Total No. of Questions : 10]

SEAT No :

P3862

[Total No. of Pages : 2

[5058]-301
T.E. (Civil)
HYDROLOGY AND WATER RESOURCES ENGINEERING
(2012 Pattern) (Semester - I) (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 Q6, Q.7 ro Q.8, Q.9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain with a neat sketch hydrological cycle. **[3]**

b) Explain construction and application of DAD Curves with sketch. **[7]**

OR

Q2) a) The isohyet drawn for a storm which occurred over a drainage basin of area 950 km^2 yielded the following information. Calculate the average depth of rainfall over a basin. **[6]**

Isohyet interval in mm	85-75	75-65	65-55	55-45	45-35
Area between isohyets in Km^2	125	236	264	175	150

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

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

b) Explain Ultrasonic method to measure stream discharge. **[5]**

OR

Q4) a) A well of 0.5m diameter penetrates fully into a confined aquifer of thickness 20 m and hydraulic conductivity $8.2*10^{-4}$ m/s. What is the maximum yield expected from this well if the drawdown in the well is not to exceed 3 m. The radius of influence may be taken as 260m. **[7]**

b) Explain construction of open well with neat sketch. **[3]**

P.T.O.

Q5) a) State various factors affecting runoff and explain in detail. **[14]**

b) Explain any one method of base flow separation. **[4]**

OR

Q6) a) Given below are the observed flows (cumecs) from a storm of 6 hour duration on a stream with a drainage area of 316 sq.km. Assume a constant base flow of 17 cumecs, derive a 6 hour duration unit hydrograph. **[9]**

Time (hr)	0	6	12	18	24	30	36
Flow	17	113.2	254.5	198	150	113.2	87.7
Time (hr)	42	48	54	60	66	72	Base Flow=17
Flow	67.9	53.8	42.5	31.1	22.64	17	

b) Explain synthetic hydrograph with neat sketch. **[9]**

Q7) a) Explain flow mass curve and explain the step by step procedure to calculate the reservoir capacity and surplus water. **[8]**

b) What is apportionment of total cost for multipurpose reservoir. Explain equal apportionment method and alternative justifiable expenditure method. **[8]**

OR

Q8) a) Draw a section of dam indicating details of sedimentation. Explain significance of trap efficiency. **[8]**

b) What method you will suggest to control evaporation loss and loss due to seepage. **[8]**

Q9) a) Explain participatory irrigation management. **[8]**

b) Wrtie a note on Warabandi. **[8]**

OR

Q10)a) What are the ill effects of water logging and how will you control it. **[9]**

b) Draw a neat section of lift irrigation scheme and state the authorities from whom permission for implementing it is necessary. **[7]**

✡ ✡ ✡

Total No. of Questions :8]

SEAT No. :

P1682

[Total No. of Pages :4

[5058]-302

T.E. (Civil)

STRUCTURAL ANALYSIS - II

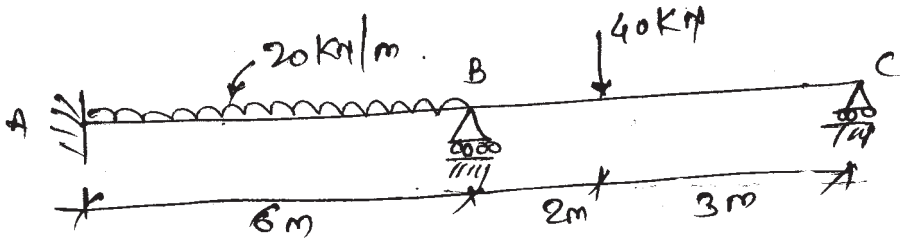
(2012 Course) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

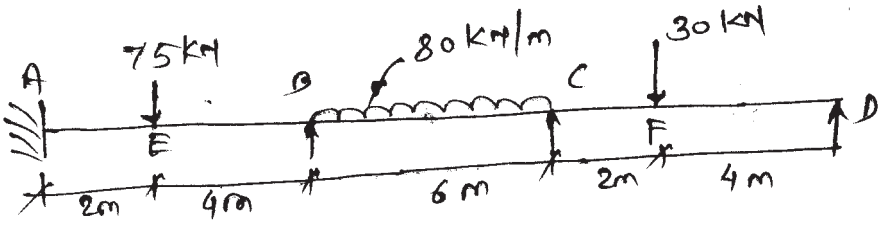
Instructions to the candidates:

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

Q1) a) Analyse the beam by slope deflection method. Draw BMD & SFD. Take EI = 3900 kN-m^2. The support 'B' sinks by 30mm. **[10]**



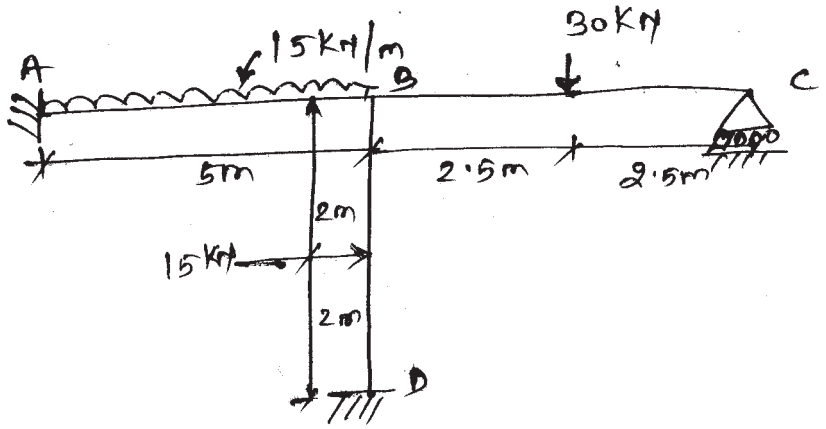
b) Analyse the continuous beam shown in figure using flexibility method & draw the bending moment diagramme. **[10]**



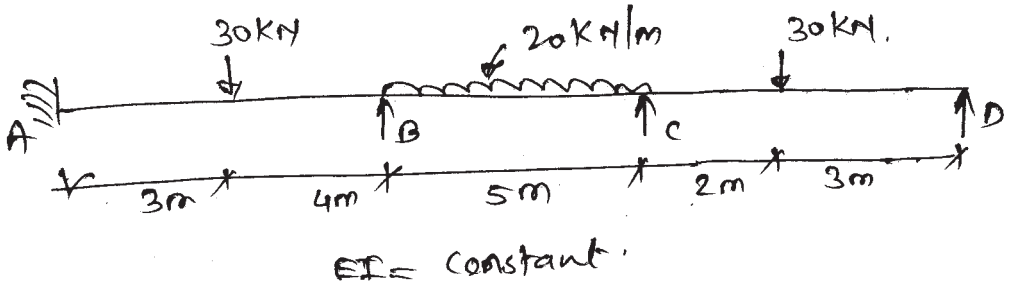
OR

P.T.O.

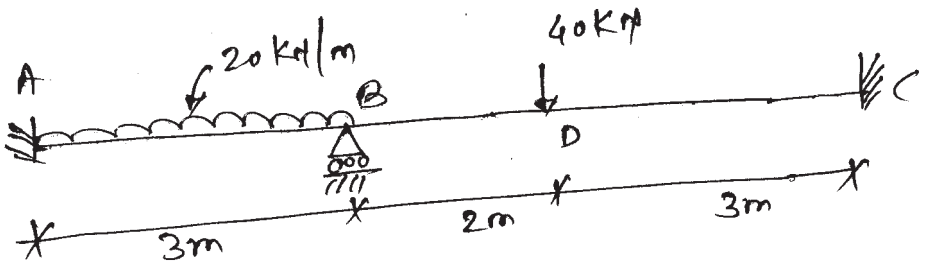
Q2) a) Analyse the frame as shown in figure. EI is constant. Use slope deflection method. **[10]**



b) Analyse the continous beam shown in figure by moment distribution method. Draw BMD & SFD. **[10]**

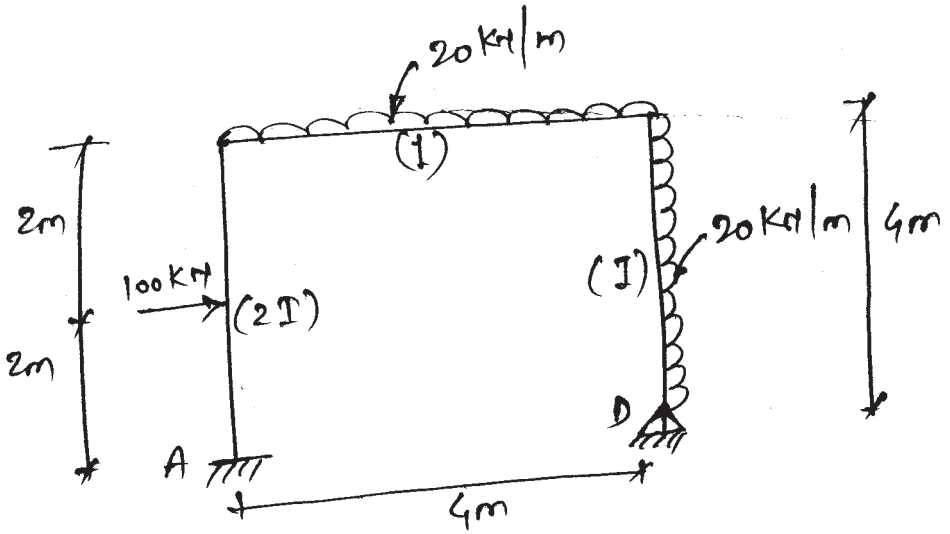


Q3) Analyse the beam shown by stiffness matrix method. Draw BMD & elastic curve. EI = constant. **[16]**

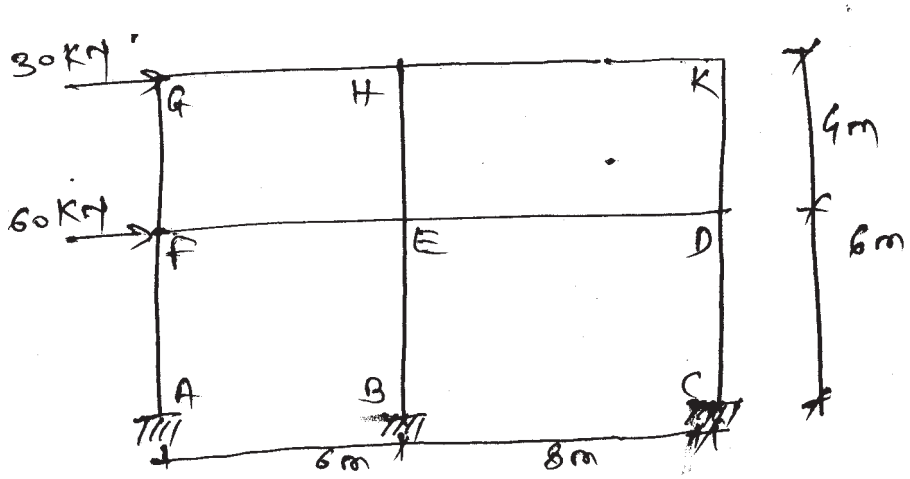


OR

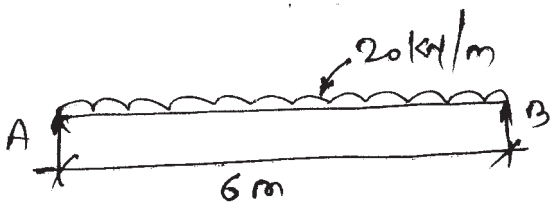
Q4) Analyse the frame by stiffness matrix method & sketch BMD. **[16]**



Q5) a) Determine the approximate values of moment, shear & axial forces in member of the frame loaded & supported as shown in figure using cantilever method of analysis. **[12]**



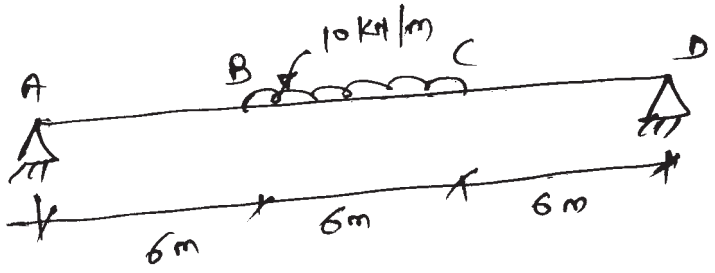
b) A simply supported beam of length 6m is loaded as shown in figure. Determine the maximum deflection. **[6]**



OR

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

b) The beam is loaded & supported as shown in fig. Determine deflection at nodal points. Take 3 nodes. **[8]**



Q7) a) Explain the terms: **[8]**

i) Constant strain Triangle.

ii) Linear strain Triangle.

iii) Higher order elements.

iv) Nodes.

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

OR

Q8) a) Explain shape function & state properties of shape function. **[8]**

b) Differentiation between Axisymmetric & Isoparametric elements. **[8]**

EEE

Total No. of Questions : 10]

SEAT No : ____

P1683

[Total No. of Pages : 3

[5058]-303
T.E.(Civil)
STRUCTURAL DESIGN - I
(2012 Course) (Semester -I) (End Semester)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3, or Q.4, Q.5or 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, fub = 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.***

SECTION - I

Q1) a) Explain in brief design philosophy of limit state for strength and serviceability. **[4]**

b) Design a single angle discontinuous strut which carry factored load of 100 kN. Unsupported length of member is 3 m. **[6]**

OR

Q2) a) Differentiate between lacing and battening in a built - up column on the basis of general and design consideration. **[4]**

b) Design a suitable single equal angle section to carry a factored tensile force of 250 kN. Use 5 mm size of fillet weld. **[6]**

Q3) a) Determine the design compressive strength for a column ISHB 350 @ 72.4 kg/m of 3.5m length. The column is restrained in direction and position at both the ends. **[4]**

P.T.O.

b) A column ISHB 350 @ 67.4 kg/m carries an axial factor load of 1700 kN. Design a suitable gusseted base (Design of not expected). the base is rest on M20 grade of concrete pedestal. **[6]**

OR

Q4) a) Design a column of a building with an effective length of 3.2 m subjected to a factored load of 500 kN and a factor moment of 5 kNm. Check for section strength only. **[6]**

b) Design a laced column with 2 channel section placed back to back has an effective length of 11 m carries a factored load of 1200kN. Calculate spacing between two channels. **[4]**

Q5) a) Explain laterally supported and unsupported beam with suitable example.**[4]**

b) Design a laterally supported simply supported beam of 7 m effective span. It carries a load of 250 kN which is uniformly distributed load over the whole span. In addition the beam carries a point load of 100kN at mid span. **[12]**

OR

Q6) An ISLB 600@ 99.5 kg/m has been used as a simply supported beam over 7.2m span. Determine the intensity of uniformly distributed load excluding self weight so that the beam carries in flexure. Assume the compression flange of the beam is laterally unrestrained throughout the length against lateral buckling. **[16]**

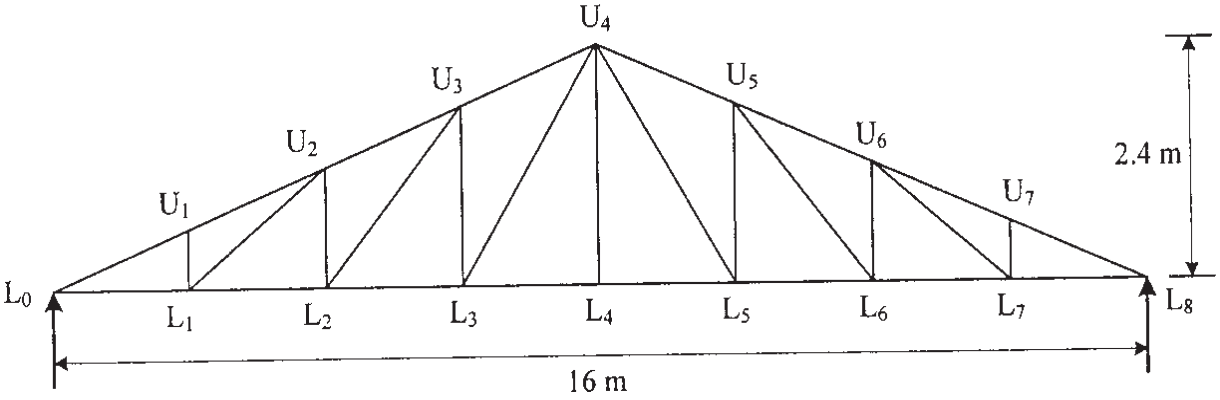
Q7) a) Differentiate between stiffened and un-stiffened seated connection with suitable sketches. **[6]**

b) An ISLB 300 @ 37.7 kg/m transmit an end reaction of 385 kN, under factored factor load to the web of ISMB 450 @ 72.4kg/m. design a bolted framed connection assuming bolt 4.6 grade. **[10]**

OR

Q8) A simply supported welded plate girder of an effective span of 26 m subjected to uniformly distributed load 35 kN/m throughout the span excluding self weight. Assume compression flange to be laterally supported design cross section of the girder. Also design end bearing and intermediate stiffener. **[16]**

Q9) A truss shown in Fig. is spaced at 4m c/c used for an industrial building situated at pune. The truss is covered with AC sheets of weight 180 N/m^{2}Calculate the panel point dead, live, and wind load. Design members L_0 L_1, U_1 L_1 and L_0 U_1. The design wind pressure is 876 N/m^2. (Cpe - Cpi) = ± 0.8 **[18]**



OR

Q10)Design a gantry girder supporting an electronically operated crane to the following data. **[18]**

Capacity of Crane = 250 kN

Span between crane rails = 16m

Self weight crane girder = 150kN

Weight of crab, electric motor, Hook, trolley etc. = 50 kN

Minimum hook approach = 1.0 m

Wheel Base = 3.5m

Span of Gantry = 6.5m

✡ ✡ ✡

Total No. of Questions : 12]

SEAT No. :

P1684

[Total No. of Pages : 3

[5058]-304
T.E. (Civil)
FLUID MECHANICS - II
(2012 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Figures to right indicates full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) A kite weighing 20 N has effective area of $1.1m^2$. The tension in the kite string is 36 N when the string makes an angle of 47° with the horizontal. For a wind of 35 km/hr, what are the coefficients of lift and drag if the kite assumes an angle of 10° with the horizontal? Take specific weight of air as $11.8\ N/m^3$. **[4]**

b) Draw approximate flow pattern and the pressure distribution around a flat plate placed perpendicularly in a stream flow. **[3]**

OR

Q2) A cylindrical tank 12m high, containing water upto top is completely emptied through a hole located in the bottom in 8.4 minutes. How long would it take for the water level to drop form the top of the tank when full to 4 m from the top? **[7]**

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

b) Calculate critical depth for a discharge of 6 m^3/s in the following channels: **[3]**

i) Rectangle channel with base width (B) = 2.0 m

ii) Triangular channel with side slope 1:0.5.

OR

Q4) a) Classify channel flows. **[3]**

b) Draw and explain specific force diagram. **[4]**

P.T.O.

Q5) Derive relation between conjugate depths. **[7]**

OR

Q6) Determine the dimensions of concrete lined (Manning's roughness coefficient 'n' = 0.015) trapezoidal channel of efficient proportions to carry a discharge of 7.0 m^3/s. The bed slope of the channel is 0.0006 and side slope 1V : 1.25 H. **[7]**

Q7) a) Derive expressions for force exerted and efficiency for the case jet striking on symmetrical moving curved vane at the centre. Also derive expression for maximum efficiency. **[8]**

b) A centrifugal pump with external diameter 600 mm and internal diameter 200 mm delivers 500 *lps* of water against a head of 15 m. The speed of the pump is 600 rpm. The vanes of the impeller are curved backwards at an angle of 30º to the wheel tangent at outlet. The velocity of flow is constant at 2 m/s. If the entry to the pump is radial, determine: **[8]**

i) power required,

ii) efficiency,

iii) Minimum Starting Speed.

OR

Q8) a) Water impinges on a smooth moving curved vane under the following conditions: **[9]**

velocity of vane = 15 m/s; direction of jet at entry to vane = 30º to the direction of the vane; velocity of jet = 30 m/s. At the exit side the vane makes an angle of 170º with the direction of motion of the vane (i.e. it is curved backwards). Find:

i) the vane angle at entry so that the water strikes the vanes tangentially;

ii) the absolute velocity of the water after leaving the vane and its direction;

iii) the work done on the vanes per unit weight of water supplied.

b) Define various heads of centrifugal pump. Draw a neat sketch showing all heads. **[7]**

Q9) a) Design a Pelton wheel which is required to develop 1500 kW, when working under a head of 160 m at a speed of 420 rpm. The overall efficiency may be taken as 85%, and assume other data required. **[8]**

b) Define unit quantities and derive expressions for each of them. **[9]**

OR

Q10)a) Draw a neat sketch showing sectional arrangement of Francis turbine and explain the working of each component part. **[9]**

b) A turbine develops 7355 kW under a head of 24.7 m at 210 rpm. What is its specific speed? Indicate the type of turbine suitable for the purpose. If this turbine is tested in the laboratory where the head of water available is only 7.5 m, what power will it develop and at what speed? **[8]**

Q11)a) Starting from the basic principle, derive an expression of GVF for a wide rectangular channel in the form. **[8]**

$$\frac{dy}{dx} = S_o \frac{1 - \left(\frac{y_n}{y}\right)^{10/3}}{1 - \left(\frac{y_c}{y}\right)^3}$$

Where, dy/dx = slope of water surface profile, S_o = bed slope

y_n = normal depth, y_c = critical depth.

b) Explain the Graphical Integration Method of GVF computation. **[8]**

OR

Q12)a) Explain the profiles on mild slope. Give example of each profile. **[8]**

b) A wide rectangular channel carries a flow of 10 $m^3/s/m$ width of the channel with a bed slope of 1 in 3000 and Manning's n = 0.015. If the depth at a section is 4.0 m, determine how far upstream or downstream of the section, the depth of flow would be within 5% of the normal depth. Use direct step method with two steps. Classify and sketch the profile. **[8]**

Total No. of Questions :12]

SEAT No. :

P1685

[Total No. of Pages :3

[5058] - 305

T.E. (Civil)

INFRASTRUCTURE ENGINEERING

(2012 Course) (End Semester) (Semester - I) (301002)

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, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Compare railway transportation with Road transportation and mention characteristics of railway transportation. **[6]**

OR

Q2) Discuss the provision made for airports & ports with reference of 12th five year plan. **[6]**

Q3) Describe the functions and requirements of rail in a railway track **[8]**

OR

Q4) a) Define the following. **[4]**

i) Turnout

ii) Tongue rail

iii) Stock rail

iv) Switch

b) What is creep? What are its effects? **[4]**

Q5) Explain in brief the Vacuum Dewatering System. **[6]**

OR

P.T.O.

Q6) What is slip form shuttering? State the distinct advantages of this method over the conventional method. **[6]**

Q7) a) State the circumstances under which Tunneling operation is desirable. **[6]**

b) Write short note on : Earth Pressure Balance Method. **[6]**

c) State the general sequence of operation for driving tunnels through hard rock. **[4]**

OR

Q8) a) Explain in detail NATM construction technique. **[6]**

b) Discuss in detail classification of tunnels based on shape. **[6]**

c) Write short Note on : Pilot Tunnel. **[4]**

Q9) a) Define a port and bring out the difference between a port and harbour. **[6]**

b) Define Harbour. Explain in brief classification of harbour based upon utility. **[6]**

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

OR

Q10)a) Discuss in detail various methods of construction of breakwater. **[6]**

b) Write short note on : Marin Railway. **[6]**

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

Q11)a) Differentiate between labor & equipment oriented works. **[6]**

b) What are the factors affecting for the selection of machinery for any earth work. **[6]**

c) Write short note on : Preventative maintenance of equipment. **[6]**

OR

Q12)a) What are the factors to be considered for calculation of output estimation of equipment. **[6]**

b) Write short note on: **[12]**

i) Economic life of equipment

ii) Backhoe

iii) Dumpers

Total No. of Questions : 10]

SEAT No :

P1686

[Total No. of Pages : 3

[5058]-306
T.E. (Civil)
ADVANCED SURVEYING
(2012 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer to the Two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) Attempt the following:

a) Explain various points to be considered while selecting triangulation station. **[5]**

b) Explain with neat sketches working of GPS in association with space, control and user segment. **[5]**

OR

Q2) Attempt the following:

a) What are the methods of locating Sounding? Explain anyone of them. **[5]**

b) Explain in detail setting out of a tunnel site. **[5]**

Q3) Attempt the following:

a) Derive the equation for determination of difference in elevation between two points for angle of elevation. **[5]**

b) Two Triangulation stations A and B 110 km apart having elevations 125 m and 502 m respectively. The intervening peak C 60 km from A has an elevation of 131 m. Ascertain if point A is visible from B. If necessary find the height of scaffolding at B so that the line of sight has a minimum clearance of 3 m anywhere. **[5]**

OR

Q4) Attempt the following:

a) Explain with neat sketch the analytical method of solving three points in hydrographic survey. **[5]**

P.T.O.

b) The following reciprocal observations were made from points A and B

i) Horizontal distance between A and B = 4950m

ii) Angle of Elevation of B at A = 1° 05′ 20″

iii) Angle of depression of A at B = 1° 01′ 05″

iv) Height of instrument at a = 1.45m

v) Height of instrument at B = 1.55m

vi) Height of signal at A = 6.25m

vii) Height of signal at B = 6.35m

Find the difference of level between A and B.

Take R sin 1″= 30.88m **[5]**

Q5) Attempt the following

a) Describe any two laws of weights of an observation with help of suitable example. **[8]**

b) What do you understand by method of correlates? **[10]**

The angles from triangle ABC were recorded as follows. Calculate the corrected values of angles. Use method of Correlates

A = 77° 14' 22"	Weight - 2
B = 49° 40' 31"	Weight - 1
C = 53° 04' 53"	Weight - 3

OR

Q6) Attempt the following:

a) Define the terms any four

i) MPV

ii) True Value

iii) Residual error

iv) Weight of an observation

v) Independent quantity **[8]**

b) Find the most probable values of the angles A,B and C from the following observations at one station:

A = 76° 42' 45" with weight 4

A + B =134° 36' 34" with weight 3

B + C =185° 35' 27" with weight 2

A + B + C =262° 18' 11" with weight 1

Use method of Normal Equation **[10]**

Q7) Attempt the following:

a) What are the various methods of determining scale of Vertical photograph? **[8]**

b) The ground length of a line PQ is known to be 550m and the elevations of P and Q are respectively 500m and 300m above mean sea level. On a vertical photograph taken with a camera having focal length of 20 cm include the images p and q of these points and their photographic co-ordinates are xp = + 2.70cm, yp = +1.38cm, xq=-1.92cm, yq=+3.65cm.

The distance pq scaled directly from photograph 5.221 cm. Calculate the flying height above the mean sea level. **[8]**

OR

Q8) Attempt the following:

a) Define parallax of a point and describe the procedure of measuring parallax difference using a parallax bar. **[8]**

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

i) Crab Drift

ii) Tilted and Oblique Photographs

Q9) Attempt the following:

a) Explain use of remote sensing in Civil Engg. Also Compare Arial photograph with satellite images. **[8]**

b) What is GIS? Explain in detail the component parts of GIS. **[8]**

OR

Q10) Attempt the following:

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

i) Digital image processing.

ii) Active and Passive remote sensing.

b) Explain in detail applications and limitations of GIS. **[8]**

X X X

Total No. of Questions :12]

SEAT No. :

P1687

[Total No. of Pages : 3

[5058] - 307

T.E. (Civil)

FOUNDATION ENGINEERING

(2012 Pattern) (Semester - II) (End Sem.)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4 and 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) ***Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) Explain Standard penetration test. What are the various corrections? What is the importance of this test in foundation engineering? **[6]**

OR

Q2) The inner diameters of sampling tube and that of cutting edge are 72 mm and 70 mm respectively. Their outer diameters are 74 mm and 76 mm respectively. Determine the inside clearance, outside clearance and area ratio of sampler. **[6]**

Q3) Enlist the assumptions made in Terzaghi's theory for bearing capacity determination and state Terzaghi's equation for bearing capacity with meaning of each term. **[7]**

OR

Q4) Write notes on: **[7]**

a) Bearing capacity of layered soil,

b) Effect of depth on bearing capacity,

c) Effect of eccentricity on bearing capacity.

P.T.O.

Q5) A clay stratum 6 meters thick has initial void ratio of 1.52 and effective overburden pressure of 125 kN/m^2. When the sample is subjected to increase in pressure of 100 kN/m^2, the void ratio reduces to 1.45. Determine the coefficient of volume compressibility, compression index and final settlement of stratum. **[7]**

OR

Q6) Explain with a neat sketch, logarithm of time fitting method for determination of coefficient of consolidation. **[7]**

Q7) a) Explain pile load test with its limitations. **[6]**

b) Determine the capacity of pile by using following data. Diameter of pile = 600 mm, length = 7 m, $\phi = 30°$, soil density = 17 kN/m^3, c = 20 kN/m^2, reduction factor, $\alpha = 0.5$, Nc = 65, Nq = 35, $N\gamma = 18$, factor of safety = 3. **[6]**

c) Enlist the types of piles according to function. **[5]**

OR

Q8) a) A group of piles consists of 15 piles arranged in three rows and five columns. Compute the efficiency of pile group by-Felds rule. **[5]**

b) What is Caission disease? How it is controlled? **[6]**

c) What do you understand by 'Tilt' and 'Shift'? What are the remedial measures to rectify the same? **[6]**

Q9) a) Calculate the factor of safety of a cantilever sheet pile with the following details. **[5]**

i) Length of sheet pile = 8 m.

ii) Depth of embedment = 5 m,

iii) Angle of internal friction of soil = 30°.

b) What is cofferdam? Where they are used? **[5]**

c) Discuss any three types of cofferdams. **[6]**

OR

Q10)a) Explain 'vibroflotation technique' of soil improvement. **[5]**

b) Explain 'swelling pressure test' with neat sketch. **[5]**

c) State and explain various design principles to be followed during construction of foundation on black cotton soil. **[6]**

Q11)a) What are the advantages and disadvantages of geosynthetics over conventional materials? **[6]**

b) Explain any three types of geosynthetics. **[6]**

c) Explain the use of geosynthetics in bearing capacity improvement. **[5]**

OR

Q12)a) What do you mean by 'Liquefaction'? What are its effects on built environment? **[6]**

b) Explain different types of seismic waves. **[6]**

c) Explain how 'liquefaction susceptibility' of a soil is determined? **[5]**

●●●●●

Total No. of Questions : 10]

SEAT No. :

P1688

[Total No. of Pages : 3

[5058]-308
T.E.(Civil)
ENVIRONMENTAL ENGINEERING-I
(2012 Course)(Semester-II)(End semester)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2,Q3or Q4, Q5 or Q6 , Q 7 or Q 8, Q 9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables are allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) What sound pressure level results from combining the following three levels-65 dB, 78 dB and 75 dB. **[6]**

b) Write a note with a neat sketch on: Fabric filter. **[4]**

OR

Q2) a) Following is the population data for a town. Water supply scheme is to be designed for this town with a design period of 30 years. Find the population at the end of the year 2040 by arithmetical method. **[6]**

Year	1970	1980	1990	2000	2010
Population	48,000	59,000	67,000	76,000	89,000

b) Draw a flow diagram of a public water supply scheme and explain each component. **[4]**

Q3) a) Explain following terms with unit: **[6]**

i) Weir loading

ii) Overflow rate

iii) Flow through velocity

b) Explain cascade aerator with a neat sketch. **[4]**

OR

P.T.O.

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

b) Write a procedure for the determination of pH and alkalinity of water. **[4]**

Q5) a) Acidity introduced by alum dose of 90mg/lit is to be neutralised using lime as CaO. Commercial CaO available is of 85% purity. Work out the quantity of the commercial CaO required in kg/day, if the raw water to be treated is 5 MLD. **[8]**

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

OR

Q6) a) A water treatment plant treats 200 m^3/hr. of water. Work out the following with respect to flocculator: **[8]**

i) Dimensions of flocculator unit.

ii) Power input by paddles to water.

iii) Size and number of paddles.

Assume μ_{water}=0.89 □ × □ 10^{-3} N.s/m^2.

b) Explain with a neat sketch diffused double layer theory. **[8]**

Q7) a) What is break point chlorination? Explain with figure What are its advantages? **[8]**

b) Explain adsorption technique with sketch for removal of odour and colour. **[8]**

OR

Q8) a) What do you mean by disinfection? Discuss the factors affecting efficiency of disinfection. Enlist at least four disinfectants used in water treatment plant and discuss anyone in detail. **[8]**

b) Explain zeolite process in detail with neat sketch. **[8]**

Q9) a) Write a short note on: **[9]**

i) Reverse osmosis

ii) Packaged water treatment plant

b) Explain the following layout systems for water distribution: **[9]**

i) Tree or Dead end system

ii) Ring or Circular System

OR

Q10) a) Find required balancing capacity of the reservoir by analytical method for the following data: **[9]**

Population : 1.0 million.

System of water supply : continuous

Rate of water supply : 270 lit/capita/day.

Break-up of water demand is as follows:

Sr.No.	Time	Liters per capita
1	7 am to 1 pm	100
2	1 pm to 5 pm	45
3	5 pm to 11 pm	95
4	11 pm to 2 am	20
5	2 am to 7 am	10
	TOTAL	270

Water is supplied from the treatment plant at a uniform rate of 11.25 million lit/hour for all 24 hours.

b) What do you mean by rain water harvesting? Write a necessity of rain water harvesting system. Draw a sketch of 'Roof Top Rain Water Harvesting System for a bungalow. **[9]**

Total No. of Questions :12]

SEAT No. : ____

P2196

[Total No. of Pages : 6

[5058]-309
T.E. (Civil Engineering)
STRUCTURAL DESIGN -II
(2012 Course) (Semester-II)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q10 and Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of IS 456-2000 and non programmable calculator is allowed.***
5) ***Mere reproduction from IS code as answer, will not be given full credit.***
6) ***Assume suitable data, if necessary.***

Q1) a) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[3]**

b) Explain need of Under reinforced section in L.S.M. Design. **[3]**

OR

Q2) Explain the terms bond stress and development length. Calculate development length for 16mm diameter bar in compression and tension by both methods (WSM and LSM). Use M20 concrete and Fe 500 steel. **[6]**

Q3) Calculate the moment of resistance by LSM for flanged beam section detailed as below: **[8]**

a) Width of rib = 230 mm

b) Effective flange width = 1400 mm

c) Thickness of flange = 125 mm

d) Effective depth = 565 mm

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

f) Use M20 grade of concrete and Fe 415 grade of steel.

OR

P.T.O.

Q4) A rectangular beam section, 230 mm wide and effective depth 415 mm is reinforced with 3 bars of 20 mm diameter in the tensile zone and 2 bars of 16 mm in the compression zone. Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe 415 grade of steel. **[8]**

Q5) Design a cantilever slab for effective span of 1.3 m subjected to floor finish of 2 kN/m^2 and live load 3 kN/m^2. Use Concrete of grade M20 and Fe 500 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

OR

Q6) Design a simply supported slab for a room with clear inner size 3 m x 7 m. The slab is supported by beams of width 230 mm along all the edges. The slab is subjected to floor finish of 1 kN/m^2 and live load 4 kN/m^2. Use Concrete of grade M20 and Fe 500 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

Q7) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Spam AB = 4.5 m, BC = 6.5 m and CD = 5.5 m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 16 kN/m. The beam supports 120 mm slab on both sides. Calculate design moment for span BC after 20% redistribution of moments by considering proper load case. Design span BC for flexure and shear. Draw the reinforcement details. Material-Concrete of grade M25, Fe 500 reinforcement. **[16]**

OR

Q8) Design a continuous beam ABCD for flexure only using IS Code coefficients. AB = BC = CD = 4.2 m. The beam supports 120 mm slab on both sides. The beam carries dead load of 18 kN/m (including its self-weight) and live load of 10 kN/m. Take material M20 and Fe 500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[16]**

Q9) A rectangular RC beam of span 6m, size 300 mm x 600 mm with effective cover 40 mm is subjected to following actions: **[16]**

a) Factored BM = 90 kN.m

b) Factored SF = 60 kN

c) Factored Torsional Moment = 35 kN.m

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

OR

Q10) Design an axially loaded short column to carry a working load of 950 kN. The unsupported length of column is 3.5 m. The column is held in position and not restrained against the rotation at both ends. Also design the footing for this column only for flexure and one way shear. Take SBC = 200 kN/m^2.

Material M 25 and Fe 500 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation. **[16]**

Q11) Design a bi-axial rectangular short column by limit state method with material M25 and Fe 415 to carry a working load of 900 kN. Working moment of 90 kN-m about major axis bisecting the depth of column and 35 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. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. **[16]**

OR

Q12) Design an uniaxial square short column by limit state method with material M25 and Fe 500 to carry ultimate load of 900 kN and working moment of 75 kN-m about major axis bisecting the depth of column. The unsupported length of column is 3.6m. The column is fixed at one end and hinged at the other. Also design the footing for this column only for flexure and punching shear. Take SBC = 225 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[16]**

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

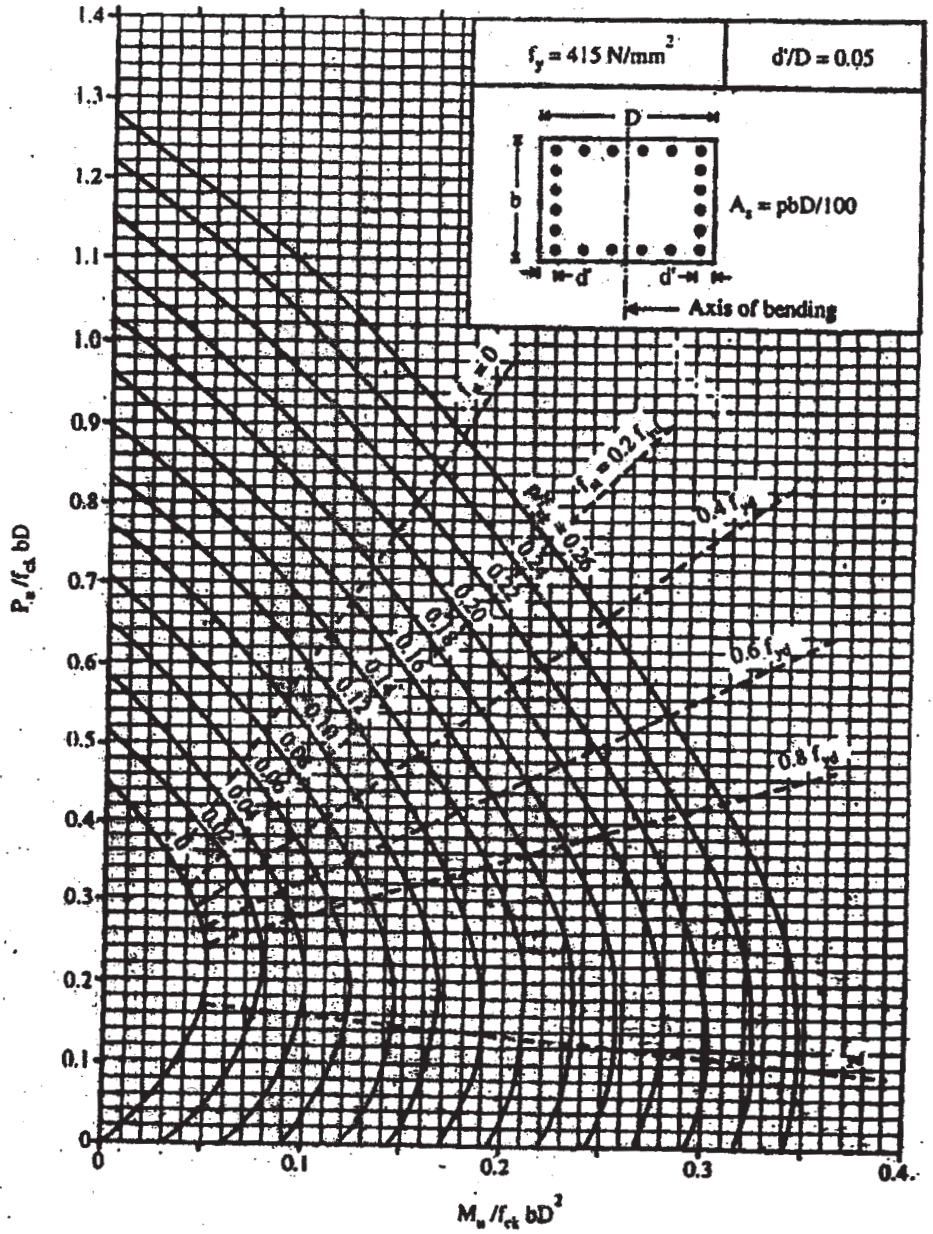


Chart 5

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

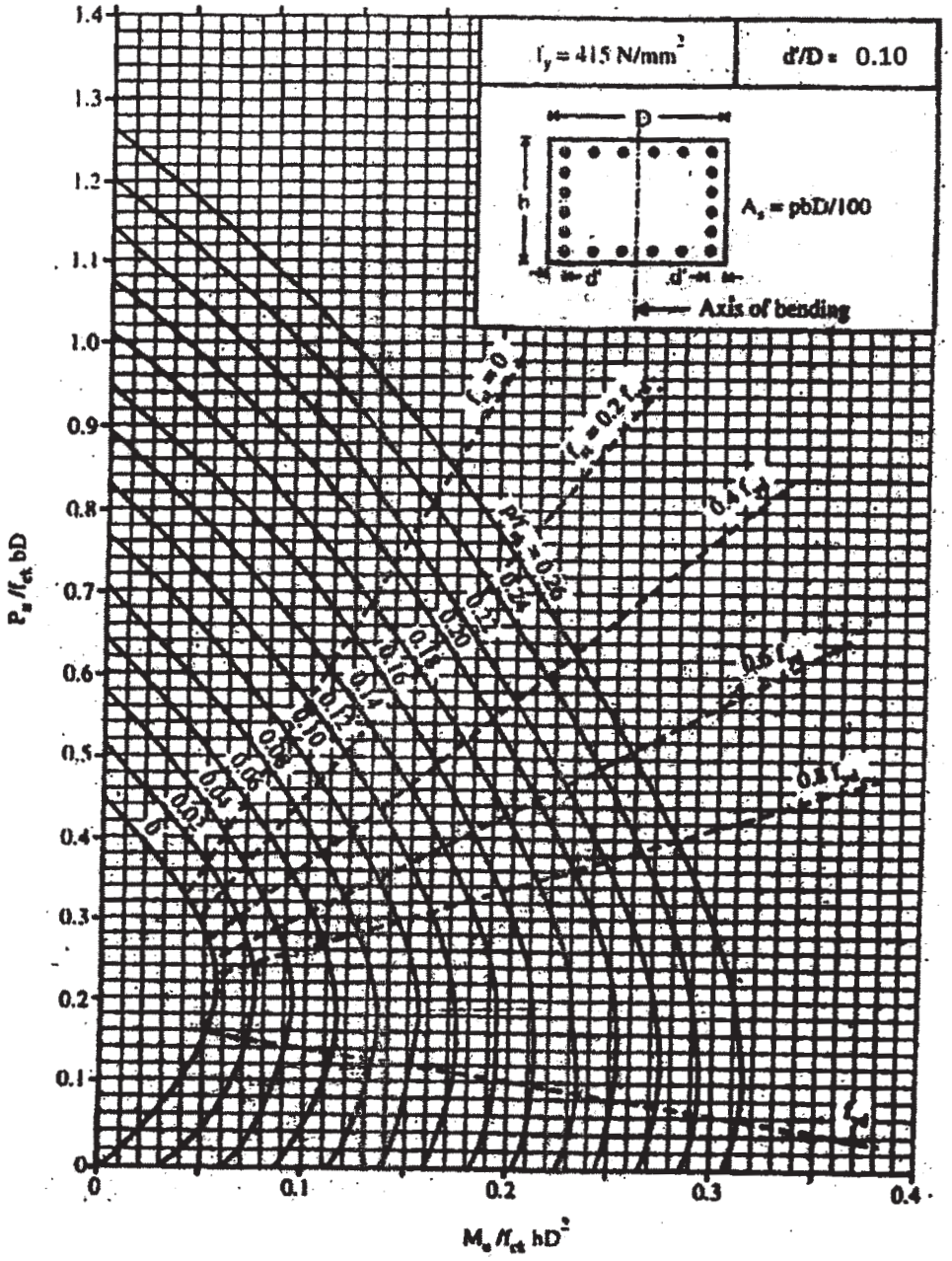
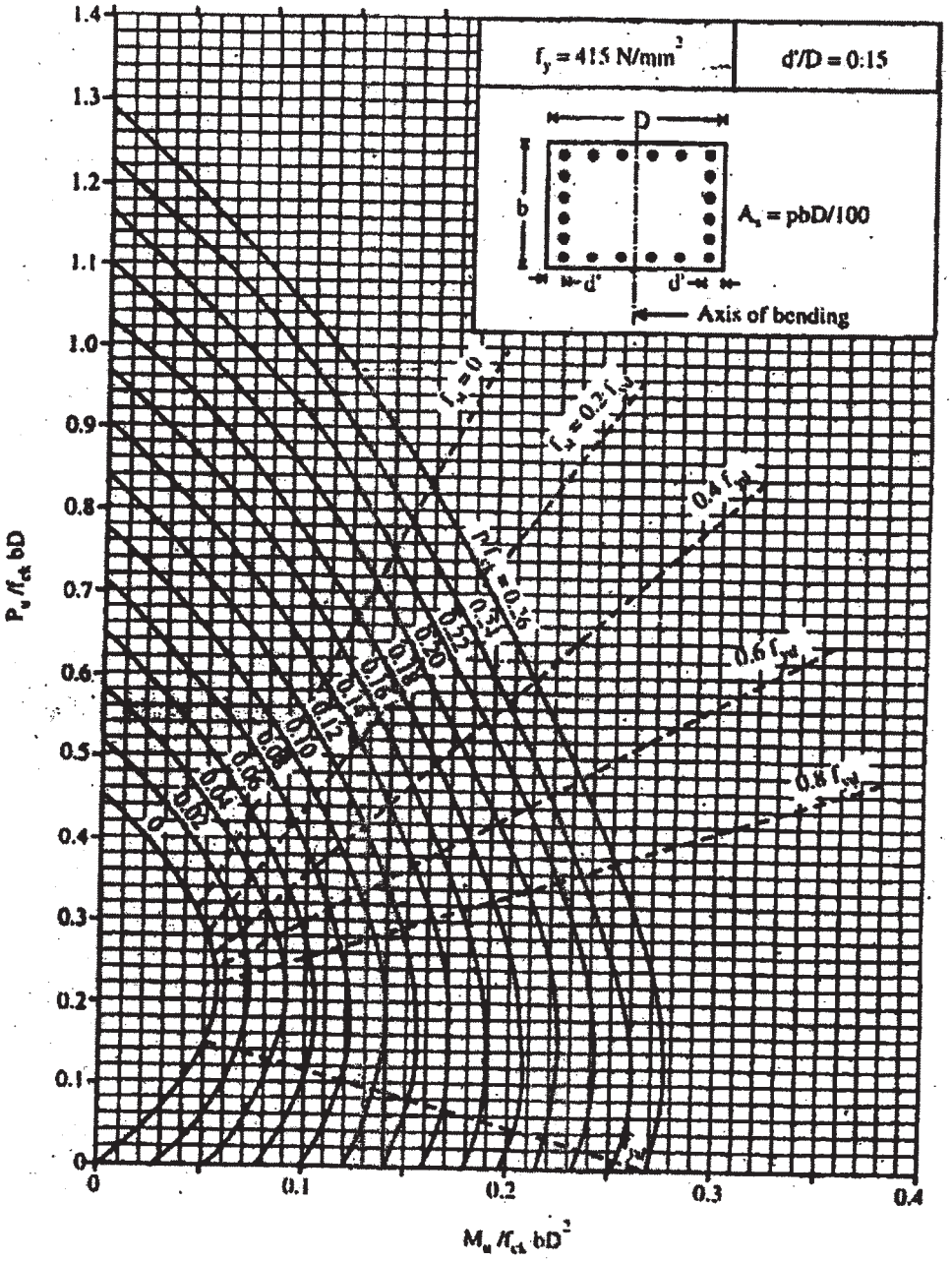


Chart 6

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



●●●●●

Total No. of Questions :10]

SEAT No. :

P1689

[Total No. of Pages :3

[5058] - 310

T.E. (Civil)

PROJECT MANAGEMENT & ENGINEERING ECONOMICS

(2012 Pattern) (Semester - II) (End Semester) (301008)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1or 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 the term "Project Life Cycle". Draw and describe the project life cycle for construction of a dam project showing various phases. **[5]**

b) Differentiate between CPM and PERT. **[5]**

OR

Q2) a) Write a note on Precedence Network. **[5]**

b) Discuss the procedure for step by step network crashing. **[5]**

Q3) a) Write short note on : PMBOK. **[5]**

b) Explain three time estimates in PERT. **[5]**

OR

Q4) a) Discuss in detail various function of management. **[5]**

b) Write short note on: Merits & Demerits of matrix structures. **[5]**

Q5) a) State the laws of diminishing marginal utility. Explain with an example. **[6]**

b) Diffentiate between cost, price and value with an example. **[6]**

c) Discuss the application of economics in civil Engineering. **[6]**

OR

P.T.O.

Q6) a) State & Explain law of supply. **[6]**

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

i) Equilibrium Price

ii) Law of substitution.

c) Discuss the indifference curve technique. **[4]**

Q7) a) Following table shows the annual consumption of the items used in a project and their unit cost. Classify them in A, B, C classes and plot the ABC analysis curve. **[8]**

Item No.	Annual Consumption in unit	Unit Cost (RS)
1	12000	3.00
2	22000	2.50
3	1900	1.70
4	45000	2.80
5	3500	1.70
6	60000	1.50
7	9000	2.0
8	32000	3.0

b) What kind of safety measures are to be adopted on dam construction site. **[4]**

c) Design safety guidelines for high rise building construction. **[4]**

OR

Q8) a) Write Short note on: **[6]**

i) Purchase order

ii) Fixed & variable cost

b) A construction company purchases 10,000 bags of cement annually. Each bag of cement cost Rs. 350/- and cost incurred in procuring each lot is Rs. 160/-. The cost of carrying is 24%. Find EOQ. **[4]**

c) What are the various causes of accidents on construction site. **[6]**

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

i) Break Even analysis.

ii) Pay-back period.

b) A company is thinking about invest in a new project it has two alternatives A and B. Following data pertains to the two alternatives. **[8]**

Particulars	**Project A**	**Project B**
Initial Investment	1,00,000	1,60,000
Cash Inflows in Rs		
Year 1	80,000	90,000
Year 2	60,000	70,000
Interest Rate	10%	10%

Which project will the company select based on NPV and IRR.

OR

Q10)a) Explain in detail various methods of project appraisal. **[6]**

b) Define project. What are the requirements for successful completion of a project . **[6]**

c) State the advantages of NPV method over IRR method. **[4]**

Total No. of Questions :10]

P1690

SEAT No. :

[Total No. of Pages : 4

[5058]-311
T.E.(Mechanical)
DESIGN OF MACHINE ELEMENTS -I
(302041) (2012 Pattern)(Semester-I)(End Smester)

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

Instructions to the candidates:

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

Q1) a) Explain the following: **[6]**

- Factor of safety and service factor.
- Standards & codes.
- Preferred series.

b) Two 50 mm shaft are connected by unprotected type flange coupling. The no. of bolts used are 6 on 150 mm bolt PCD. The shaft transmits 30 KW at 750 rpm. for following safe stresses **[4]**

- Shear stress for shaft - 63 N/mm^2
- Shear stress for flange material - 10 N/mm^2
- Shear stress for key material - 46 N/mm^2
- Crushing stress for key material - 23 N/mm^2

Calculate:

i) key Dimensions

ii) Flange Dimensions

OR

P.T.O.

Q2) a) Classify Keys. Explain why taper is provided on key. **[4]**

b) A hallow circular column of external diameter 250mm and internal diameter 200 mm carries projecting bracket on which a load of 20 KN rests. The centre of load from centre of column is 500 mm. Find the stresses at the sides of column and plot stress distribution plot across circular column. **[6]**

Q3) a) Draw Neat labeled sketch of Un-Protected type flange coupling. **[4]**

b) A forged steel bar of 50 mm diameter is subjected to reversed bending stress of 250 N/mm^2. Assume there is no stress concentration factor. calculate life of bar. **[6]**

Use following data:

- S_{ut}=600 N/mm^2
- Surface finish factor=0.43
- Size factor=0.85
- Reliability factor =0.897 at 90% reliability
- Factor of safety=1.5

OR

Q4) a) Write a short note on endurance limit modifying factors. **[6]**

b) A shaft transmits 20 KW at 200 rpm. It carries a central load of 1000 N and centrally supported at 2.5 m apart. The allowable shear stress for shaft is 42 Mpa. The shock and fatigue factors for bending & torsion are 1.5 1& respectively. Determine shaft diameter by maximum shear stress theory. **[4]**

Q5) a) Explain with neat sketch, re-circulating ball screw. **[4]**

b) A nut and screw combination having double start square threads nominal diameter 25 mm and pitch 5 mm sudjected to axial load of 1000 N. The outer and inner diameter of the screw coller is 50 and 20 mm respectively. The coefficient of friction for collar thread and screw thread are 0.15 & 0.2 respectively. The screw rotates at 12 rpm. Assume uniform wear condition, and allowable bearing pressure is 5.77 N/mm^2. Determine, **[12]**

i) Power required to rotate the screw

ii) Stresses in screw Body & threads

iii) No. of threads of nut in engage with screw.

OR

Q6) a) Following data refers to C-Clamp **[13]**

- Maximum clamping force=4000N
- Screw Type-Single start square threaded
- Nominal Diameter =12 mm
- Pitch=2mm
- Coefficient of collar friction=0.25
- Coefficient of screw friction=0.12
- Mean collar Diameter=12mm
- Operator force at the end of handle=80N
- Distance between the axis of handle and surface of nut in clamped condition=150 mm
- Nut height =25 mm

Detemine,

1) Length of handle if 50 mm additional length for gripping
2) Stresses in screw body at two critical sections
3) Bearing Pressure on screw thread

b) Explain self locking and overhauling of power screw. **[3]**

Q7) a) Explain with neat sketch any four types of screw fastenings. **[4]**

b) With neat sketch write design steps for Turn Buckle, also write any two application. **[6]**

c) A cylindrical head is connected to a flange by 12 bolts, The inside diameter of cylinder is 480 mm& maximum pressure inside is 1.5 N/mm^2 if bolt have permissible shear strength of 80 N/mm^2. Determine the size of bolt neglecting initial tightenings. **[8]**

OR

Q8) a) Write advantage of welded joints. Explain primary and secondary shear stress in eccentrically loaded welded joint **[6]**

b) A welded bracket is shown in figure 1 below, carries a load of 30 KN. Calculate size of weld if shear stress in weld is 80 N/mm^2. **[12]**

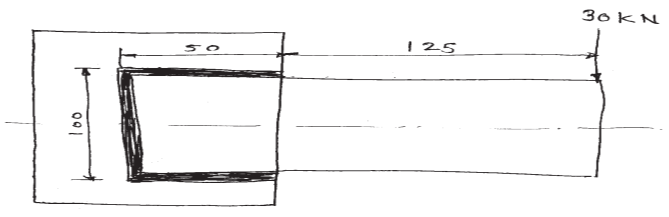


Figure - 1

[All dimensions are in mm]

Q9) a) Explain the term surge in spring. **[4]**

b) Following data is given for helical compression spring **[12]**

- Axial load=8000N
- Spring rate=72 N/mm
- Mean coil diameter=125 mm
- Tensile strength of spring material= 550 MPa
- Modulus of rigidity=80000MPa
- Permissible shear stress for spring wire is half the tensile strength of spring material.
- Standard spring wire diameter=18,19,20,21,22,23,24,25,27,29,30mm

Determine:

1) Wire diameter
2) No.of active coils

OR

Q10)a) Explain different types of stresses induced in helical spring. **[4]**

b) A composite compression spring has two closed coil. Outer spring is of 15 mm longer than inner spring.The outer spring has 10 coils of mean diameter 40 mm & wire diameter 5 mm.The inner spring has 8 coils of mean diameter 30 mm & wire diameter 4 mm. When spring is subjected to an axial load 400 N, Modulus of rigidity may be taken as 84,000N/mm^2. Find. **[12]**

i) Compression of each spring

ii) Load shared by each spring

iii) Shear stress induced in each spring.

❄ ❄ ❄

Total No. of Questions : 9]

SEAT No. :

P1691

[Total No. of Pages : 2

[5058]-312

T.E.(Mechanical Auto)

METROLOGY & QUALITY CONTROL

(2012 Pattern)(End Sem) (Semester-I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Question No. 09 is compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Draw a neat sketch of Vernier caliper and How to calculate least count of Vernier caliper give one example. **[4]**

b) write short notes on- **[6]**

i) Types of standards

ii) Electrical comparator (LVDT)

OR

Q2) a) Write short notes on universal measuring machine **[5]**

b) Explain angle Dekker with neat sketch. **[5]**

Q3) a) Explain Interferometry applied to flatness testing by using optical flat **[5]**

b) Determine the dimensions and tolerances of shaft and hole having size of 30H7f8 fit. (IT7=16i, IT8=25i, D is in a step 18-30mm, Fundamental deviation for f= $-5.5D^{0.41}$) **[5]**

OR

Q4) a) Derive an expression for best wire size for measuring effective diameter. **[6]**
Calculate Effective diameter and best wire diameter for M22×2.5 screw plug gauge by using Floating carriage Micrometer for which reading were taken as

Diameter of standard cylinder 20 mm
Micrometer reading over standard cylinder with two wire is=15.9334mm
Micrometer reading over plug screw gauge with two wire is=15.2245mm

b) Write short notes on Gear tooth vernier caliper **[4]**

P.T.O.

Q5) a) Explain Deming's cycle and 14 point towards quality improvement. **[8]**

b) Explain seven old quality tools. **[8]**

OR

Q6) a) Explain the concept of quality circle and their structure and limitation **[8]**

b) What is cost of quality? Explain its types. **[8]**

Q7) a) Control chart for $\overline{X}$ is to be prepared for a certain dimension of component the sub group size is 4 after 20 sub group it is found that $\Sigma \overline{x} = 825.60$mm and $\Sigma R = 5.60$ mm compute the central line and the control limits for $\overline{X}$ chart d2 for sub group size 4=2.059.

If the specified dimension is 41.0 ± 0.40mm and the above process is in the control and is normally distributed, can it meet the specification requirement? If not, determine the percentage of rejection. **[8]**

b) Explain the following OC curve characteristics

i) Changing of lot size.

ii) Changing of sample size.

iii) Changing of acceptance number

iv) Changing of sample size and acceptance number **[8]**

OR

Q8) a) Explain the Multiple sampling plan with flow chart **[8]**

b) Define producer risk; consumer risk and AOQL and AOQ for the given data calculate sample size and AOQ for single sampling plan. **[8]**

i) Probability of acceptance for 0.4% defective in a lot is 0.558.

ii) Lot size N=10000

iii) np'=1.6 & c=1

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

Q9) Explain the following terms (Any Three) **[18]**

a) KANBAN

b) JIT

c) FMECA

d) DMAIC

e) FIVE S

✓ ✓ ✓

Total No. of Questions : 10]

SEAT No. :

P1692

[Total No. of Pages : 4

[5058]-313
T.E. (Mechanical)
HEAT TRANSFER
(2012 Course) (Semester - I) (End Sem.) (302042)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4 ,Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Draw neat diagrams wherever necessary.***
3) ***use of scientific calculator is allowed.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) Differentiate between steady state and unsteady state heat transfer. Give examples of each. **[4]**

b) A furnace wall lining in made up of a material with k = 2.5 W/mK. The temperatures of the inner and outer surfaces of this plane wall lining are 810°C and 330°C respectively. The outer surface is exposed to ambient air at 30°C with convective heat transfer coefficient = 10 W/m^2K. **[6]**

Calculate:

i) The rate of heat flow per unit area

ii) Thickness of lining in given situation.

iii) The thickness of lining required if the heat flow rate is to be reduced by 50%.

OR

Q2) Heat is generated uniformly in a stainless steel plate having k = 20 W/mK. The thickness of the plate is 1 cm and the heat generation is 500 MW/m^3. If the two sides of the plate are maintained at 100°C and 200°C, respectively. Solving the governing differential equation, calculate the temperature at the centre of the plate. **[10]**

P.T.O.

Q3) a) Derive the expression for Lumped heat capacity with usual notations. **[8]**

b) In what medium is the lumped system analysis more likely to be applicable : in water or in air? Why? **[2]**

OR

Q4) a) An electric motor is to be connected by a horizontal steel shaft (k = 42.56 W/mK), 25 mm in diameter to an impeller of a pump, circulating liquid metal at a temperature of 540°C. If the temperature of electric motor is limited to a maximum value of 52°C with the ambient air at 27°C and heat transfer coefficient of 40.7 W/m^2K, what length of shaft should be specified between motor and pump? Assume insulated tip condition, for fin analysis. **[6]**

b) In some cases, addition of fins may actually decrease the heat transfer from a surface. Justify the statement. **[4]**

Q5) a) Define and explain the significance of Prandtl number. **[4]**

b) Identify the characteristics dimension for following cases in Natural convection:
   i) Vertical cylinder,
   ii) Horizontal cylinder,
   iii) Horizontal plate,
   iv) Sphere. **[4]**

c) Water is flowing at the rate of 50 kg/min through a tube of inner diameter 2.5cm. The inner surface of tube is maintained at 100°C. If the temperature of water increases from 25°C to 55°C, find length of tube required. **[8]**

$Nu = 0.023\ Re^{0.8}\ Pr^{0.4}$, Properties of water : $\rho = 977.8\ kg/m^3$,

$k = 0.6672\ W/m^oC$, $\mu = 405 \times 10^{-6}\ Ns/m^2$, $Cp = 4.187 kJ/kg\ ^oC$.

OR

Q6) a) Explain the significance of thermal boundary layer and velocity boundary layer. **[4]**

b) A hot plate 1m × 0.5 m at 130° C is kept vertically in still air at 20°C.

Find :
   i) Heat transfer coefficient,
   ii) Initial rate of cooling the plate in °C/min.

Assume 0.5 m side is vertical and heat transfer takes place from both the sides of the plates.

Take properties of air as $Cp = 1007\ J/kg\ ^oC$, $k = 0.029\ W/m^oC$,

$\upsilon = 19.1 \times 10^{-6}\ m^2/s$, $Pr = 0.7$

Assume mass of plate = 20 kg and specific heat of plate = 400 J/kg °C

Use $Nu = 0.59\ (GrPr)^{1/4}$. **[8]**

c) Define and explain significance of Nusselt number. **[4]**

Q7) a) If the shape factor of a surface with respect to itself is 0.6, what may be the nature of this surface? Explain with the help of sketch. Also sketch and explain the types of surface which has no (zero) shape factor with respect to itself. **[4]**

b) A gray opaque surface has an absorptivity = 0.8. It is maintained at 100°C . It receives an irradiation of 1,000 W/m^2. Its surface area is 0.1 m^2. Calculate, **[8]**

i) Radiosity of the surface,

ii) Net radiative heat transfer rate from the surface.

Recalculate the above quantities, if the surface is black.

c) What is the significance of radiation shield? List few applications of radiation shield. **[4]**

OR

Q8) a) Explain with suitable illustration how the concept of surface resistance and space resistance is used for solving radiation heat transfer problems? **[8]**

b) Determine the heat lost by radiation pre meter length of a 100 mm diameter pipe at 300 °C if it is. **[8]**

i) Located in a large room of brick wall whose temperature is 20°C.

ii) Located in a 200 mm diameter brick conduit at a temperature of 20°C.

$\varepsilon_{pipe} = 0.79$, $\varepsilon_{brick} = 0.93$.

Q9) a) Write a note on Forced convection boiling (Flow boiling)**.** **[6]**

b) A chemical having specific heat of 3.3 kJ/kgK flowing at the rate of 20,000 kg/hr enters a parallel flow heat exchanger at 120°C. The flow rate of cooling water is 50,000 kg/hr with an inlet temperature of 20°C. The heat transfer area is 10m^2 and overall heat transfer coefficient is 1050 W/m^2 °C. Taking specific heat of water as 4.186 kJ/kgK, find **[8]**

i) Effectiveness of heat exchanger.

ii) Outlet temperature of water and chemical.

c) Define NTU. What does it represent? Is as heat exchanger with a very large NTU (say, 10) necessarily a good one to buy? **[4]**

OR

Q10)a) Draw labeled temperature profiles (with suitable temperature values) of the following types of heat exchangers: **[4]**

i) Parallel flow heat exchanger

ii) Counter flow heat exchanger

iii) Condenser,

iv) Evaporator.

b) Explain phenomenon of nucleate boiling. List the factors that affect nucleate boiling. **[6]**

c) Derive the expression for LMTD for parallel flow heat exchanger. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1693

[Total No. of Pages :4

[5058]-314
T.E.(Mechanical)
THEORY OF MACHINES-II
(2012Course)(Semester-I)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Define the following terms & explain the significance. **[2]**

i) Pressure angle

ii) Contact ratio.

b) A pair of involute spur gears with 20° pressure angle mesh externally and give a speed reduction 3:1. The module is 3mm and addendum is 1.1 module. If the pinion rotates at 120 rpm, determine **[8]**

i) Minimum number of teeth on each wheel.

ii) Contact ratio.

OR

Q2) a) Define the following terms & explain the significance **[4]**

i) Normal circular pitch

ii) Helix angle.

iii) Centre distance in spiral gears

iv) Lead angle of worm.

b) Derive an expression for efficiency of spiral gears. **[6]**

P.T.O.

Q3) A drive is made up of two spiral gears of same hand, same diameter & of normal pitch 14 mm. The centre distance between the axes of shaft is approximately 150mm. The speed ratio is 1.6 & the angle between shaft axes is 75°. Assuming coefficient of friction 0.105 determine. **[10]**

i) Spiral angle on each wheel.

ii) Number of teeth on each wheel.

iii) Efficiency of drive

iv) Maximum efficiency.

OR

Q4) The annulus A in an epicyclic gear train rotates at 300 rpm about the axis of fixed sun gear which has 80 teeth. A three armed spider is driven at 180 rpm. Determine the number of teeth required on planet P. Refer Fig.1 **[10]**

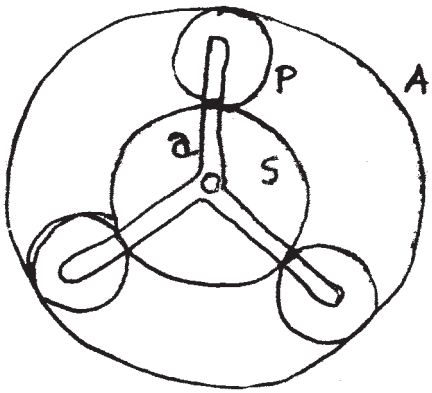


Fig. 1

Q5) a) Explain the advantages and disadvantages of stepped regulation and stepless regulation drives in context of automotive application. **[4]**

b) Explain the following **[12]**

i) Disc variator

ii) Cone variator

iii) Continuous variable Transmission

iv) Infinitely variable Transmission

OR

Q6) A rotor of the turbine of a ship has a mass of 2500 kg and rotates at a speed of 3200 rpm. Counter clockwise as seen from stern. The rotor has a radius of gyration of 0.4 m. Determine the gyroscopic couple and its effect when

a) Ship steers to the left in a curve of 80m radius at a speed of 7.75 m/s

b) Ship pitches 5 degrees above and below the mean position and the bow is descending with its maximum velocity. The pitching motion is SHM with a periodic time of 40 seconds.

c) Ship rolls and at instant, its angular velocity is 0.4 rad/s clock wise when viewed from stern . Also find the maximum angular acceleration during pitching.

[16]

Q7) a) Explain the following terms **[8]**

i) Precision points

ii) Function generation

iii) Body guidance

iv) Chebysheve spacing

b) Design a slider crank mechanism to coordinate three positions of the input and output links for the following data by inversion method. **[8]**

$\theta_{12} = 30°$ $S_{12} = 40$ mm

$\theta_{13} = 60°$ $S_{13} = 96$ mm.

Eccentricity = 20 mm

OR

Q8) a) Design a four link mechanism to coordinate three positions of input and output links for the following angular displacements by inversion method.

$\theta_{12} = 35°$ $\phi_{12} = 50°$

$\theta_{13} = 80°$ $\phi_{13} = 80°$ **[8]**

b) Design a slider crank mechanism to coordinate three positions of crank and slider for the following data by relative pole method. **[8]**

$\theta_{12} = 40°$ $S_{12} = 180$ mm

$\theta_{13} = 120°$ $S_{13} = 300$mm

Take eccentricity of slider as 20 mm.

Q9) a) Derive an expression for displacement, velocity and acceleration of a flat faced follower when it makes contact with a circular arc cam at **[14]**

i) Circular Flank

ii) Nose

b) Explain advanced cam curves. **[4]**

OR

Q10) A cam is to give the following motion to a knief edge follower

- To raise the follower through 30 mm with uniform acceleration and deceleration during 120° rotation of cam.
- Dwell for next 30°
- To lower the follower with SHM during next 90° rotation of cam
- Dwell for rest of cam rotation

Use following data to draw the cam profile

Minimum radius of cam 30 mm

Speed 800 rpm counter clockwise

Follower axis inline.

Also draw displacement, velocity and acceleration diagrams for the motion of follower in one complete rotation given to the cam, indicating the main values.

[18]

◀▶ ◀▶ ◀▶

Total No. of Questions : 12]

SEAT No. :

P3863

[Total No. of Pages : 5

[5058]-315

T.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(End Sem) (2012 Course) (302045) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Discuss important factors considered for selection of hydraulic fluids. **[4]**

b) What are the different materials used for seals in hydraulic system components. What are the points considered while selecting seal material? **[4]**

OR

Q2) a) Explain difference between flared fitting and a compression fitting. **[3]**

b) What are the functions of reservoir? Draw a neat sketch of standard reservoir by showing its internals, external features. **[5]**

Q3) a) State the important factors for selection of a pump for hydraulic power application. **[2]**

b) Explain the applications of accumulator as **[4]**

i) Power saving device.

ii) Hydraulic shock absorber device.

OR

Q4) A Pump used in power unit is found to be making noise. What may be the probable causes of this noise? What are the different remedies to reduce this noise? What precautions are taken to avoid the pump noise? Explain in brief. **[6]**

P.T.O.

Q5) What is the purpose of providing cushioning in cylinder? With the help of neat sketch explain how it is achieved. **[6]**

OR

Q6) What factors will you consider in selecting a hydraulic motor? Mention two allocations of usages of hydraulic motor with their types. **[6]**

Q7) a) Draw and explain the application of a pilot check valve for locking a double-acting cylinder. **[8]**

b) List four important considerations to be taken into account while designing a hydraulic circuit. **[4]**

c) Analyze the circuit shown in Fig. 1 and label the components. **[6]**

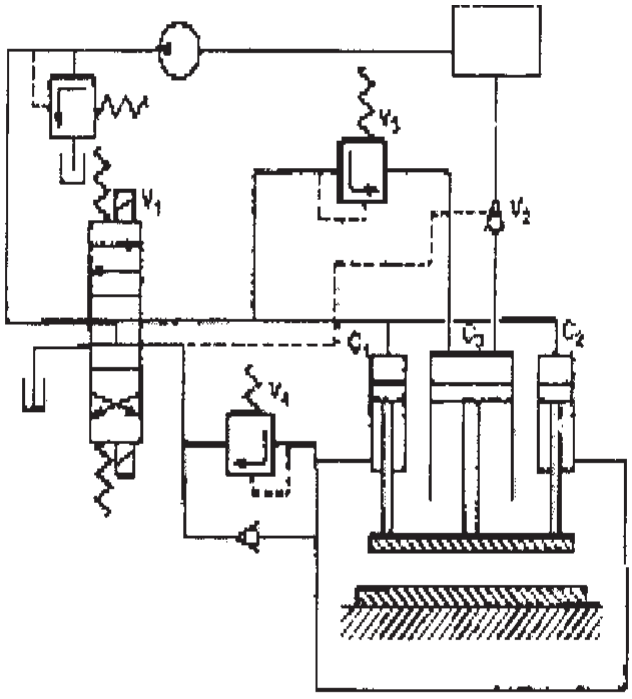


Fig.1

OR

Q8) a) Draw and explain fail-safe circuit? **[8]**

b) What are the advantages of a regenerative circuit? **[4]**

c) Analyze the circuit shown Fig. 2 and label the components. **[6]**

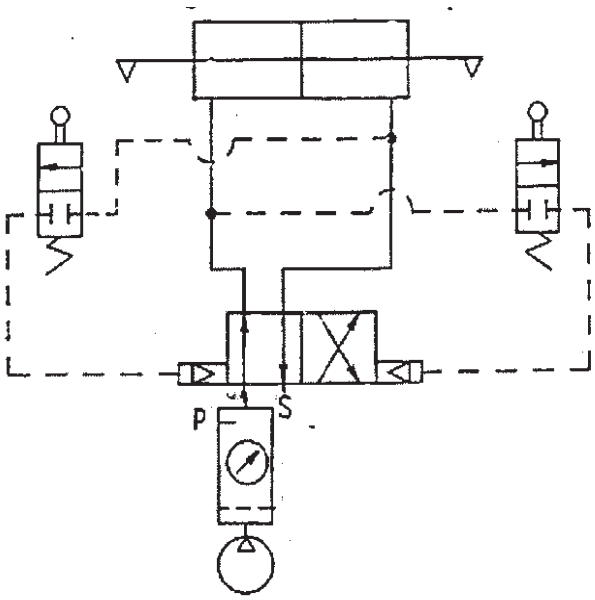


Fig.2

Q9) a) With the help of neat sketch explain a typical compressed air generation and distribution system. **[6]**

b) Explain with neat sketch working of "AND" valve and with the help of circuit diagram explain any one typical application of it. **[6]**

c) Name four reasons for considering the use of pneumatics instead of hydraulics. **[4]**

OR

Q10)a) What is the purpose of providing 'Pressure Regulator' in pneumatic circuits? **[8]**

Explain with the help of neat sketch construction and working of any one type of pressure regulator.

b) Explain with neat sketch working of "AND" valve and with the help of circuit diagram explain any one typical application of it. **[8]**

Q11)a) Two double acting hydraulic cylinders are synchronized by connecting them in series. The load acting on each cylinder is 4000 N. Cylinder 1 has the piston diameter 50 mm and rod diameter 20 mm. If the cylinder extends 200 mm in 0.05 second, find the following: **[10]**

i) The pressure requirement of the pump.

ii) Flow capacity of the pump.

iii) Pump output.

iv) Capacity of motor driving pump if overall efficiency of pump is 80%.

b) An actuator forward speed is controlled by a meter-in circuit. The pressure setting of relief valve is 50 bar and the pump discharge is 30 liters/min. The cylinder has to carry a load of 3600 N during the forward motion. The area of piston is 15 cm^2 and rod area is 8 cm^2. The flow control valve with internal free flow check is set to allow only 10 liters/min. **[6]**

Calculate the pressure drop across the flow control valve during extension, forward speed and return speed of the circuit.

OR

Q12) A press cylinder having a bore diameter of 140 mm and a 100 mm diameter rod is to have an initial approach speed of 5 m/min and a final pressing speed of 0.5 m/min. The system pressure for a rapid approach is 40 bar and for final pressing is 350 bar. A two-pump, high-low system is to be used. Assume overall efficiency of 0.85 for all pumps. Draw hydraulic circuit and determine the following: **[16]**

a) The flow to the cylinder for the rapid approach and final pressing.

b) Suitable discharge of high pressure and low pressure pump.

c) The pump motor power required for high pressure and low pressure pump.

d) The pump motor power required if single pump of 350 bar pressure rating is used.

e) Saving in power consumption if two pumps are used in system.

Based in above calculations suggest rating and settings of all components used in circuit.

DATA

1. Suction Strainer:

Model	Flow capacity (lpm)
S_1	38
S_2	76
S_3	152

2. Pressure Gauge:

Model	Range (bar)
PG_1	0-25
PG_2	0-40
PG_3	0-100
PG_4	0-160

3. Vane Pump:

Model	Delivery in/Pm		
	at 0 bar	at 35 bar	at 70 bar
P_1	8.5	7.1	5.3
P_2	12.9	11.4	9.5
P_3	17.6	16.1	14.3
P_4	25.1	23.8	22.4
P_5	39.0	37.5	35.6

4. Relief Valve:

Model	Flow capacity (lpm)	Max. Working pressure and bar
R_1	11.4	70
R_2	19	210
R_3	30.4	70
R_4	57	105

5. Flow Control Valve:

Model	Working Pressure (bar)	Flow Range (lpm)
F_1	70	0-4.1
F_2	105	0-4.9
F_3	105	0-16.3
F_4	70	0-24.6

6. Directional Control Valve:

Model	Max. Working Pressure (bar)	Flow Capacity (lpm)
D_1	350	19
D_2	210	38
D_3	210	76

7. Check Valve:

Model	Working Pressure (bar)	Flow Range (lpm)
C_1	210	15.2
C_2	210	30.4
C_3	210	76

8. Sequence Valve:

Model	Max. Working Pressure (bar)	Flow Capacity (lpm)
PO_1	210	19
PO_2	210	38
PO_3	210	76

9. Cylinder (Max. Working Pressure 210 bar):

Model	Born dia. (mm)	Rod Dia. (mm)
A_1	25	12.5
A_2	40	16
A_3	50	35
A_4	75	45
A_5	100	60

10. Oil Reservoirs:

Model	Capacity (litres)
T_1	40
T_2	100
T_3	250
T_4	400
T_5	600

ζ ζ ζ

Total No. of Questions : 10]

SEAT No. :

P1694

[Total No. of Pages : 7

[5058]-316
T.E. (Mechanical)
DESIGN OF MACHINE ELEMENTS - II
(2012 Pattern) (Semester - II) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer five questions from following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to right indicates full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Use of programmable calculator is not permitted.***
6) ***Assume suitable data if necessary.***

Q1) a) State & Explain different types of gear tooth failures, their causes & remedies. **[4]**

b) The following data is given for pair of parallel helical gear made up of steel. **[6]**

Power transmitted = 20 kW

Speed of pinion = 720 rpm

No. of teeth on pinion = 35

No. of teeth on Gear = 70

Center distance = 285 mm

Normal module = 5 mm

Face width = 50 mm

Normal pressure angle = 20º

Ultimate tensile strength = 600 N/mm^2

Surface Hardness = 300 BHN

Grade of Machining = Grade 6.

Service Factor = 1.25

P.T.O.

Calculate:-

i) Helix Angle

ii) The Beam strength

iii) The wear strength

$$Y' = 0.487 - \frac{2.87}{Z'}; K_V = \sqrt{\frac{5.6}{5.6 + \sqrt{V}}}.$$

OR

Q2) a) A steel pinion with 20º full depth involute teeth is transmitting 7.5 KW power at 1000 rpm from an electric motor. The starting torque of motor is twice the rated torque. The number of teeth on the pinion is 25, while the module is 4mm. The face width is 45mm. Assuming that the velocity Factor account for dynamic load, calculate: **[6]**

i) The effective load on gear tooth $Y = 0.487 - \frac{2.87}{Z}$.

ii) The bending stress in gear tooth $K_V = \frac{3}{3 + V}$.

b) With neat sketch, discuss the Force Analysis of Bevel Gear. **[4]**

Q3) a) A pair of straight Bevel gear with 20º pressure angle consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4 mm while the face width is 20 mm. The pinion & gear material has surface hardness of 400 BHN. The pinion rotate at 720 rpm & receives 3 kW power from a motor. The service Factor is 1.5 & Barth Factor Dynamic Loading. Determine the factor of safety in pitting. **[6]**

b) What is preloading? Explain preloading of taper roller bearing with sketch. **[4]**

OR

Q4) a) Classify Bevel Gear. State the advantages & limitations of each type. **[4]**

b) The following data is given for a belt drive.

Diameter of pulley = 250 mm

Shaft Diameter = 20 mm

Power transmitted = 5kW

Speed = 720 rpm

Ratio of Belt tensions = 3:1

Load Factor = 3

Assume the pulley to be placed centrally with the belt tensions acting vertically downward the required reliability of the bearing is 95% with the life of 10,000 Hrs.

Find the Dynamic Load carrying capacity of bearing so that bearing are selected from manufacturer's catalogue which list dynamic load carrying capacity at 90% reliability. **[6]**

Q5) a) Deduce an expression for efficiency of warm & worm gear pair. **[6]**

b) The following Data is given for worm gear pair **[12]**

Pitch circle diameter of worm = 48 mm

Pitch circle diameter of worm gear = 192 mm

Axial pitch of worm = 18.85 mm

Pressure Angle in axial plane of worm = 20.10º

Lead of worm = 18.85 mm

Effective width of worm gear teeth = 36 mm

Worm speed = 3500 rpm.

Permissible bending stress for worm gear = $90N/mm^2$

Worm gear wear factor = $830\ kN/m^2$

Coefficient of friction between worm & worm gear tooth = 0.025

Overall heat transfer co-efficient without fan = $16W/m^2\ ºC$ overall heat transfer coefficient with Fan = $15.2 + 8.25 \times 10^{-3}$ hw, $W/m^2\ ºC$

Effective area of housing = $9 \times 10^{-5} \times (a)^{1.88}$, m^2

Frictional losses in bearing = 4.5% of total input power.

Where n_w = worm speed, rpm.

a = center distance in mm

Determine:-

i) The dimensions of worm gear pair.

ii) The input power rating on the basis of strength.

iii) The temperature of lubricating oil with fan.

Is fan is necessary. Comment.

OR

Q6) a) In a design of worm gear pair why worm gear governs the design. **[4]**

b) The following data refers to worm gear drive used for transmitting 20 kW power from input speed of 1450 rpm. The reduction ratio is 20:5 while the material for worm gear is bronze K = 2.4 MPa. **[14]**

Diameter Factor = 10

Service Factor = 2

Number of starts on worm = 2

Permissible bending strength of worm gear material = 275 MPa

Wear load factor = 2.4 MPa.

Coefficient of friction = 0.026.

Velocity factor $\frac{6}{6+V9}$

Form factor for normal pressure angle of 14.5º = 0.314

Norm gear width = 0.73 × worm PCD.

Factor of safety = 1.

Standard first preference values of module are as follows:-

1, 1.025, 1.6, 2, 2.5, 3.15, 4.5, 6.8, 10, 12, 16, 20 mm.

Design worm & worm gear Drive. Would you recommend blower for gear box? If it is not possible to fit blower then what will be new value of module for worm gear.

Q7) a) A Horizontal Flat belt drive is used to transmit 25kW power from an electric motor running at 1440 rpm to a centrifugal water pump expected to run at 720 rpm. The required center distance is 4.5m. Select the flat belt for the drive. Using following data: **[12]**

Recommended Range of belt speed = 17.8 m/s $\leq$ V $\leq$ 22.9 m/sec.

Load correction factor = Fa = 1.2

Power rating per ply per mm width at 180° arc of contact & V = 10m/sec.

For HI speed belt –0.023 kW/ply/mm.

Standard pulley dia :- 90, 100, 112, 125, 140, 160, 180, 200, 224, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900, 1000, 1120, 1250 mm. Arc of contract correction factor (Fa).

Arc of contact Q	120°	130°	140°	150°	160°	170°	180°
Fa	1.33	1.26	1.19	1.13	1.08	1.04	1.00

Standard Belt width

Num. of ply	Standard belt width b, mm
4	40, 44, 50, 63, 76, 90,100, 112, 125, 152
5	76, 100, 112, 125,152

b) What are different belt tensioning methods, Explain any one with neat sketch? **[4]**

OR

Q8) a) Derive the condition for maximum power transmission capacity of belt drive based on belt strength & friction capacity. **[6]**

b) Show that maximum power transmission capacity of belt occurs at velocity of belt $V=\sqrt{\frac{Fi}{3m}}$; where Fi is the initial tension in the belt & m is mass per unit length of belt. **[6]**

c) What are different modes of roller chain failure. **[4]**

Q9) a) The following data gives a 360 ºC hydrodynamic Bearing

Radial load = 10 kN

Journal speed = 1450 rpm.

I/d ratio = 1

Bearing length = 50mm

Radial clearance = 20 microns

eccentricity = 15 microns

Specific gravity of lubricant = 2.09 kJ/kg ºC.

Calculate:

i) The minimum oil flim thickness.

ii) The coefficient of friction.

iii) The power lost in friction.

iv) The Viscocity of lubricant in Cp.

v) The total flow rate of lubricant in l/min.

vi) The side leakage &

vii) The average temperature if make up oil is supplied at 30 ºC. **[13]**

b) Write short notes on Additives for mineral oil. **[3]**

OR

Q10)a) A 50 mm dia. hardened & ground steel Journal rotate at 1440 rpm. In a lathe turned bronze bushing of 50 mm length. For Hydrodynamic Lubrication the minimum oil film thickness should be five times the sum of surface roughness of Journal & bearing. If the class of fit is H8 d8 & the Viscocity of lubricant is 18Cp Determine: **[11]**

i) The maximum radial load that the journal can carry & still operate under hydrodynamic condition.

ii) The quantity of lubricating oil required.

iii) The side leakage

iv) The temperature rise considering side leakage surface Roughness

Element	Machining method	Surface Roughness (LA)
Shaft	Grinding	1.6 microns
Bearing	Turning/Boaring	0.8 microns

Tolerance

Diameter (mm)	Tolerance (mm)	
	H8	d8
50	T0.046	–0.100
50	0.000	–0.196

Take ρ = 860 Kg/m^3 &

Cp = 2.09 kJ/kg ºC

b) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation. **[5]**

Total No. of Questions :10]

SEAT No. :

P1695

[Total No. of Pages :4

[5058] - 317

T.E. (Mechanical)

TURBO MACHINES

(2012 Pattern) (End Semester) (Semester - II)

Time : 2½Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) A Pelton turbine develops 3000 kW under a head of 400 m. The overall efficiency of the turbine is 87%. If the speed ratio is 0.48 and the coefficient of velocity is 0.96 and specific speed 18, Find **[6]**

i) Diameter of the turbine

ii) Diameter of the jet

b) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%. **[4]**

OR

Q2) a) The external & internal diameters of an inward flow reaction turbine are 2 m & 1 m respectively. The head on the turbine is 60 m. The width of the vane at inlet & outlet are same and equal to 0.25 m. The runner vanes are radial are inlet & discharge is radial at outlet. The speed is 200 rpm and the discharge is 6 m^3/s. Determine: **[6]**

i) The vane angle at outlet and inlet of the runner

ii) The hydraulic efficiency

b) Define specific speed of turbine & state its significance. **[4]**

P.T.O.

Q3) a) Define the term: Degree of reaction and explain the meaning of pure reaction and 50% reaction turbines. **[4]**

b) A Kaplan turbine develops 1500 kW under a head of 6 m. The turbine is set 2.5 m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.2 m. If the turbine efficiency is 85%, what will be efficiency of the draft tube having inlet diameter of 3 m. (Neglect losses in draft tube). **[6]**

OR

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

i) Diagram efficiency

ii) Nozzle efficiency

b) In a Parson's turbine running at 1500 rpm, the available enthalpy drop for an expansion is 63 kJ/kg. If the mean diameter of the rotor is 100 cm, find the number of moving rows required. Assume that efficiency of a stage is 0.8, blade outlet angle 20° and speed ratio 0.7. **[6]**

Q5) a) Derive an expression for the minimum speed for starting a centrifugal pump. **[6]**

b) Explain different types of casing used in centrifugal pump. **[4]**

c) A centrifugal pump delivers 1800 lit / min against a total head of 20 m. Its speed is 1450 rpm. Inner & outer diameters of impeller are 120 mm & 240 mm respectively and the diameter of suction & delivery pipes are both 100 mm. Determine the blade angles of the impeller vane at inlet & outlet respectively if the water enters radially. Assume manometric efficiency is 0.90. **[8]**

OR

Q6) a) Derive an expression of specific speed of centrifugal pump? **[6]**

b) Write a short note on Priming of a centrifugal pump. **[4]**

c) A three stage centrifugal pump has impellers 50 cm diameter and 3 cm width at outlet. The thickness of the blades has reduced the circumferential area by 10%. The manometric efficiency is 90%, overall efficiency is 80%,, whirl velocity at outlet is 20 m/s, velocity of flow at outlet is 2.25 m/s and speed is 1000 rpm. Calculate **[8]**

i) Head generated

ii) Discharge

iii) Exit vane angle

iv) Shaft power

Q7) a) Explain the terms surging and choking in a rotary compressor. **[6]**

b) The inlet conditions of a centrifugal compressor are 1 bar, 30ºC and running at 10000 rpm. It delivers a free air stream of 1.5 m^3/s. The compression ratio is 5. The velocity of flow is 50 m/s and is constant. Assume that the blades are radial outlet & the slip factor is 0.92, Calculate

i) Temperature of air outlet

ii) Power required

iii) Impeller diameter

iv) Diffuser inlet angle

v) Blade angle at inlet

Assume that power factor is 1.11 and isentropic efficiency is 0.90. **[10]**

OR

Q8) a) A centrifugal compressor develops a pressure ratio of 5.0 and an air consumption of 30 kg/s. The inlet temperature and pressure are 15ºC and 1 bar respectively. If isentropic efficiency is 0.85, Calculate **[6]**

i) The work done

ii) Exit total temperature

iii) The power required

b) What do you mean by slip & slip factor? Why diffusers are necessary in a centrifugal compressor? **[6]**

c) What is 'Pre-whirl' in centrifugal compressor? Why it is necessary? **[4]**

Q9) a) Compare Axial flow compressor and Centrifugal compressor. **[4]**

b) Write a short note on losses in axial flow compressor. **[4]**

c) The ambient conditions at inlet are 20ºC and 1 bar. At exit the total head temperature and pressure are 150ºC and 3.5 bar, and static pressure at exit is 3 bar. Calculate **[8]**

i) Isentropic efficiency

ii) Polytropic efficiency

iii) Air velocity at exit

OR

Q10)a) Represent and explain the process involved in axial flow compressor on (h-s) diagram And derive an expression for isentropic efficiency and stage pressure ratio. **[6]**

b) The speed of an axial flow compressor is 15000 rpm. The mean diameter is 0.6 m. The axial velocity is constant and is 225 m/s. The velocity of whirl at inlet is 85 m/s. The work done is 45 kJ / kg of air. The inlet conditions are 1 bar & 300 K. Assume a stage efficiency of 0.89, mechanical efficiency of 0.95 & power developed is 425 kW. **[10]**

Calculate:

i) Fluid deflection angle

ii) Pressure ratio

iii) Mass flow rate

iv) Shaft power

Total No. of Questions : 10]

SEAT No. :

P1696

[Total No. of Pages : 4

[5058]- 318

T.E. (Mechanical)

MECHATRONICS

(2012 Course) (End Semester) (Semester - II) (302050)

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) From the block diagram in Figure 1, determine the transfer function : X/Y. **[8]**

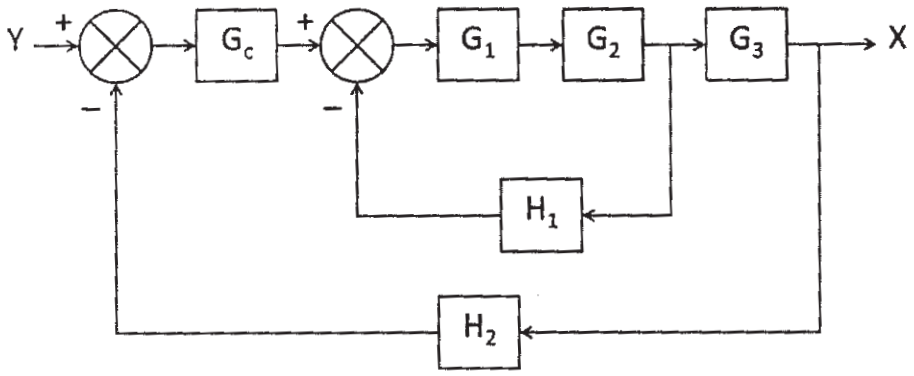


Figure 1

b) Write two distinct points of comparison between Potentiometer and Digital Encoder. **[2]**

OR

P.T.O.

Q2) a) Reduce the block diagram in Figure 2 and determine the transfer function: C/R. **[8]**

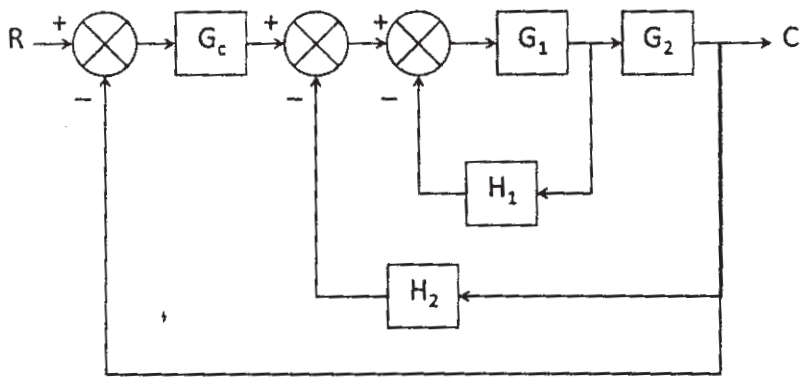


Figure 2

b) List any two reasons to justify the need for a signal conditioner in a mechatronic system. **[2]**

Q3) a) Draw a suitable block diagram and explain the working of a DAQ system. **[6]**

b) A LVDT is to be selected for measurement of displacement. Discuss, in brief, any four criterions for selection of the said sensor. **[4]**

OR

Q4) a) For a 4 bit ADC with a V_{ref} = 10 volts, find the digital equivalent of V_{in} = 6 volts. **[6]**

b) Draw a suitable diagram and explain the working of a strain gauge for force measurement. **[4]**

Q5) a) Using a suitable example discuss the working of the following in a PLC:

i) Latch ii) Counter **[8]**

b) Considering a suitable example explain the working of the SCADA system. **[8]**

OR

Q6) a) A circuit involves four NO type switches, P1, P2, S1 and S2, and a DC motor (M). Draw a ladder diagram such that the said circuit satisfies following objectives: **[10]**

i) When P1 is pushed the circuit shall turn *On* and shall continue to remain *On* until P2 is pushed.

ii) When S1 is pushed and S2 is not pushed then Motor is *On* is clockwise direction.

iii) When S2 is pushed and S1 is not pushed then Motor is *On* in anti-clockwise direction.

iv) When P2 is pushed the circuit turns O*ff*.

b) Draw a suitable block diagram and explain the architecture of a PLC.**[6]**

Q7) a)

$$\frac{C(s)}{R(s)} = \frac{0.5s + 2}{s^2 + 0.5s + 2}$$

From the transfer function, of a second order system, presented by Eq. (1), determine: **[10]**

i) Location of Pole

ii) Location of Zero

iii) Damping Factor ζ

Also, for the transfer function in Eq. (1), comment on:

i) Absolute stability of the system.

ii) Unit step response of the system.

b) Discuss the advantages and the dis-advantages of the frequency domain analysis in comparison to the domain analysis. **[6]**

OR

Q8) a) Draw suitable sketch and explain "Time Domain Specifications and Analysis". **[10]**

b) Determine the approximate Rise Time, 2% Settling Time and % Overshoot of a second-order system driven using a unit step input. Assume the system to have a damping factor = 0.75 and natural frequency = 5 rad/sec. **[6]**

Q9) a) The equation of error is $e = 0.5t + 0.03t^2$. With $K_P = 5$, $K_D = 0.5$ and $p(0) = 50\ \%$, sketch the graph of the controller output vs time for a Proportional plus Derivative controller (in series form) from t = 0 to t = 2 sec. **[10]**

b) Write the equation for the control signal for Integral action. Also, discuss the advantages as well as the disadvantages of adding Integral action to the Proportional action. **[8]**

OR

Q10) a) Derive the transfer function of the Proportional Integral Derivative (PID) controller in parallel form. Also, discuss, in detail, the advantages and disadvantages of adding Derivative term to the Proportional term. **[12]**

b) W.R.T parallel form, discuss the advantages offered by the Series Form of PID control. **[6]**

Total No. of Questions : 12]

SEAT No. :

P1697

[Total No. of Pages : 4

[5058]- 319

T.E. (Mechanical/Automobile)

NUMERICAL METHODS AND OPTIMIZATION

(2012 Course) (End Semester) (Semester - II) (302047)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4 and 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) Evaluate error in the calculations 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 m. **[6]**

OR

Q2) Find the root of the equation $\sin(x) - x.\cos(x)$; using Newton - Raphson method. Assume initial guess as $x_1 = 3\pi/2$ upto accuracy of 0.00001. **[6]**

Q3) Draw a flowchart for Gauss - Seidal Method. **[6]**

OR

Q4) Find the numerical solution of the given system of equations **[6]**

$$x - y + 4z = 16;$$

$$3x + 2y + z = 18;$$

$$x + 4y - 2z = 12$$

by using Gauss Elimination method with partial pivoting.

P.T.O.

Q5) Two products P_1 and P_2 are to be manufactured by a firm. Profits on P_1 and P_2 are Rs.30 and 20 respectively. The products are to be processed on two machines, i.e. first on milling machine and other on surface grinder. The capacities and the time required to produce a unit are as follows: **[8]**

	P_1	P_2	Capacity
Milling Machine	3 hours	1 hour	1500 man hrs./month
Surface Grinder	1 hour	1 hour	1000 man hrs./ month

How many products of type P_1 and P_2 should be manufactured to get maximum profit? (use Simplex Method)

OR

Q6) a) Maximize, $z = 80x + 120\,y$ **[5]**

Subjected to constraints : $x + y \leq 9$

$x \geq 2$

$y \geq 3$

$20\,x + 50\,y \leq 360$

$x, y \geq 0$

(Use graphical method).

b) Write a short note on Simulated Annealing. **[3]**

Q7) a) Using the following table, fit a curve of the form $y = a\,x^b$. Find the formula by the method of group averages. **[8]**

x	25	20	12	9	7	5
y	0.22	0.2	0.15	0.13	0.12	0.1

b) Use Lagrage's formula to fit a polynomial to the data and hence find y ($x = 1$). **[8]**

x	–1	0	2	3
y	–8	3	1	12

OR

Q8) a) Fit a parabola $y = ax^2 + bx + c$ in least square sense to the data. **[8]**

X	10	12	15	23	20
Y	14	17	23	25	21

b) The population of a town is as follows: **[8]**

Year (x)	1941	1951	1961	1971	1981	1991
Population in Lakhs (y)	20	24	29	36	46	51

Estimate the population increase during the period 1941 to 1946.

Q9) a) Evaluate $\int_6^{14}\int_1^5 \frac{x+xy}{2y}\,dx.\,dy$ by using Simpson's 1/3rd rule. Take number of strips for x and y equal to 4. **[8]**

b) Draw the combine flowchart for Gauss - Legendre two point and three point formula. **[8]**

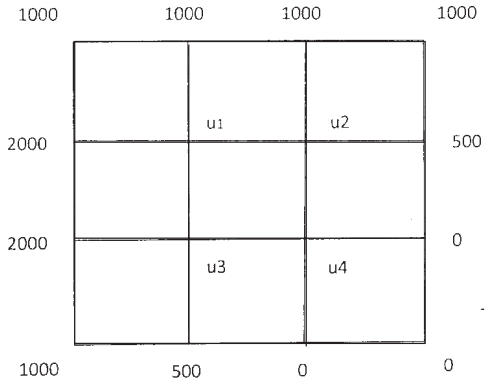
OR

Q10)a) Evaluate $\int_0^2 \frac{x}{\sqrt{2+x^2}}.\,dx$ by using Trapezoidal rule with four strips. **[8]**

b) Explain what is meant by Simpson's strip for 1/3rd and 3/8th rule. Explain why Simpson's 3/8th rule give more accuracy compared to Trapezoidal and Simpson's 1/3rd rule with same number of strips. **[8]**

Q11)a) Using Runge Kutta method of 4th order to solve the following differential equations in the interval [0, 0.4] $\frac{dy}{dx} = \frac{y+x}{y-x}$, $y = 1$ at $x = 0$ and $h = 0.2$. **[8]**

b) Following are the values of $u(x, y)$ on the boundary of the square as shown in fig. Evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of this fig. **[10]**



OR

Q12)a) Solve the following pair of differential equations $\frac{dy}{dx} = \frac{x+y}{z}$ and $\frac{dz}{dx} = x$ $y + z$ with initial conditions $x_0 = 5$, $y_0 = 1.5$, $z_0 = 1$ for $x = 0.6$. **[8]**

b) Solve for $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ the following explicit finite scheme is given by,**[10]**

i) $u = \sin(\pi x)$ for $t = 0$ where $0 \le x \le 1$,

ii) $u = 0$ for $x = 0$ and $x = 1$ for $t = 0$ to 0.06, and

iii) increment in t is $k = 0.02$ and in x is $h = 0.2$,

calculate values of u for $t = 0$ to 0.06 at $x = 0$ to 1.

Total No. of Questions :10]

SEAT No. :

P1698

[Total No. of Pages :3

[5058] - 320

T.E. (Mechanical)

MANUFACTURING PROCESS - II

(2012 Pattern) (Semester - II) (End Sem.)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve Q.1or 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) Draw a neat sketch of twist drill with its nomenclature and explain various terminologies of twist drill. **[6]**

b) A hole of 25 mm diameter and 70 mm depth is to be drilled. The suggested feed 1.3 mm/rev. and cutting speed 60m/min. assuming tool approach and tool overtravel as 6mm, Calculate: **[6]**

i) Spindle speed
ii) Feed Speed
iii) Cutting Speed

OR

Q2) a) Describe the Tool and Cutter grinder with neat sketch. **[6]**

b) Write short notes on Burnishing Process. **[6]**

Q3) a) In orthogonal cutting of a 60mm diameter MS bar on lathe, the following data was obtained:
Rake angle = 10°, Cutting Speed = 100m/min, Cutting force = 200N, Feed Force = 70N, Chip thickness = 0.3 mm, feed = 0.2 mm/rev.
Calculate:

i) Shear angle
ii) Coefficient of friction
iii) Chip flow Velocity **[4]**
iv) Friction Angle

b) Explain chip breakers with its function? **[4]**

OR

P.T.O.

Q4) a) With the help of neat sketch explain the relation between shear velocity, cutting velocity and chip flow velocity. **[4]**

b) What is Machinability? Explain different factors affecting Machinability. **[4]**

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

b) Compare the ECM and EDM with various process parameters. **[8]**

OR

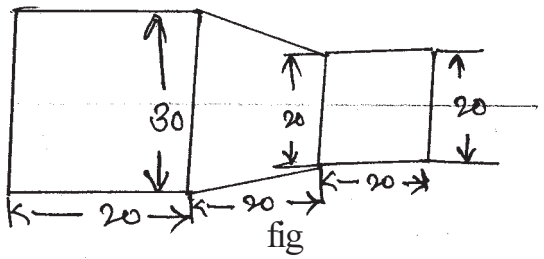
Q6) a) Draw a Schematic diagram of 'Laser Beam Machining' and Explain its working principle and process parameters. **[8]**

b) Explain AJM process with its adv., limitations and applications. **[8]**

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

b) Explain with neat sketch NC motion control system. **[4]**

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



fig

OR

Q8) a) Explain machining center with neat sketch. State its advantages, disadvantages and applications. **[6]**

b) Differentiate between open and close loop system with neat sketch. **[6]**

c) Explain the following codes G03, M00, G91, M08. **[4]**

Q9) a) What is 3-2-1 location principle? Explain with neat sketches. **[6]**

b) Draw and explain dimond pin locator. **[4]**

c) Design and draw drilling jig for drilling the ϕ 10 mm holes in the component show in fig. (a) **[8]**

OR

Q10)a) List various types of locating devices used in jig and fixtures. Explain any one in detail. **[6]**

b) Write short notes on modular fixture. **[4]**

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

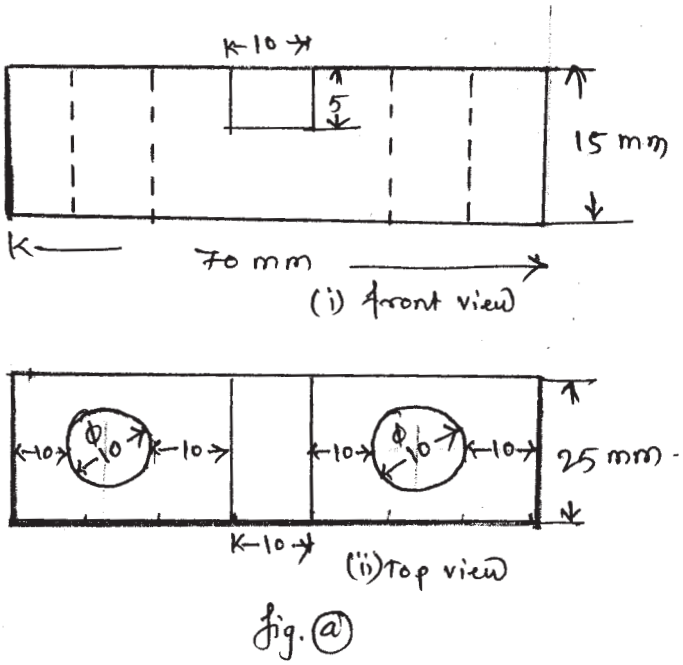


fig. (a)

Total No. of Questions :10]

P1699

SEAT No. :

[Total No. of Pages : 3

[5058]-321
TE(Automobile Engineering)
DESIGN OF MACHINE ELEMENTS
(2012 pattern) (316481) (Semester-I)(End sem.)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***A 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 design procedure of a lever. **[6]**

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

OR

Q2) a) A knuckle joint is to connect two members of 50 mm diameter. If the shear stress in the pin is 20 Mpa, what is the axial load and the torque transmitting capacity? **[4]**

b) Differentiate between straight beam and curved beam. **[4]**

c) Define factor of safety. **[2]**

Q3) a) What are the different types of keys? **[2]**

b) A machine slide weighing 3 KN is elevated by a double start Acme threaded screw at the rate of 0.84m/min,If the coefficient of friction is 0.12,calculate the power to drive the slide. The end of the screw carries a thrust collar of 32 mm inside diameter and 58 mm outside diameter. Pitch of the screw thread is 7mm and outside diameter is 44mm. Take coefficient of friction as 0.09. **[8]**

OR

P.T.O.

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

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

Q5) a) A cold drawn steel rod of circular section is subjected to a variable bending moment of 565 Nm to 1130 Nm as axial load varies from 4500 to 13500 N. The maximum bending moment occurs at the same extent that of axial load is maximum. Determine the diameter of rod for factor of safety 2. Assume. Ultimate stress as 550 Mpa,Yield point stress as 470 Mpa, K_{ft} as 1, A as 1 for bending and 0.7 for axial, B as 0.85 and C as 0.89. **[16]**

OR

Q6) A hot rolled steel rod is subjected to torsional load varying from -110 Nm to 440 Nm and an axial load varies from 4500 to 13500 N. Assume factor of safety 8, ultimate stress as 550 Mpa, yield point stress as 470 Mpa, k_{ft} as 1, A as 1 for torsion and 0.7 for axial, B as 1 and C as 0.89. Calculate the diameter of rod. **[16]**

Q7) a) How do you classify bearings? **[6]**

b) The following data is given for full hydrodynamic bearing used for electric motor. Radial load=1200N, Journal speed=1440rpm, Journal diameter=50mm, static load on the bearing=350N. The values of surface roughness of the journal and the bearing are 2 and 1 micron respectively. The maximum oil film thickness should be 5 times the sum of surface roughness of the journal and the bearings. Determine length of the bearing, radial clearance,minimum oil film thickness, viscosity of lubricant and flow of lubricant. Select suitable oil for this application assuming the operating temperature as 65^{o} C and bearing pressure as 1 Mpa. **[10]**

I/d	S	(h_o/c)	Q/rcnl
1	0.121	0.4	4.33
0.5	0.779	0.6	4.29

OR

Q8) a) Derive petroff's equation for bearing. **[6]**

b) The bearing of a system carries a radial load of 3000N and axial load 1000N.The angular speed of shaft is 60 rad/sec, The bearing has to operate 8 hrs/day. The diameter of shaft is 50 mm. Check the design for safety. Take C=27070N,C_0 =20595N,X=0.56.y=1.71 and v=1 **[10]**

Q9) a) What are the standard systems of gear tooth? **[2]**

b) Design spur gear set to transmit 20 KW at 900 rpm of pinion. The transmission ratio is 3. Take 20^0 FDI, Z_1=18,σ_d=193.2Mpa, BHN=250 for pinion and σ_d=47.1Mpa, BHN=200 for geat. Check only tangential tooth load. Take form factor Y=π(0.154-0.912/Z) and C_v=3.05/3.05+v. **[14]**

OR

Q10)a) Draw the spur gear nomenclature. **[4]**

b) Design a pair of helical gears are to transmit 15 KW at 10,000rpm of the pinion wih PCD 80mm. The transmission ratio is 3:1 Assume $\alpha=20^0$FDI, $\beta=45^0\sigma_d$=193.2Mpa, BHN=250 for pinion and gear Check only tangential tooth load.

Y=π(0.154-0.912/Z_e), C_v=5.55/5.55+$v^{0.5}$ **[14]**

❄ ❄ ❄

Total No. of Questions :12]

SEAT No. :

P1700

[Total No. of Pages :3

[5058] - 325

T.E. (Automobile)

AUTOMOTIVE ELECTRICAL & ELECTRONICS

(2012 Pattern) (Semester - I) (End Semester) (316482)

Time : 2:30 Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) Discuss in brief different battery failure. **[6]**

OR

Q2) a) Explain in brief wiring hardness. **[3]**

b) Compare lead acid battery with alkaline batteries. **[3]**

Q3) With the help of sketch explain current and voltage regulator. **[8]**

OR

Q4) a) Explain with neat sketch semiconductor type regulator. **[4]**

b) Write a short note on spark advance mechanism. **[4]**

Q5) What is the purpose of the indicating and warning devices provided in vehicle? Enlist reason in support of their usefulness. **[6]**

OR

P.T.O.

Q6) Explain following warning light. **[6]**

a) Oil pressure warning light

b) Chock out warning light

c) Ignition warning light

Q7) a) Explain in detail with the help of neat sketch. **[8]**

i) Throttle angle sensor

ii) MAP sensor

b) Explain actuators with its types. **[8]**

OR

Q8) a) Explain solenoid actuator with the help of neat sketch and give any four automotive applications. **[8]**

b) Explain in detail with the help of neat sketch. **[8]**

i) Air flow rate sensor

ii) Angular position sensor

Q9) a) Describe construction and working of electronic ignition system. **[8]**

b) Explain in detail fuel control MAPs. **[8]**

OR

Q10)a) Write a short note on **[8]**

i) ECU

ii) Microcontroller

b) Explain idle speed control with its types. **[8]**

Q11)a) Explain ABS system with layout and working. **[8]**

b) Write a short note on. **[10]**

i) Crash sensor

ii) Collision avoidance

OR

Q12)a) Write a short note on. **[10]**

i) Radar warning system

ii) Cruise control

b) Explain electronic control of suspension with neat diagram. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1701

[Total No. of Pages : 4

[5058]-326
T.E. (Automobile)
DESIGN OF ENGINE COMPONENTS
(2012 Course) (316484) (END SEM) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) What do you mean by firing order? Discuss the relationship between engine balancing & firing order. **[6]**

b) The cylinder of a four stroke diesel engine has the following specifications:- **[4]**

i) Brake Power = 3 kW.

ii) Speed = 800 rpm.

Indicated mean effective pressure = 0.3 MPa.

Mechanical Efficiency = 80%.

Determine the bore and length of cylinder liner.

OR

Q2) a) Why radiator is necessary? State its types and location. **[4]**

b) The engine of the Fiat car has four cylinders of 68 mm bore and 75 mm stroke. The compression ratio is 8. Determine the cubic capacity of the engine and the clearance volume of each cylinder. **[6]**

Q3) a) Why engine cooling is required? Discuss. **[4]**

b) The following data is given for the piston of a four stroke diesel engine, Cylinder bore = 250 mm, Material of piston rings = Grey Cast Iron, Allowable tensile stress = 100 N/mm^2. Allowable radial pressure on cylinder wall = 0.03 MPa. Thickness of piston head = 42 mm, Number of piston rings = 4. Design piston rings and piston barrel. **[6]**

P.T.O.

Q4) a) Discuss the functions of lubrication system. **[4]**

b) Determine the dimensions of cross section of the connecting rod for a diesel engine with following data. **[6]**

Cylinder bore = 100 mm.

Length of connecting rod = 350 mm.

Maximum Gas Pressure = 4 MPa.

Factor of safety = 6.

Q5) a) Explain Dry and Wet Liner with neat sketch. **[4]**

b) The cylinder of a four stroke diesel engine has the following specifications. **[12]**

Brake Power = 7.5 kW, Speed = 1400 rpm, mechanical efficiency = 80%, Indicated mean effective pressure = 0.35 MPa, Maximum gas pressure = 3.5 MPa.

The cylinder liner and head are made of grey cast iron FG 260 (S_{ut} = 260 N/mm^2 and u = 0.25). The studs are made of plain carbon steel 40C8 (S_{yt} = 380 N/mm^2).

The factor of safety for all parts is 6.

Calculate :-

i) Bore and length of cylinder liner.

ii) Thickness of the cylinder liner.

iii) Thickness of cylinder head.

iv) Size, number and pitch of studs.

Reboring allowance for I.C. engine cylinder is:

D	75	100	150	200	250	300	350	400	450	500
C	1.5	2.4	4.0	6.3	8.0	9.5	11.0	12.5	12.5	12.5

OR

Q6) a) Design an exhaust valve for a horizontal diesel engine using the following data: **[8]**

Cylinder bore = 150 mm, length of stroke = 275 mm

Engine speed = 500 rpm, Maximum gas pressure = 3.5 MPa.

Seat angle = 45°.

Calculate:

i) Diameter of the valve port.

ii) Thickness of the valve head.

iii) Diameter of the valve stem.

iv) Maximum lift of the valve.

Assume mean velocity of the gas = 50 m/s. Constant K for steel valve as 0.42 and permissible bending stress as 50 N/mm^2.

b) The cylinder of four stroke diesel engine has the following specification. **[8]**

Cylinder bore = 150 mm.

Maximum gas pressure = 3.5 N/mm^2.

Cylinder material = Grey C.I. FG 200 (S_{ut} = 200 MPa)

Factor of safety = 5.

Poisson's ratio = 0.25.

Determine thickness of the wall and net circumferential stresses in the cylinder wall.

Q7) a) Explain the working procedure of mechanical fuel pump with neat sketch. **[8]**

b) Explain working of exhaust gas CO and HC analyzer with neat sketch. **[8]**

Q8) Write short notes on: **[16]**

a) Cylinder leakage Test.

b) Cylinder Compression Test.

c) Vacuum gauge test.

d) Cylinder power balance.

Q9) a) Describe with neat sketch PCI stratified charge engine. **[10]**

b) Discuss the methods of obtaining variable compression ratio using: **[8]**

i) changing the stroke length.

ii) Varimax VCR engine.

OR

Q10)a) Describe in detail Homogeneous Charge Compression Ignition Engine. **[10]**

b) Discuss the advantages of Dual Fuel Engines. **[8]**

☛ ☛ ☛

Total No. of Questions : 10]

SEAT No. :

P 1702

[Total No. of Pages :2

[5058] - 327
T.E. (Automobile Engineering)
AUTOMOTIVE TRANSMISSION
(2012 Course) (Semester - VI)

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) ***Assume Suitable data if necessary.***

Q1) a) Draw the neat layout of following chassis. **[6]**

i) Two Wheeler

ii) Three Wheeler

iii) Four Wheeler

b) Discuss the construction and working of cone clutch. **[4]**

OR

Q2) a) With neat sketch explain front engine rear wheel drive layout. **[4]**

b) Draw the neat sketch of four wheel drive. Also state the applications of the same. **[6]**

Q3) a) Explain the construction and working of the centrifugal clutch with neat sketch. Also discuss the advantages of centrifugal clutch. **[7]**

b) Why helical gears are used in gearbox instead of straight spur gears? **[3]**

OR

Q4) a) Draw and explain construction and working of multiplate clutch with neat layout. Also give the applications **[7]**

b) Differentiate in-between Sliding Mesh and Constant Mesh Gearbox. **[3]**

P.T.O.

Q5) a) Enlist the different types of rear axles? Explain any one of them with neat sketch stating the different loads carried by it1. **[8]**

b) What is need of differential? Explain differential in detail. **[8]**

OR

Q6) a) What is the function of the rear axle? Explain the loads acting on the rear axle. **[8]**

b) Write a note on **[8]**
i) Differential Lock/ Locking Differential
ii) Non Slip/ Limited Slip type of a Differential

Q7) a) Explain the performance characteristics of Fluid Coupling. Also give the advantages and disadvantages of the same. **[9]**

b) Explain construction and working Torque Converter with its advantages and limitations. **[9]**

OR

Q8) a) Draw and explain construction and working of simple epicylic gear train and discuss gear ratio. **[9]**

b) Explain the performance characteristics of Torque Converter. Also give the advantages and disadvantages of the same. **[9]**

Q9) a) Differentiate in between semi automatic and fully automatic transmission. **[8]**

b) List down the advantages and disadvantages of the Continuous Variable Transmission (CVT). **[8]**

OR

Q10) a) With neat sketch explain the Continuous Variable Transmission(CVT). **[8]**

b) What is the Principle of semi-automatic & fully automatic transmission. **[4]**

c) Sate and explain the Principle of Hydramatic Transmission. **[4]**

☆ ☆ ☆ ☆

Total No. of Questions : 9]

SEAT No. :

P1703

[Total No. of Pages :2

[5058]- 328
T.E. (Automobile)
Automotive Aerodynamics and Body Engineering
(2012 Course) (Semester - I) (316486)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of logarithmic tables, slide rule, electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Question 9 is compulsory.***

Q1) a) Explain development of lift on aerofoil. **[4]**

b) Enlist measuring equipments and transducers with their use for wind tunnel testing. **[6]**

OR

Q2) a) Explain the term down force and write its significance. **[4]**

b) Write a short note on the origin of forces and moments. **[6]**

Q3) a) Describe various strategies for aerodynamic development of car. **[4]**

b) Draw and elaborate hatch back, fast back & square back dust flow pattern at rear. **[6]**

OR

Q4) a) What is aerodynamic drag? Describe different types of aerodynamic drag. **[4]**

b) Write a note on open type full scale wind tunnel. **[6]**

P.T.O.

Q5) a) Draw and explain, **[8]**

i) Convertible car

ii) Limousine,

iii) Estate Van

iv) Sedan car

b) Explain Bus body layout with the help of floor height, Engine Locations, Entrance cum exit location. **[8]**

OR

Q6) a) Write a short note on Drivers visibility and explain testing for the same. **[8]**

b) Draw and Explain, **[8]**

i) Double Dekker bus

ii) Split level bus

iii) Articulated bus

iv) Mini Bus

Q7) a) Write a short note on tipper body construction. **[8]**

b) Define and sketch driver seat with respect to vehicle control management. **[8]**

OR

Q8) a) Explain in brief about Light construction vehicles. **[8]**

b) What is the procedure to design of chassis frame? **[8]**

Q9) Solve any three from the following: **[3 × 6 = 18]**

a) Write a short note on Idealized structure.

b) Explain in brief about longitudinal load on vehicle structure.

c) Write a note on use of energy absorbing system in automobiles.

d) Write a short note on Air bags.

e) Draw a layout of Automotive body building workshop and explain.

Total No. of Questions : 10]

SEAT No. :

P1704

[Total No. of Pages : 3

[5058]-331

T.E.(Mechanical Sandwich Engineering)

MACHINE DESIGN

(2012Course)(Semester-I) (New)

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

Instructions to the candidates:

1) ***Answer questions Q1 or Q2,Q3 or Q4 and 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) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is Machine Element? Explain the traditional design procedure? **[6]**

b) Explain with neat sketch Goodman approach? **[4]**

OR

Q2) a) Explain design of shaft on strength basis? **[6]**

b) Write in detail about endurance strength? **[4]**

Q3) a) Write note on stresses in Power Screw? **[4]**

b) A bracket supporting an eccentric load is welded by three fillet welds as shown in fig.1 Determine size of weld, if permissible shear stress is limited to 66MPa. **[6]**

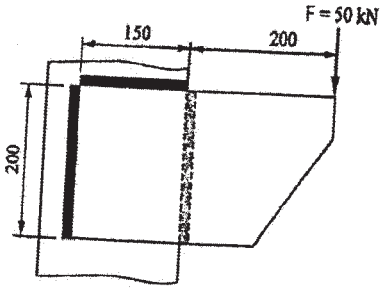


Fig: 1

OR

P.T.O.

Q4) a) What is strength of butt welds? **[4]**

b) A double threaded power screw with ISO metric trapezoidal threads is used to raise a load of 600KN. The nominal diameter is 150 mm and pitch is 14mm. The coefficient of friction at screw threads is 0.35. Neglecting collar friction. Calculae Torques to lower the load. **[6]**

Q5) a) A helical gear with 30° helix angle has to transmit 35kW at 1500 rpm. With a speed reduction ratio 2.5.If the pinion has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depths the teeth. Assume 15Ni 2Cr 1Mo 15 material for both pinion and wheel.**[12]**

b) Explain different types of gear lubrication methods? **[6]**

OR

Q6) a) The following data is given for a pair of spur gear with 20degree of full depth involutes teeth. Number of teeth on pinion=26, Number of teeth on gear=76, speed of pinion=1400rpm Module 3mm, Service factor = 1.5, Face width = 30 mm, factor of safety=2. Both the gears made up of steel with an Ultimate tensile strength,=700N/Mmm^2 Using the velocity factor to account for the dynamic load calculate Beam strength, Velocity Factor. **[12]**

b) With neat sketch explain force analysis of spur gear? **[6]**

Q7) a) Write note on designation of Ball Bearing. **[6]**

b) Asingle row deep groove ball bearing has a dynamic load capacity of 70,000N and operates on following work cycle.

i) Radial load 7000N at 500 rpm for 25% of the time.

ii) Radial load 18000N at 600rpm for 50% of the time.

iii) Radial load 8000 N at 400rpm for 25% of the time.

Determine life of bearing in hours. **[10]**

OR

Q8) a) Why there is need of rolling contact bearings? Write its application **[6]**

b) Derive Stribeck's equation for the basic static capacity of bearing and explain the mounting and preloading of a taper roller bearing. **[10]**

Q9) a) Write construction of V belt? **[4]**

b) A leather belt 125 mm wide and 6mm thick, transmit power from a pulley with the angle of lap 150 and μ=0.3. If the mass of $1m^3$of leather is 1mg and the stress in the belt is not to exceed 2.75 Mpa, find the maximum power that can be transmitted and the corresponding speed of the belt. **[12]**

OR

Q10)a) Explain geometry of chain drive? **[4]**

b) A crane is lifting a load of 18 kN through a wire rope and a hook. The weight of the hook etc,is 10kN. The load is to be lifted with an acceleration of $1m/sec^2$. Calculate the diameter of the wire rope. The rope diameter may be taken as 30 times the diameter of the rope. Take a factor of safety of 6 and Young's modulus for the wire rope $0.8\times105N/mm^2$. The ultimate stress may be taken as 1800 N/mm^2. The cross-sectional area of the wire rope may be taken as 0.38 times the square of the wire rope diameter. **[12]**

Total No. of Questions :12]

SEAT No. :

P1705

[Total No. of Pages :3

[5058] - 332

T.E. (Mechanical - Sandwich)

NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES

(2012 Pattern) (End Semester) (Semester - I) (302061)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) Find root of $e^{-x} - x = 0$ correct to four decimal places using Newton Raphson method consider starting point as $x = 0$. **[6]**

OR

Q2) Evaluate $\int_{0.2}^{1.5} \left(e^{-}x^{2}\right)$ using Gauss Quadrature 2 Point Formula. **[6]**

Q3) Find the value of y at x = 310 using Lagrange's Interpolation. **[6]**

x	300	304	305	307
y	2.4771	2.4829	2.4843	2.4871

OR

Q4) Find the value of y at x=45 using Newton's Forward Difference Interpolation. **[6]**

x	40	50	60	70
y	31	73	124	159

P.T.O.

Q5) Solve the following set of simultaneous equations using Gauss Siedel method. Do four Iterations. **[8]**

$$10x - 2y - 2z = 6$$
$$-x + 10y - 2z = 7$$
$$-x - y + 10z = 8$$

OR

Q6) Solve the following set of simultaneous equations using Gauss Elimination method. **[8]**

$$2x + 4y + z = 3$$
$$3x + 2y - 2z = -2$$
$$x - y + z = 6$$

Q7) a) Draw Flowchart to fit second degree polynomial to fit through given set of points. **[8]**

b) Fit a power curve $y = ax^b$ to the given data: **[8]**

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.10	6.80	7.50

OR

Q8) a) If 1.414 is used as the value of $\sqrt{2}$, whose true value is 1.41421356, Find absolute and relative error? **[4]**

b) Explain the following with suitable example **[4]**

i) Significant Digit

ii) Inherent Error

c) Fit a straight line through the given data: **[8]**

x	100	120	140	160	180	200
y	0.45	0.55	0.6	0.7	0.8	0.85

Q9) a) Using 'Modified Euler's Method', find y at x = 0.2 and 0.4 for the following equation $dy/dx = y+e^x$, *where y (0) = 0* for 2 decimal accuracy. **[8]**

b) Draw Flow Chart for 'Euler's Method'. **[8]**

OR

Q10)a) Draw Flow Chart for 'Predictor - Corrector Method'. **[8]**

b) Using Runge Kutta method of 4th Order find y for following equation **[8]**

$$\frac{dy}{dx} = \frac{\left(y^2 - 2x\right)}{\left(y^2 + x\right)}$$ for x = 0.1, 0.2, 0.3, 0.4 and 0.5, when y = 1 at x = 0.

Q11)a) Solve the Parabolic Equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to condition **[10]**

$u(x,0) = \sin \pi x, 0 \le x \le 1, u(0,t) = u(1,t) = 0$ using Crank-Nicolson method, do two iterations taking h 1/3, k = 1/36.

b) Draw flow chart to solve Parabolc Equation by Explicit Method. **[8]**

OR

Q12)a) Draw flow chart to solve Hyperbolic Equation. **[8]**

b) Evaluate the pivotal values of equation $u_{tt} = 16u_{xx}$, taking $\Delta x = 1$ upto t = 3. The boundary conditions are $u(0,t) = u(5,t) = 0$ and u $(x, 0) = x^2 (5 - x)$. List values for 3 iterations. **[10]**

Total No. of Questions :10]

SEAT No. :

P2980

[Total No. of Pages :3

[5058] - 334 - A

T.E. (Mechanical S/W)

MECHATRONICS

(2012 Course) (End Sem.) (Semester - I) (302050)

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.***

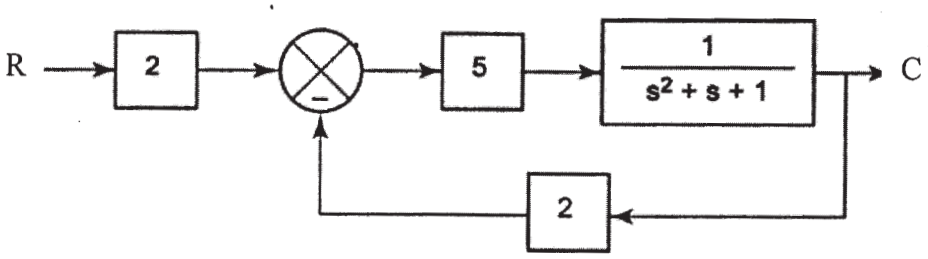
Q1) a) What is meant by temperature compensation? Explain it with respect to strain gauges. **[6]**

b) Write four distinct points of comparison between Open Loop and Closed Loop system. **[4]**

OR

Q2) a) Discuss how velocity is measured by using electromagnetic transducers. **[6]**

b) Find the transfer function C (s)/ R (s) for the block diagram shown below. **[4]**



P.T.O.

Q3) a) Discuss, in brief, the role of power amplifier and actuator in a mechatronic system. **[2]**

b) Draw a flowchart and explain the operation of a 4 bit SAR type ADC. **[8]**

OR

Q4) a) List two exclusive advantages of the transfer function based modelling approach. **[2]**

b) Draw a suitable diagram and explain interfacing of sensors & actuators to DAQ system. **[8]**

Q5) a) Using a suitable block diagram explain the working of SCADA system. **[8]**

b) Draw the ladder rungs to represent the following: **[8]**

i) Two switches that are NO and either of the switches have to be closed for a lamp to operate;

ii) Both NO switches have to be closed for a coil to be energized in order for a solenoid to operate;

iii) A control valve is switched ON by pressing a pushbutton start switch and it remains actuated until another pushbutton stop switch is pressed;

iv) Stop a motor from running when a pushbutton is pressed. The input field device is a closed pushbutton.

OR

Q6) a) Draw a suitable block diagram and explain the architecture of a PLC. **[10]**

b) What are the advantages of PLC over a relay control system? **[6]**

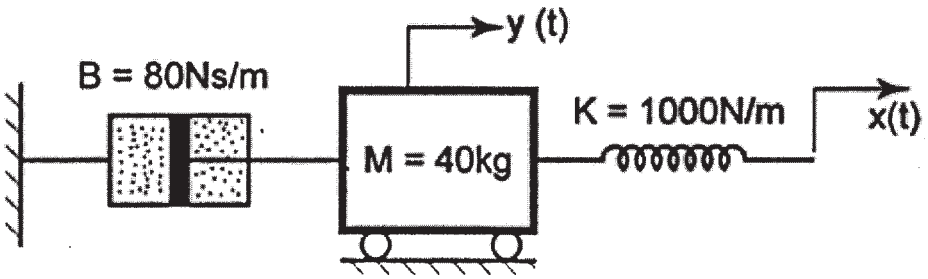
Q7) a) Define Pole, Zero and discuss their utility wrt stability analysis. **[6]**

b) Draw a suitable block diagram and explain the procedure for experimentally determining the frequency response a system. **[10]**

OR

Q8) a) Draw a suitable sketch and explain time response of second-order system to a unit step input. **[6]**

b) Determine the transfer function x(s)/y(s) for the system shown in figure below. **[10]**



Q9) a) Draw a suitable block diagram and derive the transfer function of a PID controller. Also, discuss the significance of the integral term in the PID controller. **[10]**

b) Write the step wise procedure for the tuning of a PID control, manually. **[8]**

OR

Q10)a) A proportional controller is used to control temperature within 50°C to 130°C with a set point of 73.5°C. The set point is maintained with 50% controller output. The offset error is corresponding to load change which causes 55% controller output. If the proportional gain is 2 find the % controller output if the temperature is 61°C. **[10]**

b) Discuss the importance of Transient Response Specifications w.r.t performance of control system. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1706

[Total No. of Pages : 2

[5058]-335

T.E.(Mechanical Sandwich)

MATERIALS AND MANUFACTURING ENGINEERING

(2012 Course)(Semester-II)(End Semester)(Self Study-I)(302066)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) What are the differences in properties of linear and crossed link polymers? **[8]**

b) Classify composite materials and discuss Fiber reinforced materials. **[8]**

OR

Q2) a) What are the factors affecting properties of polymers? **[8]**

b) What are the properties of composite materials? **[8]**

Q3) a) Classify biomaterials and compare their properties. **[8]**

b) Write a note on "Magnetic Materials". **[8]**

OR

Q4) a) What is carbon Nano-tubes? Discuss the technological advantages of nano materials. **[8]**

b) How Nano and Biomaterials contributes in miniaturization of product? **[8]**

Q5) a) What is anodizing? Which metals are suitable for anodizing? State the advantages of it. **[6]**

b) What are the different methods of prevention of corrosion? Explain any two of them. **[12]**

OR

Q6) Write short notes on **[18]**

a) Mechanisms of Dry corrosion.

b) Factors affecting corrosion resistance of film.

c) Inter-granular corrosion and stress corrosion.

P.T.O.

SECTION-II

Q7) a) Write notes on: i) Self Lubricated bearings ii) Cermets **[8]**

b) What is the effect on tribo-performance of product if formed by PM process? **[8]**

OR

Q8) a) Discuss the advantages and limitations of Powder metallurgy. **[8]**

b) What is the effect of compaction pressure and sintering temperature on material density y of a product formed by PM? **[8]**

Q9) a) Write the meaning of following M codes. **[8]**

M00, M02, M03, M04, M06, M07, M09, M99,

b) Write the meaning of following G codes. **[8]**

G00, G01, G02, G03, G70, G71, G98, G99

OR

Q10)a) How do you classify CNC machines? Compare open loop and closed loop control system in CNC with figure. **[8]**

b) What is absolute and incremental programming? Explain. **[8]**

Q11)a) How do you specify Broaching Machine? Draw a neat sketch of broach and name its parts. **[8]**

b) Explain form gear cutter method of generating gears with neat sketch. **[10]**

OR

Q12)a) Discuss honing and lapping of gears. **[8]**

b) Explain the types of thread rolling methods. Discuss the advantages and disadvantages of thread rolling. **[10]**

✓ ✓ ✓

Total No. of Questions : 12]

SEAT No. :

P 1707

[Total No. of Pages :2

[5058] - 336

T.E. (Mechanical sandwich)

INDUSTRIALENGINEERING &PRODUCTION MANAGEMENT

(Self study-II)(2012 Course) (Semester - II)(302067)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Black figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss Maslow's hierarchy theory of needs. **[8]**

b) What are the functions and applications of industrial engineering in today's industry?

OR

Q2) a) What are the different management approaches? **[8]**

b) State and explain briefly principles of scientific management. **[8]**

Q3) a) List the objectives of work measurement and the techniques used for work measurement . **[8]**

b) State the need for breaking the job into elements during work study and also state any 4 types of elements used during observation of the job.**[8]**

OR

Q4) a) Discuss the equipments used during time study. **[8]**

b) What is work sampling? State the procedure of work sampling. **[8]**

Q5) Write short notes on: **[18]**

a) Factors affecting Performance Rating.

b) Ergonomics in industry.

c) SIMO Chart.

OR

P.T.O.

Q6) a) What are the qualities of a production manager? **[8]**

b) Explain consideration in selection of plant location for a steel plant in India. **[10]**

SECTION - II

Q7) a) What are the objectives and functions of PPC. **[8]**

b) Explain the concept of MRP. **[8]**

OR

Q8) a) Explain any four principles of Material handling. **[8]**

b) Explain VED analysis in detail. **[8]**

Q9) a) Explain the concept of Bill of Material. **[8]**

b) Compare CPM with PERT. **[9]**

OR

Q10)a) Discuss general consideration in selecting machining methods in process planning. **[8]**

b) State any four principles of process planning and give format of a typical process sheet. **[8]**

Q11) Write short notes on: **[18]**

a) Concurrent Engineering.

b) Poka Yoke.

c) KAIZEN.

OR

Q12)a) Write short note on computerized product management system. **[10]**

b) Explain energy conservation and energy audit in the context of a mechanical industry. **[8]**

☆ ☆ ☆ ☆

Total No. of Questions :10]

SEAT No. :

P1708

[Total No. of Pages :3

[5058] - 341

T.E. (Electrical)

ADVANCED MICROCONTROLLER AND ITS APPLICATIONS

(2012 Course) (End - Semester) (303141) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Compare RISC and CISC architectures. **[6]**

b) Explain the function of Bank select register. **[4]**

OR

Q2) a) Write a program to copy data from memory location 202H to WREG. **[6]**

b) Write a short note on any two data types used in embedded C Programming. **[4]**

Q3) a) Explain the following addressing modes of PIC 18 microcontroller. **[6]**

i) Immediate addressing mode

ii) Register direct addressing mode

b) Write a short note on following: **[4]**

i) Assembler

ii) Simulator

OR

P.T.O.

Q4) a) Explain Timer 0 (T0CON) control register in detail. **[6]**

b) Explain the following instructions in detail. **[4]**

i) MOVFF

ii) ADDLW

Q5) a) Draw a neat diagram of interfacing an LED with PIC microcontroller. Write a program of blinking display of the LED. **[8]**

b) Write short note on SPI protocol. **[8]**

OR

Q6) a) 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. **[8]**

b) With a neat diagram of interfacing of 4×4 keypad with PICI8F458. Using a flow chart explain the method of key press detection. **[8]**

Q7) a) Explain the steps for programming the capture mode of CCP module in PIC 18 microcontroller for measuring period of pulse. **[8]**

b) Write a short note on speed control of DC motor using PIC 18 microcontroller. **[8]**

OR

Q8) a) A stepper motor is interfaced with PIC 18 microcontroller through lower nibble of Port B (RD0-RD3). Write program to rotate the stepper motor in anticlockwise direction continuously. **[8]**

b) Explain compare mode of PIC18 and also explain SFR CCP1 CON register in detail. **[8]**

Q9) a) Explain in detail the functions of the following special function registers ADCON0, ADCON1 of PIC18 microcontroller. **[9]**

b) Explain with a neat diagram, interfacing of DAC 0808 with PIC microcontroller and write a program for saw tooth waveform generation using DAC interfaced with PIC microcontroller through Port B. Assume the crystal frequency to be 10MHz. **[9]**

OR

Q10)a) Explain the steps involved in programming of A/D converter in PIC18F458 microcontroller using method of polling. **[9]**

b) Write a short note on measurement of temperature using PIC 18 microcontroller. **[9]**

Total No. of Questions : 10]

SEAT No. :

P 1709

[Total No. of Pages :3

[5058] - 342
T.E. (Electrical)
ELECTRICAL MACHINES - II
(2012 Pattern) (End Semester) (Semester - I) (303142)

Time : 2½ Hours and 30 min: *[Max. Marks : 70]*

Instructions to the candidates :

1) *Answer Q No1 or Q No2,QNo 3 or QNo 4, QNo 5 or QNo 6,QNo 7 or QNo 8, QN09 or QNo 10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume Suitable data if necessary.*

Q1) a) With a neat diagram explain construction of three phase Alternator. **[5]**

b) Effective resistance of a 1200 kVA, 3300V, 50Hz three phase star connected alternator is 0.3Ω per phase. A field current of 35A produces a current of 200A on short circuit and 1100V across line on open circuit. Find the per unit change in terminal voltage when full load of 1200kW at 0.8 power factor lagging is thrown off. **[5]**

OR

Q2) a) Explain pitch factor with diagram. **[4]**

b) Explain the procedure to determine the regulation of three phase alternator by m.m.f, method. **[6]**

Q3) a) Compare three phase synchronous motor with three phase induction motor on following point. **[5]**

i) Starting ii) Speed
iii) Power factor iv) Cost/kVA
v) Size/kVA

b) A three phase 10kW synchronous motor is connected to 1000V supplyand has synchronous reactance of 10Ω per phase. Find the value of minimum.current and the corresponding induced emf for full load condition the efficiency of the motor is 0.8 Neglect the armature resistance. **[5]**

OR

P.T.O.

Q4) a) Define short circuit ratio of alternator. Elaborate its significance. **[4]**

b) An alternator has direct axis synchronous reactance of 0.9 per unit and quadrature axis reactance of 0.55 per unit. Find the per unit open circuit voltage for full load at lagging power factor of 0.8. **[6]**

Q5) a) Explain construction and working of brushless d.c. motor. **[8]**

b) Explain stator side speed control methods of three phase induction motor. **[8]**

OR

Q6) a) Explain construction and working of variable reluctance stepper motor. **[8]**

b) Draw complete slip- torque characteristics of three phase induction motor and explain working of induction generator. **[8]**

Q7) a) Explain procedure to plot circle diagram of a.c.series motor. **[8]**

b) Explain the working of universal motor with its operating characteristics. **[8]**

OR

Q8) a) Compare uncompensated a.c. series motor with compensated a.c. series motor. **[8]**

b) A universal motor having resistance of 40 Ω and inductance of 0.3H connected to 240V d.c. supply and loaded draws 1A at 200rpm. Find the speed and torque when the motor is connected with 240V, 50Hz a.c.supply and loaded to draw the same value of current when connected with d.c. supply. **[8]**

Q9) a) With neat diagram explain double revolving field theory. Hence draw torque- speed characteristics of single phase induction motor. **[8]**

b) With a suitable diagram explain no load and blocked rotor test on single phase induction motor. How equivalent parameters are obtained from these tests. Draw equivalent circuits of the motor under two test conditions. **[10]**

OR

Q10)a) With neat diagram explain constrution and working of split phase induction motor. Draw its torque speed characteristics. **[8]**

b) A 230V, 50Hz, 4pole single phase induction motor has the following equivalent circuit parameters $R_1 = 3\Omega R_2 = 5\Omega, X_1 = 3\Omega, X_2 = 2.5\Omega$ and $X_m = 75\Omega$. Friction, windage and core losses are 50W and slip is 0.025. Calculate:

i) Input current

ii) Power factor

iii) Developed power

iv) Output power

v) Efficiency **[10]**

☆ ☆ ☆ ☆

Total No. of Questions : 10]

SEAT No. :

P1710

[Total No. of Pages : 2

[5058]-343
T.E. (Electrical)
POWER ELECTRONICS
(2012 Course) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Describe working of single phase bridge converter with R load Draw waveforms of load voltage, load current. **[5]**

b) How ac voltage regulators are classified? Explain single phase ac regulator feeding inductive load. Draw output voltage waveform. **[5]**

OR

Q2) a) Draw & Explain Gate Characteristic of SCR. **[5]**

b) Explain the following ratings of the thyristor. **[5]**

i) Latching current

ii) Holding current

Q3) a) Explain working of three phase full converter with a firing angle of 30^{o} & obtain expression for phase voltage & Line voltage. **[5]**

b) State and explain the effect of source inductance on operation of converter. **[5]**

OR

Q4) a) Draw and explain single phase semi converter with output waveforms with RL load. **[5]**

b) Explain R-C triggering circuit of Thyristor. **[5]**

Q5) a) Explain Class E chopper feeding RLE load in detail. **[8]**

b) Describe the basic structure of MCT. Give its equivalent circuit and explain the turn on and turn off process. **[8]**

OR

P.T.O.

Q6) a) What is time ratio control in dc choppers? Explain the use of TRC for controlling the output voltage in choppers. **[8]**

b) For Type A chopper the supply voltage is 230V, load resistance being 10Ω for the duty cycle of 40%. Find the average and rms values of the output voltage and chopper efficiency by taking voltage drop of 2V across the chopper during ON condition. **[8]**

Q7) a) Explain with circuit diagram and waveforms operation of single phase current source inverter. **[8]**

b) Explain Sinusoidal Pulse width modulation with necessary waveforms. **[8]**

OR

Q8) a) Explain with circuit diagram and waveforms operation of single phase current source inverter. **[8]**

b) Derive expression for output voltage in single pulse Modulation by Fourier analysis. **[8]**

Q9) a) Explain working of three phase six step voltage source inverter in 120^o mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **[10]**

b) Compare Multilevel inverter and Multi Pulse Inverter. **[8]**

OR

Q10)a) Draw neat diagram and explain cascaded multilevel inverter. **[8]**

b) Explain working of three phase six step voltage source inverter in 180^o mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **[10]**

Total No. of Questions :8]

SEAT No. :

P1711

[Total No. of Pages :2

[5058] - 344

T.E. (Electrical)

ELECTRICAL INSTALLATION, MAINTENANCE & TESTING

(2012 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What is meant by condition based maintenance? **[6]**

b) Explain failure modes of transformer. **[7]**

c) Which parameters of induction motors are considered for condition monitoring? **[7]**

OR

Q2) a) Explain insulation deterioration. **[6]**

b) Write the IS specifications for testing of transformer oil. **[6]**

c) Explain fault diagnostic methods of induction motor. **[8]**

Q3) a) Describe the methods of cable fault location. **[8]**

b) Explain routine and special tests for transformer testing. **[8]**

OR

Q4) a) Describe the faults in induction motors. **[8]**

b) Describe the testing of capacitor banks. **[8]**

P.T.O.

Q5) a) Compare overhead and underground distribution system with focus on volume of copper required for conductor. **[6]**

b) A single phase distributor AB of 500 mt long is fed from end A and is loaded as below: **[10]**

i) 100 A at 0.7 power factor lagging 300 mt. from A.

ii) 200A at 0.85 power factor lagging 500 mt. from A.

The total resistance and reactance of the distributor is 0.25 Ω and 0.15 Ω per km. Calculate the total voltage drop in the distributor. The load power factors are referred to the voltage at the far end.

OR

Q6) a) Describe the energy losses in feeders. **[6]**

b) Explain how kelvin's law is helpful in deciding the economic choice of conductor. **[10]**

Q7) a) Describe the various arrangements of bus bar in substations. **[10]**

b) Explain the method of testing earth resistance. **[8]**

OR

Q8) a) Explain the procedure of installation of underground LT service line. **[8]**

b) Explain the estimation of LT underground cable line for a substation. Justify your answer by considering cable size, price, labour rates, rate escalation. **[10]**

Total No. of Questions :12]

SEAT No. :

P1712

[Total No. of Pages :3

[5058] - 345

T.E. (Electrical Engineering)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2012 Course) (End Sem.) (Semester - V) (311121)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Define management. What are the different functions of management? State the importance of management. **[5]**

b) Differentiate between proprietary firm and partnership firm. **[5]**

OR

Q2) a) Define micro Economics. Explain the concept of supply and elasticity of supply. **[5]**

b) What are the different types of organization? Explain functional organization. **[5]**

Q3) a) Explain in brief following. **[6]**

i) Quality circle

ii) Pareto Analysis

b) Differentiate between Administration and management. **[4]**

OR

Q4) a) Explain in brief following: **[6]**

i) Ethics in technology management

ii) Pokka yoke

iii) Classification of technology

b) Explain the contribution of F.W. Taylor in the field of management. **[4]**

P.T.O.

Q5) a) What is sales promotion? State its significance along with the advantages and its disadvantages. **[5]**

b) Define the concept of financial management. Elaborate the scope of financial management in a business organization. **[5]**

OR

Q6) a) State different types of costs. Explain the same. **[5]**

b) What is marketing research? State and explain methods of marketing research. **[5]**

Q7) a) Define Leadership. Describe its types. What are their importances? **[6]**

b) Define Entrepreneur. Explain the different traits of Entrepreneur. **[6]**

OR

Q8) a) State group dynamics theories. What are different types of conflicts? **[6]**

b) Define motivation. Distinguish between X and Y Theory **[6]**

Q9) a) Explain in brief following **[7]**

i) HR planning

ii) Training and Development

iii) Time management

b) What is performance appraisal? State the objectives and types of performance appraisal. **[7]**

OR

Q10)a) What are the provisions of Labour welfare as per Factories Act 1948? **[7]**

b) Explain in brief following. **[7]**

i) Halo Effect

ii) Professional and Business ethics

Q11)a) State the patent Laws, Trade mark, and copy Right laws. **[7]**

b) What is the Intellectual Property Rights (IPR)? **[7]**

OR

Q12)a) Explain the patent format and structure. **[7]**

b) State the criteria for securing patents. What are the guidelines of the common IPR policy on patents? **[7]**

Total No. of Questions : 10]

SEAT No. :

P1713

[Total No. of Pages : 2

[5058]-346

T.E.(Electrical)

ENERGY AUDIT AND MANAGEMENT

(2012 Pattern) (Semester) (End Semester)(303150)

Time : 2½ Hourse] *[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 and Q.9 or Q.10.***
2) ***neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculate or is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) What are the various features of energy conservation building code (ECBC) of India? **[6]**

b) Classify various energy resources? **[4]**

OR

Q2) a) Enlist IE Rules. **[4]**

b) What are the basic Principles of Energy Management? **[6]**

Q3) a) What are various constraints of Supply side management? **[6]**

b) Explain energy manager skills required for successful energy management. **[4]**

OR

Q4) a) Explain DSM through tariff (TOD). **[6]**

b) Explain role of Energy Monitoring Systems. **[4]**

Q5) a) Define Energy Audit? Explain procedure for detail energy audit. **[10]**

b) Explain Cusum Technique. **[8]**

OR

Q6) a) Explain Energy audit case study in cement industries. **[10]**

b) Explain procedure involved in energy audit report writing. **[8]**

P.T.O.

Q7) a) Explain energy conservation techniques in heating system. **[8]**

b) Explain topping and bottoming cycles of cogeneration with block diagrams. **[8]**

OR

Q8) a) What are the advantages of energy efficient motors? Explain energy conservation potential in electric motors. **[8]**

b) Explain energy conservation techniques in air-conditioning systems. **[8]**

Q9) a) Explain NPV method used in economic analysis of energy conservation project. What are the advantages of this method? **[8]**

b) Explain energy audit case study in Educational institutes. **[8]**

OR

Q10)a) What is Budgeting? Explain various sources of capital. **[8]**

b) Explain energy audit case study in transmission and distribution (T &D) sector. **[8]**

✓ ✓ ✓

Total No. of Questions :10]

SEAT No. :

P1714

[Total No. of Pages :3

[5058] - 347

T.E. (Electrical)

POWER SYSTEM - II

(2012 Course) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Scientific Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Find the following for a single circuit transmission line delivering 50MVA at 110kV and p.f. 0.8 lagging:

i) Sending end voltage

ii) Sending end current

iii) Sending end power

iv) Efficiency of transmission line. Given that $A = D = 0.98 \angle 3°$; $B = 110 \angle 75°$ ohm; $C = 0.0005 \angle 80°$ siemens. **[6]**

b) Compare bipolar and mono polar HVDC system. **[4]**

OR

Q2) a) Draw and describe Monopolar and Bipolar HVDC transmission system with merits and demerits. **[6]**

b) In EHV AC transmission line, show that the power losses in the transmission line is inversely proportional to square of operating voltage. **[4]**

Q3) a) Derive power flow equation for receiving end side of transmission line. **[6]**

b) Explain phenomena of corona in EHVAC power transmission. **[4]**

OR

P.T.O.

Q4) a) Derive the formula for critical disruptive voltage in corona. **[6]**

b) Write short note on "HVDC lines in India". **[4]**

Q5) a) Derive power flow equation for 'n' bus system. **[8]**

b) Three motors are connected to a common bus. Each motor is rated 5000 HP, 3.3kV, 0.8 p.f. with 17% reactance. They are supplied by a generator 20MVA, 11kV with reactance 10% through 11/3.3kV, 18MVA transformer and having 5% leakage reactance. Draw the per unit reactance diagram. Take $1kVA = 1.1 \times HP$. Take 20MVA and 11kV base on generator. **[9]**

OR

Q6) a) Distinguish clearly between per unit method and percentage reactance method. Show that per unit reactance referred to the circuits connected by transformer is same if base kVA is taken for both circuits and the base kVs ratio equal to transformer ratio. **[8]**

b) Derive Y_{BUS} matrix using singular transformation method for 'n' bus system. **[9]**

Q7) a) Draw sub-transient, transient and steady state reactance diagram of alternator and show that $x_d'' < x_d' < x_d$ of an alternator. **[8]**

b) A three phase 11kV, 10MVA, generator has a direct axis steady state reactance of 10%. It is connected to a 5MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV side is connected to a transmission line having $1 + j4$ ohm impedance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current assuming no load prior to the fault when fault is at **[9]**

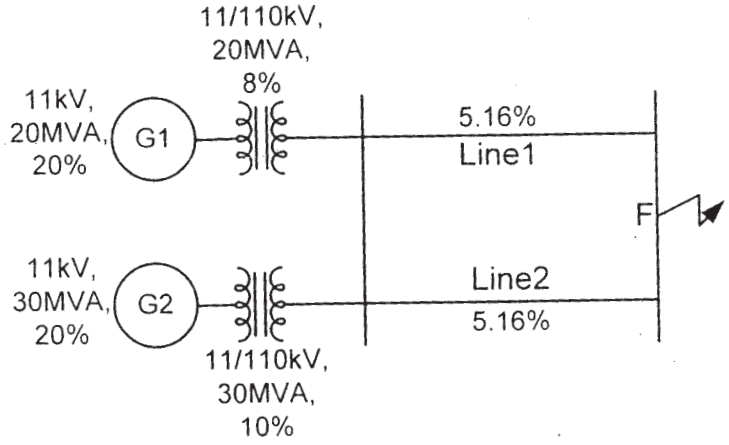
i) Sending end of line.

ii) Receiving end of line. Take base of 11kV, 10MVA on generator.

OR

Q8) a) Draw and explain oscillograph diagram of three phase fault current if the fault is taken place on an unloaded generator terminals. Clearly indicates the duration of each period. **[8]**

b) For the following system if the three phase fault is occurred at point F. Determine fault current supplied by each generator. All impedances are given on their individual rating. Take base of 11kV, 30MVA on generator side. **[9]**



Q9) a) If x_1 and x_2 are positive and nagative sequence reactance respectively, show that **[10]**

$$\frac{L-L\ Fault\ current}{L-L-L\ Fault\ Current}=1.732\left(\frac{x_1}{x_1+x_2}\right)$$

b) The zero and positive sequence component of R-phase are as under V_{RO} = 0.5 – 0.866 p.u. and $V_{R1} = 2 \angle 0°$ p.u. If the phase voltage of R - phase is $V_R = 3 \angle 0°$, find the nagative sequence component of R-phase and phase voltages V_Y and V_B assuming phase sequence as RYB. **[6]**

OR

Q10)a) A three phase 11kV, 10MVA alternator has sequence reactance as follow x_0 = 0.05 pu, x_1 = 0.15 pu, x_2 = 0.15 pu. If the generator is on no load, find the ratio of fault currents for LG fault to that when all the 3- phases are dead short circuited. **[6]**

b) Derive formula for fault current in case of LLG fault. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1715

[Total No. of Pages : 3

[5058]- 348
T.E. (Electrical)
DESIGN OF ELECTRICAL MACHINES
(2012 Course) (Semester - II) (End Sem.)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain mechanical radial forces developed under short circuit condition in a transformer and the measures to counteract them. **[6]**

b) Explain the procedure to estimate the no load current of three phase transformer. **[6]**

c) Determine the dimensions of the core and yoke for a 100KVA, 50 Hz, single phase transformer. A square type core is used with distance between adjacent limbs equal to 1.6 times the width of laminations. Assume voltage per turn to be 14 volts, maximum flux density 1.1 wb/m^2, window space factor 0.32 and current density 3A/mm^2, take stacking factor = 0.9, Flux density in yoke to be 80% of Flux density in core. **[8]**

OR

Q2) a) Explain the short time rating and continuous rating of electrical Machines. **[6]**

b) Draw and explain generalized flow chart for design of transformer. **[6]**

c) The tank of 1250 KVA natural oil cooled transformer has the dimensions length, width and height as 1.55 m × 0.65 m × 1.85 respectively. The full load loss is 13.1 kw. Find the number of tubes for this transformer assuming specific heat dissipation due to radiation = 6 w/m^2 ^oC, specific heat dissipation due to radiation = 6.5 w/m^2 ^oC, improvement in convection due to provision of tubes = 40%, Temperature rise 40^oC, length of each tube = 1m, diameter of tubes = 50 mm, Neglect top and bottom surfaces of tank. **[8]**

P.T.O.

Q3) a) Derive output equation of a three phase induction motor with usual notation. **[8]**

b) Define specific electric and specific magnetic loading and explain various factors considered for choice of specific electric and specific magnetic loading of a three phase induction motor. **[8]**

OR

Q4) a) Discuss various constraints in the selection of suitable combination of stator and rotor slots. **[8]**

b) Find the main dimensions of a three phase, 10 kW, 400V, 50Hz, 4 pole squirrel cage induction motor, assume full load efficiency = 0.85, full load power factor = 0.86, specific magnetic loading = 0.4 wb/m^2, specific electric loading = 20000 A/m, winding factor = 0.955, and stacking factor = 0.9, Take rotor peripheral speed as 20 m/sec. **[8]**

Q5) a) What is unbalanced magnetic pull in a three phase induction motor and explain procedure of its estimation. **[8]**

b) Determine the main dimensions, turns per phase, number of slots, conductor cross-section and slot area of a 250 HP , three phase. 50Hz, 400V, 1410 rpm, slip ring induction motor. Assume B_{av} = 0.5wb/m^2, ac = 30000 A/m, efficiency = 0.9, and power factor = 0.9, winding factor = 0.955, current density = 3.5 A/mm^2, slot space factor = 0.4 and ratio = L/P = 1.2. The machine is delta connected. Assume 5 slots per pole per phase. **[8]**

OR

Q6) a) Explain the factors should be considered when estimating the length of air gap of three phase induction motor. Why the air gaps should be as small as possible? **[8]**

b) A 15kW, 3ϕ, 50Hz, 400V, 4 pole, star connected squirrel cage induction motor has 60 slots, each containing 7 conductors. The rotor slots are 50. Assume full load efficiency as 0.85, full load power factor as 0.9 and rotor mmf is 80% of stator mmf. Calculate the value of bar and end ring current. Also find the area of each bar and each end ring, if current density is 5/mm^2. **[8]**

Q7) a) State and explain with neat sketches different types of leakage fluxes in an induction motor and estimate slot leakage reactance in an induction motor. **[9]**

b) A 15kW, 400V, 3 phases, 50Hz, 6 pole induction motor has a diameter of 0.3m & the length of core 0.12m. The number of stator slots is 72 with 20 conductors per slot. The stator is delta connected. Calculate the value of magnetizing current per phase if the length of air gap is 0.55m. The gap contraction factor is 1.2. Assume the mmf required for the iron parts to be 35 per cent of the air gap mmf. Coil span = 11slots. **[9]**

OR

Q8) a) Explain the procedure to calculate the no load current of a three phase induction motor. **[8]**

b) Explain the effect of ducts on the calculation of magnetizing current of 3ϕ induction motor. **[6]**

c) What are the losses in a three phase induction motor? Explain in brief. **[4]**

Total No. of Questions : 8]

SEAT No. :

P1716

[Total No. of Pages : 4

[5058]-349
T.E. (Electrical)
CONTROL SYSTEM - I
(2012 Course) (303147) (End Sem-Semester - II)

Time : 2.30 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.***

Q1) a) Distinguish between **[6]**

i) Open loop and closed loop system.

ii) Feedback and feedforward system

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

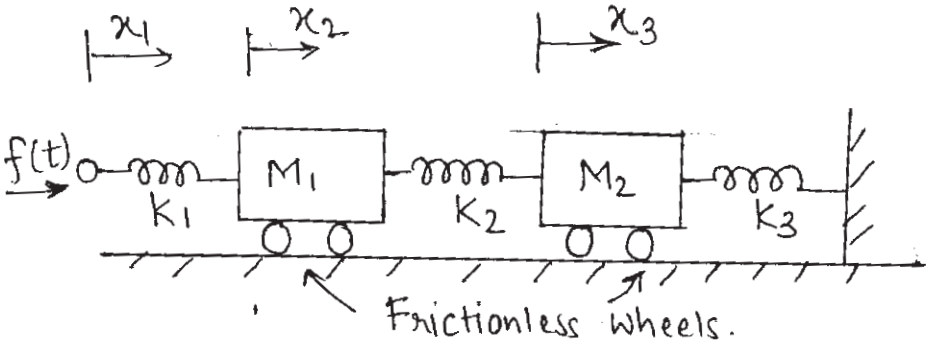
c) A unity feedback system characterised by the open loop transfer function.

$$G(s)=\frac{1}{s(0.5s+1)(0.2s+1)}$$

Determine the steady state errors for unit step, unit ramp and unit acceleration inputs. **[8]**

OR

Q2) a) Draw mechanical equivalent network of a given system and also draw the electrical analogous circuit using F-V analogy. **[8]**



P.T.O.

b) State and explain Mason's Gain Formula. **[5]**

c) Define and explain time domain specification. **[7]**

Q3) a) State and explain Routh Hurwitz stability criterion. **[6]**

b) A unity feedback control system has an open loop transfer function. **[10]**

$$G(s)=\frac{K}{s(s^2+4s+13)}$$

Sketch the root locus plot of the system by detemining the following:

i) Centroid, number and angle of asymptotes.

ii) Angle of departure of root loci from the poles.

iii) Breakaway point if any

iv) The value of K and the frequency at which the root loci cross the $j\omega$ - axis.

OR

Q4) a) Sketch the root locus for the open-loop transfer function of a unity feedback control system given below and determine

i) The value of K for $\xi = 0.5$

ii) the value of K for marginal stability. **[9]**

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

b) The open-loop transfer function of a unity feedback system is given by

$$G(s)=\frac{K}{(s+2)(s+4)(s^2+6s+25)}$$

By applying the Routh Criterion discuss the stability of the closed loop system as a function of K. Determine the value of K which will cause sustained oscillation in the closed loop system. What are the corresponding oscillation frequencies? **[7]**

Q5) a) Explain the terms gain margin, phase margin, Gain cross over frequency, phase cross over frequency. **[8]**

b) Sketch the bode plot of the transfer function and determine PM and GM from the plot.

$$G(s)H(s)=\frac{30}{s(1+0.5s)(1+0.08s)}$$ **[10]**

OR

Q6) a) Explain Nyquist stability criteria. **[8]**

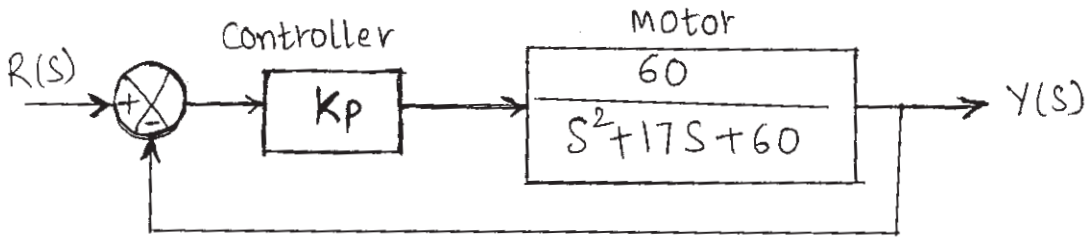
b) A control system with closed loop transfer function

$$G(s)H(s)=\frac{K(s-1)}{s(s+1)}$$

Plot Nyquist plot and comment on stability. **[10]**

Q7) a) Draw block diagram of PID controller and discuss the effect of increasing K_P, K_I, K_D on rise time overshoot and stability. **[8]**

b) The system given below is so design to have damping ratio 0.707. Determine the required value of K_P for the given damping ratio. **[8]**



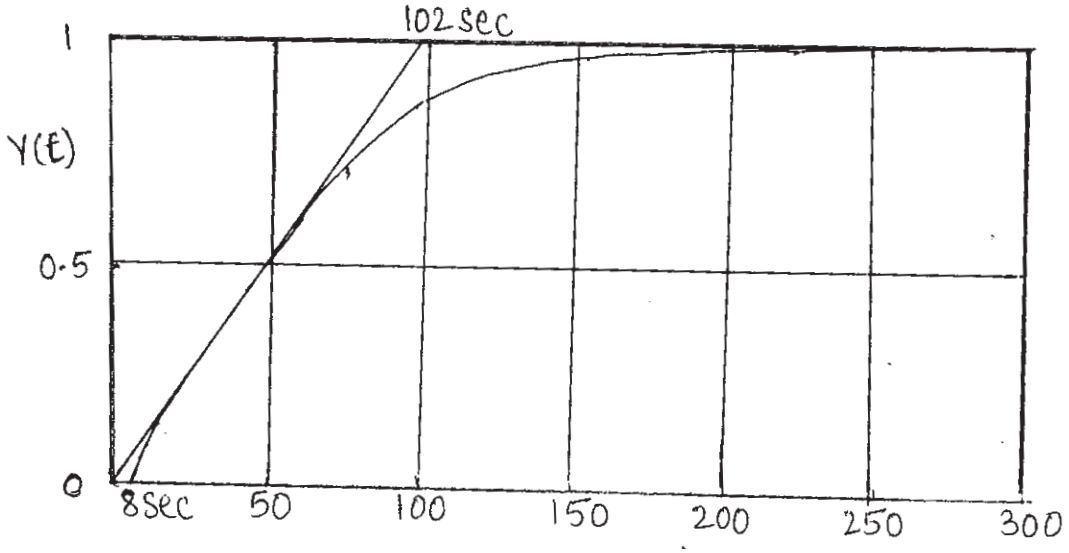
OR

Q8) a) Explain Ziegler Nichols method of tuning PID controller. **[8]**

b) An open loop test of a temperature control system yields the reaction curve shown below. The system open loop transfer function is given by

$$G(s)=\frac{1}{(20s+1)(50s+1)}$$

Used Ziegler Nichols method to determine K_P, K_I, K_D? For a quarter step response PID control system. **[8]**



Time (Sec)

Total No. of Questions :8]

SEAT No. :

P1717

[Total No. of Pages :3

[5058]-350

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2012 Course) (Semester - II) (End-Sem)

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) Describe construction and working of Ajaxwyatt furnace. **[6]**

b) Explain construction and working of Limit switch and Push button. **[6]**

c) Estimate the number and wattage of lamps which would be required to illuminate a workshop space 60 X 15 meter by means of lamps mounted 5 meter above the working plane. The average illumination required is about 100 lux, coefficient of utilization is 0.4, luminious efficiency is 16 lumens/watt. Assume specific height ratio of unity and candle power depreciation of 20%. **[8]**

OR

Q2) a) Explain electric circuit used in Refrigerator. **[6]**

b) Explain Mercury vapour lamp. **[6]**

c) An insulating slab of 2 cm thick and 150 cm^2 in area is to be heated by dielectric heating. The power required is 220 watts at a frequency of 32 MHz. The material has relative permittivity of 5 and power factor of 0.06. Determine the voltage necessary for heating and the current flowing through the material. Also calculate frequency to obtain the same heating if the voltage is limited to 620 volt. **[8]**

P.T.O.

Q3) a) Explain function of Transformer and Interrupter used in traction substation. **[8]**

b) How electric traction will be advantageous. **[8]**

OR

Q4) a) Draw and explain block diagram of electric locomotive. **[8]**

b) Explain following systems of track electrification **[8]**

i) Three phase low frequency AC system.

ii) Single phase AC to DC system.

Q5) a) Draw Trapezoidal speed-time curve and obtain expression for maximum velocity. **[8]**

b) A schedule speed of 45 kmph is required between two stops 1.5 km apart. Find the maximum speed over the run if the stop is of 20 sec duration. Acceleration and retardation are 2.4 kmphps and 3.2 kmphps respectively. Assume trapezoidal speed - time curve. **[8]**

OR

Q6) a) Define: **[8]**

i) Average Speed

ii) Schedule speed

iii) Coefficient of adhesion

iv) tractive effort

b) Elaborate the parts of total tractive effort with usual notations. **[8]**

Q7) a) Write a note on Anti-collosion system. **[4]**

b) What are the desirable characteristics of motor for traction purpose. **[6]**

c) A 2340 tonnes train including loco proceeds down a gradient of 1 in 80 for 5 minutes during which period its speed gets reduced from 60 kmph to 36 kmph by application of regenerative braking. Find the energy returned to the lines if the tractive resistance is 5 kg/tonne, rotational inertia 10% and overall efficiency of the motor during regeneration is 70%. **[8]**

OR

Q8) a) How Three phase Induction motor is suitable for traction service. **[4]**

b) Explain transition methods with neat diagram. **[6]**

c) A train weighing 400 tonne has speed reduced by regenerative braking from 40 kmph to 20 kmph over a distance of 2 km on a down gradient of 2%. Calculate the electrical energy returned to the line. Tractive resistance is 40 N/tonne and allow rotational inertia of 10% and efficiency of conversion is 75%. **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P1718

[Total No. of Pages :2

[5058] - 351

T.E. (Electronics)

ELECTRICAL MACHINES & POWER DEVICES

(2012 Course) (End Semester) (Semester - V) (304201)

Time : 2 ½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain switching characteristics of power diode. **[6]**

b) Explain the two transistor analogy for SCR and derive an expression for anode current IA. **[7]**

c) Why snubber circuits are required? Also explain the protection of power devices by snubber circuit. **[7]**

OR

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

b) Explain the need for protection of power devices and State different types of protections required to ensure safety of power devices. **[7]**

c) Write note on triggering circuit of TRIAC using DIAC. **[7]**

Q3) a) Explain the basic action of a commutator with the help of neat sketches. **[6]**

b) Write a short note on permanent magnet DC motor. State advantages, disadvantages and applications. **[6]**

c) A 20 KW, 200 V shunt generator has a armature resistance of 0.05 Ω and a shunt field resistance of 200 Ω. Calculate the power developed in the armature when it delivers rated output. **[4]**

OR

P.T.O.

Q4) a) Why starter is necessary for a DC motor? Explain the working of three - point starter with the help of neat diagram. **[6]**

b) Distinguish between self excited and separately excited DC generator. **[6]**

c) A 4 pole, 250 V, DC series motor has a wave connected armature with 200 conductors. The flux per pole is 25mWb when motor is drawing 60A from the supply. Armature resistance is 0.15 Ω while series field winding resistance is 0.2 Ω. Calculate the speed under this condition. **[4]**

Q5) a) Explain the principle of operation of a 3-phase induction motor in detail. **[8]**

b) Explain the procedure for no load test and blocked rotor test on a three phase induction motor. How are the parameters of equivalent circuit determined from test results? **[10]**

OR

Q6) a) Explain the complete torque-slip characteristics of a three phase induction motor including motoring, generating and breaking regions. **[8]**

b) A 3 Φ, 4 Pole, 50 Hz, star connected induction motor running on full load develops a useful torque of 300 N-m. The rotor emf is completing 120 cycles per minute. If the torque lost in friction is 50 Nm, calculate

i) Slip

ii) Net ouput power

iii) Rotor copper loss per phase

iv) Rotor efficiency

v) Rotor resistance per phase if rotor current is 60 A in running condition. **[10]**

Q7) a) Compare variable reluctance motor with permanent magnet stepper motor. **[8]**

b) Explain the principle of operation of capacitor start and capacitor run single phase induction motor along with the torque slip characteristics and the applications. **[8]**

OR

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

b) Explain the operation of a variable reluctance motor. **[8]**

Total No. of Questions :8]

SEAT No. :

P1719

[Total No. of Pages :3

[5058] - 352

T.E. (Electronics Engg.)

DATA COMMUNICATION

(2012 Pattern) (End Sem.) (304202)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What are the limitations of DM? Explain with suitable waveforms. **[6]**

b) Draw and explain Layered architecture of OSI model. **[7]**

c) A 1 kHz signal of voice channel is sampled at 4 kHz using 12 bit PCM. Obtain the followings. **[6]**

i) Nyquist rate

ii) BW required

iii) SNR at PCM output

OR

Q2) a) Compare ARQ and FEC. **[6]**

b) Consider a sinewave of frequency f_m and amplitude A_m applied to a DM of step size δ. Show that the slope over load distortion will occure if

$$A_m > \frac{\delta}{2\pi f_m T_s}$$

Where T_s is the sampling period. **[7]**

c) Compare RZ unipolar, RZ polar and RZ bipolar data formats. **[6]**

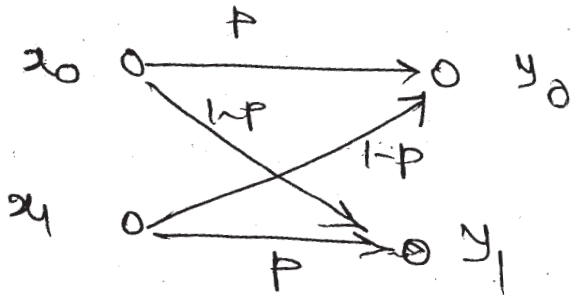
P.T.O.

Q3) a) Apply Shannan-Fano coding procedure for the following message ensemble. Also determine its efficiency. **[8]**

x	x_1	x_2	x_3	x_4	x_5	x_6
P	0.4	0.28	0.12	0.08	0.08	0.04

b) Find the rate of information transmission across the channel shown in the figure below for P = 0.8 and P = 0.6. The symbols are generated at the rate of 1000 per second. Also determine channel input information rate.

Given P (x_0) = P (x_1) = $\frac{1}{2}$. **[8]**



OR

Q4) a) The voice frequency modulating signal of a PCM system is to be quantized in 16 levels with following probabilities. **[8]**

$P_1 = P_2 = P_3 = P_4 = 0.1$

$P_5 = P_6 = P_7 = P_8 = 0.05$

$P_9 = P_{10} = P_{11} = P_{12} = 0.075$

$P_{13} = P_{14} = P_{15} = P_{16} = 0.025$

Calculate the entropy and information rate, Assume $F_m = 3kH_Z$.

b) What steps are involved in Huffman coding procedure? Evaluate the performance of Huffman code over Shannon Fano code for large mesage ensemble with equal probabilities. **[8]**

Q5) a) Explain QPSK modulation and demodulation. **[8]**

b) Derive the expression of error probability of ASK. **[8]**

OR

Q6) a) What is OFDM? Explain its working and give its application. **[8]**

b) For BPSK explain. **[8]**

i) Generation

ii) Reception

iii) Spectrum

iv) BW

Q7) a) Compare FDMA, TDMA and CDMA. **[6]**

b) Compare FH-SS and DS-SS. **[6]**

c) For DS- SS define. **[6]**

i) Chip sequence

ii) Chip period

iii) Processing gain (spread factor)

OR

Q8) a) Write a short note on CSMA. **[6]**

b) Write a short note on FH - SS **[6]**

c) Compare through puts of pure ALOHA and slotted ALOHA. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1720

[Total No. of Pages : 4

[5058]-353
T.E.(Electronics.)
NETWORK SYNTHESIS
(2012 Pattern)(Semester-I)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Test whether the following functions are positive real, **[6]**

i) $F(s)=\dfrac{s^2+4}{2s^3+3s^2+6s+1}$

ii) $F(s)=\dfrac{(s+2)(s+4)}{(s+1)(s+3)}$

b) Synthesize the following function using cauer-I and cauer-II form, **[6]**

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

c) State the properties of Transfer function and synthesize the following Transfer function. **[8]**

$$Z_{21}(s)=\frac{s}{s^3+3s^2+3s+2}$$

as a 1Ω terminated two port LC ladder network.

OR

P.T.O.

Q2) a) Define all the four transfer functions for a two port network and explain effect of location of poles and zeros on response of the network. **[7]**

b) State and explain the properties of LC impedance function and also indicate which of the following functions are LC, RC,RL, or RLC impedance functions. **[7]**

i) $Z(s)=\dfrac{s^3+2s}{s^4+3s^2+2}$

ii) $Z(s)=\dfrac{s^2+4s+3}{s^2+6s+8}$

iii) $Z(s)=\dfrac{s^4+4s^2+3}{s^3+2s}$

c) Define constant resistance network? Design a bridge T network terminated in 1Ω to give a voltage transfer ratio **[6]**

$$G_{12}(s)=\frac{s+2}{s+3}$$

Q3) a) Compare Butterworth and Chebyshev Approximation Techniques. **[4]**

b) Determine the transfer function and realize low pass Butterworth approximation filter whose requirements are characterized by,

Pass band edge frequency 0.2 Mrad/sec, maximum loss in pass band 2dB, stop band loss at least 60 dB at 6Mrad/sec **[8]**

c) Normalized third order Low pass filter is shown below in Fig.1 **[4]**

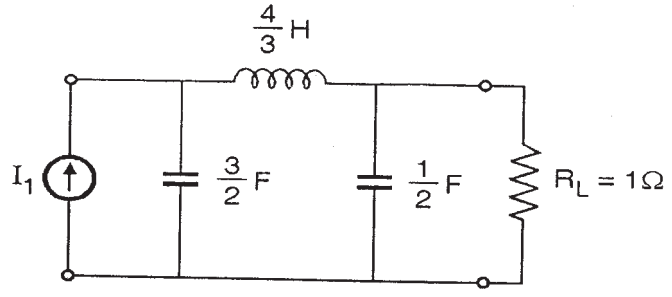


Figure 1

Design the corresponding high pass filter with its cutoff frequency $\omega_c = 10^4$rad/sec and the impedance load of 500Ω

OR

Q4) a) Explain frequecncy and impedance Scaling. **[4]**

b) State the properties of Butterworth Approximation. **[4]**

c) Determine the transfer function of Chebyshev low pass filter to meet the following specification, **[8]**

i) 0.5 dB ripple in the pass band.

ii) Cut off frequency $w_c = 5x\ 10^5$ rad/sec.

iii) The Magnitude must be down to 30 dB at w= 1.5×10^6 rad/sec.

iv) Load resistance=600Ω

Q5) a) Differentiate between Passive and Active filters. **[4]**

b) Synthesize 2nd order active low pass filter to have a pole frequency of 2 kHz and pole Q of 10. Then using RC-CR transformation, realize HPF with same cut off frequency. **[6]**

c) What are the advantages and disadvantages of biquad topologies of Active filter? **[6]**

OR

Q6) a) Design 2nd order Sallen and Key high pass Butterworth filter having cut off frequency of 600 Hz. **[4]**

b) Explain the different feedback topologies used in active filter designing. **[4]**

c) Synthesize the following high pass filter function using RC-CR transformation. **[8]**

$$H(s)=\frac{ks^2}{s^2+s+25}$$

Q7) a) Define Sesitivity? Give some of its important properties. **[4]**

b) Explain the concept of gain sensitivity? Also explain the various factors affecting the gain sensitivity. **[6]**

c) Explain effect of the following op-amp characteristics on the active filter. **[8]**

i) Dynamic range

ii) Input Bias Current.

iii) Slew rate.

iv) CMRR

OR

Q8) a) For the series RLC circuit shown in Fig.2, find transfer function V_2/V_1. Calculate the sensitivities of K, the pole frequency ωp, the factor(Q_p) with respect to R,L and C. Comment on the result obtained. **[6]**

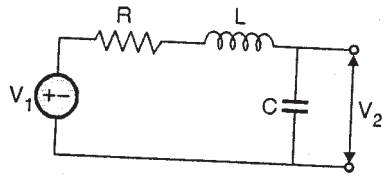


Figure 2

b) Prove the following sensitivity relationships. **[6]**

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

ii) $S_{\sqrt{x}}^p = 2S_x^p$

iii) $S_x^{y+c} = \frac{y}{y+c} S_x^y$

c) Explain the effect of offset voltage on active filter performance. The input to the inverter shown in Fig.3 is a sine wave of amplitude 5 volt. If the slew rate of the op amp is 1V/μ sec, find the frequency at which the slew rate limiting occurs. **[6]**

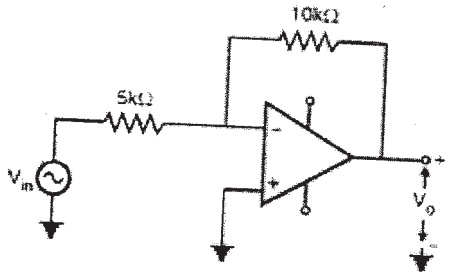


Figure 3

Total No. of Questions :8]

SEAT No. :

P1721

[Total No. of Pages :2

[5058] - 354

T.E. (Electronics Engineering)

MICROCONTROLLERS AND APPLICATION

(2012 Course) (304203) (End Semester) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answers the Q.1 OR Q.2 and Q.3 OR Q.4 and Q.5 OR Q.6 and Q.7 OR Q.8.***
2) ***Answer any four 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 data if necessary.***

Q1) a) Explain how Microcontroller is suitable for embedded system. **[6]**

b) Describe in detail the interrupt structure of 8051 Microcontroller. **[6]**

c) What are the addressing modes of PIC 18FXXX Microcontroller? Explain with suitable Example? **[8]**

OR

Q2) a) Explain the Logic Analyzer, Assembler and Compiler. **[6]**

b) Explain the following instruction with suitable example. **[6]**

i) CJNZ

ii) MOVC A, @ A+PC

iii) ORL A, Rn

c) Draw and Explain the PIC 18FXXX Microcontroller architecture. **[8]**

Q3) a) What are the different timer modes and their applications of PIC 18FXXX? **[8]**

b) Draw an interfacing diagram and write an Embedded C Program to interface 16×2 LCD with PIC 18FXX Microcontroller to display the "SPPUPUNE" message on second row fifth position. **[8]**

OR

P.T.O.

Q4) a) Draw and Explain the interrupt structure for the PIC 18FXX microcontroller. **[8]**

b) Write a C18 Program to toggle only the PORTB. 4 bit continuously every 50ms. Use timer1, 16 bit mode. Assume that XTAL = 8MHZ. **[8]**

Q5) a) Explain the MSSP with 12C Master mode. **[8]**

b) Write a PIC 18 C Program to send the two message "Low Speed" and "High Speed" to the serial port. Assume that SW is connected to pin PORTC. 0, monitor its status and set the baud rate as follows. **[8]**

SW = 0 9600 baud rate

SW = 1 38400 baud rate

Assume that XTAL = 10MHZ for both case.

OR

Q6) a) Compare SPI and 12C Communication buses. **[8]**

b) Draw interfacing diagram and write a program for 12C based RTC with PIC18FXXX. **[8]**

Q7) a) Explain in brief various steps involved in designing data acquisition system. **[10]**

b) Design and Explain how DC Motor Speed can be controlled using PWM? **[8]**

OR

Q8) a) What are design consideration to design Digital voltmeter? Design the Digital voltmeter using PIC microcontroller to measure the voltage range 0 V to 300 DC Volt. Draw the block diagram and flow chart. **[12]**

b) Design a frequency counter with the help of block diagram. **[6]**

Total No. of Questions :8]

SEAT No. :

P1722

[Total No. of Pages :3

[5058] - 355

T.E. (Electronics Engg.)

ELECTROMAGNETIC AND WAVE PROPAGATION (304204)

(2012 Pattern) (End Semester) (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 diagram must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***

Q1) a) Derive the equation for Electric Field E due to infinite sheet of charge. **[6]**

b) Two extensive homogeneous isotropic dielectrics meet on plane z = 0. For z>0, $\varepsilon_{r1} = 3$ and for z< 0, $\varepsilon_{r2} = 2$. A uniform electric field $E_1 = 5a_x - 2a_y + 3a_z$ KV/m exists for $z \geq 0$. Find E_2 for $z \leq 0$. **[8]**

c) Using concept of curl, obtain point form of ampere's circuit law $\bar{\nabla} \times \bar{H} = \bar{J}$. **[6]**

OR

Q2) a) Three infinite uniform sheets of charge are located in free space follows $3nC/m^2$ at z = -4,6 nC/m^2 at z = 1 and -8 nC/m^2 at z = 4. Find E at the point. **[8]**

i) A (2,5,-5)

ii) B (4,2,-3)

b) State and explain Electric potential and potential difference. **[6]**

c) State and prove Divergence Theorem. **[6]**

P.T.O.

Q3) a) In non magnetic medium E = 4 sin $\left(2\pi 10^7 t - 0.8\times\right)a_z$ V/m. Find the following things. **[9]**

i) ε_r, η

ii) The time -average power carried by the wave.

iii) The total power crossing 100cm^2 of plane 2 x + y = 5

b) Explain and derive the expression for displacement current. **[9]**

OR

Q4) a) A parallel plat capacitor with plate area 5cm^2 and plate separation of 3 mm has a voltage 50 sin (10^3t) V. applied to its plates calculate the displacement current when $\varepsilon = 2\varepsilon_0$ **[9]**

b) What is pointing vector? What is its significance? Derive the expression for average pointing vector. **[9]**

Q5) a) Explain and derive the plane wave equation in good conductor. **[8]**

b) An EM wave travels in free space with the electrical field component $E_S = 100e^{j(0.866y + 0.5z)}$ax V/m. **[8]**

Determine

i) ω and λ

ii) Magnetic field component

iii) The time average power in the wave

OR

Q6) a) Explain and Derive the expression for and Helmholtz equation. **[8]**

b) Explain and derive the plane wave equation in good conductor. **[8]**

Q7) a) Derive the Fundamental equations for free space propagation. **[8]**

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

i) MUF

ii) Skip Distance

iii) D & E Layer

iv) Virtual height

OR

Q8) a) Explain the following terms: **[8]**

i) Fading

ii) Multipath delay spread,

iii) Coherence Bandwidth

iv) Coherence Time

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

i) Multi hop propagation

ii) Ionospheric abnormalities

Total No. of Questions : 10]

SEAT No. :

P1723

[Total No. of Pages : 2

[5058]-356
T.E.(Electronics)
INSTRUMENTATION SYSTEMS
(2012 Course) (End Semester)(304209)(Semester-II)

Time : 2.5 Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) List various temperature sensors. Explain non-contact type of temperature measurement using optical pyrometer. **[5]**

b) Explain the following static characteristics of measuring instruments. **[5]**
   i) Linearity
   ii) Sensitivity
   iii) Drift
   iv) Resolution
   v) Hysterisis

OR

Q2) a) Explain the different fundamental standards and units for common physical parameters. **[5]**

b) A transparent bottle moving on a conveyor is to be sensed using a proximity sensor. Suggest a suitable proximity sensor and also explain working principle of the chosen sensor. **[5]**

Q3) a) An Airbus 330 jetliner uses pitot tube for the measurement of airspeed. Explain with suitable diagram working principle of pitot tube. **[5]**

b) Explain construction and working of electromagnetic flow sensor. **[5]**

OR

Q4) a) State working principle of thermocouple. Explain how cold junction compensation is achieved for thermocouple. **[5]**

b) Explain capacitive sensor for level measurement when,
   i) Liquid is conducting
   ii) Liquid is not conducting **[5]**

P.T.O.

Q5) a) Draw a neat sketch of (i) Orifice plate (ii) Ventury tube (iii) Flow nozzle. Explain working principle of orifice plate as a flow sensor. **[8]**

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

i) Micro-machined hot wire anemometer.

ii) Magnetic field sensors.

OR

Q6) a) Explain the steps involved in surface micromachining of MEMS accelerometer. Draw a neat sketch of MEMS accelerometer. **[8]**

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

i) Micro-machined absolute pressure sensor.

ii) Smart sensors.

Q7) a) Explain how simultaneous analog and digital communication is achieved with HART protocol? **[8]**

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

i) I^2C bus.

ii) Profibus.

OR

Q8) a) Explain with neat diagram working principle of electro-pneumatic converter. **[8]**

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

i) RS 232 standard.

ii) IEEE 488 bus.

Q9) a) What is actuator. Explain with diagram working of

i) Spring diaphragm actuator **[4]**

ii) Piston actuator **[4]**

b) Explain principle of operation of DC motor. State various types of D.C. motor. **[8]**

OR

Q10)a) Explain with neat diagram working of poppet valve. Draw the symbol for a 2/2 valve and a 3/2 valve. **[8]**

b) A 5V control signal is to be used to turn ON and OFF a solenoid valve operating on 230VAC. Explain a relay driver circuit which can be used for this application. **[8]**

✓ ✓ ✓

Total No. of Questions : 10]

SEAT No. :

P 1724

[Total No. of Pages :2

[5058] - 357
T.E. (Electronics Engineering)
EMBEDDED PROCESSORS (304211)
(2012 Course) (Endsem - I)

Time : 2 ½Hours] *[Max. Marks :70]*

Instructions to the candidates:

1) ***Answer the Q1 or Q2, Q3 or Q4, Q5 or Q,6,Q7 or Q8, Q9 or Q10.***
2) ***Answers 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 data, if necessary.***

Q1) a) What are privileged & non-privileged modes of operation of ARM processor? Explain it. **[4]**

b) What is significane of special purpose registers r_{13}, r_{14}, r_{15}? **[4]**

c) Explain following ARM instructions (assume suitable data) **[2]**

i) ORR
ii) BIC

OR

Q2) a) Differentiate between ARM mode & thumb mode operation of ARM 7 processor. **[4]**

b) What are the different operating modes of ARM 7 ? **[4]**

c) What is meant by 7 TDMI w.r.t ARM core ? **[2]**

Q3) a) Explain the GPIO ports available & registers to control the same. **[6]**

b) Explain the steps to generate the delay of 500 ms using timer when PCLK =15MHz. .**[4]**

OR

Q4) a) Explain the significance of PLLO & PLL 1 with suitable diagram. **[4]**

b) Draw interfacing diagram between LPC 2148 & LCD16×2 display. State Algorithm, SFR's involved with their typical value & LCD commands used to display "PUNE" on LCD. **[6]**

P.T.O.

Q5) a) List different cortex A,R,M processor family series & versions. Also write applications of each family. **[6]**

b) Draw & explain block diagram of ARM cortex M3. What are the improvements of ARM cortex M3 over ARM 7. **[10]**

OR

Q6) a) Explain thread & handler mode with suitable diagram. Also write the features of LPC 1768. **[8]**

b) Explain CMSIS standard with structure in detail. Also explain Firmware in embedded systems. **[8]**

Q7) a) Interface RGBLED with LPC 1768, also write embedded 'C' program to generate different colours. **[8]**

b) Write the applications of LPC1768 in real word interfacing with example in detail. **[8]**

OR

Q8) a) Draw interfacing of LPC 2148 with DC motor with PWM control. Also explain different PWM control applications.. **[8]**

b) How NVIC differs from VIC? Explain features of NVIC in LPC 1768. **[8]**

Q9) a) Draw & explain interfacing diagram of USB using USB device mode with LPC 1768. **[8]**

b) Draw & explain interfacing of TFT with LPC 1768 also draw flowchart/ Algorithm for the same. **[10]**

OR

Q10)a) Write a short note on following block in LPC 1768. **[12]**

i) CAN

ii) USB

iii) Ethernet

b) Explain different self test condition in CAN. **[6]**

☆ ☆ ☆ ☆

Total No. of Questions : 8]

SEAT No. :

P1725

[Total No. of Pages : 2

[5058]-358

T.E. (Electronics)

POWER ELECTRONICS AND APPLICATIONS

(2012 Course) (304212) (Semester - VI) (End Sem.)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Draw the circuit of a 3 φ controlled full wave rectifier and describe its working with suitable waveforms. **[7]**

b) Explain with the help of circuit diagram and waveform working of 1 φ full bridge inverter. **[7]**

c) How are choppers classified? Explain with a typical application. **[6]**

OR

Q2) a) With the help of circuit diagram and output waveforms explain the working of 1 φ LCC for inductive load. What is meant by inversion operation of LCC. **[6]**

b) With the help of neat diagram and waveforms explain operation of 120º mode of 3 φ inverters for star load. **[7]**

c) Compare different control strategies of a chopper. **[7]**

Q3) a) With the help of circuit diagram and waveforms, explain the operation of SLR DC-DC converter. **[6]**

b) Define power quality. State various power line disturbances and their sources. **[6]**

c) Compare ZCS and ZVS. **[4]**

OR

P.T.O.

Q4) a) Compare switched, linear and resonant converter. **[4]**

b) Explain the concept of zero current switching (ZCS) and zero voltage switching (ZVS) using circuit diagram and waveforms. **[6]**

c) With the help of neat diagram and waveforms explain the operation of ZCS resonant switch DC-DC converter. **[6]**

Q5) a) Draw the block diagram of an online UPS and explain the function of each block. **[8]**

b) Draw the block diagram of HVDC transmission system and explain its operation. **[8]**

OR

Q6) a) Explain the operation of electronic ballast with the help of block diagram. **[8]**

b) Draw the waveforms and circuit diagram of 12 pulse converter. Explain its operation. **[8]**

Q7) a) Explain with block diagram grid connected PV system. **[8]**

b) Explain the need of battery in PV system. State factors involved in selection of battery. **[4]**

c) What is meant by MPPT? Explain in brief analog and digital methods used for implementation of MPPT. **[6]**

OR

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

b) State advantages, disadvantages and applications of solar cell. **[4]**

c) Briefly explain vertical axis wind turbine generator. **[6]**

Total No. of Questions :8]

SEAT No. :

P1726

[Total No. of Pages :2

[5058]-359

T.E. (Electronics Engineering)

INDUSTRIAL MANAGEMENT

(2012 Pattern) (Semester - II) (End-Sem.) (304213)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Distinct between Traditional organization and Modern organization. **[6]**

b) Discuss in detail Quality Management assistance tools. **[6]**

c) Explain the Capital Structure. What are different factors which influences the capital structure decision? **[8]**

OR

Q2) a) Define Forms of Organization-Line, Line-staff, committee. **[6]**

b) Explain 5S Quality management standard. **[6]**

c) What do you mean by Project crashing and resource Leveling explain in detail. **[8]**

Q3) a) Give the strategic importance of HRM. **[6]**

b) Discuss in detail - Challenges to HR professionals. **[6]**

c) What are the objectives and process for human resource planning. **[6]**

OR

Q4) a) What are the key parameter for talent acquisition. **[6]**

b) Comment on carrier planning and management. **[6]**

c) Discuss recent trends in human resource development. **[6]**

P.T.O.

Q5) a) Write a note on Entrepreneurship. **[6]**

b) How to identify the business opportunity. **[6]**

c) Discuss different sources of finance. **[4]**

OR

Q6) a) Give different type of business. **[6]**

b) What are the government policies for business. **[6]**

c) Write a note on Women Entrepreneurship. **[4]**

Q7) a) What is management information system. **[6]**

b) Give the characteristics of information system. **[6]**

c) Comment on Contemporary approach to MIS. **[4]**

OR

Q8) a) What is decision support system. **[8]**

b) Write on B2B, B2C, C2B and C2C. **[8]**

ɛɛɛ

Total No. of Questions :10]

SEAT No. :

P1727

[Total No. of Pages :4

[5058]-360

T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2012 Course) (End-Sem) (Semester - I) (304210)

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 electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) A digital communication link carries binary coded words representing samples of input signal $x(t) = 3\cos 600\pi t + 2\cos 1800\pi t$. The link is operated at 10000 bits/s & each input sample is quantized into 1024 different voltage levels **[6]**

i) What is the sample frequency & folding frequency in Hz?

ii) What is Nyquist rate of sampling for x(t) in Hz?

iii) What is resolution of quantization?

b) Find sequence x(n) for which IDFT x(k) is given by X(k) = {3 2+j 1 2-j}. **[4]**

OR

Q2) a) Peform circular convolution of following two sequences **[6]**

$x_1(n) = \{1, 2, 3, 1\}$ $x_2(n) = \{4, 3, 2, 2\}$ using DFT & IDFT method.

b) Define & explain sampling theorem & alising effect. **[4]**

P.T.O.

Q3) a) Prove the following properties of z transform **[6]**

i) Time shifting

ii) Convolution of two sequences in time domain.

b) Derive DIT FFT flow graph for N = 4, hence find DFT of x(n) = {1, 2, 3, 4} **[4]**

OR

Q4) a) Compute the inverse z transform of the following

$$x(z) = \frac{z-1}{1-3z^{-1}} \text{ ---- ROC } |z| < 3. \quad \textbf{[6]}$$

b) Explain advantages of digital signal processing over analog signal processing. **[4]**

Q5) a) Explain in detail frequency sampling method of designing FIR filter. **[7]**

b) Design a low pass digital filter with cut off frequency $\omega_C = \pi/2$ using frequency sampling technique for N = 17. **[10]**

OR

Q6) a) Determine the filter coefficients hd(n) for the desired frequency response of a low pass filter given by **[8]**

$$H_d(e^{jw}) = \begin{cases} e^{-j2w} & -\pi/4 \le w \le \pi/4 \\ 0 & -\pi/4 \le w \le \pi \end{cases}$$

If we define new filter coefficients by $h_d(n)\, w(n) = h(n)$, where

$$w(n) = \begin{cases} 1 \text{ ---- for } 0 \le n \le 4 \\ 0 \text{ ---- otherwise} \end{cases}$$

then determine h(n).

b) Explain the need of window functions in design of FIR filter. Also explain advantages & disadvantages of window function. **[5]**

c) Realize a linear phase FIR filter with following impulse response. Give necessary equations $H(z) = \frac{2}{3}z + 1 + \frac{2}{3}z^{-1}$. **[4]**

Q7) a) Using Bilinear transformation, design a butter worth filter which satisfies the following conditions **[9]**

$0.8 \le |H(e^{jw})| \le 1$ --- $0 \le w \le 0.2\pi$

$|H(e^{jw})| \le 0.2$ --- $0.6\pi \le w \le \pi$ & Ts = 1.

b) Explain impulse invariance transformation. What is drawback of this transformation & how BLT overcomes it. Show graphical representation. Explain concept of frequency prewarping. **[8]**

OR

Q8) a) Determine direct form I & II for the filter given by **[6]**

$y(n) = 2b\cos w_o y(n-1) - b^2 y(n-2) + x(n) - b\cos w_o x(n-1)$.

b) Write short note on chebyshev filter approximation. **[4]**

c) Find out H(z) using impulse invariance method at 5Hz sampling frequency from H(s) as given below $H(s) = \frac{2}{(s+1)(s+2)}$. **[7]**

Q9) a) Design 2 stage interpolator for following system consider one of the interpolator factor $I_1 = 2$. **[8]**

Baseband 0 - 20 KHz

I/P sampling frequency 44.1 KHz

O/P sampling frequency 176.4 KHz

Stopband attenuation 50 dB

Passband ripple 0.5 dB

Transition width 2KHz.

Stopband edge frequency 22.05 KHz

b) Explain any four addressingmodes of DSP processor in detail. **[8]**

OR

Q10)a) Explain DC motor control method using DSP processor. **[8]**

b) Explain sampling rate conversion by a non integer factor. **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P1728

[Total No. of Pages :3

[5058] - 361

T.E. (E & TC)

SYSTEM PROGRAMMING AND OPERATING SYSTEM

(End Sem.) (2012 Course) (Semester - VI) (304185)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain the steps in program development. **[7]**

b) Explain different assembly language statements with examples. **[7]**

c) Explain with example use of Terminals and non-Terminal in representing language grammer. **[6]**

OR

Q2) a) What is the need for code optimization? Explain various code optimization techniques. **[7]**

b) List different loading schemes and explain any one in details. **[7]**

c) Explain lexical analysis and syntactical analysis with example. **[6]**

Q3) a) List different types of operating systems with examples. Explain in brief any 2 functions of operating system. **[6]**

b) Explain various states of a process with diagram. **[6]**

P.T.O.

c) Consider the following processes where Arrival and Burst time are as shown below **[6]**

Process	Burst Time	Arrival Time
P1	06	0
P2	04	1
P3	07	3
P4	02	5

Calculate the Average Waiting Time and Average Turn-around Time if the processes are scheduled using FCFS.

OR

Q4) a) Draw and Explain Many to One, One to One and Many to Many multithreading models. **[6]**

b) Draw and explain process control block. **[6]**

c) Find out the safe sequence for execution of 4 processes using Bankers algorithm. Maximum Resources: R1 = 5, R2 = 5. **[6]**

Allocation Matrix

	R1	R2
P1	1	0
P2	1	1
P3	1	2
P4	1	1

Maximum Requirement Matrix

	R1	R2
P1	1	1
P2	2	3
P3	2	2
P4	3	2

Q5) a) List the page replacement algorithms. Explain LRU with example. **[6]**

b) Explain the techniques of managing memory using First fit, best fit and worst fit with suitable example. **[6]**

c) Define segmentation and its advantages. **[4]**

OR

Q6) a) Explain the design issues for paging. **[6]**

b) Consider the following Page reference string: 1, 2, 3, 4, 2, 3, 4, 5, 6, 7, 3, 2, 4. The number of page frames = 4, calculate the page faults and the hit ratio for First In First Out Page replacement algorithm. **[6]**

c) Explain demand paging with advantages. **[4]**

Q7) a) Explain Input/Output software layers. **[6]**

b) Explain Linux Ext 2 I-node with diagram. **[6]**

c) List the different file operations. Explain access rights in file sharing. **[4]**

OR

Q8) a) Write short note on RAID disk and optical disk (CD and DVD). **[6]**

b) Explain memory mapped I/O and direct memory access. **[6]**

c) Explain different directory structures and directory operations. **[4]**

Total No. of Questions :8]

SEAT No. :

P1729

[Total No. of Pages :3

[5058] - 362

T.E. (E & TC)

DIGITAL COMMUNICATION

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

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Draw block diagram of Adaptive Delta modulator and explain the same. What are the advantages of Adaptive delta modulator over Delta Modulator. **[8]**

b) Explain Inter symbol interference. Explain its causes and remedies to avoid it. **[6]**

c) A random process X (t) is expressed as X (t) = M. Cos (ω_0 t) + N. Sin (ω_0 t) where ω_0 is constant while M and N are random variables. **[6]**

i) Prove that the necessary condition for X (t) to be stationary is, E [M] = E [N] = 0.

ii) Prove that X (t) is wide sense stationary if M and N only if and are uncorrelated and have equal variance. i.e. E [MN] = 0 and E [M^2] = E [N^2] = σ^2 .

OR

Q2) a) Draw and explain CCIT hierarchy of multiplexing. **[6]**

b) An audio signal with highest frequency component 3300 Hz is pulse code modulated with a sampling rate of 8000 samples/sec. The required signal-to-quantization noise ratio is 40dB. **[8]**

i) What is the minimum number of uniform quantising levels needed?

ii) What is the minimum number of bits per sample needed?

iii) Calculate the minimum number of bits per sample needed.

P.T.O.

c) Define mean, correlation and covariance function for random process. Write down mathematical expression for the same. **[6]**

Q3) a) Derive expression for signal to noise ratio of Integrate and Dump filter. **[8]**

b) Explain Geometrical representation of signal and Gram-Schmidt procedure. **[8]**

OR

Q4) a) Derive the expression for signal to noise ratio and error probability of a matched filter in the presence of white gaussian noise. **[8]**

b) Explain the principle of Maximum Likelihood receiver with the help of various methods of detection of signal. **[8]**

Q5) a) Find the bit error probability for a BPSK system having a bit rate of 1 Mbits/s. The receiver receives the waveforms S_1 (t) = A. Cos (ω_0 t) and S_2 (t) = - A. Cos (ω_0 t). The received signals are co-herently detected using a matched filter. If A = 10mV and single sided noise power spectral density is No = 10^{-11} W/Hz. Assume that the signal power and energy per bit are normalized. Assume if necessary erfc [2.24] = 41×10^{-5} and erf [3.1] = 0.9999. **[8]**

b) Give mathematical representation of QPSK signal. Draw signal space diagram of QPSK signal. Write the expression of all message points in the diagram. **[8]**

OR

Q6) a) Explain M-ary PSK transmitter with suitable block diagram. What are the advantages of M-ary PSK over M-ary FSK. **[8]**

b) Draw signal space of 16 - QAM system and comment on Euclidean distance and probability of error for 16 - QAM signals. **[8]**

Q7) a) What is PN sequence? Verify the three properties of PN sequence with the help of shift register. **[6]**

b) A spread spectrum communication system is characterised by the following parameters. Duration of each information bit $T_b = 4.095$ ms, Chip duration of a PN sequence $T_c = 1\ \mu S$. Calculate the processing gain and jamming margin if $(E_b / N_o) = 10$ and the average probability of error $P_e = 0.5 \times 10^{-5}$. **[6]**

c) Explain in brief frequency reuse schemes and cell splitting in mobile communication system. **[6]**

OR

Q8) a) Draw the block diagram of FH-SS systems transmitter and receiver. Write the functional names inside the blocks and input output signals of each block. **[6]**

b) What are multiple access techniques? Explain WCDMA in detail. **[6]**

c) Write a short note on Cellular Telephone system. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1730

[Total No. of Pages : 3

[5058]-363

T.E. (Electronics & Telecommunication)
ELECTROMAGNETICS AND TRANSMISSION LINES
(2012 Course) (Semester-I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.***
2) ***Figure to right indicate full marks.***
3) ***Neat diagram must be drawn wherever required.***
4) ***Use electronic pocket calculator and smith chart is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive expression for flux density for an infinite line charge using Gauss law. **[6]**

b) Derive relation between $\bar{E}$ and V. Also state significance of potential gradient. **[8]**

c) State & explain stokes theorem. **[6]**

OR

Q2) a) A point charge of 2nC is located at (4, –1, –3) & a uniform line charge of –25nC/m lies along the intersection of planes X = –4 & Z = 6 calculate $\bar{D}$ and $\bar{E}$ at (3, 1, 0). **[8]**

b) Derive boundary condition for perfect dielectric media. **[8]**

c) In the region $0 < r < 0.5$m in cylindrical coordinates, the current density is $\bar{J} = 4.5e^{-2r}\, a_z \left(\frac{A}{m^2}\right)$ and J = 0 elsewere. Use Ampere's law to find $\bar{H}$. **[4]**

P.T.O.

Q3) a) What is pointing vector? What is its significance? Derive the expression for average pointing vector. **[8]**

b) In free space $\bar{E} = 20\cos(wt - 50x)\ \overline{ay}$ V/m determine: **[8]**

i) I_d ii) H

iii) W

OR

Q4) a) Write Maxwell's equation on the basis of Ampere's circuit law in integral as well as differential form and modify the above equation for sinusoidal time varying field in free space. **[8]**

b) A boundary condition exists at Z = 0 between two dielectrics $\in_{r1} = 2.5$ region $Z < 0$ & $\in_{r2} = 4$ in the region $Z > 0$. The field in the region of $\in_{r1}$ is $\bar{E} = = -30\overline{ax} + 50\overline{ay} + 70\overline{az}\ \frac{V}{m}$ **[8]**

Find:

i) Normal component of E_1.

ii) Tangential component of E_1.

iii) Angle α_1 between E_1 & normal to surface.

iv) Normal component of D_2.

v) Tangential component of D_2.

vi) Angle α_2 between D_2 & normal to surface.

Q5) a) Define various parameters of transmission line. **[6]**

b) What are the different types of distortion? Derive the condition for Inductance loading on Telephone cable. **[10]**

OR

Q6) a) Derive the equation for voltage & current of general solution of transmission line. **[10]**

b) Prove that $Z_0 = \sqrt{Z_{oc} Z_{sc}}$. **[6]**

Q7) a) Derive expression for characteristic impedance, propagation constant and velocity of propagation for distortion less line. **[8]**

b) A transmission line with characteristics impedance of $692\angle -12^{\circ}\Omega$ is terminated in 200Ω resistor. Determine reflection coefficient & SWR. **[10]**

OR

Q8) a) What do you mean by single stub matching on a line and derive the equation of single stub along the line. **[8]**

b) In lossless 100Ω transmission line is terminated in an impedance 50 + j60 Ω. Calculate VSWR, reflection coefficient, impedance of 0.35λ from the load using smith chart. **[10]**

●●●●●

Total No. of Questions : 10]

SEAT No. :

P2981

[Total No. of Pages : 3

[5058]-364
T.E. (E & TC)
DIGITAL SIGNAL PROCESSING
(2012 Pattern) (End Sem.) (Semester - I) (304182)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) With the help of neat diagram explain the basic elements of DSP. **[4]**

b) Consider the analog signal $X_a(t) = 3 \cos 2000 \Pi t + 5 \sin 6000 \Pi t + 10 \cos 8000 \Pi t$. **[4]**

i) What is the Nyquist rate for this signal?

ii) If Sampling rate $F_s = 6000$ samples/s. What is the discrete - time signal obtained after sampling?

c) State and prove any two properties of DFT. **[2]**

OR

Q2) a) Compute 8 point DFT of a sequence x(n) = {1 2 3 4 4 3 2 1} using Decimation In Time FFT algorithm. **[8]**

b) Explain the concept of orthogonality. **[2]**

Q3) a) What is the relationship between Z transform and DFT. **[3]**

b) Compute the DFT of the following sequence **[4]**

x(n) = {0 1 2 3}

c) By using partial fraction method find the Inverse Z transform of **[3]**

$$X(z) = \frac{z^3}{(z+1)(z-1)}$$

OR

P.T.O.

Q4) a) Show that the computational complexity is reduced if 32 point DFT is computed using Radix - 2 DIT FFT algorithm. **[3]**

b) Compute the z transform and draw ROC of the following sequences. **[3]**

i) $x(n) = n\,u(n)$ for $n \geq 0$

ii) $x(n) = 2^{(n-1)}\,u(n-1)$

c) Compute the Discrete Cosine Transform of the following sequence **[4]**

$f(x) = \{1\ 2\ 4\ 7\}$

Q5) a) The system transfer function of analog filter is given by **[8]**

$$H(S)=\frac{s+0.1}{(s+0.1)^2+16}$$

using bilinear transformation method, determine the transfer function of digital filter H(z) the resonant frequency is $w_r=\frac{\pi}{2}$.

b) Explain the steps used for designing an IIR filter using bilinear transformation method (BLT). What is Warping effect in BLT? **[8]**

c) What are the limitations of Impulse invariance method? **[2]**

OR

Q6) a) Obtain direct form I and II realization of a system described by **[8]**

$$y(n) - 3/4\ y(n-1) - 1/2\ y(n-2) + 1/8\ y(n-3) = x(n) + 5/4\ x(n-2).$$

b) A digital filter has specifications as:

Passband frequency = $w_p = 0.2\Pi$, Stopband frequency = $w_s = 0.3\Pi$

What the corresponding specifications are for pass band and stop frequencies in analog domain if **[6]**

i) Impulse Invariance Technique is used for designing

ii) Bilinear Transformation Method is used for designing.

c) Write a note on, "finite word length effect in IIR filter design". **[4]**

Q7) a) Compare FIR filter with IIR filter. **[6]**

b) Design FIR digital filter to approximate an ideal low pass filter with passband gain of unity, cut off frequency 850 Hz and sampling frequency 5000 Hz. The length of impulse response should be 5. Use Hamming window. **[10]**

OR

Q8) a) Explain the Gibb's Phenomenon. **[6]**

b) Design a linear phase FIR low pass filter using Hanning Window the frequency characteristics of the filter is given as **[10]**

$$\text{H}d(w) = e^{-j3w} \quad \text{For} -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$

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

Q9) a) Design a two stage decimator for the following specifications: **[10]**

Sampling rate of an input signal = 20 kHz

Down sampler D = 100

Passband = 0 to 40 Hz

Transition band = 40 to 50 Hz

Passband ripple = 0.02

Stopband ripple = 0.002

b) Explain the application of DSP in Image processing. **[6]**

OR

Q10)a) Draw the architectural block diagram and explain the important features of TMS 320C 67XX series DSP processor. **[8]**

b) Explain the necessity of: **[8]**

i) MAC unit

ii) Data Address Generators in Digital Signal Processors.

Total No. of Questions :8]

SEAT No. :

P1731

[Total No. of Pages :2

[5058] - 365

T.E. (Electronics Engineering)

MICROCONTROLLERS AND APPLICATIONS

(2012 Course) (End Semester) (Semester - II) (304183)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.1 OR Q.2 and Q.3 OR Q.4 and Q.5 OR Q.6 and Q.7 OR Q.8.***
2) ***Answer any four questions.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the rigth side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) a) Explain Counter operation in 8051 microcontroller. **[6]**

b) Compare Assembler and compiler? **[6]**

c) How performance of any microcontroller is evaluated? **[8]**

OR

Q2) a) Write features of PIC18FXX Microcontroller over PIC16FXXX. **[6]**

b) Explain addressing modes of 8051 microcontroller. **[6]**

c) Draw and explain PORT0 and POTR2 structure of PIC 18FXXX Microcontroller. **[8]**

Q3) a) Draw an interfacing diagram and write an Embedded C Program to interface 16x2 LCD with PIC 18FXX Microcontroller to display the "My College" message. Use 8 bit interface mode. **[8]**

b) Draw and Explain the interrupt structure for the PIC 18FXX microcontroller. What are peripheral interrupts, IVT and ISR? **[8]**

OR

P.T.O.

Q4) a) Write a program to generate 100 msec delay Using Timer1. What are the values to be loaded in TMRCON1, TMIL RIH TMRIL? Assume that XTAL = 8 MHZ. **[8]**

b) Explain the Capture and Compare Mode of PIC 18FXXX in detail. **[8]**

Q5) a) Write a program to read only numbers from input UART string. **[8]**

b) How SPI is better than 12C Bus? Explain MSSP for 12C master mode. **[8]**

OR

Q6) a) Explain the MSSP with SPI mode? **[8]**

b) Draw and explain Interfacing of RTC with PIC 18FXXX? Also write embedded c program to update date. **[8]**

Q7) a) Write a Embedded C Program for reading single analog input range from 0V to 5V and display it on LCD. **[8]**

b) Design PICI 18FXXX based four digit decimal counter using seven segment with a delay of one second. **[10]**

OR

Q8) a) How the speed of the DC motor controlled by PWM, explain in brief? **[6]**

b) Design Frequency counter for the range from Dc to 5 MHz frequency using PIC 18FXXX. Design and draw interfacing circuit. Also explain required flow chart. **[12]**

Total No. of Questions :8]

SEAT No. :

P1732

[Total No. of Pages :3

[5058]-366

T.E. (Electronics and Telecommunication Engineering)
INFORMATION THEORY AND CODING TECHNIQUE
(2012 Course) (Semester - II) (304189)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) A discrete source emits messages X_1 & X_2 with probabilities $\frac{3}{4}$ & $\frac{1}{4}$ with BSC, Find H(X), H(Y), H(X,Y), H(X/Y), I(X;Y). **[7]**

b) Obtain the coding efficiency of a Shannon Fano and huffman code for a zero memory source that emits six messages (G, N, H, A, E, S) with probabilities of {0.19, 0.15, 0.02, 0.16, 0.4, 0.08} respectively. **[8]**

c) Determine Lempel-Ziv code for the following bit stream 0100 1111 1001 10000010101 0110 0110 000. **[5]**

OR

Q2) a) For a systematic Linear Block code, the three parity check digits C_4, C_5, C_6 are given $C_4 = d_1 + d_2 + d_3$ $C_5 = d_1 + d_2$ and $C_6 = d_1 + d_3$ **[6]**

i) Construct Generator matrix

ii) Determine error correcting capability

iii) Prepare a suitable decoding table

Decode the received words 101100 and 000110.

b) Construct a systematic (7, 4) cyclic code using generator polynomial $g(X) = X^3 + X + 1$. Construct the decoding table for the received code word 1 1 0 1 1 0 0, determine the transmitted data word. **[7]**

c) Explain any two properties of mutual information and show that Shannon's limit for AWGN Channel is -1.6dB. **[7]**

P.T.O.

Q3) a) Obtain generator polynomials and specifications for BCH code with block length n=15 & error correcting capability t_c = 1,2,3. **[8]**

b) Explain the following terms with the help of equations **[6]**

i) Primitive Polynomial

ii) Minimal Polynomial

iii) Generator Polynomial

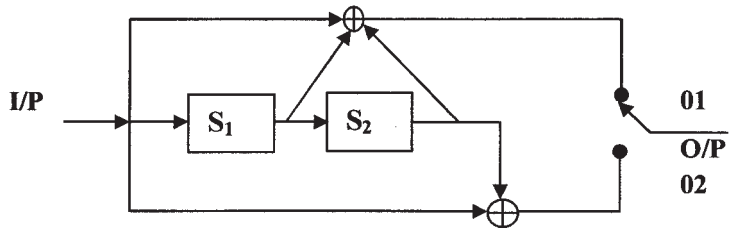
c) Differentiate between BCH and RS codes. **[4]**

OR

Q4) a) Consider the BCH (15,5) triple error correcting code has the following generator polynomial $g(x) = x^{10}+x^8+x^5+x^4+x^2+x+1$ Find the errors using Gorenstein-Zierler algorithm in received polynomial $x^9+x^6+x^5+x^4$. **[10]**

b) Explain the applications of RS codes and CRC code. **[8]**

Q5) a) A convolution encoder has code rate =½ constraint length K=3 as shown in Figure below. Draw the trellis diagram. By using Viterbi algorithm decode the sequence 010001000. **[8]**



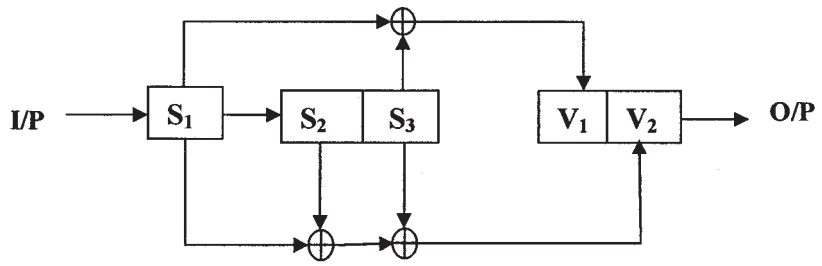
b) A convolutional encoder is rate 1/3, constraint length K =4 $g^1 = 1+D+D^2+D3$, $g^2 = 1+D2+D3$, $g^3 = 1+ D +D3$.

i) Obtain State Table.

ii) Draw the state diagram. **[8]**

OR

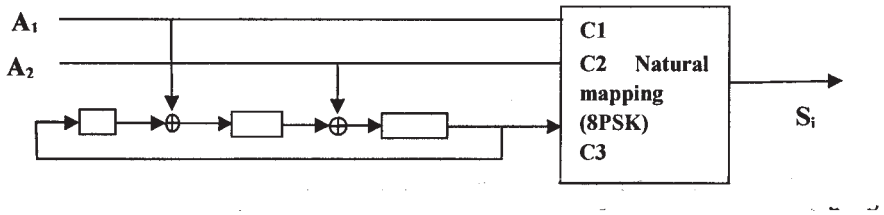
Q6) a) For the convolution encoder shown in figure below. Sketch the state diagrams, Code Tree and trellis diagram. Find the output data sequence 10011. **[10]**



b) Explain FEC and ARQ systems. **[6]**

Q7) a) What are the Ungerboek's TCM design rules. Explain asymptotic coding gain. **[6]**

b) Consider the 8 state, 8 PSK. TCM scheme as shown below. **[10]**



i) Draw trellis diagram

ii) Find d_{free} and Asymptotic coding gain and comment on it.

OR

Q8) a) What are turbo codes? Explain necessity of Inter-leaver in turbo codes? **[6]**

b) Explain Euclidean distance, Asymptotic coding gain of trellis coded Modulation. **[4]**

c) Discuss the importance of Trellis Coded Modulation with the block diagram of Communication System. **[6]**

EEE

Total No. of Questions :10]

SEAT No. :

P1733

[Total No. of Pages :3

[5058] - 367

T.E. (E & TC)

EMBEDDED PROCESSORS

(2012 Course) (Semester - II) (End Semester) (304191)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) State & explain different operating modes of ARM7. **[6]**

b) Draw interfacing diagram to interface LED bank to port pins p 0.0 - p 0.3 of LPC2148. Write down the algorithm to blink the LEDs. **[4]**

OR

Q2) a) What is the need of Pin connect Block in LPC 2148? Explain the role of PINSELX registers. **[6]**

b) Explain the following ARM instructions (any two) **[4]**

i) MLA R_0, R_1, R_2, R_3

ii) MVN R_2, R_3, ASR # 2

iii) STR R_0, [R_1,# 4]

iv) ANDS r_0, r_1, r_2

Q3) a) Explain the architecture of LPC 2148 with a neat block diagram. **[8]**

b) Compare I_2C & SPI protocol. **[2]**

OR

P.T.O.

Q4) a) Enlist the features of on-chip ADC in LPC 2148. Explain ADOGDR register. **[6]**

b) Draw and explain the interfacing diagram of SD card with LPC 2148. **[4]**

Q5) a) Compare cortex - A, cortex - R, cortex - M series processor. **[8]**

b) Enlist need and desired features of operating system in developing complex applications in embedded system. **[8]**

OR

Q6) a) Draw and explain CMSIS standard for firmware development in ARM cortex based system. **[6]**

b) Discuss various cortex M3 based controllers. **[4]**

c) Compare cortex processors over ARM7 for embedded system design. **[6]**

Q7) a) Draw & explain architecture of LPC 1768. **[10]**

b) Explain four reset sources under system control block of LPC 1768 in detail. **[8]**

OR

Q8) a) Draw interfacing diagram of motor control using PWM with LPC 1768 & write down the algorithm to control the speed of the motor. **[8]**

b) Explain three clock sources (oscillators) for LPC 1768. **[6]**

c) Describe any two registers with reference to LPC 1768. **[4]**

i) FIOMASK

ii) FIOPIN

iii) FIOSET

iv) FIODIR

Q9) a) Explain CAN protocol and frame structure with reference to AMR M3 (LPC 1768). **[8]**

b) Explain the architecture & operation of Ethernet bus with reference to ARM CORTEX M3 (LPC 1768). **[8]**

OR

Q10)a) With respect to USB controller in LPC 1768 explain. **[8]**

i) Features to USB 2.0

ii) Frame structure

b) How in & out data transactions take place in USB? Give operational overview. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1734

[Total No. of Pages : 2

[5058]- 368
T.E. (E & TC Engineering)
POWER ELECTRONICS
(2012 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat diagrams and waveforms wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of nonprogrammable calculators is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw and Explain steady state characteristics of IGBT. **[7]**

b) Explain triggering circuit for SCR using IC 785. **[6]**

c) Draw neat circuit diagram and explain single phase full bridge inverter with R-L load. Explain the effect of FWD on the operation of it. **[7]**

Q2) a) Explain with circuit diagram and waveforms three phase inverter with 180 degree conduction mode. **[7]**

b) Draw and Explain the Steady State characteristics of SCR. **[6]**

c) Draw the circuit diagram of three phase Semi converter with R load. Explain its operation. Draw the output voltage waveform. **[7]**

Q3) a) What is DC to DC converter? Explain 4 Quadrant Chopper with circuit diagram & waveforms. **[9]**

b) Draw the circuit diagram of single phase AC Voltage controller with R load. Explain its operation. Draw the waveform of output voltage. **[9]**

P.T.O.

Q4) a) In a dc chopper, the average load current is 30 Amps, chopping frequency is 250Hz, supply voltage is 110 volts. Calculate the ON and OFF periods of the chopper if the load resistance is 2 ohms. **[8]**

b) Draw the block schematic of SMPS and explain its advantages over Linear Power Supply. **[10]**

Q5) a) Explain OFF-line UPS with neat block-diagram. State its specifications and applications. **[6]**

b) Explain with circuit diagram working of single phase separately excited DC motor drive. Draw neat waveforms across load. **[10]**

Q6) a) What are AC drives? Explain with block diagram, speed control technique of three phase Induction motor by using V/F method. **[8]**

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

i) Electronic ballast and

ii) Battery Charger

Q7) a) Explain SLR half bridge DC/DC converter with neat circuit diagram and Waveforms. **[8]**

b) What is EMI? Explain different sources and minimizing techniques of EMI. **[8]**

Q8) a) Explain with circuit diagram and neat waveforms ZCS resonant converters. **[10]**

b) Explain overvoltage and over current protection circuits. **[6]**

Total No. of Questions :8]

SEAT No. :

P1735

[Total No. of Pages :2

[5058]-369
T.E. (E&TC)
INDUSTRIAL MANAGEMENT
(2012 Course) (End Semester) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain how today's managers use Scientific Management. **[8]**

b) Explain 'Six Sigma' Quality Management Standard. How it is superior to conventional statistical quality control techniques? **[8]**

c) Distinguish between Fixed Capital and Working Capital. **[4]**

OR

Q2) a) Describe the characteristics of an organization. How the concept of an organization is changing? **[8]**

b) Explain the basic philosophy of 'Kaizen'? **[6]**

c) Explain Break Even Analysis. What are it slimitaions? **[6]**

Q3) a) What are the functions involved in HRM? **[8]**

b) Discuss the competencies and responsibilities of HR professionals in an organization. **[8]**

OR

Q4) a) Why Talent acquisition is always on top priority in the role of HR? **[8]**

b) What would be your mix of selection methods for selection of middle level managers? **[8]**

P.T.O.

Q5) a) Explain different forms of business ownerships. **[8]**

b) Elaborate Government policies and incentives for small business developments in India. **[8]**

OR

Q6) a) What do you understand by the term 'Entrepreneurship'? Explain various sources of finance available for new entrepreneurs in India. **[8]**

b) How do you prepare a new business proposal? Explain. **[8]**

Q7) a) What is Information System? Differentiate between Information system and MIS. **[10]**

b) Define ERP and ERP Systems. What are their benefits? What are the difficulties in implementing ERP. **[8]**

OR

Q8) a) What is meant by Decision Support System? What are its benefits. **[8]**

b) List different types of e-commerce. Explain B2B in detail. **[10]**

EEE

Total No. of Questions :8]

SEAT No. :

P1736

[Total No. of Pages :3

[5058]-370

T.E. (E&TC)

ANTENNA AND WAVE PROPAGATION

(2012 Course) (End-Semester) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) A plane wave of 200MHz travelling in free space impinges normally on a large block of material having $\varepsilon r=4$, $\mu r=9$ and $\sigma=0$, determine η_1, η_2, β_1, β_2, Γ_T and Γ_R. **[8]**

b) Explain the field regions surrounded by an antenna. **[6]**

c) Explain the following characteristics of wireless channel **[6]**

i) coherence band width

ii) coherence time and

iii) fading

OR

Q2) a) What is polarization of wave. Explain linear and circular polarization of wave. **[6]**

b) Derive the fundamental equation of free space propagation. Also explain the spatial loss in detail. **[8]**

P.T.O.

c) Calculate the maximum effective aperture of a lossless horn antenna operating at 10GHz with a directivity of 20db. Also find maximum power received when incident power density is 2×10^{-3} (W/m^2). **[6]**

Q3) a) Derive the equation for input impedance and directivity of half wave dipole. **[8]**

b) Give the comparison of far fields of small loop and short dipole. **[8]**

OR

Q4) a) What do you meant by loop antennas; give the classification of loop antennas explain the properties of electrically small loop antenna. **[6]**

b) A 1 m long car radio antenna operates in the AM frequency of 2MHz. How much current is required to transmit 4 watts of power? **[4]**

c) Show the current distribution on small dipole and derive the equation for its input impedance. **[6]**

Q5) a) Explain in detail the working principle of broadside array. **[6]**

b) Derive antenna array factor for N-element linear array taking the centre element as reference for N is odd and even. **[6]**

c) With the help of suitable diagram explain the principle of pattern multiplication. **[4]**

OR

Q6) a) Draw and explain the radiation pattern of an end fire array. **[8]**

b) Design a broadside Dolph - Tchbyschev array of 10 elements with half wave spacing (d) between the elements and with a major to minor lobe ratio of 26 dB. Calculate the excitation coefficient. **[8]**

Q7) Explain the following antennas with its structural details dimensions, radiation pattern, diagram, specifications, features and applications. **[18]**

a) Micro strip antenna

b) Slot antenna

c) Super turnstile antenna

OR

Q8) a) With the help of suitable diagram explain the operating principle of **[10]**

i) Biconical antenna

ii) Lens antenna

b) Explain the Rhombic antenna in detail. **[8]**

EEE

Total No. of Questions :10]

SEAT No. :

P1737

[Total No. of Pages :2

[5058] - 371

T.E. (Instrumentation & Control)

INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

(2012 Pattern) (Semester - I) (End Sem.)

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) Compare classical and Instrumental methods of chemical analysis. **[4]**

b) Explain principal and experimental setup of Voltametry. **[6]**

OR

Q2) a) Compare Potentiostatic and Amperostatic methods of Coulometry. **[6]**

b) List out the different electrodes used in chemical analysis methods. **[4]**

Q3) a) Explain with neat sketch Double beam Filter photometer. **[5]**

b) Explain with neat sketch UV-Visible Spectrophotometer. **[5]**

OR

Q4) a) State the Lamberts Law. **[4]**

b) Explain with neat sketch what is Sputtering Process. **[6]**

Q5) a) Explain the Instrumentation of Flame Photometer. **[8]**

b) Write a short note on Inductively Coupled Plasma. **[8]**

OR

P.T.O.

Q6) a) What is Fluorescence? Explain the working of double beam flouriometer. **[8]**

b) Explain the principle and working of Fourier Transform Infrared Spectrophotometer (FTIR) with the help of suitable block diagram. **[8]**

Q7) a) Explain the Principle of Mass Spectrometer. And explain any one type of Mass Spectrometer. **[10]**

b) Explain Fourier Transform Nuclear Magnetic Resonance Spectrometer (FTNMR) with a neat sketch. **[8]**

OR

Q8) a) Explain the block diagram of Gas Chromatography. List the GC detectors. **[8]**

b) Write a short note on: **[2×5=10]**

i) Infrared Gas analyzer.

ii) CO Gas Analyzer.

Q9) a) Explain the Instrumentation of High Pressure Liquid Chromatography (HPLC). Explain any one detector. **[8]**

b) What is ESCA? Explain Auger Emission Spectroscopy? **[8]**

OR

Q10)a) Explain the Instrumentation for X-ray spectrometry. **[8]**

b) Write short notes on Ionization Chamber. **[8]**

Total No. of Questions : 10]

SEAT No. :

P 1738

[Total No. of Pages :2

[5058] - 372
T.E. (Instrumentation and Control)
EMBEDDED SYSTEM DESIGN
(2012 Pattern) (Semester-I) (306261)

Time : 2½ Hours : *[Max. Marks : 70]*

Instructions :

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

Q1) a) Explain the internal memory organization of 8051µC. **[7]**

b) Explain the function RS0 and RS1 bits of PSW register of 8051µC. **[3]**

OR

Q2) a) Explain the power on reset circuit of 8051µC. **[7]**

b) Explain PSW register of 8051 µC. **[3]**

Q3) a) With neat sketch explain interfacing of three digit common anode multiplexed LEd display with 8051µC. **[7]**

b) List different interrupts with vector addresses of 8051µC. **[3]**

OR

Q4) a) With neat sketch explain interfacing of DAC0808 with 8051µC **[7]**

b) Explain port-1 structure of 8051µC. **[3]**

Q5) a) Explain the interfacing of LM35 with 89C 51 µC with suitable interfacing diagram. **[8]**

b) Explain the interfacing of serial RTC with 89C51 µC. **[8]**

OR

Q6) Discuss the design of traffic light controller using 89C51 µC based on following points. **[6]**

a) Block diagram.

b) Circuit explanation . **[10]**

P.T.O.

Q7) a) Explain the architectural features of AT8535 AVR µC. **[8]**

b) Explain the stack operation of AT8535 AVR µC. **[8]**

OR

Q8) a) Explain following instructions of AT8535 AVR µC. **[8]**

i) LPM

ii) SBRS Rd, b

iii) BREQk

iv) SLEEP

b) What is watchdog timer? Explain watchdog timer of AT8535 AVR µC. **[8]**

Q9) a) Explain timer-0 operation of AT8535 AVR microcontroller. **[9]**

b) Explain UART of AT8535 AVR microcontroller. **[9]**

OR

Q10)a) Explain different clock sources used in AVR µC. **[9]**

b) Explain with suitable block diagram ADC pre-scaler of ATMega8535 AVR µC. **[9]**

☆ ☆ ☆ ☆

Total No. of Questions : 10]

SEAT No. :

P1739

[Total No. of Pages : 2

[5058]-373

T.E. (Instrumentation & Control)

CONTROL SYSTEM COMPONENTS

(2012 Course) (Semester-I) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Draw neat sketches wherever necessary.***
2) ***Answer 05 questions.***
3) ***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.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain the use of a level switch in level control application. **[6]**

b) Compare pneumatic and hydraulic system. **[4]**

OR

Q2) a) State the selection criteria for electromechanical relay. Draw and explain one application of electromechanical relay. **[6]**

b) Explain with diagram construction & working of a reed relay. **[4]**

Q3) a) Explain with diagram the short circuit protection and over load protection of motors. **[5]**

b) Draw and explain working of a pneumatic relief valve. **[5]**

OR

Q4) a) Explain with wiring diagram the concept of sequencing of motors. **[5]**

b) Draw and explain the pneumatic circuit for continuous to-and-fro motion of a double acting cylinder. **[5]**

P.T.O.

Q5) a) State the advantages of positive displacement pumps over non-positive displacement pumps. Draw and explain the construction & working of external gear pump. **[10]**

b) Draw and explain the hydraulic supply. Explain the function of each component of hydraulic supply. **[8]**

OR

Q6) a) Draw & explain the meter-in and meter-out circuit in hydraulics. **[10]**

b) Enlist the types of hydraulic cylinders. Draw & explain the working of a hydraulic pressure reducing valve. **[8]**

Q7) a) State the application areas of feeders. Draw and explain the volumetric shaker feeder. **[8]**

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

OR

Q8) a) Draw and explain the working and construction of a circuit breaker. **[8]**

b) State the desirable characteristics of a fuse. Draw and explain construction of a high rupturing capacity (HRC) fuse. **[8]**

Q9) a) Draw and explain the tesla's tube. State the advantages of fluidic devices. **[8]**

b) Define hazardous area. Explain the hazardous area classification in detail. **[8]**

OR

Q10)a) Draw and explain the ignition triangle and Explosion-Proof enclosure. **[8]**

b) Write a note on intrinsic safety and its types. **[8]**

●●●●●

Total No. of Questions : 10]

SEAT No. :

P2982

[Total No. of Pages : 3

[5058]-374

T.E. (Instrumentation and Control)

CONTROL SYSTEM DESIGN

(2012 Course) (Semester - I) (306264)

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.***
5) ***All questions are compulsory.***

Q1) a) Derive the transfer function for electrical lead network. **[6]**

b) Explain effect of addition of poles on stability of system using root locus approach. **[4]**

OR

Q2) a) Find out damping ratio, frequency of natural oscillation, velocity error constant if system with transfer function $G(s)=\frac{4}{s(s+2)}$ is compensated using lead compensator with transfer function $G_c(s)=4.7\frac{s+2.9}{s+5.4}$. **[6]**

b) Compare the features of Lead and Lag compensator **[4]**

Q3) a) Explain P, I and D control action with controller settings and their effect on stability of system. **[4]**

b) Explain direct synthesis method of controller design for first order system with and without delay time in brief. **[6]**

OR

Q4) The forward path transfer function of unity feedback control systems is given as $G(s)=\frac{100}{(s+1.5)(s+4)(s+8)}$ if $e_{ss} = 0.1$ for unit ramp input, the dominant closed loop pole located at -1 ± 2.5 j. Design a PID controller. **[10]**

P.T.O.

Q5) a) Obtain state model in three different canonical form for system with transfer function. **[12]**

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

b) Explain advantages of state space representation over classical representation. **[6]**

OR

Q6) a) Find out transfer function of system from state model. **[12]**

$$\text{and } \dot{x}=\begin{bmatrix}0 & 0 & -20\\ 1 & 0 & -24\\ 0 & 1 & -9\end{bmatrix}x+\begin{bmatrix}3\\ 1\\ 0\end{bmatrix}u \text{ and } y=\begin{bmatrix}0 & 0 & 1\end{bmatrix}x.$$

b) Explain the terms state, state variable, state vector and state space. **[6]**

Q7) a) Determine state transition matrix using Cayley Hamilton theorem for following plant matrix $A=\begin{bmatrix}-4 & 3\\ -6 & 5\end{bmatrix}$. **[8]**

b) Determine controllability and observability of system of following state model. **[8]**

$$\dot{x}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}x+\begin{bmatrix}1\\ 0\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}10 & 5 & 1\end{bmatrix}x$$

OR

Q8) a) Obtain output response of following system with unit step input and initial condition as $x(0)=\begin{bmatrix}1\\ 1\end{bmatrix}$. **[10]**

$$\dot{x}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}x+\begin{bmatrix}0\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}1 & 0\end{bmatrix}x$$

b) Determine whether following system is state controllable and state observable or not? **[6]**

$$\dot{x}=\begin{bmatrix}-2 & 0\\ 0 & -1\end{bmatrix}x+\begin{bmatrix}3\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}1 & 0\end{bmatrix}x$$

Q9) Find state feedback gain matrix for the system to place the desired closed loop poles at location $s = -2 + 2j$, $s = -2 - 2j$. **[16]**

$$\dot{x}=\begin{bmatrix}0 & 1\\ 0 & -1\end{bmatrix}x+\begin{bmatrix}0\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}1 & 0\end{bmatrix}u$$

OR

Q10)Design a Full order observer for the system defined by following state equation

$$\dot{x}=\begin{bmatrix}0 & 1\\ 0 & -1\end{bmatrix}x+\begin{bmatrix}0\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}1 & 0\end{bmatrix}u$$

Given the set of desired poles for the observer $s = -8, -8$. **[16]**

Total No. of Questions :10]

SEAT No. :

P1740

[Total No. of Pages :2

[5058] - 375

T.E. (Instrumentation and Control Engineering)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(2012 Course) (Semester - I) (End - Semester)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 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) Write short notes on- **[10]**

a) Balanced score card

b) Need of inspection & qualities of inspector.

OR

Q2) a) What is the need of Quality Objectives? Explain with any example. **[4]**

b) Write a short note on ISO 9001. **[6]**

Q3) a) What are the types of business organizations? Explain any one. **[5]**

b) Write a note on EOQ. **[5]**

OR

Q4) a) Write a note on supply chain management and its benefits. **[6]**

b) Why is it needed to perform SWOT analysis for developing business environment? **[4]**

P.T.O.

Q5) Write notes on: **[18]**

a) Leadership skills

b) Training methods

c) Appraisal management

OR

Q6) a) What is motivation? What are the benefits of motivating employees? Explain Maslow theory of motivation. **[12]**

b) What is performance Appraisal? What may be the contents of Appraisal form? **[6]**

Q7) a) What is capital? What are its types? Explain in brief. **[8]**

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

i) Balance sheet

ii) Money market

OR

Q8) a) Write a note on "Capital budgeting and its methods". **[8]**

b) What are the different areas that need to be considered for preparation of capital budget? **[8]**

Q9) Write notes on: **[16]**

a) E-business and related ethics

b) Role of IT in modern business

OR

Q10) Write notes on: **[16]**

a) Ethics-the right way for business growth

b) Enterprise Resource Planning

Total No. of Questions : 10]

SEAT No. :

P1741

[Total No. of Pages : 3

[5058]-376

T.E. (Instrumentation and Control)

DIGITAL SIGNAL PROCESSING

(2012 Course) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Define following with respect to discrete-time system: **[4]**

i) Linearity

ii) Causality

iii) Time-invariance

iv) Stability

b) The discrete-time system is described by following difference equation: **[6]**

$$y(n)=y(n-1)-0.5y(n-2)+x(n)+x(n-1)$$

Determine transfer function and sketch the pole-zero plot.

OR

Q2) a) Determine the linear convolution of following sequences: **[6]**

$x_1(n)=\{3,1,5,1\}, x_2(n)=\{2,2,3,4\}$.

b) State the time-shifting and differentiation in frequency domain properties of DTFT. **[4]**

Q3) a) Determine and plot the frequency response of the discrete-time system described by, $y(n)-2y(n-1)+y(n-2)=x(n)$. Use $\omega=0,\frac{\pi}{4},\frac{\pi}{2},\pi$. **[4]**

b) Determine the discrete-time Fourier series for $x(n) = \{4, 1, 0, 3\}$ **[6]**

OR

P.T.O.

Q4) a) Compute z-transform of following signal $x(n) = (1/4)^n u(n + 4)$ **[4]**

b) Use the DFT and IDFT method to find the linear convolution of $x(n) = \{2, 3, 1, 1\}$ and $h(n) = \{1, 1, 2, 4\}$ **[6]**

Q5) a) ~~Explain the radix - 2 decimation-in-frequency (DIF) FFT algorithm for N = 8.~~ **[8]**

b) Determine 8-point DFT of $x(n) = \{1, 1, 0, 0, 2, 2, 3, 3\}$ using radix-2 decimation-in-time (DIT) FFT algorithm. **[8]**

OR

Q6) a) Determine 8-point DFT of $x(n) = \{1, 1, 0, 0, 2, 2, 3, 3\}$ using radix-2 decimation-in-Frequency (DIF) FFT algorithm. **[8]**

b) ~~Explain the radix - 2 decimation-in-frequency (DIF) FFT algorithm for N = 8.~~ **[8]**

Q7) Design a FIR linear-phase, digital filter approximating the ideal frequency response:

$$H_d(\omega) = \begin{cases} 1 \text{ for } & |\omega| \le 0.4\pi \\ 0 \text{ for } & 0.4\pi, < |\omega| \pi \end{cases}$$

a) Determine the desired impulse response $h_d(n)$ of a 11-tap filter. **[4]**

b) Design the filter using Bartlett window. **[6]**

c) Design the filter using Hanning window. **[6]**

OR

Q8) Design a FIR linear-phase, digital filter approximating the desired frequency response:

$$H_d(\omega) = \begin{cases} e^{-j5\omega} \text{ for } & |\omega| \le \dfrac{\pi}{5} \\ 0 \text{ for } & \dfrac{\pi}{5}, < |\omega| \le \pi \end{cases}$$

a) Determine the coefficients of a 11-tap filter based on a rectangular window. **[6]**

b) Repeat part (a) using Blackman window. **[6]**

c) Compare the FIR filter design and IIR filter design methods. **[4]**

Q9) A digital low-pass filter is required to meet the following specifications:

Passband ripple: ≤ -1 dB

Passband edge: 0.4π

Stopband attenuation: ≥ -18 dB

Stopband edge: 0.6π

This filter is to be designed by performing a bilinear transformation on Butterworth analog design.

a) Determine the order and cut-off frequency of analog filter. **[6]**

b) Determine the analog poles of the filter. **[6]**

c) Convert the analog system function into a digital filter system function. **[6]**

OR

Q10)a) Determine the order and poles of a type - I low-pass Chebyshev filter that has a 1 dB ripple in the passband frequency $\Omega_p = 1000\pi$, a stopband frequency $\Omega_s = 2000\pi$ and an attenuation of 40 dB or more for $\Omega \geq \Omega_s$. **[8]**

b) Explain the following IIR digital filter design methods: **[6]**

i) Bilinear transformation.

ii) Impulse invariance.

c) Compare the Butterworth filter with Chebyshev filter design methods. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1742

[Total No. of Pages :2

[5058] - 377

T.E. (Instrumentation and Control Engineering)

INSTRUMENT & SYSTEM DESIGN

(End -Sem.) (2012 Course) (Semester-II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

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

Q1) a) Explain the significance of EMI and EMC in instrumentatio system design. **[4]**

b) Draw the internal constructional diagram of IC AD 595. Explain how the ice point compensation block works? **[6]**

OR

Q2) a) What is grounding? Explain hybrid ground. **[5]**

b) Write the features and applications of IC XTR 110. **[5]**

Q3) a) Write a note on phases of product life cycle. **[5]**

b) Enlist the various mechanisms for protection against ESD. **[5]**

OR

Q4) a) Explain Johnson noise and also draw the equivalent models for it. **[5]**

b) Draw the internal circuit of IC HCNR 201 and explain its operation for positive input positive output. **[5]**

Q5) a) A 12V, 100 mA lamp is to be driven with isolation facility. Suggest suitable IC. Design and draw interfacing diagram. **[9]**

b) What are the salient features of IC 7107? What is the function of test pin? Explain the operation of analog section consisting of three phases. **[9]**

OR

P.T.O.

Q6) a) Enlist features and applications of PLL IC CD 4046. Compare PC I and PC II. Explain the functions of the pins - phase pulse output, VCO in and R2 toVss. **[9]**

b) In a certain food industry, bottle filling process requires number of filled bottles to be counted. Maximum number of bottles per batch is 6000. Suggest suitable IC and draw the application diagram. **[9]**

Q7) a) Differentiate between dip soldering and wave soldering. **[8]**

b) Explain four problems occurring in design of digital circuit PCBs. **[8]**

OR

Q8) a) What are the different rules to be followed for component placement on PCB? **[8]**

b) Write short notes on solder flux and solder mask. **[8]**

Q9) a) With hypothetical timing diagram explain the terms MTTR, MTBF and MTTF. **[6]**

b) Differentiate between reliability and quality. **[6]**

c) What are the causes of unreliability? **[4]**

OR

Q10)a) Write a detailed note on documentation and its importance. **[8]**

b) Draw and explain failure rate curve for two levels of work pressure. **[8]**

☆ ☆ ☆ ☆

Total No. of Questions : 10]

SEAT No. :

P1743

[Total No. of Pages :2

[5058]- 378

T.E. (Instrumentation & Control)

UNIT OPERATION & POWER PLANT INSTRUMENTATION

(2012 Pattern) (Semester - II) (306269)

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 and Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain principle of unit operation? Give examples of it. **[5]**

b) What is difference between Distillation and Extraction? **[5]**

OR

Q2) a) Explain in detail refrigeration operation. **[5]**

b) Draw a neat sketch and label parts of Heat exchanger. **[5]**

Q3) a) State importance of cooling tower. Enlist some Applications. **[5]**

b) List out disadvantages of nuclear power plant. **[5]**

OR

Q4) a) Explain with neat sketch wind power generation. **[5]**

b) How site is selected for hydro power plant. **[5]**

Q5) a) Explain with neat sketch the building blocks of Thermal power plant. **[8]**

b) What is difference between water tube boiler and fire tube boiler. **[8]**

OR

P.T.O.

Q6) a) Explain with neat sketch 3 element water level loop in power plant. **[8]**

b) What are different components of boiler and their function. **[8]**

Q7) a) Explain with neat sketch the working of turbine. **[8]**

b) Explain lubricant oil temperature control for turbine used for cooling system. **[8]**

OR

Q8) a) Enlist different types of sensors and their function used in turbine. **[8]**

b) Explain with neat sketch the speed control system of turbine. **[8]**

Q9) a) Explain with neat sketch Electrostatic precipitator. **[9]**

b) Compare hydro and thermal power plant. **[9]**

OR

Q10)a) Explain in detail safety consideration in power plant. **[9]**

b) Explain with neat diagram how pollution monitored in power plant. **[9]**

Total No. of Questions : 10]

SEAT No. :

P2984

[Total No. of Pages : 2

[5058]-379

T.E. (Instrumentation & Control)

BIOMEDICAL INSTRUMENTATION

(2012 Course) (End - Semester) (Semester - II) (306271)

Time : 2½Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Define bio electrode and its basic types. **[6]**

b) Define the Electrode offset potential, Action potential. **[4]**

OR

Q2) a) Why silver-silver chloride electrode is suitable in biomedical applications. **[6]**

b) Define arrhythmia condition of heart. Enlist various heart valves. **[4]**

Q3) a) Distinguish between the invasive and non-invasive methods of Blood pressure measurement. **[6]**

b) What is Phono-cardiogram? What kind of information is revealed from the phonocardiogram. **[4]**

OR

Q4) a) Draw and explain the principle of photo plethesmograpghy. **[5]**

b) Explain the principle of Ultrasonic Blood flowmeter. **[5]**

Q5) a) Explain the functions of various cerebral lobes. What is function of olfactory bulb. **[10]**

b) Explain the functions of the followings. **[8]**

Cerebellum, Thalamus and Hypothalamus, Medulla oblongata, Pons.

OR

P.T.O.

Q6) a) What is an EEG? Explain the EEG machine. What do you mean by bipolar and unipolar lead configuration. **[12]**

b) Explain the various types of EEG Electrodes. **[6]**

Q7) a) Draw and explain EMG. **[8]**

b) Elaborate on the organ of vision system that are responsible for Dim light vision as well for colour vision. **[8]**

OR

Q8) a) What is audiometer? Briefly explain process of ear masking while performing Audiometric test. **[10]**

b) Explain various errors in vision with its ways of correction. **[6]**

Q9) a) Define the internal and external respiration, lung compliance. **[6]**

b) Draw a spirogram and define the followings terms with respect it - **[10]**

i) Residual volume

ii) Tidal Volume

iii) Total Lung Capacity

iv) Expiratory reserve volume

OR

Q10)a) Draw & explain Inverted bell Spiro meter for respiratory measurement. **[8]**

b) Draw and explain infrared gas analyzer. **[8]**

Total No. of Questions :10]

P2985

SEAT No. :

[Total No. of Pages :3

[5058]-380

T.E. (Instrumentation Engineering)

PROCESS LOOP COMPONENTS

(2012 Pattern) (Semester-II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answers all questions.***
2) ***Answer QNo 1 or 2. Q No 3or 4. QNo 5 or 6. QNo 7 or 8.Q.No 9. or 10***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary***

Q1) a) Draw level control loop. Explain measurement variable and controlled variable in brief with respect to the above loop. **[6]**

b) Compare two wire and four wire transmitter. **[4]**

OR

Q2) a) Draw P & ID symbols for the following components & also explain the use of each components. **[6]**

i) Air to Close control valve,

ii) High/Low Alarm signal

iii) Temperature Element

iv) Temperature Transmitter

v) Pneumatic signal line

vi) Hydraulic signal line

b) Draw and explain generalized bock diagram of transmitters. **[4]**

Q3) a) Explain the following terms related to controller. **[8]**

i) Offset

ii) Dead Zone,

iii) Reset Action.

iv) Proportional Band

b) Give the limitations of On-Off controller. **[2]**

OR

P.T.O.

Q4) a) Draw and explain the response of Proportional, Integral and derivative controller for step change in error. **[8]**

b) List various methods for tuning of controller? **[2]**

Q5) a) Explain with following w.r.t. PLC **[10]**

i) Ladder diagram

ii) Counter

iii) Scan time

iv) Rung

v) Watch dog timer

b) Develop physical ladder diagram for a motor with following :NO start P.B., NC stop P.B., thermal over load limit switch opens on high temperature, green light when running and red light for thermal overload. Assume suitable data if required. **[8]**

OR

Q6) a) Explain block diagram of PLC. Give one example of Aanlog Input and analog Output (min 2 each) **[10]**

b) Compare Relay logic and PLC logic (min 6 comparison points) **[8]**

Q7) a) List various types of control valve. Draw and explain any one type in detail. **[8]**

b) Explain w.r.t control valve. **[8]**

i) Yoke

ii) Control valve coefficient

iii) Plug

iv) Bonnet

OR

Q8) a) Draw and explain fail safe action in level control application-{Air to Open (ATO) and Air to closed (ATC) valve applications}. **[8]**

b) What do you mean by "Installed characteristics of control valve" ? Why they are different than inherent characteristics. **[8]**

Q9) a) Find (a) the valve coefficient (Cv) for a control valve that must allow 150 gal. of ethyl alcohol per minute with a specific gravity of 0.8 at maximum pressure of 50 psi and (b) the required valve size in inches. **[8]**

Use following data.

Cv	0.3	3	14	35	55	108	174	400	725
Valve size In inches	0.25	0.5	1	1.5	2	3	4	6	8

b) Explain high temperature service valves and needle valve. **[8]**

OR

Q10)a) Draw and explain Cavitation and Flashing. Draw pressure profile diagram. Also list techniques to reduce it. **[10]**

b) Compare double port and single port control valve. **[6]**

❄ ❄ ❄

Total No. of Questions : 10]

SEAT No. :

P2197

[Total No. of Pages : 3

[5058]-381
T.E. (Chemical)
CHEMICAL ENGINEERING MATHEMATICS
(2012 Course) (Semester-I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) Use Simpson's 1/3 rule to find the In an attempt to understand the mechanism of the depolarization process in a fuel cell, an electro-kinetic model for mixed oxygen-methanol current on platinum was developed.

$$T = -\int_{1.22\times10^{-6}}^{0.61\times10^{-6}} \left(\frac{6.73x + 4.3025\times10^{-7}}{2.316\times10^{-11}x} \right) dx$$

A very simplified model of the reaction developed suggests a functional relation in an integral form. To find the time required for 50% of the oxygen to be consumed, the time, T(s) is given by

a) Use Simpson's 1/3 rule to find the time required for 50% of the oxygen to be consumed.

b) Find the true error, E_t, for part (a).

c) Find the absolute relative true error, $|\in_t|$, for part (a). **[10]**

OR

Q2) The equation that gives the depth x to which the ball is submerged under water is given by $x^3 - 0.165x^2 + 3.993\times10^{-4}$. The floating ball has a specific gravity of 0.6 and has a radius of 5.5cm. Use the bisection method of finding roots of equations to find the depth x to which the ball is submerged under water. Conduct three iterations to estimate the root of the above equation. Find the absolute relative approximate error at the end of each iteration, and the number of significant digits at least correct at the end of each iteration.

[10]

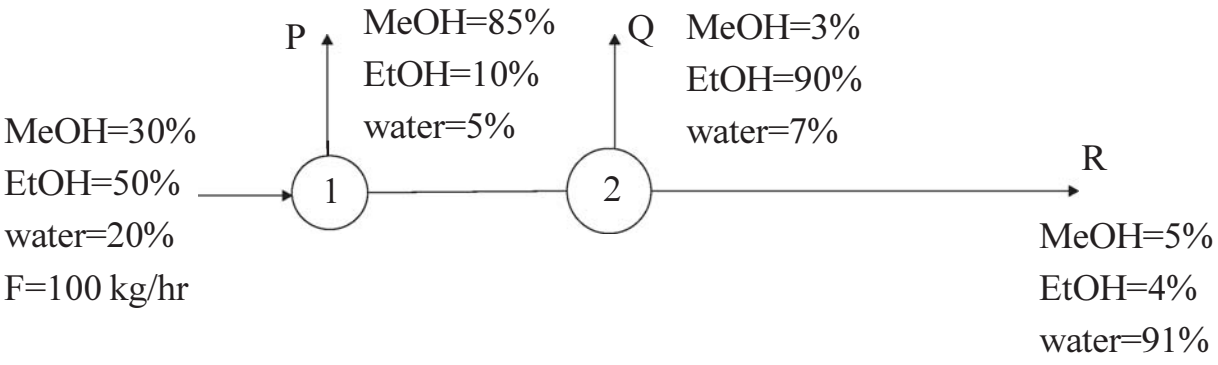
P.T.O.

Q3) a) Find the root of the equation $x^3 - x - 1 = 0$ using Mullers method. **[5]**

b) State graphical interpretation of False position method. **[5]**

OR

Q4) A process stream containing a mixture of methanol, ethanol and water is fed to two separating units (1 and 2) at a rate of 100 kg/hr. In the first separating unit, most of methanol is removed, and in the second separating unit, most of ethanol is removed. The final outlet contains a waterrich stream. The compositions of the three outlet streams (in weight%) are shown in the following figure.



Perform a material balance to obtain simultaneous equations for P, Q and R. Solve these equations by Gauss elimination to calculate the flow rates of the three outlet streams. **[10]**

Q5) a) State and explain the graphical interpretation of Eulers method. **[8]**

b) Solve by Eulers method $\frac{dy}{dx} = x - y^2$, for the given boundary conditions at $x = 0, y = 1$, find y at $x = 4$. Take step size, $h = 1$. **[8]**

OR

Q6) A ball at K is allowed to cool down in air at an ambient temperature of K. Assuming heat is lost only due to radiation, the differential equation for the temperature of the ball is given by $\frac{d\theta}{dt} = -2.2067 \times 10^{-12}(\theta^4 - 81 \times 10^8)$ where θ is in K and in seconds. Find the temperature at t- 480 seconds using Runge-Kutta 2nd order method. Assume a step size of h = 240 seconds. **[16]**

Q7) A non insulated metallic bar 1m long is held in air which is at temperature 20°C. One end of the bar is maintained at 100°C while other at 40 °C. The distribution along the length at steady state may be assumed to be $d^2T/dx^2 + h(T_a - T) = 0$. Where T is temperature in degree Celsius, x is distance measured from hot end. T_a is atmospheric temperature in °C and h = 0.01. Calculate the rod temperature at a distance 250, 500 and 750 mm from hot end. **[16]**

OR

Q8) Using the finite difference method solve the boundary value problem

$$x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} = 1 \text{ with } y(1) = y(1.4) = 0.0566$$

Find $y(1.1), y(1.2), y(1.3)$. **[16]**

Q9) a) Explain scanning and bracketing procedures for optimization of unconstrained functions of one dimensional search. **[9]**

b) What are various steps in optimization problems. **[9]**

OR

Q10) A chemical is produced by batch process. Chemicals X and Y are used to make Z with the following relationship for kg of Z produced and kgs of X and Y used, $Z = 1.5(1.1\ X2 + 1.3\ Y2 - XY)^{0.5}$.

X costs Rs. 0.18/kg, Y Rs. 0.08/kg and Z sells for Rs. 1.60/kg. One half of the selling price for Z is due to costs other than raw material. Only Z is recovered from the process. Find the maximum profit obtainable per kg of Z. **[18]**

●●●●●

Total No. of Questions : 10]

SEAT No. :

P1744

[Total No. of Pages : 3

[5058]-382

T.E.(Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS -II

(2012 Pattern) (End Semester)(309345)

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

Instructions to the candidates:

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

Q1) The volume of a mixture of two organic liquids 1 and 2 is given by **[10]**
$V=110-17X_1-2.5X_1^2$. Where V is the volume in m^3/mole at 1 bar and 300K. Find expressions for V_1,V_2, and ΔV.

OR

Q2) Show that the fugacity of a gas obeying Van der Waal's equation of state is given by **[10]**

$$1n\ f = \frac{b}{v-b} - \frac{2a}{RTV} + 1n\left(\frac{RT}{V-b}\right)$$

Q3) a) The excess gibbs energy of a binary mixture at T and P is given by **[8]**
$G^E/RT=(-2.6X_1-1.8X_2)X_1X_2$.

Find expressions for γ_1 and γ_2.

b) Explain the Daltons law with its applicability in the context of VLE. **[2]**

OR

Q4) Assuming the validity of Raoults law, do the following calculations for the benzene (1)/ Toluene(2)system: **[10]**

i) given $x_1=0.33$ and T=373.15 K find y_1 and P
ii) given $y_1=0.33$ and T=373.15 K find x_1 and P
iii) given $x_1=0.33$ and P=120 KPa find y_1 and T
iv) given $y_1=0.33$ and T=120 KPa find x_1 and P

P.T.O.

Parameters for Antoine equation are:

Component	A	B	C
Benzene (1)	13.8594	2773.78	-53.08
Toluene (2)	14.0098	3103.01	-53.36

Q5) a) Derive the following expression for SLE: **[10]**

$$\psi_i = \exp \int_{Tm_i}^{T} \frac{H_i^l - H_i^s}{RT^2} dT$$

where $\psi_i \equiv f_i^s / f_i^l$

b) Write a note on osmotic equilibrium. **[6]**

OR

Q6) a) Explain following two methods of consistency tests for VLE data **[10]**

i) Using coexistence equation.

ii) Using partial pressure data.

b) Explain triple point and eutectic temperature with neat diagram. **[6]**

Q7) a) A system initially containing 2 mol C_2H_4 and 3 mol O_2 undergoes the reactions: **[10]**

$C_2H_4(g)+½O_2(g) \rightarrow \{(CH_2)_2\}O(g)$

$C_2H_4(g)+3\ O_2(g) \rightarrow 2CO_2(g)+2H_2O(g)$

Develop expressions for the mole fractions of the reacting species as functions of the reaction co-ordinates for the two reactions.

b) A gas mixture consisting of 60% H_2, 20% N_2 and rest inert gas is passed over a suitable catalyst for the production of ammonia at 50 bar. **[8]**

$1/2N_2+3/2H_2 \rightarrow NH_3$ $\quad$ Kp=1.25 x 10^{-2}

Assuming ideal gas behaviour, determine the composition of the gases leaving the reactor.

OR

Q8) a) The equilibrium constant at 420 K for the reaction **[12]**

$C_2H_4+H_2O \rightarrow C_2H_5OH$,

is 6.8×10^{-2} and the standard heat of reaction at 298K is -45.95×10^3 J. The specific heat data is

	C_p, J/mol.K
Ethylene	$11.886+120.12\times10^{-3}T-36.649\times10^{-6}\ T^2$
Water	$30.475+9.652\times10^{-3}T+1.189\times10^{-6}T^2$
Ethanol	$29.358+166.9\times10^{-3}T-50.09\times10^{-6}T^2$

Formulate the general relationship for estimating the equilibrium constant and standard free energy change as functions of temperature.

b) Explain various methods used for the evaluation of equilibrium constant. **[6]**

Q9) a) Explain the phase rule and Duhem's theorem for reacting systems. **[7]**

b) A stoichiometric mixture of $N_2(g)$ and $H_2(g)$ at 100 bar and 800 K enter a catalytic reactor for the synthesis of ammonia. Assuming that the gas phase is ideal, estimate the degree of conversion and the equilibrium composition. The equilibrium constant for the reaction at 800K is 1.122×10^{-5}. **[9]**

OR

Q10)a) Calculate values of kp at 25°C and 800°C for the reaction. **[10]**

$CO(g)+H_2O \rightarrow H_2(g)+CO_2(g)$

Using the following data at 298K and 1 bar. Make suitable assumptions.

Component	H_2	CO	H_2O	CO_2
$\triangle G^o_{f,}$ KJ/mole	0	-137.25	-228.59	-394.38
$\triangle H^o_{f,}$ KJ/mole	0	-116.52	-241.88	-392.51

b) Calculate the equilibrium constant for the following reaction using the data at 298 K. **[6]**

$H_2O(g)+CH_3OH(g) \rightarrow CO_2(g)+3H_2(g)$

	$H_2O(g)$	$CH_3OH(g)$	$CO_2(g)$	$H_2(g)$
$\triangle g^o_{f,}$ (kJ/mol)	-228.57	-161.96	-394.36	0

✓ ✓ ✓

Total No. of Questions : 10]

SEAT No : ____

P1745

[Total No. of Pages : 2

[5058]-383
T.E.(Chemical)
CHEMICAL PROCESS TECHNOLOGY
(2012 Course) (309344) (Semester - I) (End Sem.)

Time : 2:30 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3, or Q.4, Q.5or 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) Explain dual process in detail and give its advantages over solvay process. **[10]**

OR

Q2) a) Explain electrolytic process for production of aluminium. **[5]**

b) Explain unit operations and unit processes and give two examples of each **[5]**

Q3) Explain DCDA process for manufacturing of sulphuric acid and give its major engineering problems. **[10]**

OR

Q4) Explain manufacturing of pulp by kraft process with its major engineering problems. **[10]**

Q5) a) What is hydrogenation of oil? Describe process in detail. **[8]**

b) Explain extraction of oils from soyabean seeds. **[8]**

c) Explain cleaning action of soaps & detergents in short. **[2]**

OR

Q6) a) What is carbonization of coal? **[4]**

b) Describe various steps involved in pyrolysis of coal. **[4]**

c) Explain production of coke by coke oven co-product method. Give its major engineering problems. **[10]**

P.T.O.

Q7) a) Explain production of water gas and its applications. **[4]**

b) Explain in brief about fuel cell. **[5]**

c) Enlist various refinery operations and explain thermal cracking. **[7]**

OR

Q8) a) Write short notes on following: **[9]**

i) Catalytic reforming.

ii) Isomerisation.

iii) Pyrolysis.

b) Discuss production of producer gas with its major engineering problems. **[7]**

Q9) a) Explain manufacturing of ethyle dichloride with major engineering problems. **[10]**

b) Explain production of phenol by cumene process. **[6]**

OR

Q10)a) Explain production of vinyl chloride from ethylene dichloride. **[8]**

b) Describe production of trichloroethylene in detail. **[8]**

✡ ✡ ✡

Total No. of Questions : 10]

SEAT No. :

P1746

[Total No. of Pages : 2

[5058]-384
T.E. (Chemical)
INDUSTRIAL ORGANISATION AND MANAGEMENT
(2012 Pattern) (Semester - I) (End Sem.) (New)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain Partnership with advantages and disadvantages. **[6]**

b) Write a note on Partnership Deed. **[4]**

OR

Q2) Explain in the various functions of manager. **[10]**

Q3) a) Explain Trade Unions in Chemical Industries. **[6]**

b) Explain in detail Merit Rating. **[4]**

OR

Q4) Explain in detail: **[10]**

a) Merit Rating

b) Inventory control

Q5) a) Write an explanatory note on Sales Promotion. **[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) What is Market Research? Elaborate on various methods of market research. **[8]**

Q7) a) Write Notes on: **[8]**

i) Antidumping duty.

ii) International Trade.

b) Explain Total Quality Management of a process industry. **[8]**

OR

Q8) a) Explain in detail Quality Circle. **[8]**

b) Explain in detail various factors affecting international trade. **[8]**

Q9) Write short notes on: **[18]**

a) Work study.

b) FERA and FEMA.

c) Flow Chart and Flow Diagram.

OR

Q10)a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. **[12]**

b) Write note on Patent and patent rights in India. **[6]**

Total No. of Questions :10]

SEAT No. :

P1747

[Total No. of Pages :3

[5058] - 385

T.E. (Chemical Engg.)

MASS TRANSFER - I

(2012 Course) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal 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) Differentiate molecular and eddy diffusion in detail. **[4]**

b) In an oxygen - nitrogen mixture at 10 atmosphere and 25°C, the concentrations of oxygen at two places of 0.2 cm apart are 10 and 20 volume percent respectively. Calculate the rate of diffusion of oxygen expressed as gm/cm^2 hr for the case of unicomponent diffusion (nitrogen is non-diffusing). Value of diffusivity is 0.181 cm^2/sec. **[6]**

OR

Q2) a) Explain selection criteria for absorbent. **[4]**

b) In a mass transfer operation operating at 1 atm., the individual mass transfer coefficients have the following values, $k_x = 22$ kgmol/m^2 h, $k_y = 1.07$ kgmol/m^{2}h. The equilibrium composition of gaseous and liquid phases are characterized by Henry's law $p^* = 0.08 \times 10^6$ x mm Hg. **[6]**

i) Determine the overall mass transfer coefficients.

ii) Determine the resistance in liquid and gas phases.

Q3) a) Write short note on mass, heat and momentum transfer analogies. **[4]**

P.T.O.

b) The diffusivity of gas - pair O_2-CCl_4 is determined by observing the steady state evaraporation of CCI4 (liquid) into a tube containing O_2. The entire system is held at constant temperature and pressure. Both the gases are assumed to be ideal and O_2 is stationery. The distance between the CCI4 (liquid) level and top of the liquid level is 0.171m. The total pressure on the system is $100.658*10^3$ N/m^2 (755 mm Hg) and the temperature is 273K. The vapour pressure of CCI_4 is $4.399*10^3$ N/m^2 (33mm Hg) at that temperature. The cross sectional area of the tube is $0.082*10^{-3}$ m^2. After steady state is attained, $0.0208*10^{-6}$ m^3 of CCI 4 (liquid) evaporated in a $36*10^3$ second period. What is the diffusivity of gas pair CCI4-O_2?. Assume specific gravity of liquid CCI_4 as 1.59. **[6]**

OR

Q4) a) Explain Absorption & Stripping? What is significance of minimum liquid to gas ratio for absorption? **[6]**

b) Explain film theory and surface renewable theory. **[4]**

Q5) a) Define following terms, **[8]**

i) Absolute humidity

ii) Wet bulb Temperature

iii) Enthalpy humid volume

b) Define wet bulb Depression and psychrometric ratio. Derive an expression for wet bulb depression. **[8]**

OR

Q6) a) Derive the relation for the determination of height of packing of counter current cooling tower. **[8]**

b) Moist air at 310K has WBT of 300 K. The letent heat of vaporization of water at 300 K is 2440 KJ/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 3.60KPa and 6.33KPa at 310K. Psychrometric Ratio (h_G/k_Y) = 1000 J/Kg. K and latent heat of vaporization is 2440KJ/kg. **[8]**

Q7) a) Explain different types of tray efficiencies. **[4]**

b) Explain venture scrubber and wetted wall column gas-liquid contact. **[6]**

c) What are various equipments used for gas-liquid contact. Explain sparged vessel & mechanically agitated vessels with neat diagram. **[6]**

OR

Q8) a) Explain the tray tower and operating characteristics of the try tower. **[8]**

b) Explain the different types packing used in packed towers? **[4]**

c) Explain tray towers Vs packed towers. **[4]**

Q9) a) Derive the equation for determination of constant rate and falling rate of drying period. **[8]**

b) Describe the Rotary Dryer with neat sketch. **[6]**

c) Define moisture content in the solid on wet and dry basis. **[4]**

OR

Q10)a) A wet solid is to be dried from 20% to 10% moisture (wet basis) under constant drying conditions in 2 hours. If the equilibrium moisture content is zero. How long will it take to dry solids to 4% moisture under the same conditions? Assume that no constant rate period is encountered and falling rate period is linear. **[8]**

b) Discuss theories of movement of moisture within the solid during drying. **[4]**

c) Draw and explain the Rate of Drying Curve. **[6]**

Total No. of Questions :10]

SEAT No. :

P2198

[Total No. of Pages :2

[5058]-386
T.E. (Chemical)
TRANSPORT PHENOMENA
(2012 Pattern) (Semester - II) (309349)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) Derive the expression of momentum flux and velocity for Newtonian flow of fluid through circular tube. **[10]**

OR

Q2) Derive the expression of heat flux and temperature distribution for electrical heat source. **[10]**

Q3) Diffusivity of gas-pair oxygen-carbon tetrachloride is determined by observing steady state evaporation of carbon tetrachloride. The distance between CCl_4 liquid level and top of tube is 17.1 cm. The total pressure on the system is 755 mm Hg and temperature is 0^oC. Vapor pressure of CCl_4 at this temperature is 33 mm Hg. Cross-sectional area of tube is 0.82 cm^2. If it is found that 0.0208 cm^3 of CCl_4 evaporate in 10-hour period, what is diffusivity of gas-pair CCl_4-O_2? **[10]**

OR

Q4) a) Explain power law model of non-Newtonian fluid. **[5]**

b) State boundary conditions used in mass transfer problems. **[5]**

P.T.O.

Q5) a) Derive continuity equation in Cartesian system. **[12]**

b) Derive dimensional form of equation of change. **[6]**

OR

Q6) a) Derive Euler's equation of motion. **[12]**

b) Explain different types of derivatives used in deriving eqution of change? **[6]**

Q7) a) Derive expression of fanning friction factor. **[8]**

b) Derive Ergun equation. **[8]**

OR

Q8) a) Explain macroscopic mass balance equation. **[8]**

b) Derive expression of pressure rise for liquid-liquid ejector. **[8]**

Q9) a) Explain Reynold's analogy. **[8]**

b) Explain Martinnelli's analogy. **[8]**

OR

Q10) a) Explain the correlation of binary mass transfer coefficient in one phase at low mass transfer rates? **[8]**

b) Explain Chiton-colburn analogy. **[8]**

EEE

Total No. of Questions : 10]

SEAT No. :

P2983

[Total No. of Pages : 3

[5058]-387

T.E. (Chemical Engineering)

CHEMICAL REACTION ENGINEERING - I

(2012 Pattern) (End-Semester) (Semester - II) (309348)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) How kinetic model is tested, explain rules for matching the predicted rate expression and found experimentally. **[3]**

b) For a first order reaction the following data is available. Estimate activation energy for the reaction. **[7]**

Temperature °C	310	330
$K(sec)^{-1}$	0.000886	0.0139

Assume R = 8.314 J/mol K.

OR

Q2) a) The first order reversible liquid reaction A $\rightarrow$R, C_{A0} = 0.5 mol/lit, C_{R0} = 0 takes place in a batch reactor. After 8 min, conversion of A is 33% while equilibrium is 66%. Find rate equation for this reaction. **[7]**

b) Differentiate elementary and non-elementary reaction. **[3]**

Q3) A homogeneous gas reaction A $\rightarrow$ 3R has reported rate at 215°C

$-r_A = 10^{-2} C_A^{1/2}$ [mol/lit.sec].

Find the space time needed for 80% conversion of 50% A and 50% inerts feed to a Plug flow reactor operating at 215 °C and 5 atm (C_{A0} = 0.0625 mol/lit) **[10]**

OR

P.T.O.

Q4) a) Derive performance equation of Mixed Flow Reactor. **[6]**

b) At certain temperature, the half life period and initial concentration for a reaction are

$t_{½}$ = 420 sec, C_{A0} = 0.405 mol/lit

$t_{½}$ = 275 sec, C_{A0} = 0.64 mol/lit

Find the rate constant of reaction. **[4]**

Q5) a) Define instantaneous fractional yield and overall fraction yield.

Find out instantaneous fractional yield of reaction (ψ).

$$A + B \xrightarrow{K1} R \quad \frac{dC_R}{dt} = 1.0 C_A^{1.2} C_B^{1.4}$$

$$A + B \xrightarrow{K2} S \quad \frac{dC_S}{dt} = 1.0 C_A^{0.6} C_B^{2.0}$$ **[8]**

b) The desired liquid phase reaction

$$A + B \rightarrow P + T \quad \frac{dC_P}{dt} = \frac{dC_T}{dt} = K_1 C_A^{1.5} C_B^{0.4}$$

is accompained with undesirable side reaction

$$A + B \rightarrow S + U \quad \frac{dC_U}{dt} = \frac{dC_S}{dt} = K_2 C_A^{0.5} C_B^{1.8}$$

What contacting scheme (reactor type) would you use to carry above reaction to minimize concentration of undesired product? **[8]**

OR

Q6) Consider the following aqueous reaction

$$A + B \begin{cases} \nearrow R \\ \searrow S \end{cases}$$

$$\frac{dC_R}{dt} = 1.0 C_A^{1.5} C_B^{0.3}$$

$$\frac{dC_S}{dt} = 1.0 C_A^{0.5} C_B^{1.8}$$

For 90% conversion of A find the concentration of R in the product stream. Equal volumetric flow rates of the A and of B steam are fed to the reactor, and each stream has a concentration of 20 mol/lit of reactant. The flow in the reactor follow: **[16]**

a) Plug flow

b) Mixed flow

c) Plug flow with low concentration of B when plug flow A with mixed flow B.

Q7) Calculate the heat or reaction at 600ºC of the reaction

$A \rightleftarrows B + C$

Heat capacities of the reacting species may be expressed as

$C_p = \alpha + \beta T + \gamma T^2 + \delta T^3$

Component	α	$\beta \times 10^2$	$\gamma \times 10^5$	$\delta \times 10^9$
A	–0.24	8.65	–5.12	12.05
B	–1.30	8.40	–5.55	14.25
C	6.45	0.104	–0.008	0

The heat of reaction at the standard state (25 ºC) of the reaction is 27.23 k cal/ g mol. **[16]**

OR

Q8) a) Explain effect of temperature, pressure and inert on equilibrium conversions (X_{AC}) for exothermic and endothermic reactions. **[6]**

b) Explain optimum temperature progression for exothermic reversible reaction. **[6]**

c) Draw and explain energy balance equation line for adiabatic operations. **[4]**

Q9) A sample of tracer was injected into a vessel and effluent concentration was measured as function of time. Construct C and E and determine the fraction of material leaving the vessel that has spent 33 and 6 min and fraction of material that has spent 7.75 and 8.2 min in the vessel. **[18]**

t(min)	0	1	2	3	4	5	6	7	8	9	10	12	14	16
C (g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0	0

OR

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

a) Tank in series model.

b) C and E curve.

c) Micro and macro mixing of fluids.

d) Dispersion Model.

Total No. of Questions :10]

SEAT No. :

P1748

[Total No. of Pages :4

[5058]-388

T.E. (Chemical Engineering)

CHEMICAL ENGINEERING DESIGN - I

(2012 Pattern) (End-Semester) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Define wind girders with all required design calculations. **[4]**

b) A storage tank of diameter 20 m and height 12m is to be constructed. The plates of size 6300 mm × 1800 mm in varying thickness are available for fabrication. Density of liquid to be stored is 1000kg/m^3. Material of construction is carbon steel having permissible stress of 165 N/mm^2. Weld joint efficiency is 85% and corrosion allowance is 1.5 mm. Calculate total numbers of courses required and thickness of each course. **[6]**

OR

Q2) a) With neat sketch explain bracket support with required design calculations. **[5]**

b) Explain the procedure for the design of saddle support with necessary equations. **[5]**

Q3) a) What is temperature correction factor? How is it calculated? Why is it used in design of heat exchanger? **[6]**

b) Discuss briefly on shell and tube side heat transfer coefficients in a shell and tube heat exchanger. **[4]**

OR

P.T.O.

Q4) 0.8 kg/sec of furnace oil is to be heated from 10°C to 90°C in a shell and tube heat exchanger. Heating is done by steam available at 120°C. Oil is circulated through the tubes while steam is circulated in the shell. Tubes of 16.5 mm inside diameter and 19 mm outside diameter are available. Length of tube = 3.0 m.

The film coefficient of heat transfer for oil is 90W/m^2K while the film coefficient of heat transfer for condensing steam is 7400 W/m^2K.

Density of furnace oil = 900 kg/m^3

Specific heat of furnace oil = 1970 J/kg K

Fouling resistance for furnace oil = 0.0009 m^2K/W

Fouling resistance for steam side = 0.00005 m^2K/W

Suggest suitable design of the shell and tube heat exchanger. Maximum oil velocity that can be used is 0.05 m/sec. Estimate the number of passes on tube side required in a heat exchanger. **[10]**

Q5) a) Explain feed forward triple effect evaporator with required energy balance equations. **[8]**

b) A single effect evaporator is to be designed to concentrate 10,000 kg/hr of a chemical solution from 10% to 20% solids by weight feed enters at 30°C saturated steam at 110°C (latent heat 540 kcal/kg) is available. Condensate leaves at saturation temperature. The solution boils at 45°C (latent heat 570 kcal/kg). Specific heats of all solutions may be taken as 1.0 kcal/kg °C. Overall heat transfer coefficient may be taken as 1800 kcal /hr m^2 °C. Calculate **[8]**

i) Steam consumption (kg/hr)

ii) Heat transfer area.

OR

Q6) a) Explain the design methods for mixed vapor condensers and how the true temperature difference is evaluated in such cases? **[8]**

b) In case of reboilers how the heat transfer coefficient is calculated for Pool boiling. Explain all the equations involved in the calculations. **[8]**

Q7) a) Describe any three types of agitators giving their range of rpm, functioning and application. **[8]**

b) A pitched blade turbine impeller running at 90 rpm is used for agitating 5000 liter of liquid with a density of 900 kg/m^3 and viscosity of 100 cP. The tank diameter is 1 m and the ratio of agitator diameter to tank diameter is 0.4. Find the power required for mixing. **[10]**

N_{Re}	1000	2000	3000	4000
N_P	1.1	1.2	1.3	1.4

OR

Q8) a) Explain criteria for jacket selection in a reactor. **[6]**

b) Toluene is continuously nitrated to mono-nitrotoluene in a cast iron vessel, 1 m diameter, fitted with a propeller agitator 0.3 m diameter, rotating at 2.5 Hz. The temperature is maintained at 310 K by circulating 0.5kg/sec cooling water through a stainless steel coil 25 mm OD and 22 mm ID, wound in form of a helix, 0.8m in diameter. The reacting material is having the same physical properties as 75% sulphuric acid. If the mean water temperature is 290 K, what is the overall heat transfer coefficient for desired heat transfer? **[12]**

Properties:

Water- Thermal conductivity = 0.59 W/m K, Cp=4180 J/kg K, viscosity = 1.08 mN s/m^2, density = 998 kg/m^3

75% sulphuric acid- Thermal conductivity = 0.40 W/m K, Cp = 1880 J/kg K, viscosity =6.5mN s/m^2, density = 1666 kg/m^3, Viscosity at the surface = 8.6 mN s/m^2

Thermal conductivity of stainless steel is 15.9 W/m K, Dirt resistance at inside and outside surfaces are 0.0002 and 0.0004 m^{2}K/W respectively.

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

i) Settling chamber

ii) Impingement separator

iii) Coalescer

iv) Cyclone separator

b) Design a decanter to separate light oil from water. The oil is the dispersed phase. Oil flow rate is 1000 kg/h, density of oil is 900 kg/m^3 and viscosity of oil is 3 mNs/m^2. Water flow rate is 5000 kg/h, density of water is 1000 kg/m^3 and viscosity of water is 1 mN s/m^2. **[8]**

OR

Q10)a) Write about knockout drum, role of demister pad and reflux drum. **[8]**

b) Design a horizontal separator to separate 10,000 kg/h of liquid, density 962.0 kg/m^3, from 2,500 kg/h of vapor, density 23.6 kg/m^3. The vessel operating pressure will be 21 bars. **[8]**

EEE

Total No. of Questions : 10]

SEAT No. :

P1749

[Total No. of Pages : 2

[5058]-389
T.E (Chemical)
PROCESS INSTRUMENTATION AND CONTROL
(2012 Course) (Semester-II) (309352)

Time : 2:30 Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

Q1) a) State and explain any three desirable static and dynamic characteristics of instrument. **[8]**

b) What is a transducer? **[2]**

OR

Q2) a) Distinguish between active and passive transducers with suitable example. **[5]**

b) Explain need and scope of process instrumentation. **[5]**

Q3) a) Distinguish between RTD and Thermistor. **[4]**

b) Describe pressure thermometer. **[6]**

OR

Q4) What are different types of manometers? With neat sketch explain inclined tube manometer. **[10]**

Q5) a) How level can be measured using radioactive transducer? Draw neat sketch and explain in detail. **[8]**

b) Describe turbine type flow meter. **[8]**

OR

Q6) Describe any two **[16]**

a) Ultrasonic method of level measurement.

b) Electromagnetic flow meter.

c) Rota meter.

P.T.O.

Q7) Describe any two techniques of composition analysis. **[16]**

a) Gas Chromatography

b) UV Absorption Spectroscopy

c) Mass Spectroscopy

OR

Q8) a) Explain principle, construction and working of HPLC. **[10]**

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

Q9) a) Describe the types of ideal forcing function? **[6]**

b) Derive the transfer function of mercury in glass thermometer and find the dynamic behavior for step change in input. **[12]**

OR

Q10)a) What are servo and regulatory operation? **[6]**

b) Explain modes of control action. **[6]**

c) A thermometer of time constant 10 seconds, initially at 30 ^{0}C**,** is suddenly immersed into a water bath at 100 ^{0}C. How long will it take for the thermometer reading to reach 90^{0}C? **[6]**

❖ ❖ ❖

Total No. of Questions :10]

SEAT No. :

P1750

[Total No. of Pages :4

[5058]-390
T.E. (Chemical)
MASS TRANSFER - II
(2012 Pattern) (Semester - II) (309351)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1 or Q.2, 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) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define Following terms: **[4]**

i) Relative volatility,

ii) Flash distillation.

b) A liquid mixture containing 1200 gram mole of mixture containing 30 mole% naphthalene and 70 mole% dipropylene glycol is subjected to differential distillation at pressure 100 mmHg and final distillate contain 55 mole% of feed solution. Fing bottom & distillate composition, the VLE data are **[6]**

X-	8.4	11.6	28.0	50.6	68.7	80.6	88
Y-	22.3	41.1	62.9	74.8	80.2	84.4	88.8

OR

Q2) a) For a mixture of n-heptane (A) and tolune (B) at 273^{o}K and 101.3 KN/m^{2}, PA^{o} = 106 KN/m^{2}, PB^{o} = 73.7 KN/m^{2}, find the compositions in vapor and liquid phase. **[3]**

b) Give detail procedure of finding number of plates by using Ponchon Savarit method. **[7]**

P.T.O.

Q3) a) A continuous fractionating column is to be designed for separating 10000 kg per hour of a liquid mixture containing 40 mole% methanol and 60 mole% water in to an overhead product containing 97 mole% methanol and bottom product having 98 mole% water. A mole reflux ratio of 3 is used. Calculate number of ideal plates and location of feed plate if the feed is at its bubble point . Equilibrium data: **[5]**

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0.417	0.579	0.669	0.729	0.78	0.825	0.871	0.915	0.952	1.0

b) Discuss the graphical method for finding number of stages in counter current liquid-liquid extraction when solvents are partially miscible. **[5]**

OR

Q4) a) In the extraction of acetic acid from an aqueous solution with benzene in a packed column of height 1.4 m and cross sectional area of $0.0045 m^2$, the concentration measured at the inlet and outlet of column are; acid concentration at inlet and at outlet water phase=0.690 $kmol/m^3$ and 0.685 $kmol/m^3$ respectively. Benzene inlet concentration 0.0040 $kmol/m^3$ and benzene outlet conc. 0.0115 $kmol/m^3$. Flow rate of benzene phase = 5.7 cm^3/s = 1.27 10-3 $m^3/m^2.s$. Equilibrium relation for the system is $C_{B*}/C_W = 0.0247$. Determine overall transfer coefficient and height of transfer unit. **[8]**

b) Give advantages and uses of liquid-liquid extraction. **[2]**

Q5) a) Derive an expression: $n = \dfrac{\log(1+(R-1)*^1 / f}{\log^R} - 1$ for finding the number of stages under the condition of constant underflow. **[8]**

b) In a mixture of 1 kg of inert and 100 gram of solute C, solute C is to be extracted using 1000 gram of solvent as **[8]**

i) once 1000 gram

ii) 500 gram two times,

iii) three times using 400, 200, 300 gram each.

Calculate the percentage recovery in each case if 200 gram of solvent is retained of inert. **[4]**

OR

Q6) a) Oil is to be extracted from meal by means of benzene using continuous countercurrent extraction unit. The unit is expected to treat 1000 kg of meal per hour. The untreated meal conations 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 are to contain 55 kg of unextracted oil. Experimental data on the extraction of oil from meal are as **[12]**

Solution Composition kg oil/kg solution	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70
Solution retained kg oil/kg solid	0.5	0.505	0.515	0.530	0.550	0.571	0.595	0.620

Find the number of ideal stages required

b) Define leaching. What are the uses of leaching? Give classification of leaching equipments. **[4]**

Q7) a) An aqueous solution containing valuable solute is colored by of small amounts of impurities. Before crystallization the impurity is to be removed by adsorption on decolorizing carbon which adsorb only significant amount of solute. It is desired to reduce color by 10% of original solution concentration of 9.6. Calculate the quantity of the fresh carbon per 1000 kg solution for a single stage process and for a two stage crosscurrent process using minimum total amount of carbon. The data for an equilibrium isotherm is as follows: **[14]**

Kg carbon /kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

b) What are the basic characteristics that adsorbent should posses? What are the types of adsorbents? **[2]**

OR

Q8) a) Write principles of ion exchange process and rate of ion exchange. **[8]**

b) Explain in brief **[4]**

i) Adsorption isotherm,

ii) Adsorption hysteresis

c) Differentiate between physical and chemical adsorption. **[4]**

Q9) a) Estimate the quantity of original saturated solution to be fed to the crystallizer per 1000kg of $MgSO_4$ $7H_2O$ crystals, if saturated solution of $MgSO_4$ at 353 ^oK is cooled to 303 ^oK in a crystallizer. During cooling 4% of the water is lost by evaporation. Data: solubility of $MgSO_4$ at 353 ^oK = 64.2 kg/100kg, water solubility of $MgSO_4$ at 303 ^oK = 40.8 kg/100 kg water. At wt Mg = 24, S=32, H=1. O=16. **[8]**

b) Explain ultra filtration with neat sketch. **[5]**

c) What is equilibrium solubility in crystallization? Explain solubility curves. **[5]**

OR

Q10)a) Explain reverse osmosis and its applications. **[5]**

b) What are different membrane modules? Define membrane fouling. **[5]**

c) Give classification of crystallizers? Explain working and construction of Swenson Walker Crystallizer. **[8]**

ɛɛɛ

Total No. of Questions :10]

SEAT No. :

P1751

[Total No. of Pages :3

[5058] - 391

T.E. (Computer Engg.)

DATABASE MANAGEMENT SYSTEMS APPLICATIONS

(2012 Course) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.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 distinctions among the terms primary key, candidate key, and super key. **[5]**

b) Explain the concept of specialization & generalization in E-R Model using suitable example. **[5]**

OR

Q2) a) Explain wide column store data model of NOSQL databases. **[5]**

b) Differentiate between Relational database & NOSQL database. **[5]**

Q3) a) Consider relational schema **[5]**

Customer (cname, ccity, phone)
Loan (lno, branch_name, amount)
Borrower (cname, lno)
Depositor (cname, accno)
Branch (bname, bcity)
Account (bname, accno, bal)

Write SQL queries for following requirements (Any two):

i) Find out average account balance at each branch.
ii) Find all customers who have both account and loan at the bank.
iii) Find average account balance at Shivajinagar branch.

b) Write short note on performance tuning & query optimization of NOSQL database. **[5]**

OR

P.T.O.

Q4) a) Write short note on crowd sourcing. **[5]**

b) What is recoverable schedule? Why is recoverability of schedule is desirable? **[5]**

Q5) a) What is speedup and scale up attributes in parallel database architectures? Explain the different factors affecting the speedup and scaleup attributes. **[8]**

b) Compare 2-tier and 3-tier client server architecture with suitable example. **[8]**

OR

Q6) a) Explain different steps required for JAVA to SQl database connection using JDBC. **[8]**

b) Explain distributed database system architecture. **[8]**

Q7) a) Consider the requirements of library having following elements **[7]**

students (roll_no, name, class)

Teachers (ID, Name, department)

Book (Acce._No, Title, author, publisher)

write a XML DTD for above elements.

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

i) HBASE

ii) HIVE

OR

Q8) a) List & explain advantages of using XML Schema over XMLDTD. **[7]**

b) Explain in brief different building blocks of HADOOP. **[5]**

c) Write short note on Querying XML data. **[5]**

Q9) a) Explain with neat diagram different components of data warehouse. **[5]**

b) Write short note on Data-mining association rules. **[5]**

c) Explain Recommendation algorithm. **[7]**

OR

Q10)a) What is data mining clustering? Explain how knowledge can be extracted from databases using Data Mining clustering. **[5]**

b) Explain in brief different BIS components. **[5]**

c) Write short note on Data-mining regression analysis. **[7]**

Total No. of Questions : 10]

SEAT No. :

P1752

[Total No. of Pages : 3

[5058]-392

T.E.(Computer Engineering)

DATA COMMUNICATION AND WIRELESS SENSOR NETWORK

(2013Course) (310243) (Semester-I)

Time : 2.5 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Question 1 2 3 4 (10 marks each). Solve either question1 or Question 2 and Question 3 or Question 4.***
2) ***Question 7 and 8 (18 Marks) solve any one.***
3) ***Question 5,6,910(16 Marks each) solve either Question 5 or Question 6 and Question 9 or Question 10***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume Suitable data if necessary.***
6) ***Figurs to the right indicate full marks.***

Q1) a) We have four sources, each creating 250 characters per second. If the interleaved unit is a character and each synchronizing bit is added to each frame find **[6]**

i) The data rate of each frame
ii) The duration of each character in each source
iii) The frame rate
iv) The duration of each frame
v) The number of bits in each frame
vi) The data rate of the link

b) Explain RFID Based Data Communication **[4]**

OR

Q2) a) Write key Definitions of following components of Sensor Networks

i) Sensor
ii) Sensor Node
iii) Routing
iv) Data Centric routing
v) Collaborative processing
vi) Localization and tracking **[6]**

b) Explain the Scrambling technique in encoding . What are different types of scrambling techniques? **[4]**

P.T.O.

Q3) a) Explain ALOHA,SLOTTED ALOHA and CSMA/CD, Comment on the efficiency of each random access technique. **[6]**

b) Write short note on:

i) Bluetooth architecture

ii) Virtual private networks. **[4]**

OR

Q4) a) Explain stop and wait ARQ, GO back-n ARQ and selective repeat ARQ. Comment on the performance of each. **[6]**

b) Explain in detail Delta modulation. Draw block diagram of delta modulator and demodulator,What are its advantages on PCM. **[4]**

OR

Q5) a) Define the following related to WSN and explain in brief

i) Unit node identifier

ii) Mach address

iii) Resource Identifier

iv) Network indentifier **[8]**

b) With the help of detail flow schematic diagram explain

i) Slotted CSMA-CA protocol.

ii) CSMA-CD protocol **[8]**

Q6) a) Explain the concept of low duty cycle protocol with wakeup period Also explain how it differs from Sparse Topology and Energy Management (STEM) Protocol. **[8]**

b) Explain the following with respect to WSN

i) Forward Error Correction (FEC)

ii) Block Coded FEC

iii) Convolutional codes

iv) Interleaving **[8]**

Q7) a) Explain the concept of range based localization in WSN

Explain “Range based” localization with distance measurement giving example. **[8]**

b) Explain following terminologies related to attribute based routing in WSN **[6]**

i) Direct diffusion

ii) Rumor Routing

iii) Geographical hash tables

c) Enlist different routing challenges in WSN and Enlist the design issues in WSN? **[4]**

OR

Q8) a) Explain in brief: **[8]**

i) PICONET

ii) Tunneling protocol

b) What are different types of routing strategies/ protocols **[6]**

c) Write a short note on :

i)SPIN-PP

ii) SPIN-EC **[4]**

Q9) a) Write short note on:

i) Tiny OS

ii) Magnet OS **[8]**

b) What do you mean by Content Delivery Network (CDN)? What are different services provided by CDN? **[8]**

OR

Q10)a) Explain with the help of suitable architectural diagram of Nano-RK OS **[8]**

b) Write short notes on:

i)Task driven Sensing

ii)LiteOS **[8]**

✓ ✓ ✓

Total No. of Questions : 8]

SEAT No : ____

P1753

[Total No. of Pages : 2

[5058]-393

T.E.(Computer Engineering)

COMPUTER FORENSIC AND CYBER APPLICATIONS

(2012 Course) (Semester -I)

Time : 2.5 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

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

Q1) a) What is switching? Compare packet switching and circuit switching techniques. **[8]**

b) Explain Guided transmission media with examples. **[6]**

c) Comment on language of computer crime investigaton. **[6]**

OR

Q2) a) Explain the functions of the following network components: **[8]**

i) Switch

ii) Bridge

iii) Gateways

iv) Repeater

b) What is modus operandi? Explain with the motives behind it. **[6]**

c) Write short note on cyber attacks. **[6]**

Q3) a) Explain the following with example : **[8]**

i) Digital evidence as Alibi

ii) Computer intrusion.

P.T.O.

b) How will you apply forensic science to computers? **[8]**

OR

Q4) a) Enlist the important features from Indian IT act with reference to cyber crime and forensics. **[8]**

b) Comment on Violent crime and digital evidence. **[8]**

Q5) a) Compare digital evidence on windows system & Unix systems. **[8]**

b) Explain how to handle mobile devices as source of evidence. **[8]**

OR

Q6) a) Write short note on: **[8]**

i) E-mail forgery

ii) Intellectual Property Rights (IPR)

b) How will you handle digital evidence on Windows systems? **[8]**

Q7) a) Enlist the steps for handling digital evidence at various layers. **[9]**

b) Write short note on fraud detection in mobile and wireless network. **[9]**

OR

Q8) a) Explain the network basics for digital investigators. **[9]**

b) How will you detect frauds on mobile and wireless devices? **[9]**

✡ ✡ ✡

Total No. of Questions : 10]

SEAT No. :

P1754

[Total No. of Pages : 2

[5058]-394

T.E. (Computer Engineering)

OPERATING SYSTEM DESIGN

(2012 Course) (Semester - I) (END SEM.) (310242)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain data structures for demand paging. **[6]**

b) Explain fixed and dynamic memory allocation. **[4]**

OR

Q2) a) Explain system calls *exec()* and *brk()*. **[6]**

b) Explain necessary conditions for deadlock. **[4]**

Q3) a) Reference string: - 1 2 3 2 1 5 2 1 6 2 5 6 3 1 3 6 1 2 4 3.

Execute LRU and OPR on above string. Consider page frame of 3 pages.

Write page hit and page faults if any. **[6]**

b) Explain validity fault handler. **[4]**

OR

Q4) a) Explain in brief *growreg()* and *dupreg(.)*. **[6]**

b) Explain page stealer process. **[4]**

Q5) a) What is IPC? Explain process tracing using ptrace() system call. **[8]**

b) Explain problems in multiprocessor architecture and Master/Slave solution to tackle it. **[8]**

OR

Q6) a) What is socket? Explain all system calls with parameters for client server communication. **[8]**

b) Explain System V IPC mechanism: Shared Memory and Messages. **[8]**

P.T.O.

Q7) a) **[8]**

Table 1

Name	TOC	OSD	DCWSN	DMSA	FSCA
Sushil	65	69	74	76	45
Mahesh	55	66	73	65	56
Abhishek	45	74	55	65	60
Rohit	71	70	78	77	71

Write AWK code (refer Table 1):

i) To calculate AVERAGE of marks for each student.

ii) To calculate PERCENTAGE for each student.

b) Explain *grep* utility and its variations with example. **[8]**

OR

Q8) a) What is the purpose of make tool? Explain its advantages? Explain different options for make files. **[8]**

b) Explain sorting tool (*sort*) with example. **[4]**

c) State and Explain difference between *UEFI* and *BIOS*. **[4]**

Q9) a) Explain Android architecture in details. **[8]**

b) Explain security issues in handheld system. **[5]**

c) Explain Frame of reference for handheld systems. **[5]**

OR

Q10) Write a short note on following (*solve any three*) **[18]**

a) Windows scheduling.

b) Linux scheduling.

c) PalmOS.

d) Windows Mobile Phone OS.

Total No. of Questions :8]

SEAT No. :

P1755

[Total No. of Pages :3

[5058] - 395

T.E. (Computer)

THEORY OF COMPUTATION

(2012 Course) (Semester - I) (310241)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What is Kleen Closure? What is Positive Closure? For a given language L under what circumstances will L^+ and L^* be equal? **[6]**

b) Construct a DFA over the alphabets {0, 1} for accepting the strings having number of 1's as multiple of 3. **[6]**

c) Check whether the given grammar is in CNF. If not then find its equivalent CNF. **[8]**

$S \rightarrow bA \mid aB,\ A \rightarrow bAA \mid aS \mid a,\ B \rightarrow aBB \mid bS \mid b$

OR

Q2) a) Define a Language of Polynomials recursively and give derivation for $7X^4 - 3X^3 + 15X$ **[6]**

b) Construct finite automata for the following regular expressions. **[6]**

i) 01 [((10)* +111)* + 0]* 1

ii) 1 (1 + 10)* +10 (0 + 01)*

c) Simplify the following grammar **[8]**

i) $S \rightarrow Ab, A \rightarrow a, B \rightarrow C \mid b, C \rightarrow D, D \rightarrow E, E \rightarrow a$

ii) $S \rightarrow 0A0 \mid 1B1 \mid BB,\ A \rightarrow C,\ B \rightarrow S \mid A,\ C \rightarrow S \mid \in$

P.T.O.

Q3) a) "If L_1 & L_2 are recursive languages, then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursive." Justify. **[6]**

b) What is NDTM? Construct a NDTM to recognize words of the form WW over alphabet {a, b}. **[12]**

OR

Q4) a) What is a post machine? Give formal definition of Post Machine. Construct a Post Machine for Having odd length and a's as center element. **[10]**

b) Write short note on (Any two): **[8]**

i) Universal Turing Machine (UTM).

ii) Languages accepted/ decided by TM.

iii) Recursively Enumerable Languages.

Q5) a) What is PDA? What are the different types of PDA? Give its applications. **[7]**

b) Obtain the CFG for the PDA given by M = $\{\{q_0, q_1\}, \{0, 1\}, \{z_0, X\}, \delta, q_0, z_0, \phi\}$ where δ is given as. **[9]**

$\delta(q_0, 1, z_0) = \{q_0, xz_0\}$ $\quad$ $\delta(q_0, 1, x) = \{q_0, xx\}$

$\delta(q_0, 0, x) = \{q_1, x\}$ $\quad$ $\delta(q_0, \varepsilon, z_0) = \{q_0, \varepsilon\}$

$\delta(q_1, 1, x) = \{q_1, \varepsilon\}$ $\quad$ $\delta(q_0, 1, z_0) = \{q_0, z_0\}$

OR

Q6) a) Construct a PDA that accept L = $\{a^n b^n \mid n \geq 1\}$ through Empty Stack. **[6]**

b) What is NPDA? Construct a NPDA for L = $\{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$ **[10]**

Q7) a) What do you mean by NP - Complete Problems? Listall the problems in this class and Explain any one with suitable example. **[8]**

b) Why do we need to reduce existing problems to NP-Complete problems? Explain with suitable example. **[8]**

OR

Q8) a) What is SAT problem? Explain in detail. **[8]**

b) What are Tractable and Intractable problems? Explain. **[4]**

c) What is Computational Complexity? Explain. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1756

[Total No. of Pages : 2

[5058]-396

T.E.(Computer Engineering)

PRINCIPLES OF CONCURRENT AND DISTRIBUTED PROGRAMMING

(2012 Course)(Semester-II) (End Semster)(310249)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2,Q3or Q4, Q5 or Q6 , Q 7 or Q 8, and Q 9 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) Write short note on basic user interface elements in GUI model. **[6]**

b) Explain shared-state concurrent model. **[4]**

OR

Q2) a) What are the dependency relationships between two tasks? **[6]**

b) What is the structure of a YACC file? **[4]**

Q3) a) Write short note on shared memory. **[6]**

b) Explain various types of parallelism. **[4]**

OR

Q4) a) Write a note on Handler's classification. **[6]**

b) Define speed up with respect to parallel algorithms. **[4]**

Q5) a) What is DCE? Explain it along with its components. **[10]**

b) Explain the following terms with respect to operating system: **[8]**

i) System image.

ii) Autonomy

iii) Fault Tolerance Capability.

OR

P.T.O.

Q6) a) What are various models used in distributed computing environment? **[10]**

b) Why is scalability an important feature in the design of a Distributed OS? Discuss the guiding principles for design scalable distributed system. **[8]**

Q7) a) What is Virtualization? Explain types of virtualization. **[8]**

b) Explain the common approaches to virtual computer systems. **[8]**

OR

Q8) a) What is Xen domain? Also explain hypervisor. **[8]**

b) What are the hardware-related issues that should be considered while specifying the physical systems that will host the virtual machines? **[8]**

Q9) a) Explain global memory in CUDA. **[8]**

b) How CPUs and GPUs are different? **[4]**

c) Write short notes on: **[4]**

CUDA threads

CUDA blocks

OR

Q10)a) Explain threads in CUDA. Also explain problem decomposition. **[8]**

b) Explain texture memory in CUDA. **[4]**

c) Write short notes on: **[4]**

- CUDA grids
- CUDA Kernels

Total No. of Questions :8]

SEAT No. :

P1757

[Total No. of Pages :2

[5058] - 397

T.E. (Computer Engg.)

COMPUTER NETWORKS

(2012 Course) (Semester - II) (End Semester)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain transition from IPv4 to IPv6 using tunneling. **[8]**

b) Why we need DHCP and Explain DHCP client transition diagram in detail. **[8]**

c) Explain BGP routing protocol. **[4]**

OR

Q2) a) An organization is granted a block of addresses 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets as shown below: **[10]**

- One subblock of 120 addresses.
- One subblock of 60 addresses.
- One subblock of 10 addresses.

Find out the first Address, last address of each subblock and their respective subnet masks. Also draw diagram showing all the subblocks. Mention how many address are still unused.

b) Explain Mobile IP protocol and describe triangular routing problem in Mobile IP. **[6]**

c) Draw and explain UDP header in brief. **[4]**

Q3) a) Explain Hidden station problem and expose station problem in detail. **[8]**

b) Explain WAP layered architecture with suitable diagram. **[8]**

OR

P.T.O.

Q4) a) What is Distributed and point coordination function of IEEE 802.11. **[8]**

b) Compare and explain 802.11 ad, 802.11ac and 802.11n. **[4]**

c) Draw the flowchart for CSMA/CA. **[4]**

Q5) a) Describe VoIP using H.323 protocol. **[8]**

b) Explain VANET architecture? List out the challenges in VANET. **[8]**

OR

Q6) a) Explain Video conferencing with Session Initiation Protocol. **[8]**

b) Explain DTN layered architecture. **[8]**

Q7) a) What is virtualization? Explain different types of network virtualization. **[6]**

b) Explain the components of optical network. **[6]**

c) Draw the neat diagram to explain ATM layered architecture. **[6]**

OR

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

a) Propagation of signals in optical fibers.

b) GMPLS.

c) Software Defined Network.

d) Piconets.

Total No. of Questions :10]

SEAT No. :

P1758

[Total No. of Pages :3

[5058]-398

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Pattern) (End-Sem.) (Semester - II) (310250)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) List and explain non-preemptive scheduling algorithms? **[6]**

b) What are the message pipes? How they are useful to Kernel? **[4]**

OR

Q2) a) What is the difference between Thumb and ARM modes of ARM? **[4]**

b) Give total number of registers found in ARM mode of ARM architecture? Give reason for their existence. **[4]**

c) What is tardiness and laxity? **[2]**

Q3) a) Explain Linux kernel construction. **[4]**

b) What are the following with respect to Linux kernel? **[3]**

i) zImage

ii) vmlinuz

c) Draw a typical flash memory layout. **[3]**

OR

P.T.O.

Q4) a) With the help of neat diagram, explain composite kernel image construction. **[6]**

b) Give details of Busy Box configuration. **[4]**

Q5) a) What is the use of flash memory found on the embedded/target board? What are the limitations of flash memory? **[5]**

b) What is journaling? Give the names of two file systems where it is used. **[6]**

c) What are loadable modules with respect to device drivers? Give Commands for loading and unloading device driver modules. **[6]**

OR

Q6) a) What are the responsibilities of bootloader when designed for an embedded board? **[6]**

b) How DHCP/BOOTP protocols are useful for embedded Linux development? **[6]**

c) Write a note on MTD subsystem. **[5]**

Q7) a) With the help of neat diagram, explain the Linux kernel debugging on target board. **[7]**

b) Describe GDB, DDD, cbrowser/cscope. **[6]**

c) What is SSH? When do you use it? **[4]**

OR

Q8) a) With the help of neat diagram, explain interfacing of BBB with Stepper motor. **[7]**

b) Discuss the challenges faced by developer while debugging Linux kernel code. **[6]**

c) What is gdbserver? **[4]**

Q9) a) With the help of neat diagram, explain embedded android Architecture. **[8]**

b) Explain different steps involved in porting Linux on embedded/target board. **[8]**

OR

Q10)a) Explain the following terms with respect to embedded android: **[8]**

i) Launcher

ii) Activity manager

iii) Dalvic VM

b) What is required to preempt Linux kernel? **[4]**

c) What are sources of preemption latency in Linux kernel? **[4]**

EEE

Total No. of Questions : 10]

SEAT No. :

P1759

[Total No. of Pages : 3

[5058]-399

T.E. (COMPUTER ENGINEERING)

Digital Signal Processing Applications

(2012 Course)(End Semester) (Semester-II) (310253)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Classify DT systems as: **[5]**

i) FIR and IIR systems.

ii) Causal and Noncausal systems

b) How DFT is different than Fourier Transform (FT)? State the convolution property of DFT. **[5]**

OR

Q2) a) Using ZT properties obtain the ZT of **[5]**

$x(n)=\left(\frac{1}{4}\right)^{n} u(-n)$ Sketch the ROC.

b) Define quantizer, quantization levels, quantization error and quantization step w.r.t. quantization process of ADC. **[5]**

Q3) a) Obtain the computational complexity of Radix - 2 DIT FFT algorithm. **[5]**

b) Why problem of aliasing is observed during the sampling process? State the sampling theorem and write the relationship between CT and DT frequencies. **[5]**

OR

P.T.O.

Q4) a) Compute 5 point Circular Convolution using matrix method for a given DT signals: **[5]**

x1(n)= {1,–1, –2,3, –1} and x2(n) = {1, 2, 3}

b) A system is described by means of system function. **[5]**

$$H(Z)=\frac{2Z}{Z-1}-\frac{Z}{Z-3}$$

Determine the impulse response h(n) if –

i) The system is causal

ii) The system is Non-causal

iii) The system is stable

Q5) a) What are filter structures? Explain how the Direct and Cascade form of FIR filters are obtained and realized from the system function H(Z) **[9]**

b) Obtain the system function and impulse response of the system. Realize it using Direct Form - II filter structure. **[9]**

$2y\,(n) + y\,(n–1) - 4y\,(n–3) = x(n) + 3x\,(n–1)$

OR

Q6) a) Derive the Direct Form-I IIR filter structure from system function H(Z) and represent it using multipliers, adders and delay elements. **[9]**

b) Obtain and realize Linear Phase FIR filter structure for a DT system.

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

What are the advantages of this filter structure? **[9]**

Q7) a) What is OMAP? Explain the features and applications of OMAP in brief. **[8]**

b) Explain the features of SHARC DSP processor. List the number of DAGs with it capabilities and memory pointer registers supported by DAG. **[8]**

OR

Q8) a) Draw and explain the SIMD (Single Instruction Multiple Data) architecture of SHARC DSP processor. **[8]**

b) Compare conventional Microprocessor with DSP Processor architecture. Draw and explain basic building blocks of DSP processor. **[8]**

Q9) a) How digital image is represented by means of digital computer? How gray scale image is different than colour image? What is Histogram of an image? **[8]**

b) Draw and explain Human Speech Model in speech synthesis and recognition. **[8]**

OR

Q10)a) With mathematical form, explain any two gray level transforms used for image enhancement. **[8]**

b) What is Compounding? What is its significance in audio processing? What is the impact of data rate on sound quality? **[8]**

❖ ❖ ❖

Total No. of Questions :10]

SEAT No. :

P1760

[Total No. of Pages :2

[5058]-400

T.E. (Computer Engineering)

SOFTWARE ENGINEERING

(2012 Pattern) (End Semester) (Semester - II) (310252)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) What is software engineering? What are the characteristics of software? **[5]**

b) Explain in detail the Unified process indicating workflows and process phases. What are the advantages of iterative development? **[5]**

OR

Q2) a) What do you understand with the Validating requirements? **[5]**

b) Explain Behavioral model and what types of "states" behavioral model represents? **[5]**

Q3) a) Describe the User Interface analysis and design process with diagram and Explain interface design element. **[5]**

b) What do you mean by the term cohesion and coupling in the context of software design? How are these concepts useful in arriving at a good design of a system? **[5]**

OR

Q4) a) What is the fundamental difference between the structured analysis and object oriented strategies for requirements analysis. **[5]**

b) Explain the quality attributes, considered in software design. **[5]**

P.T.O.

Q5) a) What do you understand by the term integration testing? Which types of defects are uncovered during integration testing. **[5]**

b) What is the difference between alpha testing and beta testing? **[5]**

c) What do you understand by White box testing? **[7]**

OR

Q6) a) Explain Boundary value analysis testing and orthogonal Array testing. **[5]**

b) Explain smok testing and regression testing? **[5]**

c) Basis path testing is covers all statement in program module. Justify with example. **[7]**

Q7) a) Explain COCOMO II model. **[5]**

b) List the four P's of software project management spectrum. Explain how "the people" factor contributes towards the success of the software project. **[5]**

c) Explain the decision tree for make/buy decision. **[7]**

OR

Q8) a) What is project scheduling? What are the basic principles of project scheduling? **[5]**

b) What is time line chart? Explain with suitable examples. **[5]**

c) What is Risk identification? What are the different categories of risks? **[7]**

Q9) a) What is Service-oriented architecture? **[5]**

b) What is OCL? Where it is used? **[5]**

c) Discuss architectural patterns in details. **[6]**

OR

Q10) a) What is client server computing? Explain. **[5]**

b) Explain ISO 9126 Quality Factors. **[5]**

c) What are formal methods for software development? **[6]**

EEE

Total No. of Questions :10]

SEAT No. :

P1761

[Total No. of Pages :4

[5058] - 401

T.E. (IT)

DATABASE MANAGEMENT SYSTEMS

(2012 Course) (Semester - I) (314443)

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 Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Compare DBMS and File processing system with following points. **[3]**

1) Redundancy

2) Access Control

3) Data Integrity

b) Consider the following relations: **[3]**

BRANCH(bno, street, area, city, pcode, telno)

STAFF(Sno, Fname, Lname, address, position, salary, bno)

Express the following queries in SQL:

1) List the staff who work in the branch at 'Main Street'

2) Find staff whose salary is larger than the salary of every member of staff at branch 'S1'

c) For a given functional dependencies F, find primary key? **[4]**

$A \rightarrow BCD, AE \rightarrow F, E \rightarrow G, D \rightarrow H, FE \rightarrow I,$

OR

P.T.O.

Q2) a) Followig information is maintained for online bookstore. **[6]**

i) books (ISBN, title, price, year)

ii) author (name, address, URL,)

iii) publisher(name, address, phone, URL)

iv) customer(name, address, email, phone) (name is discriminating attribute)

v) Shopping basket(basketID)

Construct an ER diagram with following constraint Each book should have an author and a publisher. Book may have more than one author. Each Customer have a dedicated shopping basket. Books can further be catagorized as books, music cassette, or compact disks.

b) Write an algorithm to find cycle in a precedence graph. **[4]**

Q3) a) List down all the possible crash recovery methods? Explain any one with proper example? **[5]**

b) Consider the following relations. **[5]**

PLAYER (PID#, Name)

MATCH (MID#, PID#, Match_date, opponent)

i) Write a simple inner join query using SQL to display information about the player and match played by the player.

ii) Show intermediate steps of inner join with proper example (assume suitable data)

OR

Q4) a) Discuss the MongoDB aggregation framework with suitable example?**[6]**

b) What do you mean by cascadeless schedule? Explain with suitable example **[4]**

Q5) a) For each of the three partitioning techniques, namely round robin, hash, range partitioning, give an example of a query for which that partitioning would provide the faster response. **[6]**

b) Compare **[6]**

i) Speedup and scaleup

ii) Horizontal and Vertical Fragmentation

c) Why it is necessary to have a client server architecture for database management system. **[6]**

OR

Q6) a) Write short note on (any two): **[12]**

i) Transaction Server Process Structure

ii) Data fragmentation in distributed databases.

iii) Interoperation parallelism

b) Discuss the relative advantages of centralized and distributed databases. **[6]**

Q7) a) Give the DTD for an XML representation of the following nested relational schema **[7]**

Emp = (ename, ChildrenSet setof(Children), SkillsSet Setof(Skills))

Children=(name, Birthday)

Birthday = (day, Month, Year)

Skills = (type, Examset setof, (Exams))

Exam = (year, city)

Use the DTD and write the following queries in XQueries format. Find the names of all employees who have a child who has a birthday in "March".

b) Discuss with examples JSON data types. **[4]**

c) What is HDFS? Role of it in Hadoop system? **[5]**

OR

Q8) a) What is XML Schema? Advantages of XML Schema over DTD? Give simple example of XML Schema? **[7]**

b) What is Hbase? Discuss various Hbase Data Model and applications. **[5]**

c) Compare JSON and XML with example. **[4]**

Q9) a) What is OLTP and OLAP? How datawarehouse is prepared to support OLAP system? **[8]**

b) Explain knowledge discovery process in detail. **[8]**

OR

Q10)a) Write short note on: **[8]**

i) Hadoop MaReduce.

ii) Schemas in Dataware house

b) Why there is need for Mobile database? Draw and explain the architecture of mobile database. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1762

[Total No. of Pages : 2

[5058]-402
T.E.(Information Technology)
SOFTWARE ENGINEERING
(2012 Course) (Semester-I)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 orQ.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Draw neat diagrams whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain the incremental software process model in detail. **[5]**

b) Differentiate between Exploratory testing versus scripted testing. **[5]**

OR

Q2) a) State & Explain different myths. **[5]**

b) Write short note on Refactoring. **[5]**

Q3) a) Write short note on UML model. **[5]**

b) Explain Requirement Prioritization with the help of KANO diagram. **[5]**

OR

Q4) a) Discuss XP values and XP process. **[5]**

b) Write short note on Generic process model. **[5]**

Q5) a) Explain architectural trade-off analysis method (ATAM). **[8]**

b) What is functional Independence? Differentiate between coupling functional independence and cohesion functional independence. **[8]**

OR

Q6) a) What are elements of Design model? What are the elements of architectural design? Explain design principles. **[8]**

b) What is software architecture? Explain Data centered and object oriented architectural style of the system. **[8]**

P.T.O.

Q7) a) What is Fitt's Law? How is it used in UI design? **[8]**

b) Explain task analysis and modeling? Draw the swimlane for reservation system. **[8]**

OR

Q8) a) Explain the mechanisms applied in user interface design for fulfilling The Mandel's three golden rules. **[8]**

b) What are the methods of collecting user requirements in user-centered design? **[8]**

Q9) a) Explain cleanroom process model. **[10]**

b) Write short notes on Elements of a Configuration Management System. **[8]**

OR

Q10) a) i) Write short note on test driven development. **[10]**

ii) What are challenges of Global Software Development?

b) How do we certify a software component during cleanroom testing? **[8]**

✓ ✓ ✓

Total No. of Questions : 10]

SEAT No : ____

P1763

[Total No. of Pages : 2

[5058]-403

T.E.(Information Technology)

COMPUTER NETWORK TECHNOLOGY

(2012 Pattern) (Semester -I) (314441) (End Semester)

Time : 2.½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

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

Q1) a) Explain distance vector routing with count to infinity problem. **[6]**

b) Explain multiplexing technique at transport layer. **[4]**

OR

Q2) a) Why three timers are required in TCP timer management? **[6]**

b) Define subnetting, supernetting and classless addressing. **[4]**

Q3) a) What is domain name system? explain how a resolver looks up a remote name with suitable example. **[6]**

b) What is MIME? Discuss its role in SMTP. **[4]**

OR

Q4) a) State and explain six commands in FTP. **[6]**

b) Explain static and Dynamic Web pages. **[4]**

Q5) a) Compare bluetooth and 802.11. What are the limitations of Bluetooth. **[8]**

b) what are Hidden Station and exposed station problems in WLAN? **[8]**

OR

Q6) a) Explain BSS and ESS in 802.11. **[8]**

b) Describe Bluetooth protocol stack. **[8]**

P.T.O.

Q7) a) What are the operating environmental constrainst in WSN? **[8]**

b) List different routing protocols used by WSN. Explain LEACH protocol. **[8]**

OR

Q8) a) Describe each component in sensor node architecture. **[8]**

b) List any six applications of sensor networks and describe in detail. **[8]**

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

a) SPIN

b) 100G

c) IOT

d) S-MAC

OR

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

a) PEGASIS

b) BYOD

c) SDN

d) AODV

✡ ✡ ✡

Total No. of Questions : 10]

SEAT No. :

P1764

[Total No. of Pages : 2

[5058]-404
T.E. (IT)
WEB ENGINEERING & TECHNOLOGY
(2012 Course) (End-Semester) (Semester - I) (314445)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain box model of CSS. **[5]**

b) Write a short note on Wireless Applications Protocols. **[5]**

OR

Q2) a) Explain drawbacks of the two-tier client-server architecture. **[5]**

b) Explain various phases in website Development. **[5]**

Q3) a) Explain various types of navigation system. **[5]**

b) Explain how the images can be inserted in HTML document. **[5]**

OR

Q4) a) What is web engineering? Enlist the basic principles used in web engineering. **[5]**

b) Explain security audits of websites. **[5]**

Q5) a) Explain the data structures used in PHP. **[8]**

b) What are Cookies? Explain Cookies in PHP. **[8]**

OR

Q6) a) What is PHPMYAdmin? Enlist the features of PHPMYAdmin. **[8]**

b) Differentiate between Java and JavaScript. **[8]**

P.T.O.

Q7) a) What is session? List the session tracking techniques. How cookies are used to track a session? **[8]**

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

OR

Q8) a) What is Servlet? Explain the lifecycle of servlet. Illustrate with an example program. **[8]**

b) What is J2EE? Explain different architectures of J2EE. **[8]**

Q9) a) Explain various types of CMS development tools. **[9]**

b) List and explain detail website deployment procedure. **[9]**

OR

Q10) a) What is AJAX? Explain the working of AJAX, with illustrative example. **[9]**

b) What is CMS? What are advantages of CMS. **[9]**

Total No. of Questions :10]

SEAT No. :

P1765

[Total No. of Pages :4

[5058] - 405

T.E. (IT)

THEORY OF COMPUTATION

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

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

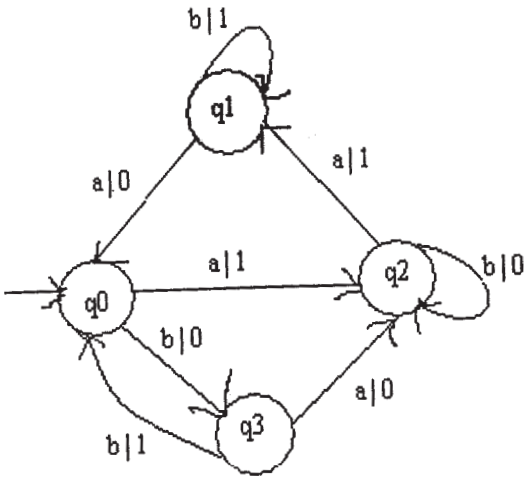
1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Construct a deterministic finite automata (DFA) for accepting L over (0, 1) such that every substring of length 4 contains at least three 1'S. **[4]**

b) Construct DFA for the R.E 10 + (0 + 11) **[6]**

OR

Q2) a) Construct Moore machine for given Mealy machine. **[6]**



b) State the pumping lemma theorem for regular sets. Show that the language $L = \{0^n \mid n \text{ is prime}\}$ is not regular. **[4]**

P.T.O.

Q3) a) Convert given CFG to GNF. **[6]**

S->AA|0

A-> SS|1

b) Consider CFG with productions **[4]**

S->baXaS|ab

X->Xab|aa

If w = baaaababaab then give rigtmost derivation and leftmost derivation of w.

OR

Q4) a) Convert the following grammar to their equivalent CNF. **[6]**

S->1A|0B

A->1AA|0S|0

B->0BB|1S|1

b) Convert Left Linear Grammar to equivalent Right linear Grammar. **[4]**

S->C0|A0|B1

A->A1|C0|B1|0

B->B1|1

C->A0

Q5) a) Define PDA **[4]**

i) Through final state

ii) Through empty stack

b) Design a PDA for the language $L = \{a^n b^m c^n | m, n >= 1\}$ by empty stack. **[8]**

c) Construct PDA equivalent to the following CFG. **[6]**

S->0A1|0BA

A->S01|0

B->1B|1

OR

Q6) a) Give CFG generating the language accepted by following PDA M = $(\{q0,q1\},\{a,b\},\{z0,\mathrm{X}\},\delta,\mathrm{q}0,\mathrm{z}0,\varnothing\}),\delta$ is given below **[8]**

$\delta(q0,b,z0)=\{(q0,\mathrm{X}\,z0)\}$

$\delta(q0,b,\mathrm{X})=\{(q0,\mathrm{XX})\}$

$\delta(q0,a,\mathrm{X})=\{(q1,\mathrm{X})\}$

$\delta(q0,\varepsilon,z0)=\{(q0,\varepsilon)\}$

$\delta(q1,\mathrm{b},\mathrm{X})=\{(q1,\varepsilon)\}$

$\delta(q1,a,z0)=\{(q0,z0)\}$

b) Design PM to for L = $\{a^n b^n c^n \mid n>=0\}$ Can you design NPDA for same? Justify. **[6]**

c) Compare the power of Post machine and Push down Automata. **[4]**

Q7) a) Design a Turing Machine to add two unary numbers. **[8]**

b) Explain Halting problem of TM. **[4]**

c) Differentiate between FA, PDA and TM. **[4]**

OR

Q8) a) Construct TM to replace string 110 by 101 in binary input string. **[8]**

b) Write short note on Universal Turing machine. **[8]**

Q9) a) Explain Post Correspondence Problem with example. **[8]**

b) Explain recursive language and recursively enumerable language with suitable example. **[8]**

OR

Q10)a) Define decidability of problem with example. Describe undecidable problems for Context Free Grammar. **[8]**

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

i) Multitape TM

ii) Turing Reducibility.

Total No. of Questions : 10]

SEAT No. :

P1766

[Total No. of Pages : 4

[5058]-406

T.E.(Information Technology)

SYSTEMS PROGRAMMING

(2012 Course)(Semester-II)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2,Q3or Q4, Q5 or Q6 , Q 7 or Q 8, Q 9 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) Show the contents of various tables alongwith stack organization generated by the II pass macro processor for the following code. Also give the code after expansion.

```
        MACRO
        EVAL & X,&Y,&Z
        AIF  (&Y EQ&Z). ONLY
        LOAD &X
        SUB &Y
        ADD  &Z
        AGO   .OVER
.ONLY   LOAD &Z
.OVERMEND
        MACRO
        MAJOR     &P,&Q,&R,&M,&N,&L
        EVAL      &P&Q&R
        STORE     &L
        EVAL &M,&N,&N
        MEND
        START
        MAJOR A,B,C,D,E,F
A       DS  1
B       DS  2
C       DS  3
D       DS  4
E       DS  5
F       DS  6
        END
```

[8]

P.T.O.

b) Define the following terms with examples. **[2]**

i) Compiler ii) Loader

iii) Assembler iv) Macroprocessor

OR

Q2) a) Give the various data structures in the design of pass-1 and pass-2 of a Two-pass direct linking loader for the given example.

```
                                    Rel.Addr.
PGA  START                          0
     ENTRY PGA1                     10
     EXTRN PGB                      20
     DC  A(PGA), A(PGB+4)           30
PGA1 DC  A(PGA1–PGA)                34
     END
PGB  START                                  0
     ENTRY PGB1                             5
     EXTRN PGA                              10
PGB1 DC    A(PGB1)                          14
PGB2 DC    A(PGB+4), A(PGB1-PGB)            18
PGB3 DC    A(PGB-PGA-16)                    22
     END
```

[8]

b) Explain the different phases of a compiler. **[2]**

Q3) a) Perform Pass I and Pass II for the given assembly language code and assume a hypothetical instruction set with each instruction of length1

```
     START 500
     MOVER AREG, LAB
     ADD BREG, LOOP
L1   DS 20
     LOAD AREG,='5'
     ADD BREG,='1'
BACK EQU L1
L2   SUB CREG, LAB
     LTORG
     MOVEM AREG, LAB
     ORIGIN L2
     SUB BREG,= '2'
LAB  DC 2
LOOP DS 5
     STOP
     END
```

[8]

b) Explain the concept of subroutine linkages in loaders and linkers. **[2]**

OR

Q4) a) Write a note on overlay structure of loaders. **[4]**

b) Convert the given regular expression of DFA: **[6]**

(a+b)*+(a+Є)*

Q5) a) Differentiate between top down parser and bottom up parser. **[4]**

b) For the given grammar, design predictive parser and show parsing table. S → +SS/*SS/ a and parse the string+*aaa. Justify **[8]**

c) Using the given table perform operator precedence parser for the expression id+id*id **[6]**

	+	-	*	/	^	id	(	)	$
+	>	>	<	<	<	<	<	>	>
-	>	>	<	<	<	<	<	>	>
*	>	>	>	>	<	<	<	>	>
/	>	>	>	>	<	<	<	>	>
^	>	>	>	>	<	<	<	>	>
id	>	>	>	>	>			>	>
(	<	<	<	<	<	<	<		
)	>	>	>	>	>			>	>
$	<	<	<	<	<	<	<		

OR

Q6) a) Compare SLR and table driven parsing methods. **[4]**

b) Define Handle and handle pruning w.r.t bottom up parser. For the grammar given, S → SS+/SS*/a.

Identify the handles at each step and parse the string aaa*a++. **[4]**

c) Design SLR parser for the given grammar. Also show the moves by the parser for input string "a/(a+a)*a". **[10]**

S → S+S/SS / (S)/ S*S/a

Q7) a) Define and explain annotated parse tree for the given grammar **[8]**

E → E+T / T

T → T*F / F

F → id

Annotate the tree for 2+3*5

b) Which are the different types of intermediate code representations. Explain w.r.t the expression. **[8]**

v1=(v2-v3)*(v2+2*v3)

OR

Q8) a) Draw the dependency graph of the expression in Q7a) and list down the synthesized and inherited attributes with definition. **[8]**

b) Write the method of generating intermediate code for the expression **[8]**

If (condition) then p=q+r

Else x=y+z

Q9) a) Obtain the TAC for the following code. **[8]**

for(i=1; i<=10; i++)

X[i][2*j-1] = Y[i][2*j-1]

b) Discuss code generation issues **[4]**

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

OR

Q10)a) Discuss with suitable example machine dependent code optimization. **[8]**

b) Explain the following code optimization techniques with examples. **[8]**

i) Removal of Loop Invariants

ii) Elimination of common sub expressions

iii) Dead Code Elimination

iv) Copy Propagation

Total No. of Questions :10]

SEAT No. :

P1767

[Total No. of Pages :3

[5058] - 407

T.E. (Information Technology)

OPERATING SYSTEM

(2012 Pattern) (314451) (Semester - II)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Explain micro kernel design approach? How will you decide that your requirement meets the criteria for micro kernel design? **[5]**

b) What resources are used when thread is created? How do they differ from those used when a process is created? **[5]**

OR

Q2) a) Explain the concept of Context Switching with the help of neat diagram. **[5]**

b) Discuss multilevel feedback queue scheduling in UNIX. **[5]**

Q3) a) What is the purpose of command interpreter? Why it is usually separate from the kernel. **[5]**

b) Explain message passing system for IPC and Synchronization. **[5]**

OR

Q4) a) Write the structure of producer and consumer process in bounded buffer problem using semaphore and discuss how critical section requirements are fulfilled. **[5]**

b) Provide two programming examples in which multithreading provides better performance than a single-threaded solution. **[5]**

P.T.O.

Q5) a) Consider the following page reference string: **[9]**

2 3 4 2 1 5 6 2 1 2 3 7 6 3 2 1 2 3 6

Calculate the no. of page faults for following page replacement algorithms.

i) FIFO

ii) Optimal

iii) LRU

Consider number of frames is 3.

b) Describe how Linux implements the following aspects of memory management. **[9]**

i) Virtual memory addressing.

ii) Page allocation.

iii) Page replacement algorithm.

iv) Kernel memory allocation.

OR

Q6) a) Explain Belady's anomaly with suitable example. **[4]**

b) What is cause of thrashing? How does the system detect thrashing? How the system can eliminate it? **[6]**

c) Explain the address translation mechanism in paging and segmentation. **[8]**

Q7) a) Assume a disk with 200 tracks and the disk request queue has random requests in it as follows: 55, 58, 39, 18, 90, 160, 150, 38, 184. Find the no. of tracks traversed and average seek length if **[8]**

i) FIFO

ii) SSTF is used and initially head is at track no. 100.

b) Explain different file organization techniques. **[8]**

OR

Q8) a) Why I/O buffering is needed? State and explain different approaches of I/O buffering. **[6]**

b) Is disk scheduling, other than FCFS, useful in a single user environment. Explain your answer. **[6]**

c) What are different disk performance parameters? **[4]**

Q9) a) With neatly labelled diagram explain embedded Linux system architecture. **[8]**

b) Explain following operations wrt NACH OS. **[8]**

i) Modes of operations.

ii) Multiprogramming.

OR

Q10) Write short notes on: **[16]**

a) Ubuntu EDGE.

b) Android OS.

c) Service Oriented OS.

Total No. of Questions :10]

SEAT No. :

P1768

[Total No. of Pages :2

[5058]-408

T.E. (Information Technology)

MULTIMEDIA TECHNOLOGIES

(2012 Pattern) (End Semester) (Semester - II) (314452)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

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

Q1) a) Distinguish between Huffman coding and LZW coding methods of text compression. **[5]**

b) Explain the concept of streaming with its two types and example. **[5]**

OR

Q2) a) Explain RGB and YUV color model. **[4]**

b) Differentiate between lossless and lossy data compression. **[6]**

Q3) a) What is variable length encoding? What is it's advantages over fixed length encoding? **[4]**

b) List and Explain CD formats in detail. **[6]**

OR

Q4) a) Explain multimedia supported audio formats in android. **[5]**

b) What is LZ coding? Why is it called "dictionary- based coding"? **[5]**

Q5) a) How is analog video digitized? Explain the role of video capture card and capture software. **[8]**

b) Explain different DVD formats. **[8]**

OR

P.T.O.

Q6) a) Waht is streaming technique? Explain RTP & RTFP protocol used for streaming. **[8]**

b) Explain following video file formats **[8]**

i) MOV

ii) Real Video

iii) H.261

iv) H.264

Q7) a) Explain any two techniques of animation creation in detail. **[8]**

b) What is openGL? State and Explain essential GLUT functions of OpenGL. **[8]**

OR

Q8) a) What is meant by rendering? Distinguish between wire frame, hidden-line and shaded rendering. **[8]**

b) Define Animation. What advantages does the computer provide over traditional animation practices? Enlist some tools to create the animation. **[8]**

Q9) a) Explain the terms Quality of data transmission and Media on Demand. **[6]**

b) What are different types of multimedia communication networks? Explain any one with suitable diagram. **[6]**

c) Explain android multimedia framework architecture. **[6]**

OR

Q10) a) Explain GStreamer based multimedia framework with suitable diagram. **[6]**

b) Differentiate between Virtual Reality and Agumented reality by taking example. **[6]**

c) What is VR? Elaborate different VR applications. **[6]**

EEE

Total No. of Questions : 10]

SEAT No. :

P1769

[Total No. of Pages : 2

[5058]-409

T.E. (Information Technology)

INFORMATION TECHNOLOGY PROJECT MANAGEMENT

(2012 Course) (Semester - II) (314453)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Compare between PERT and CPM? **[5]**

b) Explain the role of manager in Project management in detail? **[5]**

OR

Q2) a) Describe various stages of project feasibility? **[5]**

b) Explain functions of Technology management? **[5]**

Q3) a) Explain various steps of CPM planning? **[5]**

b) Describe various steps of product development process? **[5]**

OR

Q4) a) Describe various steps in selection process of team development? **[5]**

b) Write a short note on forecasting? **[5]**

Q5) a) Write a short note on Risk Management? **[8]**

b) Explain Risk identification with example? **[8]**

OR

Q6) a) How to monitor and control risk in project? Explain with example? **[8]**

b) What are Common Sources of Risk in Information Technology Projects Explain in detail? **[8]**

P.T.O.

Q7) a) Define purpose of project Auditing for project Quality Management? **[8]**

b) What is an importance of six sigma in Quality management? **[8]**

OR

Q8) a) Compare between Quality assurance and Quality Control? **[6]**

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

i) ISO 9000

ii) CMM I

Q9) a) Explain various objectives and components SCM? **[6]**

b) List out advantages and disadvantages of ERP System? **[6]**

c) Explain the concept of IP patent and Copyright concern with IT project management? **[6]**

OR

Q10)a) Write a short note on Supply chain management? **[6]**

b) Write a short note on : **[12]**

i) Business process reengineering

ii) Customer Relationship management

❖ ❖ ❖

Total No. of Questions :10]

SEAT No. :

P1770

[Total No. of Pages :3

[5058]-410

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2012 Pattern) (Semester - II) (End-Sem.)

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) Prove by method of contradiction that "There is no greatest even integer". **[5]**

b) Write an algorithm for binary search and find the worst case efficiency. **[5]**

OR

Q2) a) Set up a recurrence relation to compute n! and solve it. **[5]**

b) Construct Huffman tree for the following data and obtain it's Huffman's code. **[5]**

Character	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Q3) a) Write Warshall's algorithm to find transitive closure. **[5]**

b) Show the steps in multiplying the following two integers using efficiency integer multiplication method: 2101*1130. **[5]**

OR

P.T.O.

Q4) a) Explain the concept of divide and conquer technique. Write Master theorem. **[5]**

b) Write Flyod's algorithm to find all pairs shortest paths problem. **[5]**

Q5) a) Write recursive backtracking schema for m-coloring of the graph. **[8]**

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

i) State space tree

ii) 0/1 Knapsack Problem

OR

Q6) a) Write recursive backtracking algorithm for sum subset problem. **[8]**

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

i) The 8 queen Problem

ii) Hamiltonian Cycle

Q7) What is travelling salesman problem? Find the solution of following travelling salesman problem using branch and bound method. **[18]**

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

Cost Matrix

OR

Q8) Consider the knapsack instance n = 4, (p1, p2, p3, p4) = (10, 10, 12, 18), (w1, w2, w3, w4) = (2, 4, 6, 9) and m = 15.

Find maximum profit using FIFOBB and LCBB. Use fixed size formulation for state space tree. **[18]**

Q9) a) Specify one example of Np - hard problem. Justify why it is Np-hard. **[8]**

b) Explain in detail models for parallel computing. **[8]**

OR

Q10) a) Prove that vertex cover problem is Np complete. **[8]**

b) Explain pointer doubling algorithm. **[8]**

EEE