 = a[t8]
a[t7] = t9
t10 = 4 * j
a[t10] = x
goto (5)
t11 = 4 * I
x = a[t11]
t12  = 4 * i
t13 = 4 * n
t14 = a[t13]
a[t12] = t14
t15 = 4 * n
a[t15] = x
```

b) Discuss code generation issues. **[4]**

c) Explain dynamic code generation algorithm. **[4]**

Total No. of Questions : 10]

SEAT No. :

P3394

[Total No. of Pages : 3

[5353] - 598

T.E. (Information Technology) (Semester - II)

DESIGN AND ANALYSIS OF ALGORITHMS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Write an algorithm to solve 8 queen's problem using Brute force method. **[5]**

b) Let n = 3 and (11, 12, 13) = (5, 10, 3) find the optimal ordering on tapes using Greedy method. **[5]**

OR

Q2) a) Prove by mathematical induction that for each positive number n 1+2+3+.....+n=n(n+1)/2. **[5]**

b) Write an algorithm for finding the maximum and minimum element using divide and conquer and verify its complexity. **[5]**

Q3) a) Find the solution of following travelling salesman problem using dynamic programming. **[8]**

cost matrix =

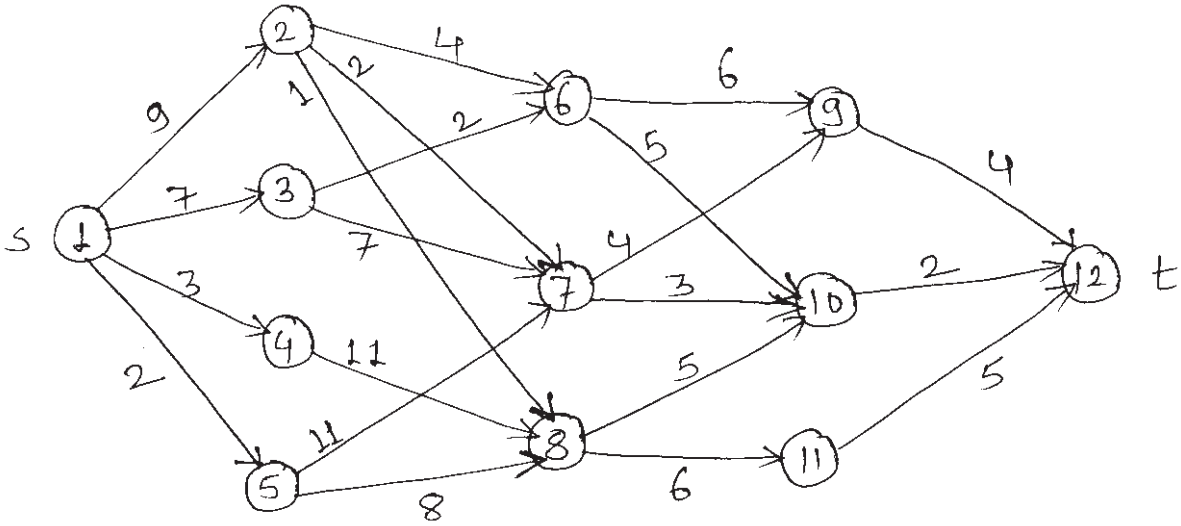
	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

b) Define greedy method. **[2]**

P.T.O.

OR

Q4) Find the minimum cost path from source (s) to sink (t) of the following multistage graph. **[10]**



Q5) a) Write a recursive and Iterative algorithm of backtracking method. **[8]**

b) Let W = {5, 10, 12, 13, 15, 18} and M = 30. Find all possible subsets of W that sum to M. Draw the portion of state space tree. **[8]**

OR

Q6) a) Write an algorithm for backtracking solution to the 0/1 knapsack problem. **[8]**

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

i) State space tree.

ii) Live node.

iii) E-node.

iv) Dead node.

Q7) a) Solve the following instance of 0/1 knapsack problem by LC branch and bound approach **[10]**

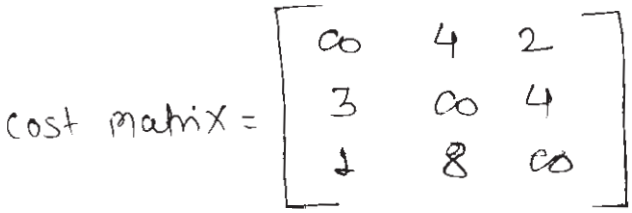
N = 4, (p1, p2, p3, p4) = (10, 10, 12, 18)

(w1, w2, w3, w4) = (2, 4, 6, 9) and M = 15

b) Write an algorithm for FIFO branch and bound. **[8]**

OR

Q8) a) What is travelling salesman problem? Find the solution of the following travelling salesman problem using branch and bound method. **[12]**



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

i) Branch and bound.

ii) LC search.

iii) Bounding Function.

Q9) a) What is Nondeterministic algorithm? Write the Nondeterministic algorithm for sorting the element of an array. **[8]**

b) Explain complexity classes P and NP. And differentiate between NP complete and NP Hard. **[8]**

OR

Q10) a) Prove that Clique Decision problem is NP complete. **[8]**

b) Explain the Flynn's classification for Parallel Computing. **[8]**

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

P3986 **[Total No. of Pages : 2**

[5353]-599
T.E. (Information Technology) (Semester - II)
CLOUD COMPUTING
(2015 Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain advantages and limitations of cloud computing in brief. **[6]**

b) Compare Private cloud versus Public cloud. **[4]**

OR

Q2) a) What is Live VM migration? Write down the steps required for Live VM migration. **[6]**

b) Write a short note on virtualization attack. **[4]**

Q3) a) Compare KVM, Xen and Vmware Workstation. **[6]**

b) Write a short note on Open Virtualization Format. **[4]**

OR

Q4) a) Explain Hardened Virtual Server image. **[6]**

b) Write short note on Overlapping Trust Boundaries. **[4]**

Q5) a) What is the role of threat agent? Enlist and describe three different threat agents. **[8]**

b) Draw and explain architecture of Google File System. **[8]**

OR

Q6) a) Explain architecture of MapReduce in Hadoop. **[8]**

b) Write short note on Amazon S3 execution environment. **[8]**

P.T.O.

Q7) a) Draw and explain the architecture of the Internet of Things. **[8]**

b) List and explain the key issues related to cloud computing energy efficiency. **[8]**

OR

Q8) a) What is RFID? How RFID works? **[8]**

b) Draw and explain architecture of Facebook platform. **[8]**

Q9) a) Explain the common steps involved during the generation of certificates by a certificate authority. **[10]**

b) What is Docker? Draw and explain Docker deployment workflow. **[8]**

OR

Q10) a) Explain architecture of Mobile cloud computing with diagram. **[10]**

b) Draw and explain Twitter architecture and access protocol sequence. **[8]**

Total No. of Questions : 10]

SEAT No. :

P4273

[Total No. of Pages : 2

[5353] - 600
T.E. (I.T) (End-Sem)
DATA SCIENCE AND BIG DATA ANALYTICS
(2015 Pattern)

Time :2½ hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What is data warehouse? Explain design and architecture of data warehouse. **[6]**

b) What is the application of tail and bound in big data. **[4]**

OR

Q2) a) List and explain data processing infrastructure challenges in Big Data.**[6]**

b) Explain how Google file system solves big data processing challenges.**[4]**

Q3) a) Given that a person's last purchase was pepsi, there is a 90% chance that his next purchase will also be pepsi. If a person's last purchase was coke, there is an 80% chance that his next purchases will also coke. What is the probability that he will purchase pepsi three purchases from new? **[6]**

b) Explain job execution in Hadoop with example. **[4]**

OR

Q4) a) Explain the Flajolet Martin Distance sampling. Find the distinct element from the element stream 1,4,2,1,2,4,4,4,1,2,4,1,7. Assume suitable hash function. **[6]**

b) Prove the principle of linearity of expectation. **[4]**

P.T.O.

Q5) a) What is data preparation? Explain its types with suitable example. **[8]**

b) Explain the different modes of data transformation in big data. **[8]**

OR

Q6) a) What is the need of big data analysis? Explain the different types of analysis techniques. **[8]**

b) Explain the data analysis life cycle in big data. **[8]**

Q7) a) What are the major challenges in visualizing the big data and how to overcome these challenges. **[8]**

b) Explain i) Google chat API ii) Cloudera **[8]**

OR

Q8) a) Explain any two visual data representation techniques with sample data set. **[8]**

b) Explain i) Data visualization with Tableau ii) Jasper reports **[8]**

Q9) a) What is social media analytics? Explain it's need with sample case study. **[9]**

b) What is text mining? Draw and explain text mining architecture and explain its need. **[9]**

OR

Q10)a) How mobile analytics is different than social media analytics. Explain with suitable example. **[9]**

b) Explain roles and responsibilities of big data analyst and data scientist. **[9]**

Total No. of Questions : 10]

SEAT No. :

P3395

[Total No. of Pages : 3

[5353] - 601

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) Find the drag coefficient C for a mass m = 73.5 kg to have a velocity of 32.8 m/s after falling for a time t = 10 sec. The acceleration due to gravity is 9.8 m/s^2. The Newtons second law of equation for velocity is given by $\frac{gm}{c}\left[1-e^{-\left(\frac{c}{m}\right)t}\right]$. Use Newton - Raphson method. **[10]**

OR

Q2) A spring loaded frictionless piston moves in the cylinder. On one side of a piston there is a fluid. The pressure of a fluid changes according to the relation p = m + n V, where p is in Kpa, m = –150 kN.m^2 and n = 7500 kN.m^2. If the fluid changes from an initial state of 0.04 m^3 to final state of 0.08 m^3, with no work other than that done on the piston, find the magnitude of work transfer using Simpsons 1/3 rule, take n = 4. Assume this to be a closed system. **[10]**

Q3) a) State five methods of interpolation. **[5]**

b) A set of values of *x* and *y* are given below, using Newton's Forward Interpolation formula, find y (1.105) **[5]**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	0.0	0.331	0.728	1.207	1.744	2.375	3.096

OR

P.T.O.

Q4) The value of Nussult number (Nu) and Reynolds number (Re) found experimentally are given below. If the relation between Nu and Re is of type $Nu = a.\ Re^b$, find the values of a and b for the given values of Nu and Re **[10]**

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

Q5) a) The temperature at one surface of a slab of thickness x = 20 cm is T = 500ºC. Find the temperature of other surface of slab by taking step size in thickness $\Delta x = 4$ cm. Heat flux is 1000 W/m^2. Use following governing relation of heat flow, **[8]**

$$\frac{dT}{dx} = -\frac{q}{A}\left[\frac{1}{0.5(0.01T+1)}\right]$$

b) Discuss the errors induced by Eulers method. **[8]**

OR

Q6) The rate of emission of a radioactive substance is proportional to the amount N of the substance remaining at any instant t, governed by the equation $\frac{dN}{dt} = -kN$ where the negative sign indicates that the radioactivity decreases with time. Taking k = 0.01 and at t = 0, N = 100 gm, find how much material remains when t = 100 sec. Use Runge Kutta second order method with h = 50. **[16]**

Q7) Solve the boundary value problem, $\frac{d^2y}{dx^2} - 64y + 10 = 0$

With $y(0) = y(1) = 0$. Using finite difference method calculate $y(0.5)$, taking step size h = 0.25. **[16]**

OR

Q8) Using the finite difference method solve the boundary value problem

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=1 \text{ with } y(1)=0\ y(1.4)=0.0566. \text{ Find } y(1.1), y(1.2), y(1.3).$$

[16]

Q9) a) What is Optimization and discuss its applications in detail. **[9]**

b) What are the limitations of linear programming. **[9]**

OR

Q10) a) Explain numerical methods for optimizing a function of one variable. **[9]**

b) Maximize $Z = 2x_1 + 3x_2$ **[9]**

Subject to the constraints

$$x_1 + x_2 \geq 1,$$
$$5x_1 - x_2 \geq 0,$$
$$x_1 + x_2 \leq 6,$$
$$x_1 - 5x_2 \leq 0,$$
$$x_2 - x_1 \geq -1,$$
$$x_2 \leq 3,$$
$$x_1 \geq 0,\ x_2 \geq 0$$

Total No. of Questions : 10]

SEAT No. :

P3396

[Total No. of Pages : 3

[5353] - 602
T.E. (Chemical) (Semester - I)
MASS TRANSFER - I
(2015 Pattern) (Theory)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) State and explain Ficks law of diffusion. **[4]**

b) Ammonia gas **[6]**

i) is diffusing through a uniform tube 0.10 m long containing Nitrogen gas

ii) at 1.0132 x 105 Pa pressure & 298K. At point one PA1 = 1.013 x 104 Pa & at point two PA2 = 0.507 x 104 Pa. The diffusivity DAB = 0.23 x 10-4m^2/sec. Calculate the flux at steady state.

(R = 8.314 kPa m^3/kmol K)

OR

Q2) a) Explain the two resistance concept, derive the equation for overall resistance to Mass Transfer. **[6]**

b) Give significance of Schmidt Number and Sherwood Number in mass transfer. **[4]**

Q3) a) Explain Absorption & Stripping. What is significance of minimum liquid to gas ratio for absorption? **[6]**

b) Write a short note on - Mass transfer coefficient. **[4]**

OR

P.T.O.

Q4) a) Derive the equation for operating lines for co-current absorption process and show the location of this line graphically. **[6]**

b) Give the Selection Criteria for Selection of Solvent in Gas absorption operation. **[4]**

Q5) a) Define following terms: **[10]**

i) Absolute humidity.

ii) Wet bulb Temperature.

iii) Enthalpy.

iv) Humid volume.

v) Percentage saturation humidity.

b) Explain Mechanism and Working of Natural Cooling Tower. **[6]**

OR

Q6) a) Moist air at 310K has WBT of 300K. The latent heat of vaporization of water at 300K is 2440kJ/kg, estimate the humidity of the air and the percentage relative humidity. The total pressure is 105kPa and the vapor pressure of water vapor at 300K is 3.60 kPa and 6.33 kPa at Psychrometric ratio hG/kY = 1000 J/kg K. **[6]**

b) Derive the relation for the determination of height of packing of counter current cooling tower. **[10]**

Q7) a) Describe the following operating characteristics of sieve tray column using following points. Draw the diagram of gas flow rate Vs liquid flow rate to explain satisfactory operation of tray tower. **[10]**

i) Flooding.

ii) Weeping.

iii) Coning.

b) Explain various types of packing used in Packed Column. **[6]**

OR

Q8) a) Write a short note on : **[8]**

i) Spray Tower.

ii) Bubble Column.

b) Explain sparged vessel & mechanically agitated vessels with neat diagram. **[8]**

Q9) a) Explain following terms: **[8]**

i) Equilibrium moisture content.

ii) Bound moisture content.

iii) Unbound moisture content.

iv) Free moisture.

b) A batch of solid for which following table of data applies is to be dried from 25% to 6% moisture under conditions identitical to those for which data are tabulated. The initial weight of wet solid is 300 kg and drying surface is $1m^2/8kg$ of dry vapours. determine the time required for drying **[10]**

x	0.35	0.25	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
n	0.3	0.3	0.3	0.266	0.239	0.208	0.180	0.150	0.097	0.07	0.025

OR

Q10) a) Describe Rotary Dryer in Detail. **[6]**

b) Derive the equation for Total Time required for drying. **[6]**

c) A certain Material was dried under constant drying condition and it was found that 2 hours are required to reduce the free moisture content from 20% to 10%. How much longer would be required to reduse free moisture content to 4%. Assume that no constant rate period is encountered. **[6]**

Total No. of Questions : 10]

SEAT No. :

P3397

[Total No. of Pages : 2

[5353] - 603

T.E. (Chemical) (Semester - I)

INDUSTRIAL ORGANISATION AND MANAGEMENT

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain FW Taylors principle of management. **[6]**

b) Write a note on Partnership Deed. **[4]**

OR

Q2) Explain in detail the various functions of management. **[10]**

Q3) a) Explain in detail Living wages and Real wages. **[4]**

b) What are tenders and explain their types. **[6]**

OR

Q4) Explain various functions of Purchase manager. **[10]**

Q5) a) What is market research? Explain with suitable example. **[8]**

b) Explain any two Pricing Strategies in detail. **[8]**

OR

P.T.O.

Q6) a) What is sales forecasting? Explain the two types of sales forecasting in detail. **[8]**

b) Write an explanatory note on Marketing Mix. **[8]**

Q7) a) Explain in detail the procedure to export a product to a foreign customer. **[8]**

b) Explain in detail Quality Circle. **[8]**

OR

Q8) a) Explain Total Quality Management of a process industry. **[8]**

b) What is ISO? Explain any three ISO standards. **[8]**

Q9) a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. **[12]**

b) Write a note on FERA and FEMA. **[6]**

OR

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

a) MRTP.

b) Monopolies Restrictive Trade Practices (MRTP).

c) Flow Chart and Flow Diagram.

Total No. of Questions : 10]

SEAT No. :

P3398

[Total No. of Pages : 2

[5353] - 604

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2015 Pattern) (End Semester)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Describe modified Solvay process. **[5]**

b) Explain process flow diagram and Process block diagram. **[5]**

OR

Q2) Explain electrolytic process for the production of aluminium. **[10]**

Q3) Discuss production of urea with its major engineering problems. **[10]**

OR

Q4) Explain production of ethyl alcohol by fermentation of molasses. **[10]**

Q5) a) Explain manufacturing of soya bean oil by solvent extraction process. **[10]**

b) What is carbonization of coal, state its types. **[6]**

OR

P.T.O.

Q6) a) Discuss continuous hydrolysis and saponification process for manufacturing of soap and glycerine as co-product. **[10]**

b) What are detergents? State its types. **[6]**

Q7) a) What are refinery operations? Explain thermal cracking. **[12]**

b) Discuss in brief about fuel cell. **[6]**

OR

Q8) Explain any two : **[18]**

a) Pyrolysis.

b) Catalytic cracking process.

c) Manufacturing of producer gas.

Q9) a) Explain production of methanol by catalytic hydrogenation of carbon monoxide. **[8]**

b) Explain production of cumene by propylene alkylation of benzene. **[8]**

OR

Q10) a) Explain production of Ethylene Dichloride. **[8]**

b) Explain manufacturing of phenol. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3399

[Total No. of Pages : 3

[5353] - 605

T.E. (Chemical Engineering)

CHEMICAL ENGINEERING THERMODYNAMICS - II

(2015 Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Obtain the relation: **[6]**

$$d(nG) = (nV)\,dP - (nS)\,dT + \sum \mu_i \, dn_i$$

b) Determine the fugacity of steam at 623 K and 1000 kPa using enthalpy and entropy values provided here with. Assume that, steam behaves ideally at 101.3 kPa. **[6]**

Given :

At 1000 kPa and 623 K : H = 3159 kJ/kg; S = 7.3 kJ/kg.K

At 101.3 kPa and 623 K : H = 3176 kJ/kg; S = 8.38 kJ/kg.K

c) Derive the Gibbs/Duhem equation. **[8]**

OR

Q2) a) Describe *Chemical Potential* as criteria for phase equilibria. **[6]**

b) Explain the concept of *Fugacity* and *Fugacity* coefficient for species in ideal solution. **[6]**

P.T.O.

c) Assuming validity of Raoult's law, perform following calculations for Benzene (1)/Toluene (2): **[8]**

Given :

1. $x_1 = 0.33$, t = 100°C, find y_1 and P.

2. $y_1 = 0.33$, t = 100°C, find x_1 and P.

Species	A	B	C
Benzene (1)	13.8594	2773.78	220.07
Toluene (2)	14.0098	3103.01	219.79

Q3) a) Draw and explain the three types of constant pressure liquid-liquid solubility diagram. **[8]**

b) Deduce the formulation : **[8]**

$$\varphi_i = \frac{\hat{\varphi}_l}{\varphi_i^{sat}}$$

OR

Q4) a) Note the criteria for phase equilibria. **[8]**

b) Crystallization is a major separation process in chemical industry. Describe the solid-liquid equilibrium mechanism in this process. **[8]**

Q5) a) Deduce the relation: **[8]**

$$\Delta G^\circ = -RT \ln K$$

b) With appropriate equations, explain the effect of temperature on the equilibrium constant. **[8]**

OR

Q6) a) Describe the application of *equilibrium criteria* to Chemical reactions. **[8]**

b) Consider a system in which following reactions occur : **[8]**

$$CH_4 + H_2O \longrightarrow CO + 3H_2$$

$$CH_4 + 2H_2O \longrightarrow CO_2 + 4H_2$$

If Initially there are 6 mol of CH_4 and 9 mol of H_2O, determine expressions for mole fractions using reaction coordinates.

Q7) Determine the number of degrees of freedom F for each of the following systems : **[18]**

i) A system of two miscible non reacting species which exists as an azeotrope in VLE.

ii) A system prepared by partially decomposing $CaCO_3$ into an evacuated space.

iii) A system consisting of the gases CO, CO_2, H_2, H_2O, and CH_4 in chemical equilibrium.

OR

Q8) a) Acetic acid is esterified in the liquid phases with ethanol at 100ºC and atmospheric pressure to produce ethyl acetate and water according to the reaction : **[10]**

$$CH_3COOH_{(l)} + C_2H_5OH_{(l)} \longrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$$

If initially there is one mole each of acetic acid and ethanol, estimate the mole fraction of ethyl acetate in the reaction mixture at equilibrium.

b) For gas phase and liquid phase reactions, explain the relation of equilibrium constant to composition. **[8]**

Total No. of Questions : 10]

SEAT No. :

P 4275

ss[Total No. of Pages : 2

[5353]-607

T.E. Chemical (End - Semester)

Transport Phenomena

(2015 Pattern)

Time : 2 ½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) Derive expression of volumetric flow rate for power law fluid. **[10]**

OR

Q2) Derive the expression of maximum temperature for nuclear fuel rod surrounded by aluminum cladding. **[10]**

Q3) A copper wire has a radius 2 mm and length 5m. For what voltage drop would the temperature rise at the wire axis be 10°C if the surface temperature of the wire is 20°C.? For copper, Lorenz number is 2.23×10^{-8} volt^2 K^{-2}. **[10]**

OR

Q4) a) Explain Bingham plastic model. **[5]**

b) Explain Fick's law of diffusion and boundary conditions to solve mass transfer problems. **[5]**

Q5) Derive Newtons second law of motion and extend it to derive Euler's equation of motion. **[18]**

OR

P.T.O

Q6) a) Derive expression of velocity distribution for Stormer viscometer in terms of the applied torque. **[12]**

b) Derive equation of change in dimensionless form **[6]**

Q7) Derive Blake-Kozeny and Burke-Plumer equation for flow of fluid through packed bed and extend these equations to derive Ergun equation. **[16]**

OR

Q8) a) Show that for laminar flow of fluid through tube, $f = \frac{16}{R_e}$ **[8]**

b) Derive expression of pressure rise for sudden expansion in pipeline. **[8]**

Q9) a) Explain Martinnelli's analogy. **[8]**

b) Explain transfer coefficients at high transfer rates by film theory. **[8]**

OR

Q10)a) A spherical water droplet 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry. still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60°C. The vapor pressure of water at 21°C is 0.0247atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3}$ mol s^{-1} cm^{-2}. **[8]**

b) Explain Chilton-Colburn analogy. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3400

[Total No. of Pages : 3

[5353] - 608

T.E. (Chemical)

CHEMICAL ENGINEERING DESIGN - I

(2015 Pattern) (Semester - II)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) Draw and explain various types of roofs used for storage vessels. **[10]**

OR

Q2) Discuss on the stresses in the shell of a tall vertical vessel. **[10]**

Q3) Explain the step-wise design procedure of saddle support for tall vessels. **[10]**

OR

Q4) A tall vertical vessel 1.5 m in diameter and 13 m high is to be provided with the skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to the diameter of the 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 1/3 yield stress of material. Yield stress is 2400 kg/cm^2, estimate the thickness of skirt support. **[10]**

Q5) a) Explain various methods of feeding for multiple effect evaporator. **[8]**

P.T.O.

b) Suggest a suitable thermal design for a condenser to be used for condensing 4.2 kg/s of steam. steam will be condensate at pressure of 4.13 KN/m^2. Steam has a dryness fraction 0.92 .cooling water is available at 17ºC and for economic reason temperature rise has to be limited up to 1.2 m/s through the tubes. The exchanger has two passes on tube side. Tubes of 19.5 mm OD and 15.75 mm ID can be used. Estimate the number of tubes, their length, tube bundle diameter and the shell diameter. Overall heat transfer coefficient based on external areas of tubes is 3400 W/m^2K. **[8]**

OR

Q6) a) Write short note on types of Reboiler. **[8]**

b) A single effect evaporator is used to concrete 7 kg/s of as solution from 10 to 50% solids. Steam is available at 205 KN/m^2, at temperature 394 K and evaporation take placed at 13.5 KN/m^2, at temperature 325 K. if the overall coefficient of heat transfer is 3 KW/m^2, estimate the heating surface required and the amount of steam used if the feed to the evaporator is at 294 K and condensate leaves heating space 352.7 K. The specific heats of 10 & 50 percent solutions are 3.76 & 3.14 KJ/kg. **[8]**

The total enthalpy of steam at 205 KN/m^2 = 2530 KJ/kg

The total enthalpy of steam at 13.5 KN/m^2 = 2594 KJ/kg

Q7) a) What is the function of agitator? State different types of agitator. Explain any one agitator in detail with neat sketch. **[8]**

b) A jacketed agitator reactor consist of a vertical cylinder 1.5 m in diameter with a hemispherical base and a flanged flat top. Jacket is fitted to the cylindrical section only and extends to height of 1m. The spacing between the jacket and the vessel wall is 75 mm.the jacket is fitted with a spiral baffle. The pitch between the spirals is 200 mm. the jacket is used is used to cool the reactor contents with chilled water at 10ºC @ 32,500 kg/h and exit temperature 20ºC. Estimate the heat transfer coefficient at the outside wall of the reactor and the pressure drop in the jacket. **[8]**

The value of $j_h = 3.2 * 10^{-3}$

Physical properties at mean temperature 15ºC.

Density = 999 kg/m^3, viscosity = 1.36 m NS/m^2, M_{pr} = 7.99

$K_f = 595 * 10^{-3}$ W/mºC.

OR

Q8) a) Explain different types of jackets with neat sketch. **[8]**

b) Write short notes on Baffles arrangements and its need for mixing. **[8]**

Q9) a) Discuss the different safety devices used in processes industries. **[9]**

b) List different types of three phase separators and explain any two with neat sketches. **[9]**

OR

Q10) a) Design steam water separator for the following conditions : **[9]**

Steam flow rate : 2000 kg/hr

Water flow rate : 1000 kg/hr

Density of water : 926.4 kg/m^3

Density of vapour : 2.16 kg/m^3

Hold up time : 10 min.

b) Write short notes on the following: **[9]**

i) Oil-Water separator.

ii) Gravity settler.

iii) Decanter.

Total No. of Questions : 10]

SEAT No. :

P 4276

[Total No. of Pages : 3

[5353]-609

T.E. (Chemical)

MASS TRANSFER - II

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) A mixture of 40% hexane and 60% octane by mole is flash distilled. If the slope of the operating line is –1.2 find the fraction of feed vaporized and the composition of distillate and residue. The equilibrium data: **[5]**

x	0	0.045	0.192	0.4	0.69	1
y	0	0.178	0.538	0.78	0.932	1

b) What are ideal mixtures? Explain positive and negative deviations from ideality. **[5]**

OR

Q2) A solution containing $CC1_4$ and CS_2 in equal masses is to be continuously fractionated at the rate of 5000 kg/h. The overhead product is to contain 90 weight% of CS_2 and the bottom product is to contain 5 wt% of CS_2. The feed is 40% vaporized and a total condenser is to be used. The reflux is saturated. Determine the product rates, number of theoretical plates if actual reflux ratio is twice the minimum and the temperature of the feed. Equilibrium data: **[10]**

x	0	0.03	0.11	0.26	0.39	0.53	0.76	0.86	1.0
y	0	0.08	0.27	0.49	0.63	0.75	0.88	0.93	1.0
T,°C	76.7	74.9	70.3	63.8	59.3	55.3	50.4	48.5	46.3

P.T.O

Q3) An aqueous solution containing 0.8 kmol/m^3 of solute is contacted with an organic solvent containing 0.005 kmol/$m^3$of solute. The raffinate stream from the column has a solute concentration of 0.78 kmol/m^3. The organic phase flow rate is 22 l/h and that of aqueous solution is 35 l/h. The column height is 1.4 m and column diameter is 0.076 m. Determine the volumetric mass transfer coefficient and HTU based on extract phase if equilibrium relation is given by $C_{org.} = 0.025\ C_{aq.}$ **[10]**

OR

Q4) a) A mixture of benzene and toluene containing 55 mole % benzene is distilled to give 95 mole% benzene and a bottom product containing 7 mole % benzene. The feed is liquid at bubble point and a total condenser is used. Find the minimum reflux ratio using Fenske Underwood method if the average reflux ratio is 2.5. **[5]**

b) Explain the effect of temperature on the binodal curve. **[5]**

Q5) a) Oil is to be extracted from meal by means of benzene using continuous countercurrent leaching unit. The unit treats 1000 kg of meal (on completely exhausted solids basis) per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids contain 55 kg of oil and 451 kg of benzene. Find the number of stages required. The entrainment data is: **[10]**

kg oil/kg solution	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
kg solution / kg solids	0.5	0.505	0.515	0.53	0.55	0.571	0.595	0.62

b) Explain constant and variable underflow. **[6]**

OR

Q6) a) Explain the triangular method for finding number of stages in continuous countercurrent leaching. **[9]**

b) Give the functioning of a Dorr thickener for leaching. **[7]**

Q7) a) An aqueous solution contains a small amount of impurity which imparts colour to it. The feed is decolourized by adsorption. The equilibrium relation for the process is given by $Y^* = 8.91 \times 10^{-5} X^{1.66}$ where Y = colour units / kg solution and X = colour units / kg adsorbent. 1000 kg of initial solution with a colour concentration of 8 colour units / kg solution is to be treated with an adsorbent. Calculate the percent of original colour removed in a single stage using 30 kg of solid. Calculate the quantity of fresh adsorbent required to reduce the colour to 10% of its original value in a two stage process, if the stream leaving the first stage has a colour concentration of 4.5 times the final colour of the solution. **[10]**

b) Explain the Langmuir and Freundlich isotherms. **[8]**

OR

Q8) a) In a laboratory setup, toluene vapours in air are passed over a bed of adsorbent. In the first experiment the bed depth was 50 cm and in the second it was 100 cm. The breakthrough was determined at 4% of the inlet concentration. In the first experiment the breakthrough occurred at 65 minutes and in the second it occurred at 140 minutes. Determine the length of unused bed. **[10]**

b) Derive the equation for continuous countercurrent adsorber. **[8]**

Q9) a) Schematically represent a crystallization process and give the material balance equation explaining each term. **[6]**

b) Explain all the membrane modules. **[10]**

OR

Q10)a) What is reverse osmosis? Give details regarding types of membrane used for the process and an application. **[6]**

b) A Swenson Walker crystallizer is used to produce hydrated crystals of sodium sulphate ($Na_2SO_4.10H_2O$) by cooling a solution from 320 K to 310K with the help of cooling water which enters at 290K and leaves at 300K. Assuming evaporation to be negligible, determine the number of sections of the crystallizer each 3m long, required to process 0.35 kg/s of product. Data: Solubility of Na_2SO_4 at 310K = 40 kg/100 kg water, Solubility of Na_2SO_4 at 300K = 14kg/ 100 kg water, Mean heat capacity of liquor = 3.8 kJ/kg K, heat of crystallization = 230 kJ/kg, available area for heat transfer = $3m^2/m$ length of crystallizer, overall heat transfer coefficient = 0.14 kW/m^2K. **[10]**

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

P3987 **[Total No. of Pages : 2**

[5353]-610
T.E. (CHEMICAL) (Semester - II)
PROCESS INSTRUMENTATION AND CONTROL
(2015 Pattern)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the difference between accuracy and precision in an instrument. **[5]**

b) Distinguish between RTD and Thermistor. **[5]**

OR

Q2) a) Define Instrumentation and classify the instruments based on function. **[5]**

b) Explain with diagram, construction, working of filled system thermometers. **[5]**

Q3) a) Define temperature and give temperature scale with inter relation. **[4]**

b) Explain with diagram, construction, working and calibration of pressure sensor using dead weight tester. **[6]**

OR

Q4) Explain construction, working principle and application of the following: **[10]**

a) Bourdon tube

b) Bellows

c) Diaphragm

P.T.O.

Q5) a) Explain with diagram, construction and working of orifice meter. **[8]**

b) Describe turbine type flow meter. **[8]**

OR

Q6) Write short notes on: **[16]**

a) Ultrasonic level method

b) Radiation method

c) Sight glass method

d) Air purge method

Q7) Describe with neat diagram the following techniques of composition analysis. **[16]**

a) Gas chromatography

b) Ultraviolet Absorption Spectroscopy

OR

Q8) Write short notes on: **[16]**

a) pH meter

b) Liquid chromatography

c) HPLC

d) Refractometry

Q9) a) Give classification of process variable with respect to process control. **[9]**

b) Explain with diagram different control actions. **[9]**

OR

Q10) a) Derive the dynamic response equation of first order system for step change. **[9]**

b) Describe the types of ideal forcing function. **[9]**