[4758] - 501

T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2012 Course) (Semester - I) (End Semester) (301001)

Time : 3 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.*
5) *Use of Calculator is allowed.*

Q1) Explain the procedure for developing depth-area-duration curves. What are the applications of these curves. **[8]**

OR

Q2) A storm with 10cm precipitation produced a direct surface runoff of 5.8cm in the equivalent depth unit. The time distribution of the storm is given in the Table below. Estimate the Φ-index of the storm and the excess rainfall hyetograph. **[8]**

Time from start (hr)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1.0	0.5

Q3) What do you understand by sub-surface irrigation? Describe it with the help of neat sketches. **[6]**

OR

Q4) The gross command area (GCA) of an irrigation canal is 1,20,000 ha. The culturable command area (CCA) is 75% of GCA and the intensities of irrigation for Kharif and Rabi crops are 40% and 55%, respectively. If the duties of water at the canal are 800 and 1550 ha for Kharif and Rabi crops, respectively, determine the head discharge of the canal. **[6]**

P.T.O.

Q5) A fully penetrating well with radius r_w in a confined aquifer is located at the centre of a circular groundwater basin having constant head boundary conditions at the outer periphery. The well is recharged maintaining a constant head at the well face. Find the recharge rate per unit rise at the well face considering flow as laminar. **[6]**

OR

Q6) A well 0.4m in diameter is being pumped at the rate of 1400 lit/min. The draw downs in the adjacent two wells at distances 5m and 19m, respectively, are 9m and 2.5m, respectively. The depth of impervious strata is 100m below the ground water level. Determine: **[6]**

a) coefficient of permeability,

b) draw down in the well if the observed points lie on the same draw down curve.

Q7) a) With the help of typical hydrographs describe the salient features of **[6]**

i) perennial,

ii) intermittent

iii) ephemeral streams.

b) The 3-h unit hydrograph (UH) for a basin has the following ordinates. Using the S-curve method, determine the 9-h unit hydrograph ordinates of the basin. **[8]**

Time (hr)	0	3	6	9	12	15	18	21	24	27	30
3-h UH ordinates (m^3/s)	0	12	75	132	180	210	183	156	135	144	96

Time(hr)	33	36	39	42	45	48	51	54	57	60
3-h UH ordinates (m^3/s)	87	66	54	42	33	24	18	12	6	6

c) What do you understand by time of concentration of a catchment? Describe briefly any one method of estimation of the time of concentration. **[4]**

OR

Q8) a) Write a brief note on frequency factor and its estimation in Gumble's method. **[6]**

b) Explain briefly the terms: **[4]**

i) design flood,

ii) standard project flood,

iii) probable maximum flood,

iv) design storm.

c) The following table gives the ordinates of a direct -runoff hydrograph resulting from two successive 3-h durations of rainfall excess values of 2cm and 4cm, respectively. Derive the 3-h unit hydrograph for the catchment. **[8]**

Time (h)	0	3	6	9	12	15	18	21	24	27	30
Direct run off (m³/s)	0	120	480	660	460	260	160	100	50	20	0

Q9) a) Explain types of reservoirs and explain the points considered for selecting the site for reservoir and state the investigation required for construction of a reservoir. **[8]**

b) A proposed reservoir has a capacity of 400 ha-m. The catchment area is 130km² and the annual stream flow averages 12.31cm of runoff. If the annual sediment production is 0.03 ha-m/km², what is the probable life of the reservoir before its capacity is reduced to 20% of its initial capacity by sediment deposition. The relation between trap efficiency $\left(\eta_{trap}\right)$ and capacity-inflow (C/I) ratio is given below: **[8]**

C/I	η_{trap} %	C/I	η_{trap} %
0.1	87	0.002	2
0.2	93	0.003	13
0.3	95	0.004	20
0.4	95.5	0.005	27
0.5	96	0.006	31
0.6	96.5	0.007	36
0.7	97	0.008	38
1.0	97.5	0.01	43
		0.015	52
		0.02	60
		0.03	68
		0.04	74
		0.05	77
		0.06	80
		0.07	82

OR

Q10) a) What is meant by trap efficiency of a reservoir? What factors influence its value? **[6]**

b) Write a note on benefit-cost studies for reservoir. Explain any two methods. **[8]**

c) Explain in brief-flood routing. **[2]**

*Q11)*a) What is water logging? What are the ill effects of water logging? State the methods to improve the sub-surface drainage. **[8]**

b) What are the merits and demerits of tile drains? **[4]**

c) Write a short note on ancient system of water distribution. **[4]**

OR

*Q12)*a) What is lift irrigation scheme? Explain the investigations necessary and approvals required for its implementation. State the design considerations for the components of lift irrigation scheme. **[8]**

b) What are the major, medium and minor irrigation projects? What are advantages and disadvantages of irrigation? **[4]**

c) Derive the expression for spacing for the tile drain. **[4]**

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[4758] - 502

T.E. (Civil)

STRUCTURAL ANALYSIS - II

(2012 Pattern)

Time : 2.5 Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer questions Q.1 or Q.2 Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *If necessary, assume suitable data and indicate clearly.*
4) *Use of electronic pocket calculator is allowed.*

Q1) a) Analyse the continuous beam ABCD shown in figure by slope deflection method. The support B sinks by 15mm. **[8]**
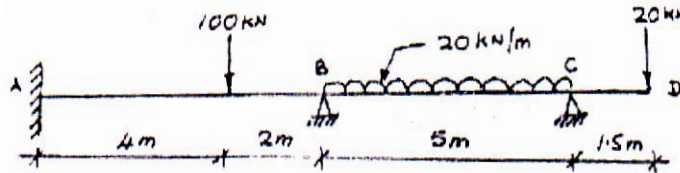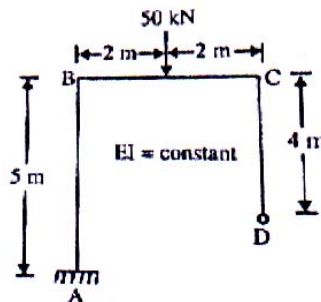

b) Analyse the continuous beam shown in figure of above question 1 a. Using the flexibility method **[8]**
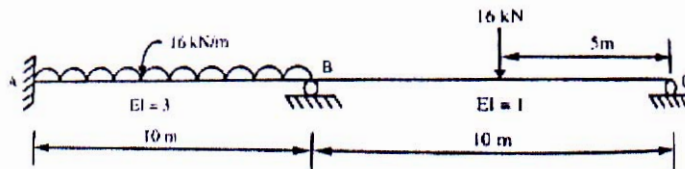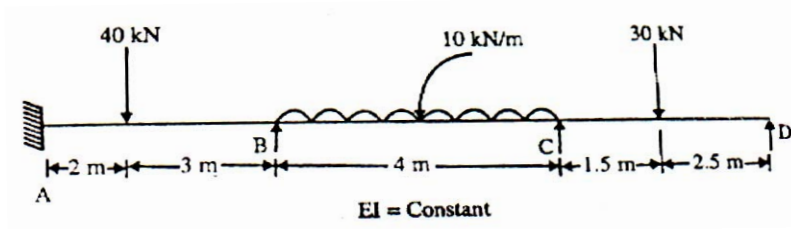

c) Explain fixed end moment and carry over **[4]**

OR

Q2) a) Analyse the portal frame loaded as shown in Fig by slope deflection method and sketch the bending moment and shear force diagram **[8]**
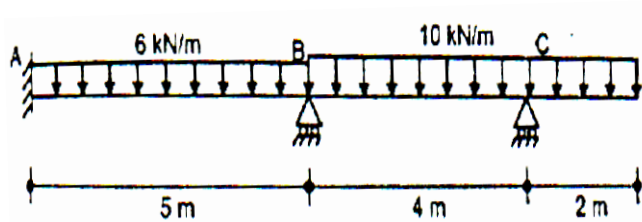
b) Analyse the continuous beam loaded as shown in figure by the method of moment distribution method. Draw BMD and SFD **[8]**
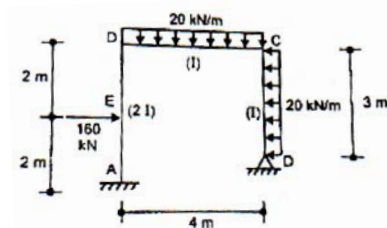

EI = Constant

c) Explain flexibility matrix **[4]**

Q3) Find the end moments of the beams as shown in fig by stiffness matrix method add draw SFD and BMD. Take EI = 3800 KN-m² **[16]**

OR

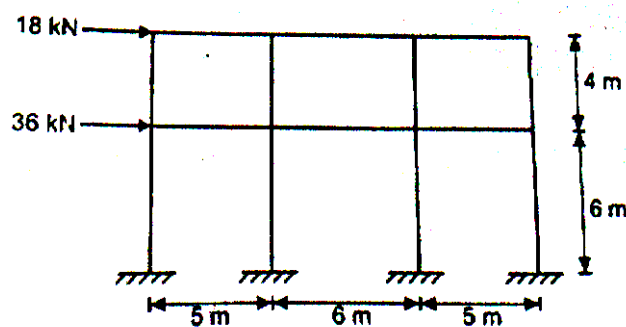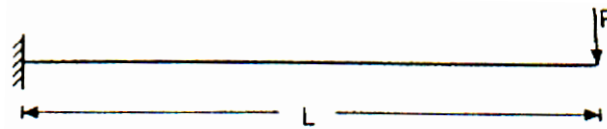**Q4)** Analyse the frame by matrix stiffness method and sketch the bending moment diagram. **[16]**

Q5) a) Analyse the portal frame under lateral loading by cantilever method. The columns are assumed to have equal cross sectional areas. **[10]**

b) The beam is loaded and supported as shown in fig. Determine the deflection at the centre of the beam. **[8]**

OR

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

b) Determine the deflection at the nodal points for beam AB loaded and supported as shown in fig. **[8]**
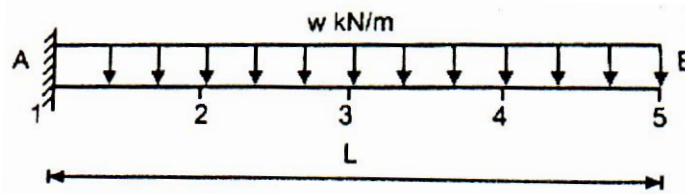
Q7) a) Explain shape functions for Quadratic rectangular element. **[8]**

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

   i) Nodes

   ii) Higher order elements

   iii) Constant strain triangle

   iv) Linear strain triangle

OR

Q8) a) Explain constant strain triangle and linear strain triangle. **[6]**

b) Determine shape funcions for the constant strain triangle (CST) using polynomial functions. **[10]**

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[4758] - 503

T.E. (Civil)

STRUCTURAL DESIGN - I

(2012 Course) (End Semester) (301003) (Semester - I)

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

Instructions to the candidates:

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

2) Neat sketches must be drawn wherever necessary.

3) Figures to the right indicate full marks.

4) Take Fe 410 grade of steel.

5) Take ultimate stress in bolt, f_{ub} = 400 N/mm².

6) Assume suitable data, if necessary.

7) Use of electronic pocket calculator IS : 800-2007 and steel table allowed.

8) Use of cell phone is prohibited in the examination hall.

Q1) a) Determine design strength of tension member consist of 2 ISA 90 × 60 × 6 @ 6.8 kg/m, the longer legs is connected to gusset back to back by means of 3 bolts of 16mm dia in one line. **[6]**

b) An ISHB 450 @ 87.2 kg/m used as a column to support a factored load of 950 kN. The column has an effective length of 5m with respect to y-axis. Check its suitability. **[4]**

OR

Q2) a) Design a double angles tension members connected on each side of 10mm thick gusset plate to carry an axial load of 340 kN. Use M_{20} black bolts of 4.6 Grade. **[6]**

b) State and explain factor which affect the design strength of compression members. **[4]**

Q3) a) Explain in brief the design specification of compression members. **[4]**

b) Design a base plate for column of ISHB 250 @ 51.0 kg/m carrying a factored load of 650 kN. Assume that the column is supported on a concrete of grade M25. **[6]**

OR

P.T.O.

Q4) a) Determine the design strength of a column ISHB 300@ 58.8 kg/m having a length of 5m. Assume that the bottom of the column is fixed and top is free. **[5]**

b) Differentiate lacing and battening in built up column on the basis of design criteria. **[5]**

Q5) a) A simply supported beam spanning 8 m carries a uniformly distributed load 5 kN/m including its self-weight. The compression flange is laterally restrained throughout the span. Design section and check for serviceability. **[6]**

b) An ISWB 600@ 133.7 kg/m, is used as a laterally unrestrained beam of span 10m subjected to uniformly distributed load of 70 kN/m. Check limit state of strength and serviceability. **[10]**

OR

Q6) Design a built up section of beam to carry uniformly distributed dead load of 400 kN and an imposed load of 600 kN. The beam is simply supported and has a span of 10m. The overall depth should not exceed 650 mm. Full lateral support is provided for the compression flange. Check for serviceability.**[16]**

Q7) a) Explain beam to beam and beam to column connection using suitable sketches. **[6]**

b) A beam ISMB 300@ 44.2 kg/m transmit an end reaction of 100 kN to the column ISMC 200 @ 22.1 kg/m. Design seated bolted connection, using M20 bolts of property class 4.6. **[10]**

OR

Q8) A simply supported welded plate girder of span 12m is subjected to dead load of 15 kN/m and live load of 30 kN/m. It is also subjected to two point load of 500 kN and 400 kN at 4m from either support. The compression flange is laterally supported throughout the span. Assuming that the depth is limited to 1500 mm for the plate girder, design the cross section and apply appropriate check. Also design the intermediate stiffeners and draw the plan and elevation. **[16]**

Q9) a) Design an I-section purlin, for an industrial building situated in the outskirts of Pune, to support a galvanized corrugated iron sheet roof for the following data: **[10]**

Spacing of truss: 6m

Span of truss : 12m

Spacing of purlins : 1.5 m

Intensity of wind pressure: 2 kN/m²

Weight of G I Sheet : 130 N/m²

b) Determine the panel point dead load, live load and wind load for an industrial truss as shown in Fig. 9. The design wind pressure is 1200 N/m², the trusses are covered with A C sheet and the centre to centre spacing of truss is 6m. **[8]**
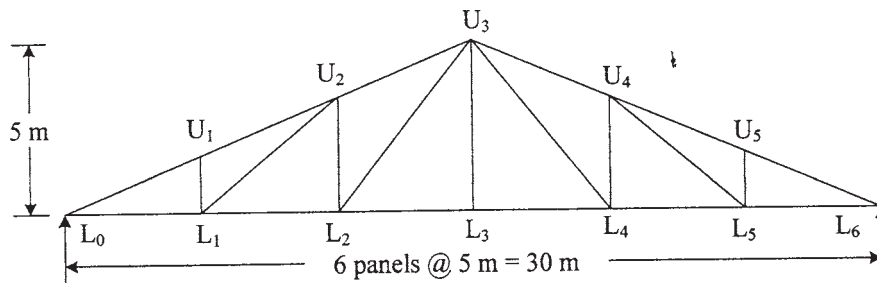
Fig. 9

OR

Q10) Design a cross section for simply supported gantry girder to carry electric overhead traveling crane for the following data. Design section should be checked for moment capacity, local capacity, shear capacity, web buckling and deflection. **[18]**

Crane capacity : 280 kN

Weight of crane excluding trolley : 150 kN

Weight of trolley : 120 kN

Minimum approach of crane hook : 1.0 m

Wheel Base: 3m

Distance between center to centre of gantry girders : 14m

Spacing of columns : 7 m

Weight of rail section : 0.3 kN/m

Height of rail section : 75 mm

T.E. (Civil)

FLUID MECHANICS - II

(2012 Course) (End - Sem.) (301005) (Semester - I)

Time : 2 ½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10, Q.No. 11 or 12.*

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: [2]

    i) Drag force

    ii) Lift force

  b) Experiments were conducted in a wind tunnel with a wind speed of 51 km/hr on a flat plate of size 2.1m long and 1.1m wide. The density of air is 1.15 kg/m^3. The coefficients of lift and drag are 0.76 and 0.16 respectively. Determine: [6]

    i) The lift force

    ii) The drag force

    iii) The resultant force

    iv) Direction of resultant force

    v) Power exerted by air on the plate.

OR

Q2) a) Explain in brief

  i) Water Hammer **[2]**

  ii) Unsteady flow **[2]**

 b) A valve is provided at the end of a cast iron pipe of diameter 160mm and of thickness 12mm. The water is flowing through the pipe, which is suddenly stopped by closing the valve. Find the maximum velocity of water, when the rise of pressure due to sudden closure of valve is 198.2 N/cm². Take K for water as 19.62 x 10⁴ N/cm² and E for cast iron pipe as 11.772 x10⁶ N/cm². **[4]**

Q3) Explain in brief:

 a) Channel transitions. **[3]**

 b) Froude number and classification of channel flow based on it. **[3]**

OR

Q4) Derive the expression "$Q = \dfrac{8}{15}.Cd.\sqrt{2g}.\tan\left(\dfrac{\theta}{2}\right).H^{5/2}$" for flow over right angled triangular notch. **[6]**

Q5) The depth of flow of water, at a certain section of a rectangular channel of 2.1m wide is 0.35m. The discharge through the channel is 1.6 m³/s. Determine, whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. **[6]**

OR

Q6) Prove that with usual notations for most economical trapezoidal channel section half of top width equal to one of sloping sides of the channel. **[6]**

Q7) a) Explain the working of centrifugal pump with neat sketch. **[6]**

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

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

OR

Q8) a) A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm, the vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 30 cm and width at outlet is 5 cm. Determine the discharge of pump if manometric efficiency is 95%. **[6]**

b) A jet of water of diameter 7.5cm strikes a curved plate at it's centre with a velocity of 20m/s. The curved plate is moving with a velocity of 8m/s in the direction of jet. The jet is deflected through an angle of 165°. Assume the plate is smooth. Find **[6]**

    i) Force exerted on the plate in the direction of jet.

    ii) Power of the jet.

    iii) Efficiency of the jet.

c) Explain in brief: **[6]**

    i) Reciprocating pump.

    ii) Submersible pump.

Q9) a) Explain: **[4x2=8]**

    i) Hydraulic efficiency(η_h)

    ii) Mechanical efficiency(η_m)

    iii) Volumetric efficiency(η_v)

    iv) Overall efficiency(η_o)

b) A Turbine is to operate under a head of 25 m and at 200 r.p.m. The discharge is 9 cumec and if the overall efficiency is 90% determine: **[8]**

    i) Power generated (kW)

    ii) Specific speed of machine.

    iii) Type of turbine.

<div align="center">OR</div>

*Q10)*a) A francies turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under head of 7.62m. The peripheral velocity $= 0.26\sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: **[8]**

    i)   The guide blade angle

    ii)   The wheel vane angle at inlet

    iii)   Diameter of wheel at inlet.

    iv)   Width of wheel at inlet

b) Explain **[4+4]**

    i)   Cavitation in turbine

    ii)   Governing of turbine

*Q11)*a) Derive the dynamic equation of G.V.F. with usual notations. **[8]**

b) Explain Ven Tee Chow method for computation of G.V.F. **[8]**

OR

*Q12)*a) Explain in detail the various types of water surface profiles. **[6]**

b) A rectangular channel 10m wide carries a discharge of 30 m³/s. It is laid at slope of 0.0001. If at a section in this channel the depth is 1.6m, how far (U/s or D/s) from the section will the depth be 2.0m? Take Manning's n=0.015. Use step method of integration. **[10]**

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[4758] - 505

T.E. (Civil)
INFRASTRUCTURE ENGINEERING
(2012 Course) (Semester - I) (End-Sem.) (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, Q.9 or Q.10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data if necessary.*

Q1) a) Write a note on Role of Infrastructure the economic progress of India with suitable examples. **[5]**

b) Explain the causes, effects and remedies of rail creep. **[5]**

OR

Q2) a) With suitable examples, justify the need for mechanization in Indian construction sector. **[5]**

b) Discuss the ideal requirements of a permanent way. **[5]**

Q3) a) With the help of neat labeled sketch, explain the electro osmosis dewatering. **[5]**

b) Differentiate between tunnel formwork and slip form. **[5]**

OR

Q4) a) Explain the significance of transportation infrastructure with suitable examples. Discuss various provisions proposed in the 12th five year plan for transportation infrastructure. **[5]**

b) Discuss in brief different methods to reduce the wear of rails. **[5]**

Q5) a) Classify the tunnels on the basis of their Purpose. Explain why they are suitable for a particular purpose. **[6]**

b) Explain the following term with neat sketches. **[6]**

    i) Pilot Tunnel

    ii) shaft

    iii) Portal

c) What are the advantages of tunnel over open cut. **[4]**

OR

Q6) a) State the various methods of tunneling in soft ground. Explain Needle Beam Method in brief. **[6]**

b) Write sequence of operations of Tunneling in soft soils. **[6]**

c) Discuss in brief advantages and disadvantages of TBM. **[4]**

Q7) a) Define port. Distinguish between port & harbour. **[6]**

b) Write short note on dry dock and wet dock. **[6]**

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

OR

Q8) a) Discuss the general layout of the port along with its components. **[6]**

b) Enlist the types of breakwaters and explain any two types with neat labeled sketch. **[6]**

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

    i) Quay

    ii) Bulkhead

    iii) Wharves

    iv) Jetty

Q9) a) Construction machinery costs Rs. 45,000. Its useful life is 5 years. The salvage value at the end of five year is Rs. 4,500. Estimate the yearly depreciation of the equipment using; **[6]**

      i) Straight line method

      ii) Double -Declining balance Method

      Tabulate your results.

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

   c) What are the different operations involved in earthwork. Enlist different equipment's used in these operations. With the help of a neat labeled sketch, explain any one equipment. **[6]**

OR

Q10) a) Differentiate between Crawler Tractor and Wheeled Tractor. **[6]**

   b) Explain in detail the operating costs of construction equipment. **[6]**

   c) Explain with neat labeled sketch "Dragline". What are the applications of it. **[6]**

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[4758] - 506

T.E. (Civil)

ADVANCED SURVEYING

(2012 Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Define Geodetic Surveying. What factors are to be considered while selecting a best triangulation figure or system? **[5]**

    b) What are different types of errors in GPS signal or result. **[5]**

OR

Q2) a) Differentiate between triangulation and traversing and trilateration. **[5]**

    b) State any four advantages of space based positioning systems. **[5]**

Q3) a) The following observations were made on three stations A,B & C from a boat at O with the help of a sextant. Station B & O being on the same side of AC. Calculate the distances of the boat from the three stations. Angle AOB = 30°25', Angle BOC = 45°25', Angle ABC = 130°10'. AB = 4000 m, BC = 4995 m. **[6]**

    b) Derive the expression for the difference of level between two points A and B a distance D apart, with the vertical angle as the angle of elevation from A to B. The height of the, instrument at A and that of the signal at B are equal. **[4]**

OR

Q4) a) A,B, & C are three visible stations in a hydrographic survey. The computed sides of the triangle ABC are AB = 1200 m, BC = 1442 m & CA = 1960 m. Station O is established outside the triangle and its position is to be determined by resection on A,B, & C, the angle AOB and BOC being respectively 45° 30' and 52° 15'. Determine distances of OA and OC, if O & B are on the opposite sides of line AC. **[6]**

b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground? **[4]**

Q5) a) Explain step by step procedure for figure adjustment for a geodetic quadrilateral without central station. **[5]**

b) Explain the following terms : **[5]**

Conditioned Equation, True Error, Most Probable Value, Residual Error.

c) Find the most probable values of the angles closing the horizon at a station, from the following observations. **[8]**

A = 110° 5' 58.9"   wt. 2

B = 98° 45' 16.1"   wt. 1

C = 72° 55' 30.7"   wt. 3

D = 78° 13' 17.3"   wt. 1

OR

Q6) a) What is spherical excess? What are the methods of computing the sides of a spherical triangle? Explain any one method. **[5]**

b) Explain the following terms : **[5]**

Independent Quantity, Weight of an observation, Mistake, True Value

c) The following values were recorded for a spherical triangle ABC, the individual angles area: **[8]**

A = 62° 28' 06"   wt. 8

B = 57° 43' 36"   wt. 6

C = 59° 48' 38"   wt. 4

Spherical excess was known to be 7". Find the corrected spherical angles.

Q7) a) Define Relief displacement. Derive an equation to determine the height of an object with neat sketch. **[5]**

b) What is parallax of a point. Describe the procedure of measuring parallax.**[5]**

c) A tower PK, 50m high, appears in a vertical photograph taken at a flight altitude of 2500 m above m.s.l. the distance of the image of the top of the tower is 6.35 cm. compute the displacement of the image of the top of the tower with respect to the image of its bottom. The elevation of the bottom of the tower is 1250 m. **[6]**

OR

Q8) a) What are the types of aerial photographs? Explain drift and crab. **[5]**

b) Explain in brief the procedure for determining Air Base Distance using mirror stereoscope. **[5]**

c) A square building on the ground 30m × 30m base, Appears on the photograph with side top = 19.60 mm, side base = 18.00 mm, focal length = 150.20 mm. Determine the height of building. **[6]**

Q9) a) Draw a neat sketch of Electromagnetic Spectrum and show all bands.**[5]**

b) What is Digital Image Processing and explain various techniques. **[5]**

c) Explain use of remote sensing and GIS for Earthquake management.**[6]**

OR

Q10) a) Explain supervised and unsupervised classification of digital images.**[5]**

b) What is geo-stationary and sun-synchronous satellites. **[5]**

c) Explain use of remote sensing and GIS for drinking water management.**[6]**

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[4758] - 507
T.E. (Civil) (Semester - II)
FOUNDATION ENGINEERING
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Non programmable calculator is allowed.*
5) *Assume suitable data wherever required and specify it clearly.*

SECTION - I

Q1) Explain with neat sketch "wash boring". **[6]**

Q2) Define : **[6]**

    a) area ratio

    b) inside clearance

    c) outside clearance

Q3) Explain modes of shear failure. **[7]**

Q4) Explain various types of mat foundations. **[7]**

Q5) Explain the terms : **[7]**
    a) allowable settlement,
    b) differential settlement,
    c) elastic settlement
    d) consolidation settlement.

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

SECTION - II

Q7) a) Differentiate between cast in situ piles and driven piles. **[6]**

b) Write note on "pile load test and interpretation of test results". **[6]**

c) Explain in detail negative skin friction on piles. **[4]**

Q8) a) Compute the efficiency of pile group consisting of 20 piles arranged in four rows, if the diameter of the pile is 400mm & spacing is 1m center to center by using : **[6]**

i) Converse Labbare's formula

ii) Seiler keeney's formula

iii) Feld's rule.

b) What is pier? Explain different methods of installation of pier. **[5]**

c) Explain different parts of well foundation with a neat sketch. **[5]**

Q9) a) Write detailed note on "earth and rockfill cofferdam". **[6]**

b) Explain with sketch "circular type cellular cofferdam". **[4]**

c) Explain with sketch construction under reamed piles. **[6]**

Q10) a) Explain 'stone column technique' of soil improvement. **[6]**

b) What are the engineering problems associated with black cotton soil as a foundation. **[5]**

c) Explain method to determine depth of embedment in cantilever sheet pile wall with simplified assumptions. **[5]**

Q11) a) What are the various types of geosynthetics used in road pavements.**[6]**

b) What are different functions of geosynthetics? Explain any four with sketches. **[7]**

c) Explain different liquefaction hazard mitigation methods. **[5]**

Q12) a) What is liquefaction? Explain any three effects of liquefaction. **[7]**

b) Enlist & explain different types of seismic waves. **[6]**

c) Differentiate between reinforcement in soil and reinforcement in concrete. **[5]**

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T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I

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

Time : 2 ½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10, Q. 11 or 12.*

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Assume suitable data, if necessary.*

5) *Use of Scientific calculator is allowed.*

Q1) Explain the noise control techniques.   **[6]**

OR

Q2) Explain primary and secondary air pollutants and state their importance. **[6]**

Q3) Explain with neat sketch the working, location and function of air relief valve and non-return valve.   **[6]**

OR

Q4) Explain with neat sketch river intake and lake intake.   **[6]**

Q5) Explain type I and type II settling. What are the various types of plain sedimentation basins? Explain any one basin type with a neat sketh.   **[8]**

OR

P.T.O.

Q6) Design a tube settler module with the following data- [8]

   a) Average output required from tube settler = 250m³/hr.

   b) Loss of water in desludging = 2% of output required.

   c) Average design flow = (250 x 100)/(100-2) = 255.1 m³/hr.

   d) Cross section of square tubes - 50mmx50mm.

   e) Length of tubes = 1m.

   f) Angle of inclination of tubes 60°.

Q7) Design a clariflocculator for desired average outflow of 250m³/hr, water lost in desludging-2%, design average flow = (250x100)/ (100-2)=255.1 m³/hr, detention period - 20 minutes and average value of velocity grdient G = 40/ second. [16]

OR

Q8) Design a RSGF unit for treating 400 MLD of supply, with underdrainage system and wash water troughs. [16]

Q9) a) Explain chlorine demand, residual chlorine, super chlorination, dechlorination, rechlorination and post chlorination. [9]

   b) Chlorine usage in treatment plant of 20MLD of water is 8.5 kg/day. The residual chlorine content after 10min. is 0.2 mg/L. Calculate dosage of chlorine in mg/L and chlorine demand of water. [4]

   c) State the factors affecting chlorination. [3]

OR

Q10) State the principles, working, advantages and disadvantages of water softening by zeolite method and demineralization of water by ion exchange method. [16]

*Q11)*a) Describe the various layouts of distribution networks in water supply scheme and state their advantages and disadvantages. **[10]**

b) Explain detection and prevention of wastage of water. **[8]**

OR

*Q12)*a) Explain the benefits of rain water harvesting and discuss the different methods of rain water harvesting. **[10]**

b) Explain RO process with a neat sketch. **[8]**

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Total No. of Questions : 12]

P3669

SEAT No. :

[Total No. of Pages :7

[4758] - 509

T.E. (Civil)

STRUCTURAL DESIGN - II

(2012 Pattern) (Semester - II) (301010) (End-Sem.)

Time : 4Hours]

[Max. Marks : 70

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q3 or Q.4, Q.5 or Q.6, Q7 or Q.8, Q.9 or Q.10, Q.11 or Q.12*
2) *Figures to the right indicates full marks.*
3) *Use I.S. 456-2000 and non programmable calculator is allowed.*
4) *Neat figures must be drawn wherever necessary.*
5) *Mere reproduction of IS Code as answer will not be considered.*
6) *Assume Suitable data if required.*

Q1) Answer the following: **[6]**

   a) Compare LSM and WSM with respect to material behavior.

   b) In what proportion f_{ck} is utilized in WSM and LSM?

OR

Q2) A simply supported beam AB of span 4.5 m carries UDL of intensity 25 KN/m Including self weight, Design suitable Singly reinforced rectangular section for flexure Only using WSM, use M20 and Fe 415. **[6]**

Q3) For an assembly hall of size 16m × 8.5m floor beams are spaced at 4 m C/C and have a Simply supported span of 8.5 m, these beams supports a floor slab of 140 mm thick, the size of the beam is 230 mm × 500 mm overall design the intermediate flanged section for flexure for the following data, use LSM. **[8]**

   a) Live load on slab = 4KN/m²

   b) Floor finish = 1.5 KN/m²

   c) Wall on beam = 230 mm thick and 3 m height

   d) Effective cover = 50 mm

   e) Material - M20 and Fe 415

OR

P.T.O.

Q4) A Simply supported RCC beam 230 × 375 overall is simply supported over a span of 5 m carries a UDL of 33.33 KN/m throughout design the section using M20 and Fe 415 LSM is recommended. **[8]**

Q5) Design a simply supported two way slab over a room 4.8 m × 4 m effective with corners are free to lift carrying L.L of 4 KN/m² and F.F of 1.5 KN/m² use M20 and Fe 500. Draw details of reinforcement LSM is recommended. **[6]**

OR

Q6) Design a Cantilever slab for effective span of 1.5 m carrying L.L of 3 KN/m² and F.F of 1.5 KN/m² use M20 and Fe 500. Draw details of reinforcement LSM is recommended. **[6]**

Q7) Design a Continuous beam ABCD (AB = BC = CD = 4.2m) for flexure and shear using I.S Code method for following data. Use M20 and Fe 415 **[16]**

a) Dead load = 24 KN/m

b) Live load = 16 KN/m

Show details of reinforcement in L-Section and cross section at continuous support and at mid span.

OR

Q8) a) A rectangular R.C.C. beam simply supported over a span of 5 m is 230 mm × 450 mm Effective is reinforced with 0.75% tension steel; Design the shear reinforcement using 6 mm diameter two legged vertical stirrups use M20 and Fe 415. **[8]**

b) A rectangular R.C.C beam 230 × 500 mm with effective cover 40 mm is subjected to following actions

i) Factored B.M. = 90 KN-m

ii) Factored S.F = 50 KN

iii) Factored torsional moment = 60 KN-m

Design the beam for flexure and shear using M20 and Fe 415 **[8]**

Q9) A R.C Beam ABC of rectangular section is simply supported at A and C, and

Continuous over support B, Span AB = BC = 4.25 m the beam carries dead load (including self weight) of 18 KN/m and L.L of 23 KN/m. Calculate design moments at central support B and near midspan of AB and BC after 20% redistribution of moments. Draw the design moment envelops and design the beam for flexure only Use M20 and Fe415. **[18]**

OR

*Q10)*Design a short RC Column by LSM using M20 and Fe 415 to carry a working load 750 KN and working moment of 90 KN-m about major axis bisecting the depth of column, assuming unsupported length of column as 4.5 m and both ends are fixed, also design the footing for this column. Take SBC of soil as 210 KN/m² show detail design calculations and reinforcement details in plan and sectional elevation. **[18]**

*Q11)*Design a short column to carry working axial load of 900 KN and working moment of M_x = 65 KN-m and M_Y = 15 KN-m acting about axis bisecting the depth and width of column respectively, the effective length about X-axis is 4.6 m and about Y-axis is 3.2 m. The unsupported length about axis is 3.8m, use M20 and Fe 415 steel show detailed design calculations and reinforcement details. **[16]**

OR

*Q12)*Design Column C-7 as axially loaded short column along with its footing for G+2 Building for the following data refer fig - 1 **[16]**

a) Floor to floor height ---- 3.15 m

b) Height of plinth above G.L ---- 1.0m

c) Depth of foundation below G.L. ---- 1.5m

d) Live load on all slabs ---- 4KN/m²

e) Floor finish load on all slabs ---- 1.5 KN/m²

f) Thickness of slab ---- 130mm

g) Thickness of wall ---- 230 mm

h) Height of parapet wall ---- 1m

i) Size of beam ---- 230 × 450 mm

j) SBC of soil ---- 200 KN/m²

k) Material ---- M20 and Fe415

Fig-1
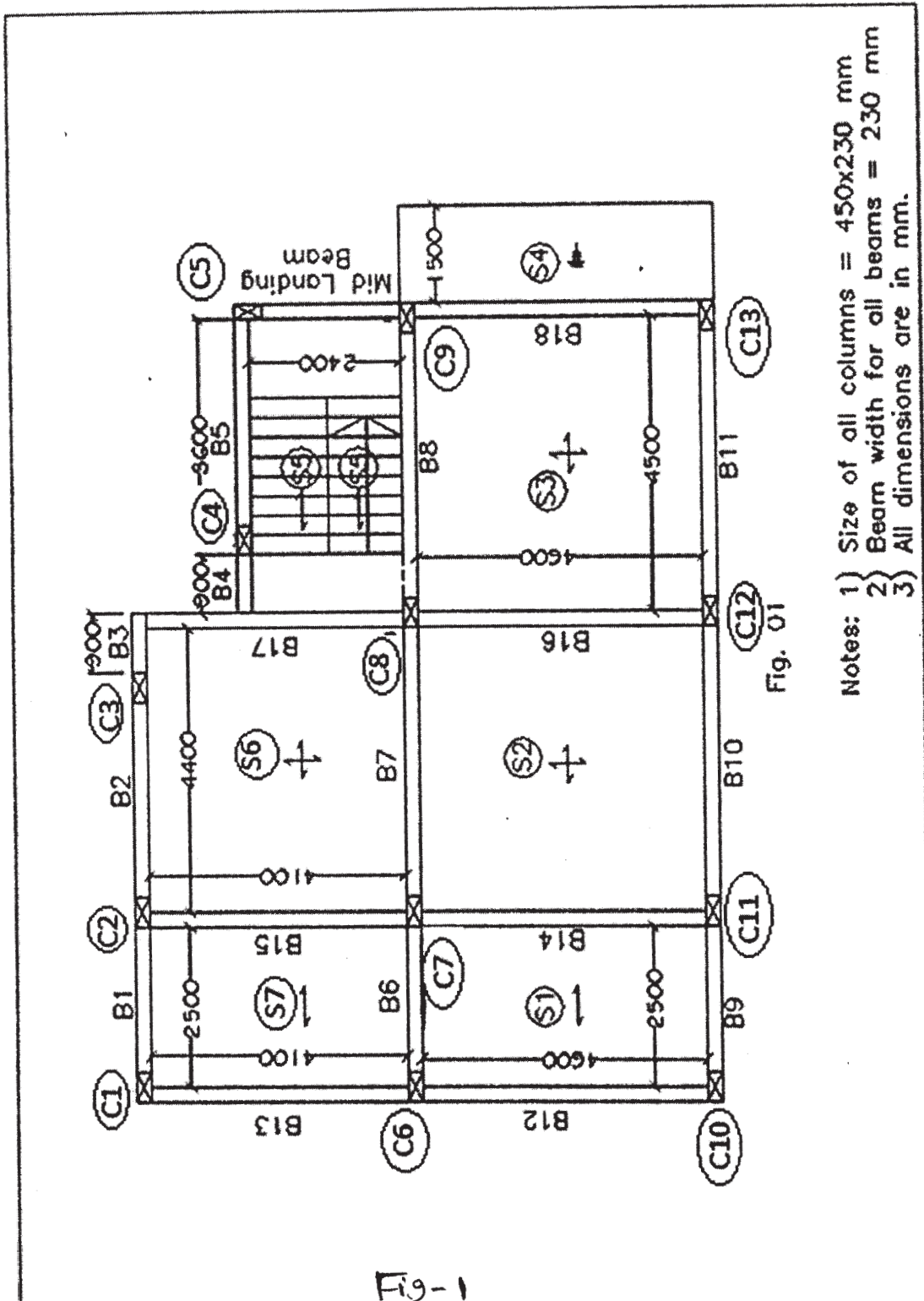
Notes: 1) Size of all columns = 450x230 mm
2) Beam width for all beams = 230 mm
3) All dimensions are in mm.

Fig. 01

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

$f_y = 415 \text{ N/mm}^2$ $d'/D = 0.05$

$A_s = pbD/100$

Axis of bending

$P_u/f_{ck}bD$

$M_u/f_{ck}bD^2$
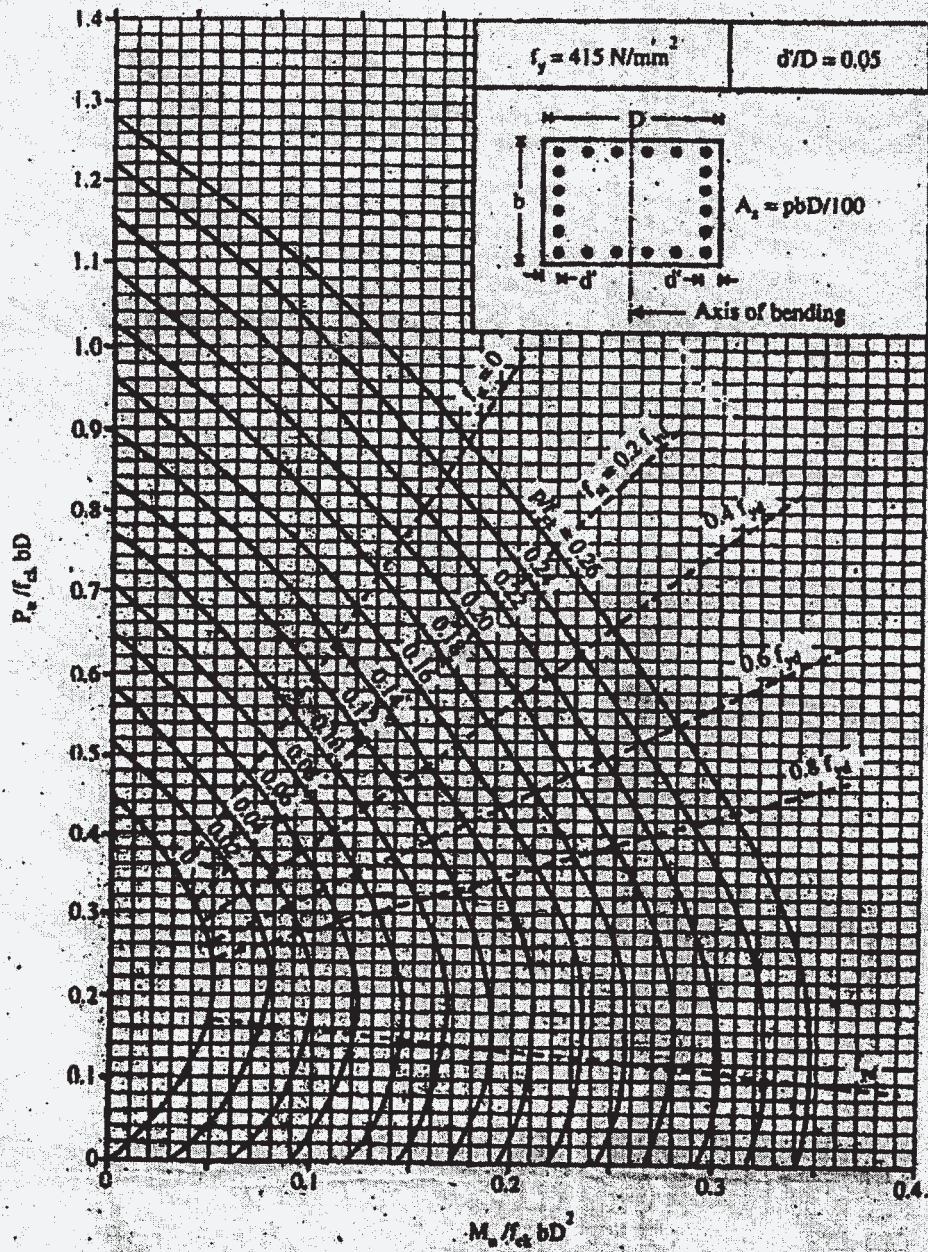
Chart 5.

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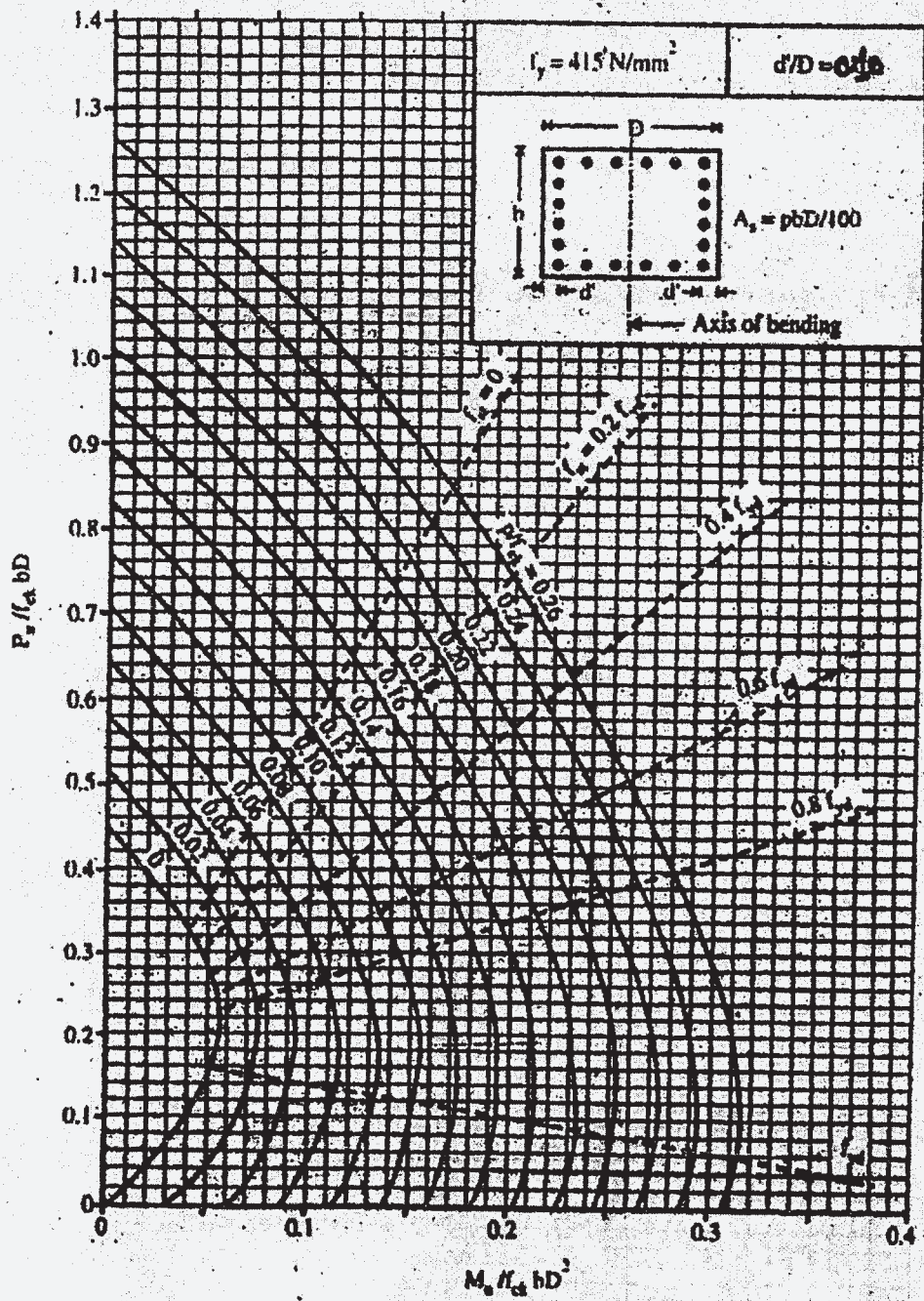
Chart 6

Chart 7 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides
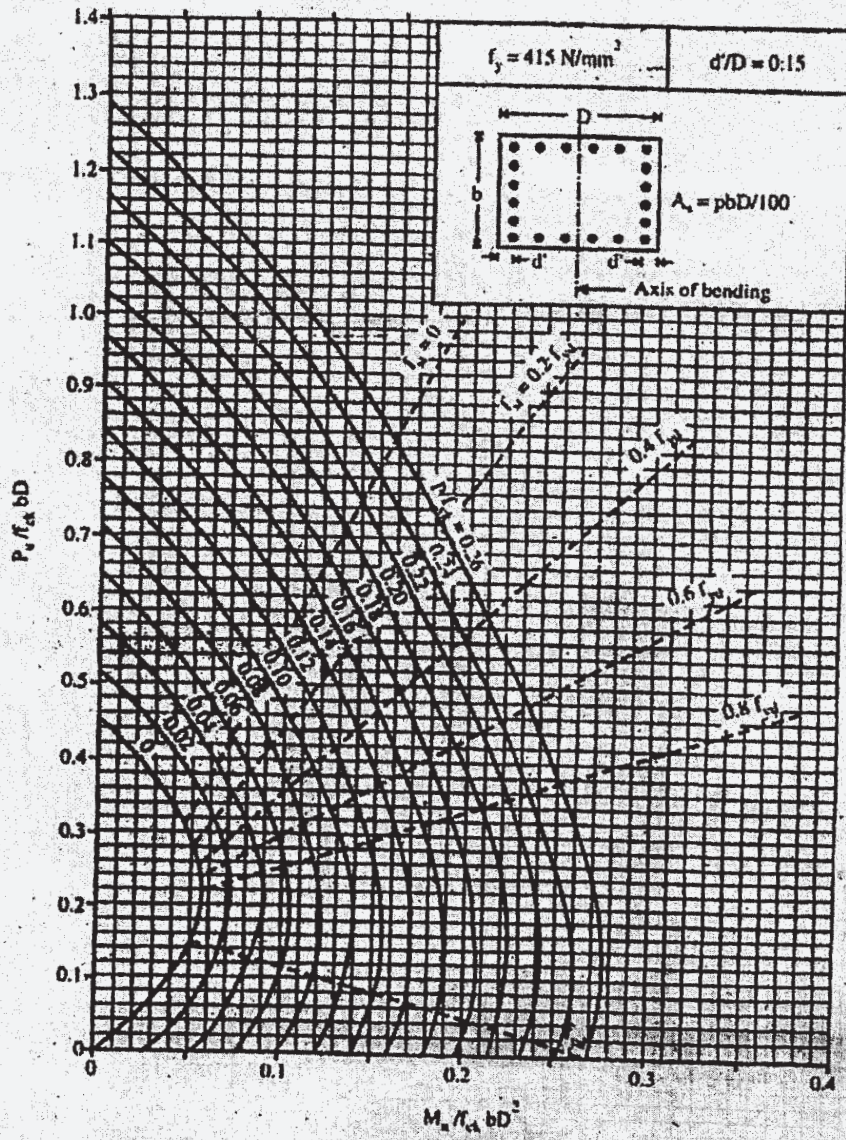
[4758]-510

T.E. (Civil)

PROJECT MANAGEMENT AND ENGINEERING ECONOMICS

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

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*

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

3) *Assume suitable data, if necessary.*

Q1) a) What are the different types of organizational structures? Explain scalar types of organizational structure. **[6]**

OR

b) List out rules of drawing network diagram & explain "Fulkerson's Rules" of numbering system. **[6]**

Q2) a) The following tables gives the time estimates of the various activity of a project. **[6]**

Activity	1 - 2	2 - 3	2 - 4	3 - 5	4 - 6	5 - 6	5 - 7	6 - 7
t_o	1	3	2	4	4	0	3	2
t_m	2	6	4	6	6	0	4	5
t_p	3	9	6	9	8	0	5	9

i) Draw project network & find out total duration.

ii) Calculate variance along critical path.

OR

b) Calculate EST, EFT, LST, LFT, IDF & IF for following activities. Tabulate the result with sample calculation. **[6]**

Acitivity	1 - 2	1 - 3	2 - 4	3 - 4	4 - 5
Duration in 'Days'	2	3	4	5	6

Q3) **a)** What is updating of network? Write down procedure for updating. **[4]**

b) Write down different project management software used in construction Industries. Explain the advantage of using these software. **[4]**

OR

Q3) The Review of small construction project was taken after 12 days & following conditions exists. **[8]**

Conditions:

a) Activity - A, B, E have been completed.

b) Activity - D has been progress for "4" weeks & required "7" more weeks for completion.

c) Activity -F, has been in progress for "1" week & require "4" more weeks for completion.

d) Activity - G has been in progress for "1" week & require "7" more weeks for completion.

e) Activity -C has been in progress for "4" weeks & require "5" more weeks for completion.

f) It has been reassessed that activity - H, needs "6" weeks for completion.

Draw original network diagram & shows critical path of following.

Event	1 - 2	1 - 3	2 - 5	2 - 4	3 - 4	4 - 5	4 - 6	5 - 6
Activity	A	B	C	D	E	F	G	H
Duration (weeks)	6	4	7	9	5	6	7	4

& after taking all conditions update your network diagram & shows all critical path.

Q4) a) Explain roll of construction industry in economical growth of any country. **[4]**

b) What are the factors influencing on demand & supply. Explain each in brief. **[6]**

c) Define "Annuity" with the help of example. State formula to find out sinking fund annuity. A financial Institution introduces a plan to pay a sum of Rs. 15 lakhs after 10 years at the rate of 18% compounded annually. Find the annual equivalent amount that person should invest at the end of every year for the next 10 years to receive 15 lakhs after 10 years from the institutions. **[6]**

OR

Q5) a) Explain law of diminishing marginal utility with help of suitable example. **[4]**

b) Explain demand & supply curve with neat diagram. **[6]**

c) What are the kinds of annuities? State the formula of capital recovery annuity.

Mayuresh developer taken a loan from a bank Rs. 40 lakhs at an interest of 15% rate compounded annually. This amount should be repaid 10 years in equal installments. Find monthly installment that Mayuresh developer has to pay to bank. **[6]**

Q6) a) Write a note on "ABC" analysis & how to conduct "ABC" analysis. **[6]**

b) Determine expression for "EOQ". **[8]**

The rate of use of a particular raw material from stores is 1000 unit/year. The cost of placing a receiving order is Rs. 50/-. The cost of each unit is Rs. 100/-. The cost of carrying inventory in percent per year is 0.20, depends on average store.

Determine

i) EOQ

ii) Calculate order point when lend time is 6 months

c) Write down safety programme for construction of Highway project. **[4]**

OR

Q7) a) What are the functions of material management Department. **[6]**

b) Perform "ABC" analysis for following data. **[8]**

Sr. No.	1	2	3	4	5	6
Items	Cement	Bricks	Nails	Dry Distemper	Oil	Tiles
Amount Expenditure (Rs.)	4,90,000	95,000	3,000	12,000	10,000	30,000

Draw the curve also.

c) Define the terms IRR, ISR, injury index & disablement. **[4]**

Q8) a) What are the appraisal essential before understanding of any project? Explain any three brief. **[6]**

b) What are the methods of capital budgeting cost of project "A" is Rs. 60000/- it has a cash inflow of Rs. 20,000/- for a period of 4 years. What is the "NPV" if the firm expects 12% of annum? **[6]**

c) Explain pay back period method with the help of suitable example. **[4]**

OR

Q9) a) Explain with neat sketch "Break even analysis". **[4]**

b) Write a short note on "concept of benefit cost analysis. **[4]**

c) Surya associates has following details. **[8]**

i) Fixed cost = Rs. 30 lakhs

ii) Variable cost per unit = Rs. 150

iii) Selling price per unit = Rs. 300

Find 1) Break even quantity.

2) Break even sale.

3) Actual production quantity is 80,000 find out contribution.

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T.E. (Mechanical)
DESIGN OF MACHINE ELEMENTS - I
(2012 Course) (Semester - I) (End Semester) (302041)

Time : 3 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, and mention it clearly.*
5) *Use of Electronic Pocket Calculator is allowed.*

Q1) a) Write in brief use of standards in design on machine element. What are three basic types of standards used in a design office? **[6]**

   b) Determine the diameter below which the angle of twist of a shaft, and not the maximum stress, is the controlling factor in design of a solid shaft in torsion. The allowable shear stress is 55MN/m² and the maximum allowable twist is 0.3deg/m. (Consider a shaft with no key). G = 80 GN/m². **[4]**

OR

Q2) a) A spring clip, made from a 25mm diameter rod, is shown in figure 1. Determine the maximum shear stress and specify its location or locations. **[6]**

Figure 1
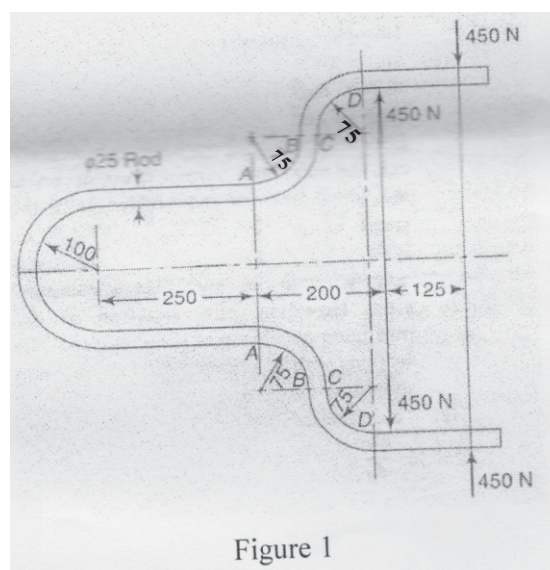
   b) Explain design of splines. **[4]**

Q3) a) Explain ASME code of shaft design.   **[2]**

b) Determine the diameter of a circular rod made of ductile material with a fatigue strength(complete stress reversal), σ_e = 265 MPa and a tensile yield strength of 350MPa. The member is subjected to a varying axial load from Wmin = -300kN to Wmax = 700kN and has a stress concentration factor = 1.8. Use factor of safety as 2.0   **[8]**

OR

Q4) a) Explain theories of failures used in Shaft Design.   **[2]**

b) A centrifugal blower rotates at 600rpm. A belt drive is used to connect the blower to a 15kW and 1750 rpm electric motor. The belt forces a torque of 250N-m and a force of 2500N on the shaft. Figure 2 shows the location of bearings, the steps in the shaft and the plane in which the resultant belt force and torque act. The ratio of the journal diameter to the overhung shaft diameter is 1.2 and the radius of the fillet is $1/10^{th}$ of overhung shaft diameter. Find the shaft diameter, journal diameter and radius of fillet to have a factor of safety 3. The blower shaft is to be machined from hot rolled steel having the following values of stresses:

Endurance limit = 180MPa, yield point stress = 300MPa, ultimate tensile stress = 450MPa. Theoretical stress concentration factor at fillet is 1.62, at keyway is 1.6.   **[8]**
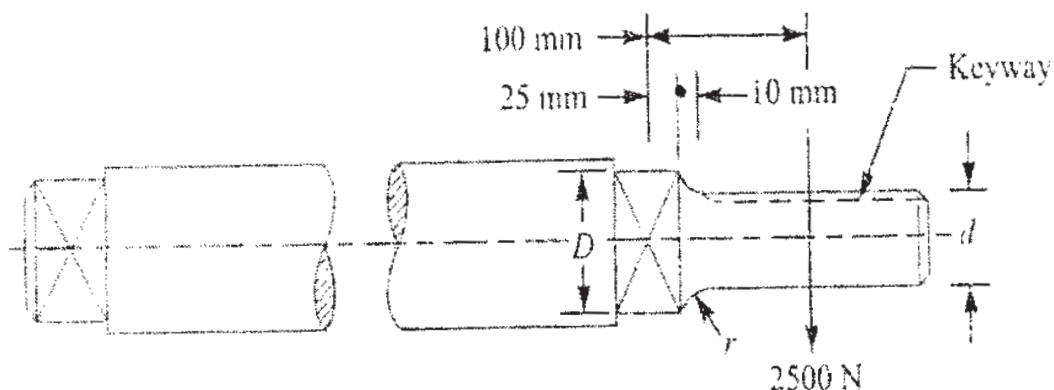
Figure 2

Q5) a) Explain significance of helix angle in efficiency of square threaded screw. Also explain two methods to increase efficiency of a square threaded screw. **[6]**

b) Design nut of screw jack for taking up a load of 50kN for a lift taking up a load of 50KN for a lift of 500mm. Take S_{yt} = 300MPa, Factor of safety = 5, pitch = 12mm and P_b = 12MPa. **[10]**
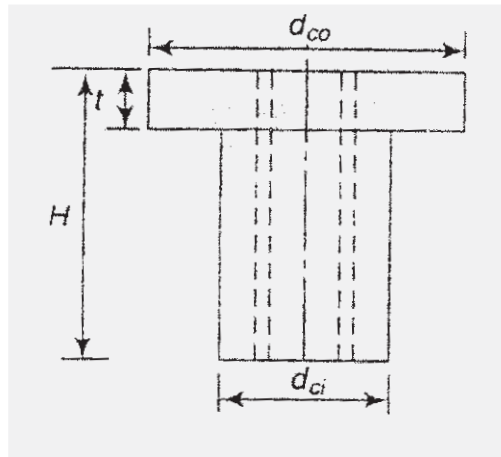
Figure 3

OR

Q6) a) Explain with neat sketch recirculating ball screw. State its applications.**[6]**

b) A load of 600kN is to be raised and lowered by means of two square threaded screws. If the coefficient of frictions between the screw and nut is 0.048, determine the size of screw and nut. Take σ_t =80MPa, P = 15MPa, pitch = 10mm. Find also the torque required to raise and lower the load. **[10]**

Q7) a) Derive the strength eq^n of **[8]**

i) single transverse fillet weld

ii) double parallel filled weld.

b) A steel bracket as shown in Figure 4 is mounted on a wall by means of three bolts of M20 size. Find the maximum load which may be taken by the bracket when applied at 350mm from the wall. Ignore initial tightening of bolt. Take $S_t = 60$MPa. **[8]**
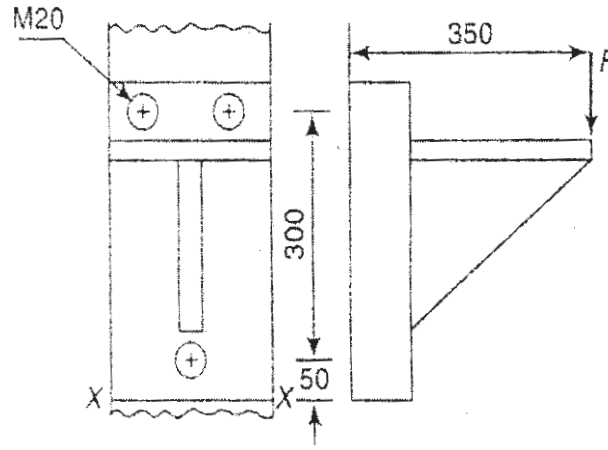
OR

Figure 4

OR

Q8) a) Explain with neat sketch 4 types of screw fasteners. **[8]**

b) Determine the torsional stress in the weldment as shown in figure 5. This is a case where a crank is made of a plate whose one end is welded to a shaft while other end is subjected to a tangential force of 12kN. Take weld thickness = 5mm and overload factor =1.2. **[8]**
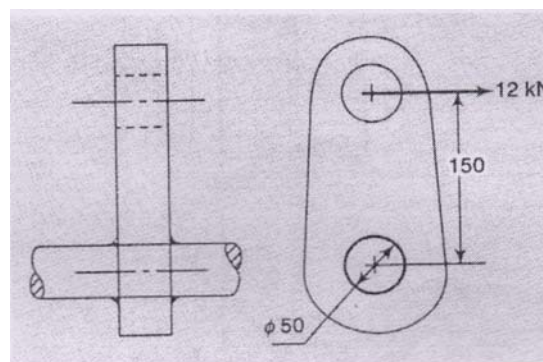
Figure 5

Q9) a) Derive basic two equations for the design of helical spring. Also state the importance of Wahl factor in spring design. **[8]**

b) A railway wagon of mass 250kN moving with a velocity of 2.5m/sec is brought to rest by springs of mean diameter 350mm. The maximum deflection of the spring is 210mm. Find the wire diameter and number of turns. Take S_s = 600MPa and G = 80 GPa. **[10]**

OR

Q10) a) Explain the following methods. **[8]**

   i) Shot peening

   ii) Nipping of leaf spring.

b) One helical spring is nested inside another; the dimensions are as tabulated. Both springs have the same free length and carry a total maximum load of 2500N. **[10]**

	Outer spring	Inner spring
Number of active coils	6	10
Wire diameter, mm	12.5	9.0
Mean coil diameter,mm	100	70

Determine:

   i) The maximum load carried by each spring.

   ii) The total deflection of each spring.

   iii) The maximum stress in two springs. Take G = 83 GN/m².

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[4758]-512

T.E. (Mechanical/Automobile)
METROLOGY AND QUALITY CONTROL (End Semester)
(2012 Pattern) (Semester-I)

Time : 2¹/₂ 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 and steam tables is allowed.
  4) Assume suitable data if necessary.

Q1) a)   Explain principle's of Engineering metrology in details.   **[6]**

     b)   Write a note on laser interferometer.   **[4]**

                                OR

Q2) a)   Explain different methods of measuring flatness.   **[6]**

     b)   Differentiate between primary texture and secondary texture. **[4]**

Q3) a)   Define Taylor's principle.   **[2]**

     b)   Write a note on floating carriage micrometer.   **[4]**

     c)   Explain universal measuring machine.   **[4]**

                                OR

Q4) a)   Explain principle of interferometry.   **[2]**

     b)   Write a note on span gauging.   **[4]**

     c)   Explain Automatic inspection system.   **[4]**

Q5) a)   Explain Deming's fourteen points in details.   **[8]**

     b)   Explain seven New Quality tools.   **[8]**

                                OR

Q6) a) Define cost of prevention, cost of appraisal, cost of internal failure & cost of external failure. **[8]**

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

Q7) a) Explain in detail OC curve and show following element on OC curve **[6]**

   i) α-Risk

   ii) β-Risk

   iii) AOQ

   iv) LTPD

b) Two machines producing components are checked up for the statistical stability. Draw the 'P' chart for both machines and comment upon the processes. Sample size for both machines are 200. **[10]**

Machine A

Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	25	28	30	30	20	29	31	26	31	27

Machine B

Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	11	08	22	15	12	27	10	15	10	02

OR

Q8) a) Differentiate between single, double and multiple sampling plan. **[6]**

b) Components are being turned on CNC lathe to a specification of 12.58 ± 0.05mm. Five batches of five components each have been drawn for inspection at 1 hour intervals. The readings are tabulated below. **[10]**

Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
12.62	12.63	12.62	12.61	12.59
12.60	12.56	12.56	12.66	12.58
12.62	12.60	12.57	12.62	12.57
12.61	12.59	12.58	12.61	12.59
12.65	12.60	12.63	12.60	12.56

i)   Determine the process capability.

ii) Determine the three-sigma limits for the $\bar{X}$ chart.

iii) Draw the control chart and give your assessment. Assume the normal distribution and d_2 for group size 5 is 2.326.

Q9) Write short notes on following (Any Three):　　　　　　　　　　**[18]**

a) TPM.

b) Six sigma.

c) Kanban.

d) QFD.

e) JIT.

f) Poka-yoke.

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[4758] - 513

T.E. (Mechanical) (Common to Mech. S/W, Automobile)
HEAT TRANSFER
(2012 Course) (302042) (End Semester) (Semester - I)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:
1) *Assume suitable data if necessary.*
2) *Figures to the right indicate full marks.*
3) *Use of Scientific calculator is allowed.*

Q1) a) Derive three dimensional general heat conduction equation in Cartesian coordinates for anisotropic material for unsteady state condition with uniform internal heat generation. **[7]**

     b) What is unsteady state? Define internal temperature gradient. When can it be neglected? **[3]**

OR

Q2) a) Write a note on temperature boundary condition and heat flux boundary condition. **[4]**

     b) A long hollow cylinder has inner and outer radii as 10cm and 20cm respectively. The rate of heat generation is 1 kW/m³, the thermal conductivity of cylinder material is 0.2 W/mk. If the maximum temperature occurs at radius of 15cm and temperature of Outer surface is 60ºC, find temperature at the inner surface of the cylinder. **[6]**

Q3) a) Explain critical radius of insulation. **[4]**

     b) A 5cm diameter steel ball, initially at a uniform temp of 450ºC is suddenly placed in an environment at 100ºC with h = 10 W/m²K. Steel properties: Cp = 460 J/kgK, density = 7800 kg/m³, K = 35 W/mK. Calculate the time required for the ball to attain a temperature of 150ºC. **[6]**

OR

Q4) a) Write a note on Overall heat transfer coefficient. **[4]**

b) A cylindrical metal rod of 5 cm diameter and 20 cm long with thermal conductivity 225 W/mK protrudes in atmosphere at 30°C. It projects from furnace wall at 300°C. A convective heat transfer coefficient of air is 10 W/m²K. Determine temperature at the free end of the rod assuming it as a fin insulated at end. **[6]**

Q5) a) Explain physical significance of any four dimensionless numbers used in convection. **[8]**

b) Water flows at the rate of 360kg/hr through a metallic tube of 10mm diameter and 3m length. It enters the tube at 25°C. Outer surface of the tube is maintained at a constant temperature of 100°C. Calculate the exit temperature of the water. **[8]**

Properties of water:

μ=5.62 × 10⁻⁴ kg/ms; C_p = 4174J/kgK; K = 0.664W/mK.

Use the following correlation:

N_u = 0.023Re⁰·⁸ Pr⁰·⁴ for turbulent flow

N_u = 3.66 for laminar flow

OR

Q6) a) Write a note on velocity boundary layer and thermal boundary layer. **[6]**

b) Explain mechanism of natural convection. Distinguish it from forced convection. **[4]**

c) A rectangular plate of length 7cm and width 4cm maintained is at 115°C. It is exposed to still air at 25°C on both sides. Calculate convective heat transfer rate if smaller side of the plate is held vertical. **[6]**

Use Correlation N_u = 0.59 (Gr.Pr)⁰·²⁵

For air at 70°C, K = 0.03 W/mK; Pr = 0.697; kinematic viscosity v = 2.076 × 10⁻⁶ m²/s.

Q7) a) State and explain following laws of radiation: **[10]**

      i)   Planck's Law

      ii)   Wein's Law

      iii) Lambert's cosine rule

      iv) Kirchoff's Law

      v)   Stefan Boltzmann Law

   b) Two large parallel steel plates of emissivities 0.8 and 0.4 are held at temperatures 1100 K & 500 K respectively. If a thin radiation shield of emissivity 0.09 is introduced between two plates, determine radiation heat exchange in W/m^2 with and without radiation shield. **[6]**

    Use $\sigma = 5.67 \times 10^{-8}$ W/m^2 K^4.

<div align="center">OR</div>

Q8) a) What is shape factor? What is shape factor for a plane surface and convex surface with respect to itself? **[10]**

    Find the shape factor of following with respect to itself:

      i)   Cylindrical cavity of diameter D and depth H,

      ii)   Hemispherical cavity of diameter D,

      iii) Conical hole of diameter D and depth H

   b) Consider two concentric spheres 'A' and 'B' with diameter of 200mm and 300mm respectively. Space in between these two spheres is evacuated. Liquid air at -153°C is stored inside sphere 'A'. The surfaces of spheres 'A' and 'B' facing each other are coated with aluminium foil ($\varepsilon = 0.03$). Latent heat of vaporization of liquid air is 209.35 kJ/kg. If the system is kept in a room where ambient temperature is 30°C,

    Calculate the rate of evaporation of liquid air. **[6]**

Q9) a)   What is the significance of critical heat flux in design of evaporators? Explain different regimes in pool boiling curve with neat sketch.   **[10]**

   b)   What is LMTD for a heat exchanger? Derive an expression for LMTD of parallel flow heat exchanger.   **[8]**

<div align="center">OR</div>

Q10) a)   Explain dropwise condensation and filmwise condensation. compare these two.   **[6]**

   b)   A parallel flow heat exchanger is to be designed to cool oil (C_p = 2.1 kJ/kgK, 20 kg/min) from 70°C to 40°C by using cold water (C_p = 4.2 kJ/kg K, 50 kg/min), available at 30°C. The overall transfer coefficient is 133 W/m²K. Find the area of heat exchanger, outlet temperature of water and effectiveness.   **[8]**

   c)   Explain effectiveness and NTU for a heat exchanger.   **[4]**

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T.E. (Mechanical / Automobile Engg. / Mech. S/W)
THEORY OF MACHINES - II
(2012 Course) (Semester - I) (End - Sem.) (302043)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Assume suitable data, if necessary.*

Q1) a)   State and prove the law of gearing.   **[6]**

b)   Explain with the help of neat sketch, the various forces acting on the tooth of a helical gear with usual notations. Also obtain the inter - relationship in between them.   **[6]**

OR

Q2) a)   Compare the cycloidal and involute gear tooth profile.   **[6]**

b)   A three start worm has pitch diameter of 80mm and a pitch of 20mm. It rotates at 600 rpm and drives a 40 tooth worm gear. If coefficient of friction is 0.05, find   **[6]**

   i)   The helix angle of the worm.

   ii)   The speed of the gear.

   iii) The centre distance.

Q3) Classify different types of gear trains with neat sketch, explanation with merit, demerits and application.   **[8]**

OR

Q4) Explain tabulation method for Sun and planet gear train and write speed of different elements. **[8]**

Q5) a) Describe cone variators used to transmit the power between parallel, non parallel and intersecting shaft axes. **[6]**

b) Each road wheel of a motor cycle has a mass moment of inertia 1.5 kg-m². The rotating parts of the engine of the motor cycle have a mass moment of inertia of 0.25 kg-m². The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle with its rider is 250 kg and its center of gravity is 0.6 m above the ground level. Find the angle of heel, if the motor cycle is travelling at 50 km per hour and is taking a turn of 30 m radius. Wheel diameter is 0.6m. **[10]**

OR

Q6) a) What is the PIV chain drive? Compare it with axially displaceable cone drive using rubber belt. **[6]**

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

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

   ii) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

Q7) a) Explain the following terms related to kinematic synthesis **[6]**

   i) Function generation,

   ii) Path generation and

   iii) Body guidance (Motion generation).

b) Synthesize a four-bar mechanism to generate a function $y = 2 \log_{10}(x)$ and x varies from 2 to 4 with an interval of 1. Assume θ to vary from 30° to 70° and ϕ from 40° to 100°. Starting position of input and output link is 30° and 40°. If length of fixed link is 1 unit determine other link lengths and draw mechanism in its first position. **[10]**

OR

Q8) a) Write short notes on [6]

   i) Precision positions,

   ii) Structural error,

   iii) Chebychev spacing.

   b) Synthesis a four bar mechanism by the method of inversion. [10]

   Assume the following data,

   i) Length of fixed link is 100 mm and input link length is 30mm.

   ii) Initial position of input link 30º and 2- positions of the input link from the initial position 30º and 60º.

   iii) 2-positions of the output link from the initial position 20º and 40º .

   And determine the length of coupler link, output link and initial position of output link.

Q9) The following data relate to a cam profile in which the follower moves with cycloidal motion during lift and returning it with uniform acceleration and retardation, acceleration being ½ of the deceleration. Minimum radius of cam is 30mm, roller radius is 10 mm, lift of follower is 45 mm, offset of follower axis is 12 mm towards right, angle of ascent is 80º, angle of decent 120º, angle of dwell between ascent and decent is 50º & speed of cam 175 rpm. Draw cam profile & determine maximum velocity and acceleration during lift. [**18**]

OR

*Q10)*a) Write short note on Jump phenomenon in cam system. [6]

   b) What do you mean by Advanced Cam Curves? Explain 3-4-5 polynomial curve. [6]

   c) Derive expressions for displacement for circular arc cam operating a flat faced follower, when the contact is on the circular flank. [6]

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T.E. (Mechanical)
HYDRAULICS AND PNEUMATICS
(2012 Pattern) (302045) (Semester -I) (End-Sem.)

Time : 3 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) Distinguish between Hydraulics and Pneumatics systems.   **[6]**

OR

Q2) Draw ISO symbols for the following components: **[6]**

   a)   Unidirectional, fixed displacement pump

   b)   Quick disconnect coupling with check

   c)   3/2, solenoid operated, spring return DCV

   d)   4/3, tandem centre, spring centered, oil pilot operated DCV

   e)   Muffler

   f)   Double acting cylinder with both side variable cushioning.

Q3) a)   Classify and Explain hydraulic accumulators.   **[4]**

   b)   A gas charged accumulator supplies energy to a system with 15 liters of
        oil within the range of 125 bar (abs) to 175bar (abs). If the accumulator
        has pre-charged pressure of 90 bar (abs). Size the accumulator for
        Adiabatic process.   **[4]**

OR

Q4) a) Classify hydraulic Pumps & define various efficiencies of a pump? **[6]**

b) Draw symbolic representation of Hydraulic Power Pack unit. **[2]**

Q5) What is Cushioning of Cylinders? Explain with neat sketch with symbolic representation. **[6]**

OR

Q6) Explain with neat sketch Piston type Hydraulic Motors. **[6]**

*Q7)*a)Draw neat sketch and explain the following with their application in circuit:**[12]**

i) Three Way, Two Position Direction Control Valve

ii) Four Way, Three Position Direction Control Valve (Closed Centre)

b) Draw & Explain Meter-In speed control circuit. Specify its application.**[6]**

OR

Q8) a) For the circuit diagram given in Fig.1, identify the type of Circuit & the numbered Components, also describe the circuit's operation. **[8]**
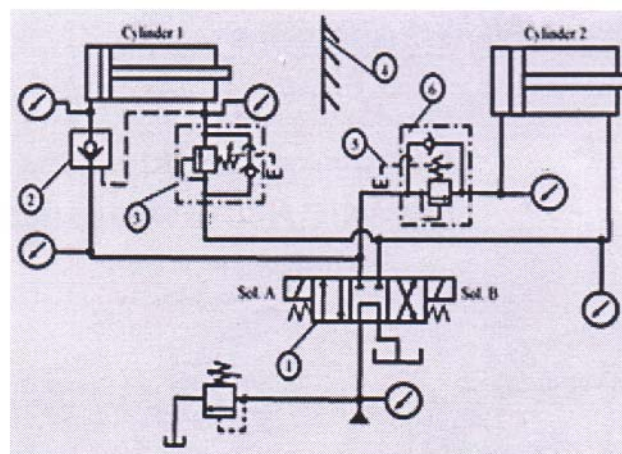
Fig.1

b) Draw a circuit for automatic cylinder recirprocation using sequence valves & explain its operation. **[10]**

Q9) a) Explain the working of a FRL unit with neat sketch and symbols. **[8]**

b) Write a short note on the following with application in the circuit: **[8]**

   i) Shuttle valve (OR Gate)

   ii) Quick Exhaust Valve

OR

Q10) a) Draw and explain position dependent sequencing circuit for two cylinders in pneumatics. **[8]**

b) Compare Air Motors with Electric Motors. **[4]**

c) Classify different actuators used in pneumatics with symbols. **[4]**

Q11) Movement of a machine is obtained by using hydraulic system. Load on the cylinder during the forward stroke is 12kN while that the return stroke is 10kN.

Requirement of the machine is such that the forward speed and the return speed are to be equal. Range of speeds for the cylinder is between 2m/min and 4m/min. The total stroke of the cylinder is 350mm.

Draw a circuit which will fulfill these requirements. Select different components used in the circuit from the data given. Mention ratings of components in case it is not available in the given data (Suitable system requirements can be assumed, if required). **[16]**

OR

Q12) A machine tool cross slide is moved by means of a hydraulic system. The motion of the cylinder is as follows: **[16]**

a) Initially it moves through a distance of 150mm against a load of 15kN in about 4 seconds.

b) It is followed by a working stroke of another 150mm against an effective load of 25kN.

   The feed rate during this part of the stroke is required to be 1m/min.

c) The load during return stroke is 15kN.

   A meter -in type of circuit is used. Draw a circuit which will fulfill these requirements. Select different components used in the circuit from the data given. Mention ratings of components in case it is not available in the given data.

DATA

1. SUCTION STRAINER:

Model	Flow capacity (lpm)
S1	38
S2	76
S3	152

2. PRESSURE GAUGE:

Model	Range (bar)
PG1	0-25
PG2	0-40
PG3	0-100
PG4	0-160

3. VANE PUMP:

Model	Delivery (lpm)		
	at 0 bar	at 35 bar	at 70 bar
P1	8.5	7.1	5.3
P2	12.9	11.4	9.5
P3	17.6	16.1	14.3
P4	25.1	23.8	22.4
P5	39	37.5	35.6

4. RELIEF VALVE:

Model	Flow range (lpm)	Max. working pressure (bar)
R1	11.4	70
R2	19	210
R3	30.4	70
R4	57	105

5. FLOW CONTROL VALVE:

Model	Max. working pressure (bar)	Flow range (lpm)
F1	70	0-4.1
F2	105	0-4.9
F3	105	0-16.3
F4	70	0-24.6

6. DIRECTION CONTROL VALVE:

Model	Max. working pressure (bar)	Flow capacity (lpm)
D1	350	19
D2	210	38
D3	210	76

7. CHECK VALVE:

Model	Max. working pressure (bar)	Flow capacity (lpm)
C1	210	15.2
C2	210	30.4
C3	210	76

8. SEQUENCE VALVE

Model	Max. working pressure (bar)	Flow capacity (lpm)
PO1	210	19
PO2	210	38
PO3	210	76

9. CYLINDER (Max. working pressure - 210):

Model	Bore Dia. (mm)	Rod Dia (mm)
A1	25	12.5
A2	40	16
A3	50	35
A4	75	45
A5	100	50

10. OIL RESERVOIR:

Model	Capacity (lit)
T1	40
T2	100
T3	250
T4	400
T5	600

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

DESIGN OF MACHINE ELEMENTS - II

(2012 Pattern)

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

Instructions to the candidates:

    1)   *Answer five questions from following.*

    2)   *Neat diagrams must be drawn wherever necessary.*

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

    4)   *Use of electronic pocket calculator is allowed.*

    5)   *Use of programmable calculator is not permitted.*

    6)   *Assume suitable data if necessary.*

Q1) a) What are the advantages and disadvantages for increasing the helix angle in helical gear. **[4]**

    b) Design a pair of spur gear with 20° full-depth involute teeth based on Lewis Equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is to be connected to 10kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as gear is made of plain carbon steel 40C8 (S_{ut} = 600 N/mm²). The factor of safety as 1.5. Design the gears based on Velocity factor and, determine their dimensions. **[6]**

    Use following data :

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

    ii)   Velocity factor $C_v = \dfrac{3}{3+V}$

    iii) Number of teeth on pinion : 18

OR

Q2) a) A spur gear pair with 20° full depth involute tooth profile consist of 18 teeth pinion meshing with 36 teeth gear. The pinion & gear is made of steel with ultimate tensile strength 600 N/mm² & 510 N/mm² respectively, the module is 5 mm while the face width is 10 x module. The surface hardness of pinion & gear are 330 BHN & 280 BHN respectively. **[6]**

Calculate :   i)   Beam strength

ii)   Wear strength

Use following Data :

- Factor of safety - 2

- pinion speed - 1440 rpm

- Lewis form factor - $Y = 0.484 - 2.87/Z$

- Velocity factor - $V = \dfrac{5.6}{5.6 + \sqrt{V}}$

b) What are different mountings of bevel gear Explain any one with sketch.**[4]**

Q3) a) A right hand 18 teeth pinion meshes with 40 teeth helical gear mounted on parallel shaft. The pinion is to be driven by 22 KW, 1440 rpm motor. The tooth system is 20° full Depth involute, while helix angle 23° & normal module is 6mm. Determine the components of tooth forces. **[4]**

b) Write selection of bearing from manufacturer's catalogue. **[6]**

OR

Q4) a) Differentiate between Spiral bevel with Hypoid bevel gear with sketch.**[4]**

b) A radial load acting on ball bearing is 2500N for first five revolutions and reduces to 1500 N for next ten revolution the load variation repeats itself. The expected life of bearing is 25 million revolutions. Determine the dynamic load carrying capacity of bearing. **[6]**

Q5) a) Derive an expression for the efficiency of worm gear pair. **[5]**

b) A worm transmitting 2.2 kW power at 1000 rpm drives a worm gear rotating at 20 rpm. The pitch diameter of the right hand, single start worm is 60mm. The transverse pitch of the worm gear is 15.7mm, while the normal pressure angle is 14.5°. The worm is above the worm gear and rotates in clockwise direction as viewed from the right side. **[11]**

Determine :

   i) The components of tooth forces acting on the worm and worm gear along with directions and free body diagram.

   ii) The efficiency of worm gear pair.

   iii) The power lost in friction.

   iv) The designation of worm gear pair.

The coefficient of friction between the worm and worm gear teeth is 0.0406.

OR

Q6) a) In a design of worm gear pair why worm gear governs the design. **[3]**

b) A worm gear pair 2/30/10/8 consist of worm gear made of phosphor bronze with Sut-245N/mm² & worm made of case hardened steel with Sut-700N/mm². The coefficient of friction between the worm & worm gear is 0.04 while normal pressure angle is 20°. The wear factor of worm gear teeth is 0.825 N/mm². The fan is used for which overall heat transfer coefficient is 22/w/m²/°C. The permissible temperature rise for the lubricating oil above the atmospheric temperature is 45°C. The worm rotates at 720 rpm. Assume service factor 1.25. Determine the input power rating based on, **[13]**

   i) Beam strenght

   ii) Wear strenght.

   iii) Thermal consideration

Also. Suggest the input power that the worm gear can take. Use following data,

Lewis form factor – $Y = 0.484 - \dfrac{2.87}{Zg}$

Velocity factor – $Cv = \dfrac{6}{6 + Vg}$

Area of housing – $A = 1.14. \times 10^{-4} \times a^{1.7}.m2$

Where   a = center distance in mm

Q7) a) A pulley of 1000mm diameter is driven by an open type flat belt from 25 KW, 1440 rpm electric motor. The pulley on motor shaft is 250mm in diameter and the center distance between the two shaft is 2m. The allowable tensile stress for the belt material is 2N/mm² and coefficient of friction between belt and pulley is 0.28. The density of belt material is 900 kg/m³. If the width of belt is 125mm, **[12]**

Determine :

i)   Thickness of belt.

ii)   Length of belt.

iii)   Initial tension required in the belt.

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

OR

Q8) a) Draw neat sketch of 6 × 7 and 6 × 19 rope. **[6]**

b) Give the classification of chain, Explain polygonal effect of chain. **[4]**

c) Explain selection of V belt from manufacturers catalogue. **[6]**

Q9) a) The following data is given for a 360° hydrodynamic bearing. **[12]**

- Radial load = 3.2 KN.

- Journal diameter = 50mm.

- Bearing length = 50mm

- Journal speed = 1490 rpm.

- Radial clearance = 50 microns.

- Viscosity of lubricants = 25 cP.

- Density of lubricant = 860 kg/m³.

- Specific heat of lubricant = 1.76 KJ/Kg°c

  Assume that the total heat generated in the bearing is carried by the total oil flow in the bearing. calculate :

  i) Minimum oil - film thickness;

  ii) Coefficient of friction;

  iii) Power lost in friction;

iv) Total flow rate of lubricant in litres/min;

v) Side leakage;

vi) Temperature rise

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

Dimensionless parameters for Full Journal Bearings

b) Explain design variables and performance variable of Hydrodynamic bearing. **[6]**

OR

Q10) a) Derive the Petroff's equation for hydrodynamic bearing. State it's limitations. **[7]**

b) The following data refers to short hydrodynamic full Journal bearing : **[11]**

- Radial Load = 1000N

- Journal speed = 2100 rpm

    (1/d) Ratio = 0.5

- Eccentricity ratio = 0.65

- Radial clearance = 0.002 × journal radius

- Flow rate of lubricant = 3.45 litres per hour

  Calculate,

  i)   the diameter of journal

  ii) the radial clearance

  iii) the dimensions of bearing

  iv) the minimum oil film thickness

  v)   the absolute viscosity of lubricant

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T.E. (Mechanical)
TURBO MACHINES
(2012 Pattern) (Semester - II) (302049) (End - Semester)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

  1)   *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.9 or Q.10.*

  2)   *Neat diagrams must be drawn wherever necessary.*

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

  4)   *Use of Calculator, Steam Table is allowed.*

  5)   *Assume suitable data if necessary.*

Q1) a) A jet of water moving with V m/s strikes at the centre of a curved vane which is moving with 'u'm/s. If the outgoing jet makes an angle θ with the incoming jet, prove that   **[6]**

  i)   Maximum efficiency $= \eta_{max} = \dfrac{8}{27}(1+\cos\theta)$

  ii) Blade speed u = V/3

  b) Explain the functions of following   **[4]**

  i)   Casing of pelton wheel.

  ii) Notch of bucket.

<div align="center">OR</div>

Q2) a) Describe with a neat sketch the construction of Francis turbine.   **[5]**

  b) A Kaplan turbine has a runner diameter of 4 m and hub diameter of 1.2 m. Discharge through the turbine = 7000 LPS. The hydraulic & mechanical efficiencies are 90% and 93% respectively. Assume no whirl at outlet. Find the net head and power developed by the turbine.   **[5]**

Q3) a) What is cavitation? How it can be prevented? **[4]**

b) Steam issues from the nozzle at an angle of $22°$ with a velocity of 430 m/s. The friction factor is 0.9. For a stage turbine designed for maximum efficiency. Find **[6]**

   i) The blade velocity

   ii) Moving blade angles for equiangular blades

   iii) Power developed

OR

Q4) a) Prove that for Parson's reaction turbine moving & fixed blades are symmetrical in shape. **[6]**

b) Explain different types of draft tubes used in reaction turbines. **[4]**

Q5) a) Define specific speed of a hydrodynamic pump. Derive expression for the same. **[8]**

b) A centrifugal pump running at 800 rpm is working against a head of 20.2 m. The external diameter of impeller is 480 mm and its width is 60 mm. If the vane angle at exit is $40°$ and manometric efficiency is 70% find **[10]**

   i) Flow velocity at outlet

   ii) Absolute velocity of water leaving the vane.

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

   iv) Discharge

   v) Specific speed.

OR

Q6) a) Explain effect of blade angle (outlet) on discharge in centrifugal pump.**[6]**

b) A three stage centrifugal pump has impeller diameter 400 mm and 20 mm wide. The vane angle at outlet is 45° and the area occupied by the thickness of vane is 8% of total area. Inner diameter of impeller is half of outer diameter and inlet width is twice that of outlet. The pump discharge is 3.6 m³ per minute & runs at 920 rpm. Flow velocity is constant from inlet to outlet. Find **[12]**

    i)   Power output of pump in KW

    ii)   Total manometric head

    iii)   Specific speed

    iv)   Shaft power

    v)   Vane angle at inlet

    Take mechanical efficiency = 88%

    Manometric efficiency = 77%

Q7) a) Explain slip and slip factor, its importance in centrifugal compressor.**[6]**

b) A centrifugal compressor inducing air at 20°C is running at 15000 rpm. The pressure ratio is 4:1 with an isentropic efficiency of 80%. Curved vanes at inlet give the air a prewhirl of 25° to the axial direction at all radii and mean diameter of eye is 25 cm. Impeller tip diameter is 60 cm. The absolute velocity of air at inlet is 150 m/s. Find the slip factor. **[10]**

OR

Q8) a) Write short note on **[6]**

    i)   Fan   ii)   Blower

b) A centrifugal compressor delivers 10m³ of air when running at 10000 rpm. The air is drawn in at 1 bar & 300K and delivered at 4 bar. The isentropic efficiency is 80%. The blades are radial at outlet and velocity of flow is constant = 64 m/s. The outer diameter of impeller is twice the inner diameter. Take slip factor as 0.9. Find **[10]**

    i)   Temperature of air at outlet tip of impeller.

ii)   Power required to drive the compressor.

iii) Impeller diameters at inlet & outlet.

iv)   Impeller blade angle at inlet.

v)   Diffuser blade angle at inlet.

Q9) a)   Explain choking and surging in an axial flow compressor.   **[6]**

b)   An eight stage axial flow compressor takes in air at a temperature of 30°C at the rate of 3 kg/s. The pressure ratio is 6 and isentropic efficiency is 89%. The compressor is designed for 50% reaction. The blade speed for each stage is constant and is equal to 180m/s. Flow velocity is 100 m/s. Find the power required to run the compressor and the direction of air at entry & exit from the rotor & stator. The total work is equally shared between the stages.   **[10]**

OR

Q10)a)   Explain Pressure co-efficient, flow co-efficient and work input factor.**[6]**

b)   An axial flow compressor with eight stages and 50% reaction compresses air with a pressure ratio of 4:1. The air enters the compressor at 20°C and flows through it with a constant velocity of 90m/s. The blades of compressor runs with a mean speed of 180 m/s. Take isentropic efficiency = 82%. Find   **[10]**

i)   Work done by machine

ii)   Blade angles

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T.E. (Mechanical) (Semester - II)
MECHATRONICS
(2012 Pattern)

Time : 3 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) Using a suitable diagram, explain the construction as well as the working of a digital optical encoder. **[6]**

    b) From the block diagram in Figure 1, determine the transfer function: Y/X. **[4]**
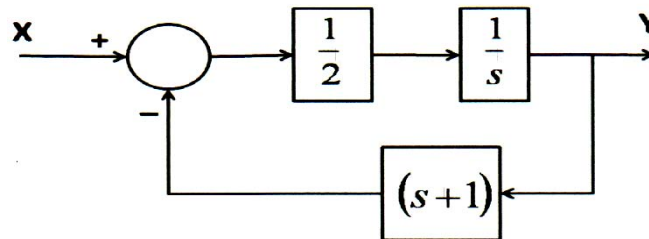
Figure 1

OR

Q2) a) A potentiometer, used to measure the angular position of a motor, has 750 turns of wire. The input range is from -150^0 to $+150^0$. The output range is from 0 to 10 Volts. Determine: **[6]**

    i) The sensitivity

    ii) The average resolution

    b) Using a suitable block diagram, explain the application of a closed loop control system in temperature control in a house hold refrigerator. **[4]**

Q3) a) Draw suitable diagrams and explain the construction, working and performance characteristics of a Current Amplifier. **[8]**

b) Define "Transfer Function" and discuss its importance in the context of control of a Machatronic system. **[2]**

OR

Q4) a) Draw the flowchart and explain the working of the SAR type Analog to Digital converter. **[8]**

b) List two important advantages of a closed loop control system. **[2]**

Q5) a) Given four normally open switches (P1, P2, S1 and S2), with DC motor (M) write a PLC program to satisfy following objectives: **[10]**

i) When P1 (Start Button) is pushed the Cycle shall start. The cycle shall continue to remain *On* until P2 (Stop Button) is pushed.

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

iii) When S2 is pushed and S1 is not pushed then Motor is ON in counter clockwise direction.

iv) When P2 is pushed the program stops.

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

OR

Q6) a) Using a suitable schematic list the components in a PLC as well as explain the significance of each of the components. **[8]**

b) List the criterion for the selection of a PLC and explain any three criterions in details. **[8]**

Q7) a) For the system in Figure 2, assume M=mass=1kg, k=stiffness=2 N/m and d=damping=0.5 Ns/m. Also, F=force input in N and y=displacement output in m. **[10]**
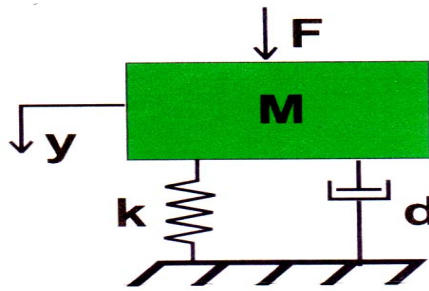
Figure 2

For this system:

i) Determine the transfer function: y(s)/F(s),

ii) Identify the location of the Poles and Zeros and

iii) Comment on the stability of the system.

b) Using the values of the natural frequency=ω_n=1.414 and the damping factor =ξ=0.177, estimate the values for percentage overshoot & 2% settling time. **[6]**

OR

Q8) a) Using four distinct points, compare, in detail, between Time Domain and Frequency Domain techniques for analysis of a system. **[8]**

b) Draw suitable sketch to depict the unit step response of a second order system when: **[8]**

i) System poles are negative and real

ii) System poles are complex conjugate pair with negative real part

iii) System poles are positive and real

iv) System poles are a imaginary pair with no real part

Q9) a) Figure 3 shows an error time graph. Sketch the PID controller (series form) output w.r.t. time. Assume $K_P=10$, $K_I = 2$, $K_D = 0.5$ and $P_O=0$ i.e the controller output is zero when the error is zero. **[10]**
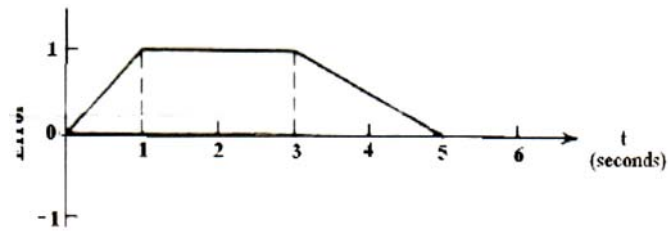
Figure 3

b) Derive the equation for the control signal, u, for the Proportional plus Derivative (PD) controller in parallel form. Discuss, in detail, the advantages and disadvantages of adding a Derivative term to the Proportional term. **[8]**

OR

Q10 a) Draw a suitable block diagram and derive the transfer function of the Proportional Integral Derivative (PID) controller in series form. Also, discuss the significance of the Integral and the Derivate term in the PID controller. **[10]**

b) Discuss the role of transient specifications W.R.T the performance of the PID controller. **[8]**

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T.E. (Common-Mechanical / Auto)

NUMERICAL METHODS AND OPTIMIZATION

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

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Assume suitable data, if necessary.*

Q1) a) Define and explain following types of errors. **[6]**

   i) Truncation Error.

   ii) Round Off Error.

   iii) Absolute Error.

   iv) Relative Error.

   v) Percentage relative Error.

   vi) Inherent Error.

b) Using Gauss Seidal method solve the following set of simultaneous equations.

$$x_1 + 20x_2 + 9x_3 = -23$$

$$2x_1 - 7x_2 - 20x_3 = -57$$

$$20x_1 + 2x_2 + 6x_3 = 28$$

Show two iterations in tabular form. **[6]**

<div align="center">OR</div>

Q2) a) Find the roots of $\cos x - x = 0$ by Regula Falsi method. Take $x_1 = 0.6$ and $x_2 = 1$. Find the value of x for 3 iterations. **[6]**

b) Draw flow chart for Thomas algorithm method. **[6]**

Q3) a) Maximize $Z = 2x_1 + 5x_2$ subjected to,

$$x_1 + 4x_2 \leq 24$$

$$3x_1 + x_2 \leq 21$$

$$x_1 + x_2 \leq 9$$

$$x_1, \, x_2 \geq 0$$ **[5]**

b) Write a note on constrained optimization. **[3]**

OR

Q4) a) Using Newton's method find the maximum value for the equation $x^3 - 5x + 3$. Take initial guess as zero up to accuracy 0.001. **[5]**

b) Write down the advantages of genetic algorithm. **[3]**

Q5) a) A material is tested for cyclic fatigue failure where by a stress in MPa is applied to the material and the number of cycles needed to cause failure is measured. The results are in the table below: **[8]**

N Cycles	1	10	100	1000	10,000	100000	1000000
σ	1131	1058	993	801	651	562	427

When a log-log plot of stress versus cycles is generated, the data trend shows a linear relationship. Use the method of least squares to find the equation of that straight line.

b) Find the polynomial passing through points (0, 1), (1, 1), (2, 7), (3, 25), (4, 61), (5, 12) using Newton's interpolation formula and hence find y at $x = 0.5$. **[8]**

OR

Q6) a) The pressure (P) and volume (V) of a gas are related by the equation PV^r = K, r and K are constants. Fit this equation for the following set of observations: **[8]**

P kg/m²	0.5	1	1.5	2	2.5	3
V(liters)	1.62	1	0.75	0.62	0.52	0.46

b) A set of values of x and $f(x)$ are given below. Using Lagrange's interpolation formula, find $f(9)$. **[8]**

x	5	7	11	13	17
$y=f(x)$	150	392	1452	2366	5202

Q7) a) Evaluate $\int_0^1 \dfrac{\sin x}{2+3\sin x}\, dx$ using Simpson's 3/8th rule. Take 6 strips. **[8]**

b) Draw flowchart for Gauss Legendre 2 point and three point formulae combinely. **[8]**

OR

Q8) a) Use Trapezoidal rule to evaluate **[8]**

$$\int_0^1\int_1^2 \frac{2xy}{(1+x^2)(1+y^2)}\, dx.dy .$$

b) Explain Simpson's $\dfrac{1}{3}$ rd rule graphically and derive formula for integration of a function. **[8]**

Q9) a) The relationship between x and y is given by $\dfrac{dy}{dx}+xy=2$. Estimate y at x = 5.1 using 2nd order Runge-Kutta method. Assume $y=2$ at $x=5$. Take step size of 0.02. **[10]**

b) Draw flow chart for Laplace equation when plate is divided in nine parts and temperatures at four nodes are to be find out when temperatures at four sides are given. **[8]**

OR

Q10)a) Using Runge Kutta method, solve $2\dfrac{d^2y}{dx^2} - 3x\dfrac{dy}{dx} + 9y = 9$ for $x = 0.1$, initial

conditions are $x = 0$, $y = 1$, $\dfrac{dy}{dx} = -2, h = 0.1$. **[8]**

b) Solve the heat equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ subjected to the conditions u $(0, t) =$

u $(1, t) = 0$ and u$(x, 0) = 2x$ for $0 \le x \le \frac{1}{2}$ and u(x, 0) = 2(1 − x) for

$\dfrac{1}{2} \le x \le 1$. Take $h = \frac{1}{4}$ and k = 1. **[10]**

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T.E. (Mechanical Engg.)

MANUFACTURING PROCESS - II

(2012 Course) (Semester - II) (End - Sem.) (302051)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Solve Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*

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

3) *Use of electronic pocket calculator is allowed.*

4) *Assume suitable data, if necessary.*

Q1) a)   Explain lapping process with neat sketch.   **[6]**

     b)   A plain surface 60 mm wide and 230 mm long is to be milled on a horizontal milling machine with cutter diameter 80 mm and speed 50 m/min. Take feed per tooth is 0.11 mm and number of teeth on cutter = 12. Calculate machining cutter.   **[6]**

<div align="center">OR</div>

Q2) a)   Draw figure of any four grinding wheel shapes used, with its names. **[6]**

     b)   Draw and explain broach tool geometry.   **[6]**

Q3) a)   A 250 mm diameter bar is turned at 40 rev/min. with depth of cut of 2 mm and feed of 0.3 mm/rev. Calculate Power consumption and specific cutting energy with cutting force 1500 N and Feed force 400 N.   **[4]**

     b)   Explain economics of machining in metal cutting.   **[4]**

<div align="center">OR</div>

Q4) a)   Draw neat sketch of single point cutting tool geometry.   **[4]**

     b)   Define built up edge. With neat sketch explain formation of BUE.   **[4]**

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

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

OR

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

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

Q7) a)   Explain CNC machines with neat sketch. State its advantages and limitations.   **[6]**

b)   Differentiate between subroutine and canned cycle.   **[4]**

c)   Write a CNC program for manufacturing component shown in fig. from a 100 mm long cylindrical component of 80 mm dia.   **[6]**

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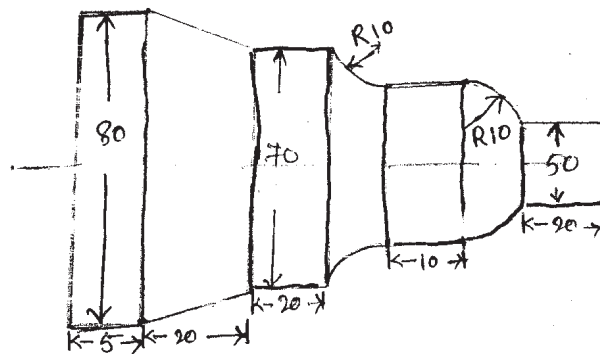
Q8) a)   Write short notes on the following: **[8]**

i)   Machining Center.

ii)   Automatic tool changer (ATC)

b)   Differentiate between absolute and incremental positioning system in CNC.   **[4]**

c)   Explain the following codes G02, M06, G04, M09.   **[4]**

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

b) What are the different types of jigs? Explain any one with suitable sketch. **[4]**

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

OR

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

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

c) Design and draw milling fixture for milling slot of 10 mm wide, 5 mm deep and 20 mm in length for the component shown in fig. (a) **[8]**

fig.(a)·

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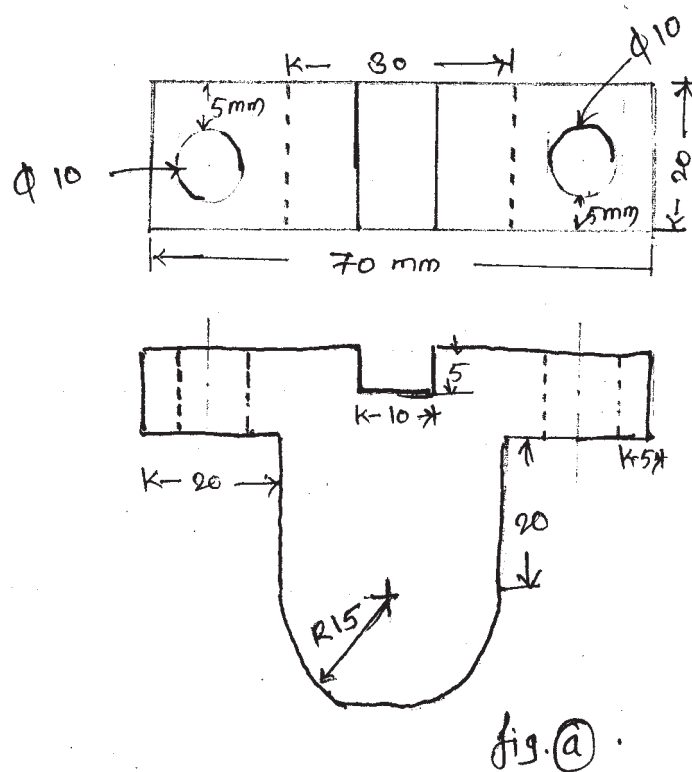
[4758] - 521

T.E. (Mechanical S/W)
MACHINE DESIGN
(2012 Pattern)

Time : 3 Hours]   *[Max. Marks : 70*
Instructions to the candidates:
    1)   *All questions are compulsory.*
    2)   *Neat diagrams must be drawn wherever necessary.*
    3)   *A figure to the right indicates full marks.*
    4)   *Use of logarithmic tables & electronic pocket calculator is allowed.*
    5)   *Assume suitable data, if necessary.*

UNIT - 1 & 2

Q1) a)   A belt pulley is keyed to the shaft midway between the supporting bearing kept at 1000mm apart. The shaft transmits 20 Kw power at 400 rpm. The pulley has 400 mm diameter. The angle of wrap of belt on pulley is 180° and belt tension acts vertically downwards. The ratio of belt tension is 2.5. The shaft is made of steel (s_{ut} = 400N/mm², S_{yt} = 240N/mm²). The combined shock and fatigue factors in bending and torsion are 1.5 and 1.25 resp. The permissible lateral deflection is 1mm/m length. Determine shaft diameter on basis of

    i)   Strength   ii)   Lateral rigidity   **[7]**

     b)   State and Explain condition for self locking and over hauling of power screw.**[3]**

OR

Q2) The following data refers to a C-clamp with single start square threaded screw.**[10]**

     ●   Maximum force exerted by the clamp = 4 KN.

     ●   Tensile yield strength for screw material (50C4) = 390 N/mm².

     ●   Yield strength in shear for nut and body material (FG 200) = 230 N/mm²

     ●   Permissible bearing pressure = 12 N/mm².

     ●   Coefficient of screw friction = 0.14.

     ●   Coefficient of collar friction = 0.16.

- Mean collar radius = 8 mm.

- Factor of safety = 3.

- Distance between axis of handle and nut surface in clamped condition = 150mm

- Force applied by an operator = 100N.

- Length for gripping on handle = 60 mm.

Nominal diameter, mm	22	24	26	28	30	32	36
Pitch, mm	5	5	5	5	6	6	6

Design screw and nut for C-clamp and determine the following :

a)   Standard dimensions of screw.

b)   Stresses in screw body at two critical section.

c)   Height of nut.

UNIT - 2 & 3

Q3) a) Determine the weld size of an annular fillet used to weld a circular cantilever shaft of diameter 30mm and length 100mm. The force acting at the free end of the shaft is 5KN and permissible weld stress is 80N/mm². **[8]**

b) State the explain necessity of modified Goodman's diagram. **[2]**

OR

Q4) a) A spring – loaded safety valve for the boiler is required to blow at the pressure of 1.20N/mm². Diameter of the valve is 65mm. The maximum lift of the valve is 17.5 mm. Design suitable compression spring of the safety valve. Assume C = 6 and provide initial compression of 30mm. Assume limiting permissible shear stress in spring material as 450N/mm² and G as 84000N/mm². **[8]**

b) State an expression for torque required to raise the load and lower the load for power screw. **[2]**

UNIT - 4

Q5) a) The following data is given for a steel spur gear pair transmitting 5KW power from a shaft running at 3000 rpm to another parallel shaft running at 1500 rpm. **[12]**

i)	Module	=	4 mm
ii)	Number of teeth on pinion	=	18
iii)	UTS for pinion and gear material	=	630 MPa
iv)	Face width	=	10 * module
v)	Surface hardness	=	400 BHN
vi)	Combined teeth error	=	15 microns
vii)	Deformation factor C (when e is in mm) =		11400 * e N/mm
viii)	Service factor and load concentration factor =		1.0

Assuming dynamic load is accounted by Buckingham's Equation, calculate:

i) Factor of safety against bending failure

ii) Factor of safety against pitting failure

$$F_d = \frac{21V\left(bc + Ft_{max}\right)}{21V + \sqrt{bc + Ft_{max}}}$$

b) What is virtual number of teeth in case of helical gear. **[4]**

OR

Q6) a) A pair of parallel helical gears consists of 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° and helix angle is 25°. The face width is 40 mm and normal module is 4 mm. The pinion is made up of plain carbon steel 55C8 (UTS = 720 MPa) and gear is made up of plain carbon steel 40C8 (UTS = 580 MPa). The pinion and gear are heat treated to a surface hardness of 350 BHN and 300 BHN respectively. The service factor and factor of safety are 1.5 and 2.0 respectively. Assuming velocity factor accounts for dynamic load, find the power transmission capacity of the helical gear pair. Barth's Velocity Factor K_v can be taken as

$$K_v = \frac{5.6}{5.6 + \sqrt{V}} \quad \text{where V is velocity in m/s.} \quad \textbf{[11]}$$

b) Derive an expression of beam strength with all assumptions for spur gear. **[5]**

UNIT - 5

Q7) a) Derive Stribeck Equation for static load carrying capacity of rolling contact bearing. State the assumptions made. **[5]**

b) A 10 KW, 720 rpm electric motor is directly coupled to a shaft of 25 mm diameter which is supported by two cylindrical roller bearings. The shaft transmits power to another shaft through a pulley of diameter 250 mm which is placed mid-way between the two bearings. The coefficient of friction between the belt and pulley is 0.3 and angle of lap is 180°. The belt is vertical. The overload factor is 1.7 5and race rotation factor is 1.0. If the expected life of bearings is 76000 hours, select one of the following bearing, which is taken from the manufacturer's catalogue.

● NU 2205 with basic dynamic capacity = 15.99 KN

● NU 2305 with basic dynamic capacity = 31.39 KN **[11]**

OR

Q8) a) Explain the preloading objectives in rolling contact bearing. **[4]**

b) A shaft of length 1.2 m is supported on two vertical identical single row deep groove ball bearings. The shaft carries a gear at its mid-length and rotates at 720 rpm. The tangential and radial force components of the gear are 1 KN and 0.8 KN respectively. The expected life of bearings is 15000 hours with reliability of 80%. Neglecting the effect of axial force, calculate the dynamic load carrying capacity of the bearing so that it can be selected from manufacturer's catalogue. Take load factor as 1.2 and race rotation factor as 1.0. Use $L = 4.48 * L_{10} * [\log_e(1/R)]^{1/1.5}$ **[12]**

UNIT - 6

Q9) a) Explain selection of roller chain from manufacturer catalogue. **[6]**

b) The following data is given for an open flat belt drive used to transmit 22 KW power from an electric motor to an exhaust fan. **[12]**

No.	Parameter	Motor Pulley	Fan Pulley
1	Diameter	300 mm	1200 mm
2	Angle of contact	2.50 radians	3.75 radians
3	Coefficient of friction	0.30	0.25
4	Speed	900 rpm	

The permissible tensile stress for belt material is 2 MPa. The belt is 6 mm thick and density of belt material is 0.97 gm/cc. Which pulley governs the design of belt and why? What width of belt should be used?

*Q10)*a)   Explain polygon effect of chain.   **[6]**

b)   A single V belt drive is to transmit power from a grooved pulley of pitch diameter of 200 mm running at 1500 rpm to a flat pulley of diameter 600 mm. The center distance between the pulleys is 1000 mm. The belt mass is 0.3 Kg/m. The coefficient of friction between belt and pulley is 0.25. The V belt pulley groove angle is 38°. If the allowable tension in belt is 800N, find :   **[12]**

   i)   Power transmission capacity of belt.

   ii)   Initial tension required in belt.

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[4758]-522

T.E. (Mechanical Sandwich)
NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES
(2012 Course) (Semester-I) (302061) (End-Semester)

Time : 2¹/₂ Hours]   *[Max. Marks : 70*
Instructions to the candidates:
1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10 and Q. 11 or Q. 12.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables, Mollier charts, electronic calculator is allowed.*
5) *Your answers will be valued as a whole.*
6) *Assume suitable data, if necessary.*

Q1) Apply successive approximation method to find the root of the following equation correct up to two decimal places near to $\pi/2$.

$$f(x) = x\tan(x) - 1 = 0$$ **[6]**

OR

Q2) Use Simpson's 3/8 rule to evaluate

$$\int_0^\pi \sqrt{1 + 3\cos^2 x}\, dx$$

with $n = 6$.   **[6]**

Q3) The velocity distribution of a fluid near a flat surface is given as   **[6]**

x	0.1	0.3	0.5	0.7	0.9
v	0.72	1.81	2.73	3.47	3.98

Where x is distance from the surface (cm) and v is velocity (cm/s). Using a suitable interpolation formula obtain the velocity at $x = 0.4$.

OR

Q4) Draw the flowchart to find interpolating value using Lagrange's interpolation formula for given set of data (x y).   **[6]**

Q5) Use Gauss elimination with partial pivoting to solve the set of equations: **[8]**

$x + y - 2z = 3$;

$4x - 2y + z = 5$;

$3x - y + 3z = 8$

OR

Q6) Use Gauss Seidel method to solve up to one decimal accuracy. **[8]**

$3x - 2y = 5$;

$-x + 2y - z = 0$;

$-2y + z = -1$

Q7) a) Explain the following with example: **[8]**

i) Round off error

ii) Truncation error

iii) Error Propagation

b) Fit the geometric curve $y = ax^b$ to the following data: **[8]**

X	2	4	6	8	10	12
Y	1.4	2.0	2.4	2.8	3.6	5.0

OR

Q8) a) Draw the flowchart to fit the curve of the form: $y = a + bx + cx^2$ for given set of data $(x\ y)$. **[8]**

b) Derive the normal equations for evaluating the parameters a and b to fit the data to population growth model of the form $y = a\ e^{bx}$. **[8]**

Q9) a) Solve the ODE using modified Euler Method. **[10]**

$$\frac{dy}{dx} = \frac{2x}{y} - xy, \qquad y(0) = 1$$

for $x = 0.25$ and 0.50.

b) What are the limitations of Taylor series method? Explain the order of accuracy of Euler, modified Euler and RK methods with respect to Taylor series. **[6]**

OR

[4758]-522 2

*Q10)*a) Use fourth order RK method to estimate $y(0.4)$ when

$y'(x) = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$. **[10]**

b) Draw the flowchart to solve ODE using predictor-corrector method.**[6]**

*Q11)*a) Draw the flowchart to solve Laplace equation $u_{xx} + u_{yy} = 0$. **[8]**

b) Solve **[10]**

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

for the following conditions by using Cranck-Nicolson method.

At $x = 0$ and $x = 3$, $u = 0$ for all t's.

At $t = 0$, $u = x^2$ for $0 < x < 3$.

Assume $h = 1$, $k = 0.1$ find u at $t = 0.3$

OR

*Q12)*a) Draw the flowchart to solve wave equation $u_{tt} = c^2 u_{xx}$. **[8]**

b) Solve Laplace equation $T_{xx} + T_{yy} = 0$ subject to the BC's as shown in Fig. **[10]**

```
         1000      1000
   750  ┌─────┬─────┬─────┐ 1000
        │     │     │     │
        │  T1 │  T2 │     │
   500  │     │     │     │ 1000
        │     │     │     │
        │  T3 │  T4 │     │
   250  │     │     │     │ 1000
        └─────┴─────┴─────┘
     0
          250   500   750
```

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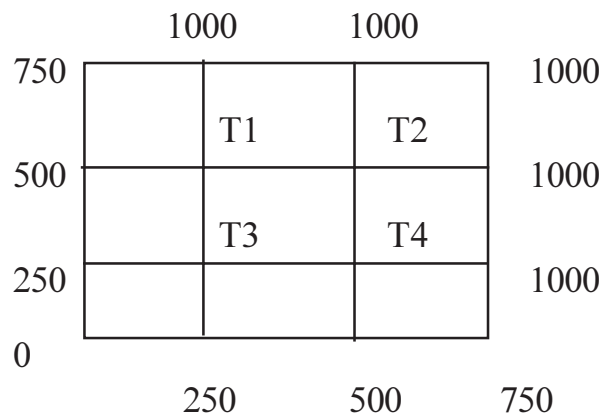
[4758] - 525

T.E. (Mechanical S/W) (Semester - I)
MECHATRONICS
(2012 Pattern)

Time : 3 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)   Using a suitable diagram explain the working of Solenoid Actuator. **[6]**

     b)   Compare: Closed Loop Control vs Open Loop Control.   **[4]**

<p align="center">OR</p>

Q2) a)   Draw a suitable diagram and explain the working of the Resistive Temperature Detector. **[6]**

     b)   Find the transfer function C(s)/R(s) for the block diagram shown in Figure 1. **[4]**
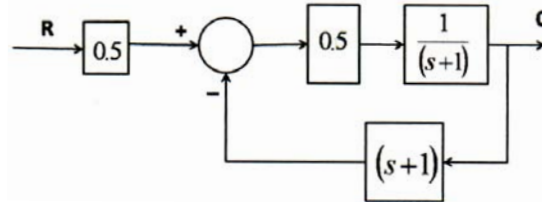
<p align="center">Figure - 1</p>

Q3) a)   An 8-bit ADC with a 0V to 10 Volts range is used for the purpose of sampling the voltage of an analog sensor. Determine the digital output code that would correspond to the analog input of 7.5 Volts. **[8]**

     b)   Discuss the importance of sensor in a Mechatronic System.   **[2]**

<p align="center">OR</p>

Q4) a)   List the criterion for selection of the Data Acquisition Card and explain any 3 criterions in detail. **[8]**

     b)   Explain why the Transfer Function approach is complicated to implement for a Multi-Input-Multi-Output (MIMO) system. **[2]**

<p align="right"><i>P.T.O.</i></p>

Q5) a) Write the truth table and draw the ladder diagram for: **[10]**

      i)   OR Login

      ii)   NOT Logic

   b) Explain in detail the functioning of following sub-systems in a PLC: **[6]**

      i)   BUS

      ii)   Output Module

<div align="center">OR</div>

Q6) a) In a certain bank, each of three bank officers has a unique key to the vault. The bank rules require that two out of the three officers be present when the vault is opened. Draw the ladder diagram for a relay logic circuit that will unlatch the door and turn on the light when two of the three keys are inserted. **[10]**

   b) Discuss the criterion for selection of the SCADA system. **[6]**

Q7) a) Discuss the procedure for Frequency Domain Analysis of a Mechanical System. **[10]**

   b) Determine the Poles and Zeros of the system shown in Eq. (1). Also comment on the stability of the system. **[6]**

$$\frac{y(s)}{u(s)} = \frac{0.5s + 2}{s^2 + 0.5s + 2} \dots\dots\dots\dots\dots(1)$$

<div align="center">OR</div>

Q8) a) For the translational mechanical system in figure 2, determine the transfer function: $Z(s)\big/u(s).$ **[10]**
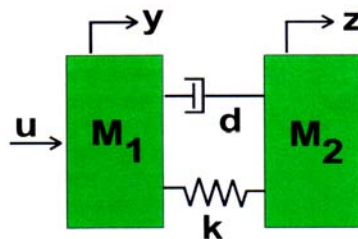
Figure - 2

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

      i)   Percent Overshoot

      ii)   Steady State Error

      iii) Gain Margin

Q9) a) Draw the block diagram and derive the transfer function of the PID controller in parallel form. Also, derive the equation for the control signal, u. **[10]**

b) A position control system has a proportional gain K_p of 2 N-mm/deg and works against a constant friction torque of 6N - mm. What is the size of the dead band? **[8]**

OR

Q10) a) List the disadvantages of the P1 control. Also, discuss how the D control will assist with overcoming these disadvantages. **[10]**

b) Draw the block diagram and derive the transfer function of the PID controller in series form. **[8]**

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[4758] - 527

T.E. (Mechanical Sandwich)
INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT
(2012 Pattern) (Semester - II) (Self Study - II)

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

Instructions to the candidates:

1)   Answer Section–I and Section–II in separate answer book.

2)   Neat diagrams must be drawn wherever necessary.

3)   Figures to the right side indicate full marks.

4)   Use of calculator is allowed.

5)   Assume suitable data if necessary.

SECTION - I

Q1) a)   Define Industrial Engineering. Explain its role in production management.**[8]**

b)   Explain various functions of Management.   **[8]**

OR

Q2) a)   What are ideas and thoughts of F.W. Taylor? How did they lay the foundation for Industrial Engineering? Explain.   **[8]**

b)   Explain Maslow's hierarchy theory of needs.   **[8]**

Q3) a)   Explain different tools and technique used in method study.   **[8]**

b)   Explain :   **[8]**

    i)   Two hand Chart

    ii)   Multiple activity chart

OR

Q4) a)   What measurements are to be done in a stop watch time study? Discuss briefly how they are done? What is measurement of difficulty in stop watch time study? How is it done?   **[8]**

b)   Differentiate between IE and Ergonomics. State some laws or principles of ergonomics and how do you use them in human effort design? Explain. **[8]**

Q5) a)   Explain concept of productivity and total productivity with suitable example.   **[8]**

b)   Explain procedure for selection of plant location & layout for a typical two wheeler automobile plant.   **[10]**

OR

Q6) Write short note on the following : **[18]**

   a)   Factors affecting plant location

   b)   Responsibilities of Production manager

   c)   Principle of Material Handling

SECTION - II

Q7) a) Define production planning and control. Explain the functions and techniques of production planning and control. **[8]**

   b) An automobile company uses 36000 units of a particular component per year. The ordering cost is Rs. 500 per order and inventory carrying cost is estimated at 20% of average inventory value. The cost per unit of the component is Rs. 10. Assuming 300 working days in a year, determine.**[8]**

     i)   EOQ

     ii) No. of orders/year

     iii) Inventory Cycle and

     iv) Total Inventory Cost

OR

Q8) a) Explain the following : **[8]**

     i)   EOQ

     ii) ABC analysis

   b) Differentiate between Production Planning and Production Control. **[8]**

Q9) a) Describe what you understand by process planning. What is the role of it in product engineering department? **[8]**

   b) State and explain how CPM and PERT techniques used as a tool of project net work analysis. **[8]**

OR

Q10) a) Explain various phases of process planning in detail. **[8]**

    b) Explain with example Crashing of network in PERT CPM. **[8]**

Q11) a) Why is an ISO-9000 certification important to a firm? Explain the methodology of ISO-9000 certification. **[10]**

    b) Describe the seven sources of manufacturing wastes as identified in the JIT system. **[8]**

[4758] - 527   **-2-**

*Q12)*Write short note on following :   [18]

    a)   Concept of Loading and Scheduling.

    b)   Supply chain Management.

    c)   Concurrent Engineering.

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[4758] - 528

T.E. (Automobile Engg.)
DESIGN OF MACHINE ELEMENTS
(2012 Pattern) (Semester - I) (316481) (End-Sem.)

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

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

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

b)   Differentiate between rigid and flexible coupling.   **[4]**

OR

Q2) a)   A foot lever is 1m from the center of shaft to the point of application of 800N load, find   **[6]**

    i)   diameter of shaft

    ii)   dimensions of the key

    iii)   dimensions of rectangular arm of the foot lever at 60mm from the center of the shaft, assuming width of the arm as 3 times thickness. The allowable tensile strength may be taken as 73MPa and allowable shear stress as 70MPa, Width of key = 12mm and thickness of key = 8mm.

b)   Explain the different types of keys.   **[4]**

Q3) a)   How do you classify couplings?   **[2]**

b) A square threaded power screw has a nominal diameter of 30mm and a pitch of 6mm with double threads. The lead on the screw is 6KN and the mean diameter of thrust collar is 40mm. The coefficient of friction for the screw is 0.1 and for the collar is 0.09. Determine **[8]**

   i)   Torque required to rotate the screw against the load

   ii) Torque required to rotate the screw with load

   iii) Overall efficiency

OR

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

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

Q5) a) What are the causes of stress concentration and what are the methods of reducing stress concentration? **[6]**

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

OR

Q6) a) Derive soderberg equation. **[10]**

b) A mass of 500Kg is being lowered by means of steel wire rope having cross sectional area 250mm². The velocity of weight is 0.5m/sec. when the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take E = 0.8×10⁶ MPa. **[6]**

Q7) a) Explain the hydrodynamic theory of lubrication. **[6]**

b) The following data is given for a 360° hydrodynamic bearing. Radial load = 3.2KN, Journal speed = 1490 rpm, journal diameter = 50mm, bearing length = 50mm, radial clearance = 0.05mm, viscosity of lubricant = 25cP. Assuming that the total heat generated in the bearing is carried by the total flow in the bearing. Calculate **[10]**

   i)   coefficient of friction

   ii) power lost in friction

   iii) minimum oil film thickness

   iv) flow requirement in Lit/min

   v)   temperature rise

I/d	S	(r/c)f	(h_o/c)	Q/rcnl
1	0.121	3.22	0.4	4.33
1.5	0.134	3.49	0.6	4.89

OR

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

b) A 6306 radial ball bearing with inner ring rotation has a 10 seconds work cycle as follows. If basic dynamic capacity of the bearing is 24.25KN, determine the expected life of this bearing. Take radial factor x = 0.56, thrust factor y = 1.43 and rotating factor v = 1. **[10]**

	For 2 seconds	For 8 seconds
Radial load	4KN	3KN
Axial load	2KN	0
Speed	900rpm	1200rpm

Q9) a) Derive Lewis equation for beam strength. **[6]**

b) Design spur gear set to transmit 20KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2$MPa, BHN = 250 for pinion and $\sigma_d = 47.1$ MPa, BHN = 200 for gear. Check only tangential tooth load. Form factor **[12]**

$$Y = \pi(0.154\text{-}0.912/Z), C_V = 3.05/3.05\text{+}V.$$

OR

Q10) a) Derive an expression for formative number of teeth in helical gear. **[6]**

b) Design a pair of helical gears are to transmit 15KW at 10,000 rpm of the pinion with PCD 80mm. The transmission ratio is 3:1. Assume $\alpha = 20°$FDI, $\beta = 45°$. $\sigma_d = 193.2$MPa, BHN = 250 for pinion and gear. Check only tangential tooth load. **[12]**

$$Y = \pi(0.154\text{-}0.912/Z_e), C_V = 5.55/5.55\text{+}V^{0.5}.$$

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[4758] - 532

T.E. (Automobile)
AUTOMOTIVE ELECTRICAL & ELECTRONICS
(2012 Pattern) (Semester - I) (End -Sem.) (316482)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

    1)   *Neat diagrams must be drawn wherever necessary.*

    2)   *Use of logarithmic tables slide rule, Mollier chars, electronic pocket calculator and steam tables is allowed.*

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

<div align="center">OR</div>

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

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

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

<div align="center">OR</div>

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 indicating & warning devices provided in vehicle? Enlist reason in support of their usefulness. **[6]**

<div align="center">OR</div>

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]**

<div align="center">OR</div>

Q8) a) Explain solenoid actuator with the help of neat sketch & 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 & working of electronic ignition system. **[8]**

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

<div align="center">OR</div>

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

  i) ECU

  ii) Micro controller

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

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

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

  i) Crash sensor

  ii) Collision axoidance

<div align="center">OR</div>

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

  i) Radar Warning system

  ii) Cruise control

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

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[4758] - 533

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2012 Pattern) (Semester - II) (316484) (End Semester)

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

Instructions to the candidates:

1)   Answer any Five questions from the following.

2)   Figures to the right side indicate full marks.

3)   Neat diagrams must be drawn wherever necessary.

4)   Use of non-programmable calculator is allowed.

5)   Assume suitable data if necessary.

Q1) a) Describe the different types of radiator matrix commonly used. What are their relative advantages and disadvantages? **[4]**

b) As Designer Select the type of engine for TATA 407 truck with 1665kg load capacity & estimate the bore diameter, stroke length, swept volume, engine speed. If the engine develops 66 kW power with mean effective pressure of 0.8 N/mm^2 & mean piston speed of 666m/min. **[6]**

OR

Q2) a) What are difference between water & air cooling system? **[4]**

b) Estimate - bore diameter, stroke length, swept volume, engine speed for a diesel engine which develops 91 kW power with mean effective pressure of 0.7 N/mm^2 & mean piston speed is 650m/min. **[6]**

Q3) a) Define Indicated thermal efficiency & Brake thermal efficiency. **[2]**

b) Determine the dimension of small end & big end bearing of the connecting rod for a diesel engine with the following data: **[8]**

Cylinder bore = 100mm, maximum gas pressure = 4 MPa, (l/d) ratio for piston pin bearing = 2, (l/d) ratio for crank pin bearing = 1.3, allowable bearing pressure for piston pin bearing = 12MPa, allowable bearing pressure for crank pin bearing = 7.5 MPa.

OR

P.T.O.

Q4) a) Enlist the type of lubricant used in recent I.C. Engine with grade. **[2]**

b) The following data is given for the piston of a four stoke diesel-engine Cylinder bore = 250mm, Maximum gas pressure = 4N/mm², Allowable bearing pressure for skirt = 0.4 MPa, ratio of side thrust on liner to maximum gas load on piston = 0.1, Width of top land = 45mm, width of ring grooves = 6mm, total number of piston ring = 4, Axial thickness of piston rings = 7mm. Calculate Length of the skirt & length of the piston.**[8]**

Q5) a) Draw Valve gear mechanism for 4-Stroke I.C. engine & explain the function of each component. **[4]**

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

Brake power = 7.5kW, speed = 1400 rpm, indicated mean effective pressure = 0.35 MPa, mechanical efficiency = 80%, maximum gas pressure = 3.5MPa. The cylinder liner and head are made of grey cast iron FG 260 (S_{ut} = 260 N/mm² and μ = 0.25). The studs are made of plain carbon steel 40 C8 (S_{yt} = 380 N/mm²) The factor of safety for all parts is 6.

Calculate:

i) Bore and length of the cylinder liner

ii) Thickness of the cylinder liner

iii) Thickness of the cylinder head

iv) Size, number and pitch of studs.

Re-boring allowance for I.C.engine cylinder is:

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

OR

Q6) a) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore = 150mm, length of stroke = 275mm, engine speed = 500 rpm, maximum gas pressure = 3.5 MPa, seat angle = 45°.**[8]**

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 = 50m/s, constant K for steel valve as 0.42 and permissible bending stress σb as 50N/mm².

b) The Cylinder of four stoke diesel engine has the following specification, Cylinder bore = 150mm, maximum gas pressure = 3.5 N/mm², Cylinder material = Grey C.I. FG 200 (S_{ut} = 200MPa), Factor of Safety = 5, possion ratio = 0.25, Determine thickness of the wall & net circumferential stresses in the cylinder wall. **[8]**

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]**

OR

Q8) Write a short note on: **[16]**

a) Cylinder leakage test

b) Cylinder compression test

c) Vacuum gauge test

d) Cylinder power balance

Q9) a) Write the advantages of Dual Twin Spark-ignition (DTS-i) over single spark ignition Engine. **[9]**

b) Explain Homogenous Charge Compression Ignition (HCCI). **[9]**

OR

*Q10)*a) Explain Variable valve timing (VVT) with neat sketch. **[9]**

b) Write a note on Wankel Engine & Dual fuel engine. **[9]**

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[4758] - 534

T.E. (Automobile Engineering)
AUTOMOTIVE TRANSMISSION
(2012 Course) (Semester - II) (End-Sem.) (316485)

Time :2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:
1) *Attempt all questions.*
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 construction & working to torque tube drive arrangement with neat sketch. **[5]**

b) Compare front engine rear wheel drive with Rear engine rear wheel drive. **[5]**

OR

Q2) a) Explain Bus chasis layout with all components mounted on it. **[5]**

b) Explain constant velocity joint with neat sketch. **[5]**

Q3) a) Explain in detail with neat sketch construction and working of centrifugal clutch. **[5]**

b) Explain with neat sketch working of single plate clutch. **[5]**

OR

Q4) a) Which are the clutch lining materials? Explain it in brief. **[5]**

b) Explain construction and working of synchromesh gearbox with neat sketch. **[5]**

Q5) a)   Explain with neat sketch semi floating axle?   **[8]**

b)   What are types of differential? Explain the construction & working of conventional differential.   **[8]**

OR

Q6) a)   What is the function of final drive? Enlist the various types of loads acting on the rear axle.   **[8]**

b)   Explain fully floating rear axle in detail with neat sketch.   **[8]**

Q7) a)   An epicyclic gear train as shown in fig.A. Sun Wheel S-30 teeth & two planet wheels P, P-50 teeth each. The planet wheels mesh with internal teeth of a fixed annulas A. The driving shaft is connected to an arm which carries the planet wheels. The driving shaft carries the sun wheel transmits 4kW at 300rpm determine speed of driven shaft and torque transmitted if overall efficiency is 95%.   **[12]**
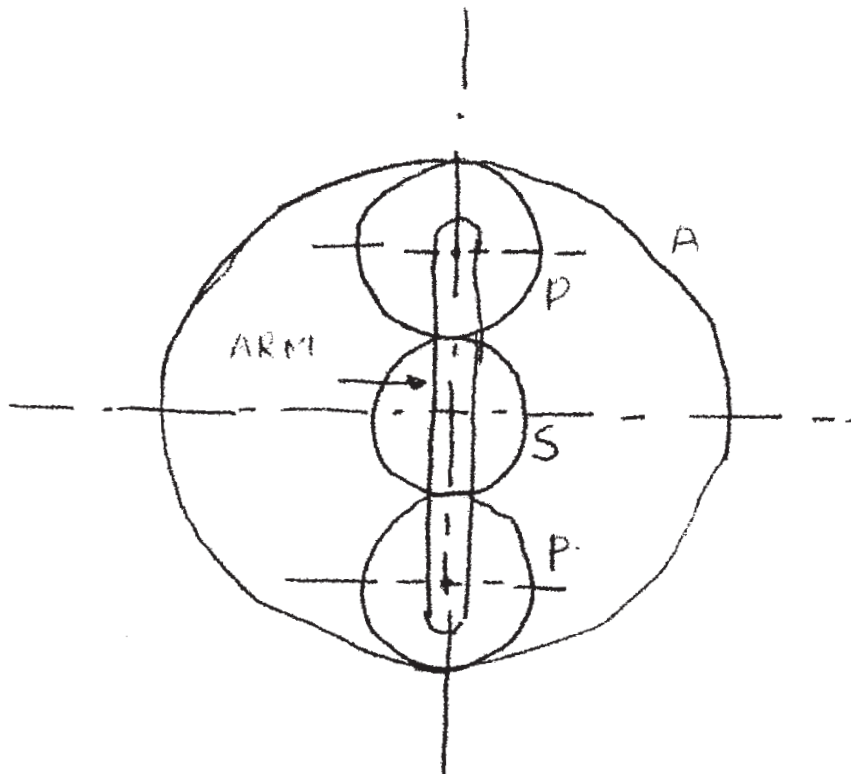
Fig (A) Epicyclic Gear train

b)   Explain the torque converter with its constructional details?   **[6]**

OR

Q8) a) An epicyclic gear train consist of a sun wheel S a stationary internal gear E and three identical planet wheels P carried on a star shaped planet carrier C. The size of different toothed wheel is such that the planet carrier C rotate at $\frac{1}{5}^{th}$ speed of sun wheel S. The minimum number of teeth on any wheels is16 the driving torque on sun wheel is 98.1 Nm. Determine (Refer Fig. B). **[12]**

   i)   Number of teeth on different wheels of train

   ii) Torque necessary to keep the internal gear stationary.
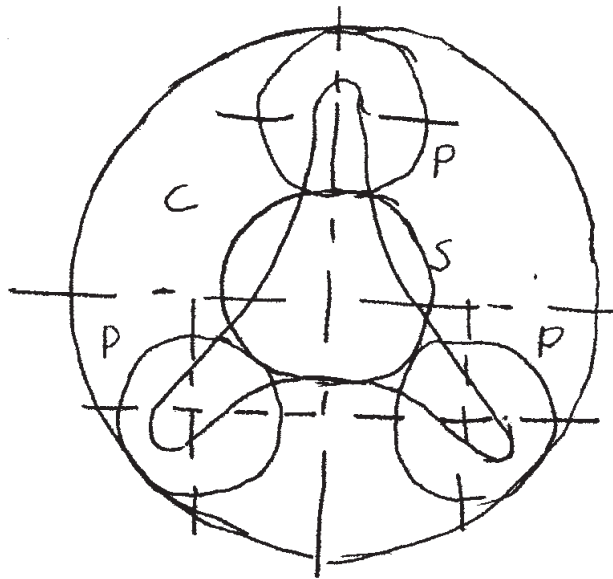
Fig ⑧ Epicyclic Gear train.

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

Q9) a) Explain with neat sketch continuous variable Transmission (CVT). **[8]**

   b) What do you mean by Hydromatic transmission? Explain it in detail with neat sketch. **[8]**

OR

Q10) a) Compare manual transmission with Automatic transmission. **[8]**

   b) What are the advantages & disadvantages of CVT. **[8]**

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[4758]-535

T.E. (Automobile)

AUTOMOTIVE AERODYNAMICS & BODY ENGG.

(2012 Pattern) (Semester - II) (End - Semester) (316486)

Time : 2 ½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*

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

3) *Assume suitable data, if necessary.*

4) *Use of non- programmable calculator is allowed.*

Q1) Write a short note on: **[6]**

a) Rolling, pitching & yawing.

b) Development of lift on Aero foil.

OR

Q2) Explain the various body optimization techniques to reduce drag. **[6]**

Q3) Write a short note on: **[8]**

a) Full scale wind tunnel

b) Flow visualisation technique

OR

Q4) a) Explain the strategies for aerodynamic development of car. **[6]**

b) Describe drag cars as a bluff body. **[2]**

Q5) Explain with a neat sketch Hatch back, fast back & square back for dust flow pattern at rear. **[6]**

<div align="center">OR</div>

Q6) How forces and moments will act on the vehicle at running condition. **[6]**

Q7) a) Prepare the layout of the luxury bus having capacity of 42 seats considering any sik features. **[12]**

b) Sketch and explain typical car body with its nomenclature. **[6]**

<div align="center">OR</div>

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

   i) Double skin construction.

   ii) Split level and articulated bus.

b) Sketch five types of car classified as per styling forms, similarly write two constructional features of each. **[10]**

Q9) a) List six major requirements of driver cabin. What factors to be considered while designing driver cabin for truck. **[8]**

b) Write a short note related to bus. **[8]**

   i) Luggage space location.

   ii) Emergency door location.

<div align="center">OR</div>

*Q10)*a) Sketch the different types of commercial vehicle bodies with its brief description. **[10]**

b) Explain ladder type chassis frame with neat sketch. **[6]**

*Q11)*a) Explain different types of seats and seat belts used in Automobiles.**[10]**

b) Explain the ergonomic considerations in driver seat design for bus. **[6]**

OR

*Q12)*a) Define and explain the working and non working joints with neat sketch.**[8]**

b) Explain symmetric and asymmetric loading with neat sketch.   **[8]**

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[4758] - 536

T.E. (E& TC)
SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2012 Course) (Semester - I) (End-Sem.) (304185)

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 indicate full marks.*
4) *Assume suitable data if necessary.*

Q1) a) Show parsing steps of <id>+<id>*<id> according to the following grammar: **[7]**

E   :: = TE"

E" :: = + E | ε (epsilon)

T   :: = VT"

T" :: = *T| ε (epsilon)

V   :: = <id>

b) Explain design of direct linking loader. Also explain the required data structures. **[7]**

c) Explain analysis phase of a compiler. **[6]**

OR

Q2) a) What is parsing. Explain the language processing tools. **[7]**

b) Discuss the terminologies Translated origin, Link origin, Load origin Relocation factor. **[7]**

c) Explain nested macros with example. Also explain expansion time variables with example. **[6]**

Q3) a) Explain various states of a process with diagram. **[6]**

b) List the categories of system calls and explain process system call with an example. **[6]**

c) Find out the safe sequence for execution of 3 processes using Bankers algorithm **[6]**

Maximum Resources: $R_1 = 4$, $R_2 = 4$

Allocation Matrix   Maximum Requirement Matrix

	R_1	R_2			R_1	R_2
P_1	1	0		P_1	1	1
P_2	1	1		P_2	2	3
P_3	1	2		P_3	2	2

OR

Q4) a) Explain different models of threads. **[6]**

b) Explain dining philosopher's problem and Readers-Writers problem with example. **[6]**

c) Consider the following processes where Arrival and Burst time are as shown below **[6]**

Process	Burst Time
P_1	05
P_2	04
P_3	07
P_4	06

Calculate the Average Waiting Time and Average Turn-around Time if the processes are scheduled using SJF.

Q5) a) List the design issues for paging systems and explain any 2. **[6]**

b) Consider the following Page reference string: 8,1,3,5,3,1,4,8,5,7,1,2.

The number of page frames = 3, calculate the page faults and the hit ratio for First In First Out Page replacement algorithm. **[6]**

c) Explain the types of fragmentation and ways to reduce them. **[4]**

OR

Q6) a) Write the difference between paging and segmentation. **[6]**

b) Consider memory partitions as 100K, 500K, 200K, 300K and 600K in order. How would each of the First fit, Best fit and Worst fit algorithms place the processes of 212K, 417K, 112K and 426K are to be allocated (in order)? Which algorithm makes the most efficient use of memory. **[6]**

c) Explain need of demand paging with advantages. **[4]**

Q7) a) Explain file attributes and the file operations. **[6]**

b) Explain Linux EXT 2 file system with diagram. **[6]**

c) Explain I/O software layers. **[4]**

OR

Q8) a) Write short note on CD and DVD. **[6]**

b) Explain the directory system with diagram and directory operations. **[6]**

c) Explain the need of EXT 3 over EXT 2 file system of Linux. **[4]**

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[4758]-537

T.E. (E & TC)

DIGITAL COMMUNICATION

(2012 Course) (Semester-I) (304181) (End Semester)

Time : 2¹/₂ Hours] [*Max. Marks : 70*

Instructions to the candidates:

1) Attempt all questions.

2) Neat diagrams must be drawn wherever necessary.

3) Figures to the right indicate full marks.

4) Use of electronic pocket calculator and steam tables is allowed.

5) Assume suitable data if necessary.

Q1) a) The signal $x(t) = \cos(200\pi)t + 0.25 \cos(700\pi)t$ is sampled at the rate of 400 samples per second, waveform is then passed throught an ideal low pass filter with 200 Hz BW. Write an expression for filter output and sketch the frequency spectrum of sampled waveform. **[8]**

b) Explain ergodic process if $x(t) = A \cos(2\pi \, fct + \phi)$ is random process with ϕ as a random variable uniformly distributed over (0.2π) prove that $x(t)$ is ergodic in mean. **[6]**

c) Explain various data formats. **[6]**

OR

Q2) a) With suitable spectral diagram prove the sampling theorem and explain aliasing effect. **[6]**

b) What is digital Hierarchy used in digital communication system? Explain anyone with a neat sketch. **[6]**

c) When a WSS random process $x(t)$ is applied to input of LTI system with impulse response $h(t) = 3e^{-2t} u(t)$ find the mean value of system if $E[x(t)] = 2$ and its autocorrelation. **[8]**

Q3) a) A polar binary signal $p_i(t)$ is +1 or −1 pulse during interval [0, T]. AWGN noise with power spectral density 10^{-5} W/Hz is added to the signal. Determine the energy per bit with bit error probability of $Pe \leq 10^{-4}$ using match filter. **[8]**

b) Derive an expression of error probability of BPSK using matched filter. **[8]**

OR

P.T.O.

Q4) a) Explain likelihood ratio test in detection theory. **[8]**

   b) Explain Gram-Schmit procedure for orthogonalization. **[8]**

Q5) a) Explain GMSK and its use in wireless data transmission. **[8]**

   b) Compare following digital modulation schemes **[10]**

       i)   QPSK

       ii)   DPSK

       iii) FSK

<div align="center">OR</div>

Q6) a) Sketch the waveforms of MSK for the given bit stream 11001001. **[8]**

   b) A bandpass data transmission scheme uses PSK with bit interval 0.2m sec. The carrier amplitude at the receiver input is 1mV and PSD of AWGN is 10^{-11} watt/Hz. Calculate the probability of error of the receiver. **[10]**

Q7) a) What is PN sequence? State the properties of PN sequence with the help of 4 stage shift register. **[8]**

   b) Draw and explain FHSS. System with transmitter and receiver section. **[8]**

<div align="center">OR</div>

Q8) a) Explain in brief: **[8]**

       i)   Processing gain.

       ii)   Jamming margin.

       iii) Fast freq. hopping.

       iv) Slow freq. hopping

   b) Represent variation of the frequency of an fast hop spread spectrum system with binary FSK, having following parameters. Number of bits per MFSK symbol K = 2, Number of MFSK tones M = 2^K = 4, length of pN segment per hop K = 3, total number of frequency hops 2^K = 8 for the binary message of 0111110001001111010. **[8]**

<div align="center">●●●●●</div>

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T.E. (Electronics & Telecommunication)
ELECTROMAGNETICS AND TRANSMISSION LINES
(2012 Pattern) (304184) (Semester - I) (End Semester)

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

Instructions to the candidates:

  1) *Answers to the two sections should be written in separate answer books.*
  2) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Use of calculator is allowed.*
  6) *Assume suitable data if necessary.*

Q1) a) Derive the expression for electric field intensity $\bar{E}$ at a point 'P' due to infinite line charge with uniform line charge density 'ρ_L'. **[6]**

  b) Derive Laplace and Poisson equations for electrostatics & hence state physical significance of Laplace & Poisson equations. **[6]**

  c) A current sheet $\bar{k} = 9\bar{a}_y$ A/m is located at $z = 0$. The region 1 which is at $z < 0$ has $\mu_{r1} = 4$ and region 2 which is at $z > 0$ has $\mu_{r2} = 3$.

   Given : $\bar{H}_2 = 14.5\bar{a}_x + 8\bar{a}_z$ A $/ m$ Find $\bar{H}_1$ **[8]**

<div align="center">OR</div>

Q2) a) Derive the expression for the capacitance of spherical plate capacitor.**[6]**

  b) Derive expression for Biot & Savart law using magnetic vector potential. **[6]**

  c) $\bar{D} = \dfrac{5x^3}{2}\hat{a}x$ c/m². Prove divergence theorem for a volume of cube of side 1m. Centered at origin & edges parallel to the axis. **[8]**

Q3) a) Define displacement current and displacement current density & hence show that **[8]**

$$\nabla \times H = J_c + J_d$$

Where $J_c \rightarrow$ conduction current density

$J_d \rightarrow$ Displacement current density

b) Select values of K such that each of the following pairs of fields satisfies Maxwell's equation. **[8]**

i) $\bar{E} = (Kx - 100t)\bar{a}_y \text{ V} / m$

$\bar{H} = (x + 20t)\bar{a}_z \text{ A} / m$

$\mu = 0.25 H / m \quad \varepsilon = 0.01 F / m$

ii) $\bar{D} = 5x \, \hat{a}_x - 2y \, \hat{a}_y + Kz\hat{a}_z \, \mu c / m^2$

$\bar{B} = 2\bar{a}_y \, m\text{T}$

$\mu = \mu_0 \quad \varepsilon = \varepsilon_0$

OR

Q4) a) What is mean by uniform plane wave, obtain the wave equation travelling in free space in terms of E. **[8]**

b) Derive Maxwell's equations in differential and integral form for time varying and free space. **[8]**

Q5) a) Derive the expression for characteristic impedance (Z_0) and propagation constant (r) in terms of primary constants of transmission line. **[8]**

b) A cable has an attenuation of 3.5dB/Km and a phase constant of 0.28 rad/km. If 3V is applied to the sending end then what will be the voltage at point 10 km down the line when line is terminated with Z_0. **[8]**

OR

Q6) a) Explain the phenomenon of reflection of transmission line and hence define reflection coefficient. **[6]**

b) A transmission line cable has following primary constants. **[10]**

R = 11 Ω/km, G = 0.8 μ mho / km

L = 0.00367 H/Km C = 8.35 nF/km

At a signal of 1 kHz calculate

i) Characteristic impedance Z_0

ii) Attenuation constant (α) in Np/Km

iii) Phase constant (β) in radians / Km

iv) Wavelength (λ) in Km

v) Velocity of signal in Km/sec.

Q7) a) What is the impedance matching? Explain necessity of it, what is stub matching? Explain the single stub matching with its merits and demerits.**[9]**

b) Explain standing wave and why they generate? Derive the relation between the SWR and magnitude of reflection coefficient? **[9]**

OR

Q8) a) What do you mean by distortionless line. Derive expression for characteristic impedance and propagation constant for distortionless line. **[8]**

b) The VSWR on a lossless line is found to be '5' and successive voltage minima are 40 cm a part. The first voltage minima is observed to be 15cm from load. The length of a line is 160cm and characteristic impedance is 300 Ω. Using Smith chart find load impedance, sending end impedance. **[10]**

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2012 Course) (Semester - I) (304182) (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 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) Consider the analog signal $x_a(t)$ as $x_a(t) = 6 \cos 50\, \pi t + 3 \sin 200\, \pi t - 3 \cos 100\, \pi t$ **[5]**

 i) Determine the minimum sampling frequency.

 ii) Determine $x(n)$ at minimum sampling frequency.

 iii) Sketch the waveform and show the sampling points.

 b) Determine the transfer function and impulse response of the LTI system given by the difference equation. **[5]**

$$y(n) + \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + x(n-1)$$

OR

Q2) a) State and prove convolution property of Z transform. **[5]**

 b) Compute 4- points DFT of the sequence given by $x(n) = (-1)^n$ using DIT FFT algorithm. **[5]**

Q3) a) State four important advantages of digital signal processing over analog signal processing. **[4]**

b) For the following sequences, **[6]**

$$x_1(n) = \begin{cases} 1 & 0 \le n \le 2 \\ 0 & \text{otherwise} \end{cases}$$

$$x_2(n) = \begin{cases} 1 & 0 \le n \le 2 \\ 0 & \text{otherwise} \end{cases}$$

Compute linear convolution using circular convolution.

OR

Q4) a) Using partial fraction expansion, find inverse Z-Transform of following system function and verify it using long division method, **[5]**

$$H(Z) = \frac{1 + 2\ Z^{-1}}{1 - 0.4Z^{-1} - 0.12\ Z^{-2}} \quad \text{if } h(n) \text{ is causal.}$$

b) State and prove circular time shift property of DFT **[5]**

Q5) a) Design a butterworth digital IIR lowpass filter using bilinear transformation to satisfy following specifications: **[10]**

$$\begin{aligned} 0.6 \le |H(e^{jw})| \le 1.0 & \quad 0 \le w \le 0.35\pi \\ |H(e^{jw})| \le 0.1 & \quad 0.7\pi \le w < \pi \end{aligned} \quad . \quad \text{Use T = 0.1 seconds.}$$

b) Compare between Bilinear transformation method and impulse invariant method. **[3]**

c) Draw direct form I & direct form II realisations for the second order system given by: **[4]**

$$y(n) = 2b \cos w_0\ y(n\text{-}1) - b^2\ y(n\text{-}2) + x(n) - b \cos w_0 x(n\text{-}1)$$

OR

Q6) a) The system function of an analog filter is given by **[4]**

$$H(s) = \frac{s + 0.2}{(s + 0.2)^2 + 9}$$

Convert it to digital filter using Impulse Invariant technique. Assume T = 1 second.

b) Given $H(s) = \frac{1}{s+1}$. Apply impulse invariant method to obtain digital filter transfer function and difference equation. Assume T = 1 second. **[4]**

c) For the system given by following equation **[9]**

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2z^{-1} - 0.15z^{-2}}.$$

Draw cascade and parallel realisation.

Q7) a) Design a linear phase FIR band pass filter using hamming window with cut off frequencies 0.2 rad/sec & 0.3 rad/sec. M = 7. **[9]**

b) Explain the characteristics of window function. **[4]**

c) Distinguish between FIR and IIR filter. **[4]**

OR

Q8) a) Design a linear phase FIR lowpass filter with a cutoff frequency of 0.5 rad/sample by taking 11 samples of ideal frequency response. **[9]**

b) What is Gibb's phenomenon? How it is reduced? **[4]**

c) Show that the filter with symmetric impulse response has linear phase response. **[4]**

Q9) a) With the help of neat diagram, and waveform explain sampling rate conversion by non-integer factor. **[4]**

b) Sampling rate is to be reduced from 96kHz to 1 kHz. Highest frequency of interest is 450 Hz δ_P = 0.01, δ_S = 0.001. Design a decimator with decimating factors of 32 and 3. **[6]**

c) Write short notes on **[6]**

   i) MAC unit

   ii) Barrel shifter

OR

Q10) a) What is the role of anti aliasing filter & anti imaging filter in decimator & interpolator, respectively. **[4]**

b) Describe four important features of a digital signal processor. **[6]**

c) Explain the architecture of TMS 320C67XX digital signal processor. **[6]**

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T.E. (E & TC) (Semester - I)
MICROCONTROLLER APPLICATION

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

Instructions to the candidates :

   1)   *All questions are compulsory.*

   2)   *Neat diagrams must be drawn wherever necessary.*

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

   4)   *Use of Calculator is allowed.*

   5)   *Assume suitable data, if necessary.*

Q1) a) What are different addressing modes of 8051 Microcontroller? Explain giving example. **[6]**

    b) What is RISC Microcontroller, how it is different than CISC Microcontroller? **[6]**

    c) Explain memory mapping of PIC18F Microcontroller? **[8]**

OR

Q2) a) Explain role of microcontroller in embedded system. **[6]**

    b) Explain Interrupt Enable and Interrupt Priority register? **[6]**

    c) Draw and Explain PIC18F Microcontroller Architecture. **[8]**

Q3) a) Write a program for 1Khz 10% duty cycle PWM waveform. **[8]**

    b) Draw and Explain the interfacing of LCD with Port D and Port E of PIC18Fxxx microcontroller. Write C code to display 'WELCOME'.**[8]**

OR

Q4) a) Explain different Timer modes and their applications of PIC 18xx in detail. **[8]**

b) Draw and explain the interfacing of LCD in 8-bit mode with PIC18x microcontroller without busy flag. Write C code to display "S.P. Univ. Pune". **[8]**

Q5) a) Draw interfacing diagram and write a algorithm for DC Motor speed controller using PIC18xxx. **[10]**

b) Compare SPI and I2C protocol. **[8]**

OR

Q6) a) Darw interfacing diagram and write a program for I2C based RTC with PIC18Fxxx. **[10]**

b) Draw and Explain MSSP structure of PIC18Fxx. **[8]**

Q7) Design of DAS system for pressure monitoring system (use any suitable sensor). **[16]**

OR

Q8) Design of Digital Multimeter to display values on LCD display. **[16]**

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T.E. (E & TC)

INFORMATION THEORY AND CODING TECH.

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

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or 2, 3 or 4, 5 or 6, 7 or 8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
4) *Assume suitable data, if necessary.*

Q1) a) Design a Shannon-Fano code for a source generating 5 different messages with probabilities 0.45, 0.3, 0.15, 0.05, 0.05. Find the coding efficiency. **[7]**

    b) What are interleaved codes? Explain with suitable example. **[7]**

    c) Write the procedure for decoding a cyclic code. **[6]**

OR

Q2) a) What is Run length encoding? Explain how it is used in bitmap file formats. **[7]**

    b) What are single parity check codes? Write about the decoding performance of these codes. **[7]**

    c) What is CRC code? Explain how are they generated? **[6]**

Q3) a) Find the generator polynomial for (7, 4) BCH code. Use primitive polynomial $x^3 + x + 1$. **[10]**

    b) What are RS-codes? Write features & applications of Rs. codes. **[6]**

OR

Q4) a) The received code polynomial for a (7, 4) BCH code is $r(x) = x^6 + x^4 + x^3 + x^2$. Find the corrected codeword polynomial if single error has occured. **[8]**

    b) What are cyclic hamming codes? Give one example of cyclic hamming code. **[4]**

    c) Explain stop-and-wait ARQ. **[4]**

Q5) a) Draw state diagram for following convolutional encoder. **[6]**
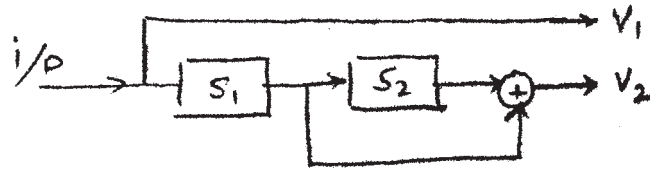
b) Explain with suitable example generator polynomial description of convolutional codes. **[8]**

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

OR

Q6) a) For the following convolutional encoder, find the coded output if input message is 10110000. **[8]**
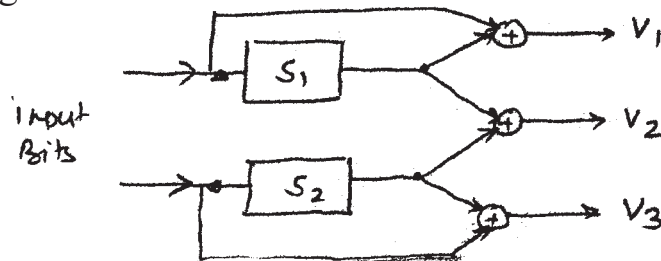
b) What is sequential decoding? Explain in brief. **[6]**

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

Q7) a) Explain how the goals of the communication system designer are conflicting. **[6]**

b) What is bandwidth efficiency plane? Explain different regions in the plane. **[6]**

c) Write Ungerboeck's TCM design rules. **[4]**

OR

Q8) a) What is error probability plane? Indicate various trade-offs on this plane. **[6]**

b) What is coding gain inTCM encoder? How it is calculated? **[6]**

c) What are typical design specifications of communication system? What techniques are used when **[4]**

   i) Power is limited

   ii) Bandwidth is limited

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T.E. (E & TC)
EMBEDDED PROCESSORS

(2012 Pattern) (End-Sem.) (Semester -II) (304191)

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

Instructions to the candidates:

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

Q1) a)   What is the function of Barrel shifter in ARM data flow model.   **[2]**

b)   What is the significance of special purpose registers r_{13}, r_{14} and r_{15}.   **[3]**

c)   Compare ARM 7, ARM 9, ARM 11.   **[5]**

OR

Q2) a)   Write a program for on chip ADC for LPC 2148.   **[6]**

b)   List the features of UARTO? Compare it with UAR 11.   **[4]**

Q3) a)   Draw and explain interfacing diagram of I2C EEPROM to LPC 2148. **[4]**

b)   Draw and explain block diagram of LPC 2148.   **[6]**

OR

Q4) a)   Draw and explain CPSR register structure of LPC 2148.   **[4]**

b)   Explain the following instructions with example.   **[6]**

i)   SWP R_0, R_1

ii)   MUL R_1, R_2, R_3

iii) LDR R_2, $[R_3]$!

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Q5) a) Draw and explain CMSIS structure of cortex series. **[8]**

b) Draw and explain interfacing diagram of 7 segment display with LPC1768. Draw flow chart. **[8]**

OR

Q6) a) Compare ARM7 with CORTEX M series. **[4]**

b) What is need of operating system in ES? Explain desired features of OS for complex embedded system design. **[6]**

c) Draw & explain with algorithm interfacing diagram for RGB LEDs with LPC 1768. **[6]**

Q7) a) What is PWM? Write a embedded C program to drive DC motor using PWM for LPC 1768. **[8]**

b) Explain the role of following registers in LPC 1768. **[8]**

    i) Direction registers

    ii) SET Registers

    iii) Clear Registers

    iv) Mask registers

OR

Q8) a) Draw and explain block diagram of LPC 1768 in detail. **[8]**

b) Draw and explain power control block of LPC 1768 and explain various power saving modes. **[8]**

Q9) a) Draw and explain clock control block of LPC 1768 in details. **[9]**

b) Explain the following blocks of LPC 1768. **[9]**

i) NVIC (Nested Vector Interrupt Controller)

ii) MPU (Memory Protection Unit)

OR

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

a) Ethernet (Features, Frame structures etc)

b) CAN Protocol (Features, Block diag, applications, etc)

c) USB (Features, frame structures, etc)

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T.E. (E & TC Engineering)
POWER ELECTRONICS
(2012 Pattern) (Semester - II)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates :

1)   *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*

2)   *Neat diagrams and wave forms must be drawn wherever necessary.*

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

4)   *Using of nonprogrammable calculator is allowed.*

5)   *Assume suitable data if necessary.*

Q1) a)   Draw two transistor analogy of SCR and derive an expression for its anode current I_A? **[7]**

   b)   Draw & explain single phase fully controlled rectifier (full converter) for R-L load with various o/p voltage waveforms. **[7]**

   c)   Single phase full bridge inverter is operated from 48V dc supply, it has a resistive load of R = 2.4 Ω. Find : **[6]**

   i)   rms o/p voltage at fundamental frequency (VO1)

   ii)   rms o/p power

   iii) rms o/p voltages at second & third harmonic (VO2 & VO3)

<div align="center">OR</div>

Q2) a)   Draw construction diagram of n-channel enhancement type MOSFET and explain its steady state characteristics. **[7]**

   b)   Draw & explain three phase half controlled bridge converter for R load with o/p voltage waveforms. **[7]**

c) Compare 120^0 mode with 180^0 mode in three phase inverter for balanced star R load. **[6]**

Q3) a) Explain operation of step up chopper with circuit diagram and derive an expression for its o/p voltage : $Vo = \dfrac{Vs}{(1-D)}$ where D is duty cycle. **[6]**

b) A DC chopper with R-L load is operated from 220V dc supply. The load parameters are R = 5 Ω , L = 7.5 mH and chopping frequency Fc = 1KHz. If peak to peak load ripple current is maximum, calculate : **[6]**

   i) Maximum instantaneous load current

   ii) Minimum instantaneous load current

   iii) Peak to peak load ripple current

   iv) Average load current

c) Explain various control strategies in DC chopper. **[6]**

OR

Q4) a) Explain operation of four quadrant chopper with circuit diagram. **[6]**

b) Explain with block schematic working of SMPS. What are its advantages over linear power supply. **[6]**

c) A single phase full wave ac vlotage controller has a resistive load of R = 10 Ω and the input voltage is Vs = 120 V(rms), 50 Hz. The delay angles of thyristors T1 and T2 are equal : $\alpha 1 = \alpha 2 = \pi/2$. Determine **[6]**

   i) the rms output voltage

   ii) the rms output current

   iii) the input PF

Q5) a) Explain with block schematic working of On-line & off-line UPS. **[8]**

b) The speed of a separately excited dc motor (armature) is controlled by a 1 - ϕ semi-converter. The field current is also controlled by a 1- ϕ semi-converter and is set to its maximum possible value. The ac supply to both armature & field converters is single phase 208V, 60Hz. The armature resistance Ra = 0.25Ω, field resistance R_f = 147Ω. The motor voltage constant Kv = 0.7032 V/A. rad/s, the armature & field currents are continuous & ripple free. If load torque T_L = 45 N-m at 1000 rpm, calculate: **[8]**

     i)   Field current I_f
     ii)   Back emf Eg

     iii)   Firing angle of converter in armature circuit

     iv)   Input power factor of armature circuit converter.

<div align="center">

OR

</div>

Q6) a) Explain voltage & frequency control method for 3- ϕ induction motor drive in detail. **[8]**

b) What are advantages of electronic ballast over conventional ballast? Explain working of electronic ballast with block schematic. **[8]**

Q7) a) What is EMI? Explain various sources & minimizing techniques of EMI. **[6]**

b) For a thyristor, Maximum junction temperature is 125^{0}C. The thermal resistances are $\emptyset_{JC}$ = 0.16, $\emptyset_{CS}$ = 0.08^{0}C/W. for heat sink temperature of 70^{0}C, calculate total average power loss in thyristor - sink combination.
     If heat sink temperature is reduced to 60^{0}C, find new total average power loss in thyristor - sink combination. **[4]**

c) Write a note on "over voltage protection" in power electronics. **[6]**

OR

Q8) a) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. **[8]**

   b) Explain SLR half bridge dc-dc converter in low frequency with suitable waveforms. **[8]**

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SEAT No. :

[Total No. of Pages : 2

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T.E. (E & TC)

INDUSTRIAL MANAGEMENT

(2012 Course) (End - Sem.) (304192)

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

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

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 theories of F.W. Taylor and Henry Fayol.   **[4]**

b)   Explain any 2 Quality Management Assistance tools with examples. **[8]**

c)   Write short note on CPM and explain following terms related to CPM.**[8]**

  i)   Earliest Start Time

  ii)   Earliest Finish Time

  iii) Latest Start Time

  iv)   Latest finish Time

OR

Q2) a)   Enlist advantages and disadvantages of Line Organization.   **[6]**

b)   Write a short note on Five S(5S).   **[6]**

c)   Explain project crashing and resource leveling in detail.   **[8]**

Q3) a)   Explain in detail challenges faced by HR professionals.   **[10]**

b)   What do mean by Human resource planning. Explain different steps of HR planning with neat block diagram.   **[8]**

OR

Q4) a)   What is HR management. Explain significance of Human Resource Management at all levels.   **[10]**

b)   Explain different roles played by HR professional.   **[8]**

Q5) a)   Explain any 4 C's of opportunity identification.   **[8]**

b)   Enlist advantages and disadvantages of any 2 types of business ownerships.   **[8]**

OR

Q6) a)   Role of an Entrepreneur in Economic Development. Explain any 8 points.   **[8]**

b)   Enlist and explain different traits of entrepreneur.   **[8]**

Q7) a)   Explain different types of B2C(Business to consumer) companies. **[10]**

b)   Write a short note on Decision support System (DSS).   **[6]**

OR

Q8) a)   Define MIS. Explain its components. Enlist any 6 advantages of MIS.**[10]**

b)   Write a short note on ERP (enterprise resource planning).   **[6]**

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T.E. (E & TC)

ANTENNA & WAVE PROPAGATION

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

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

Instructions to the candidates:

1) *Answer any one Questions out of Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Assume suitable data if necessary.*

Q1) a) What is polarization of wave? Explain the polarization of three types of wave with the help of relevant diagram? **[8]**

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

i) Ionospheric abnormalities

ii) Multihope propagation

c) A lossless resonant $\lambda/2$ dipole antenna with input impedance of 73 Ω is to be connected to a transmission line whose characteristics impedance is 50Ω. Assuming that the pattern the antenna is given approximately by $U = B o \sin^3\theta$. Find the overall maximum gain of this antenna. **[6]**

OR

Q2) a) What is poynting vector? What is its significance? Derive an expression for poynting vector? **[6]**

b) Explain antenna radiation mechanism in detail. **[6]**

c) Calculate the mean excess delay, rms delay spread, and the maximum excess delay (10dB) for the multipath profile given in the figure below. Estimate the 50% coherence bandwidth of the channel. **[8]**

figure.
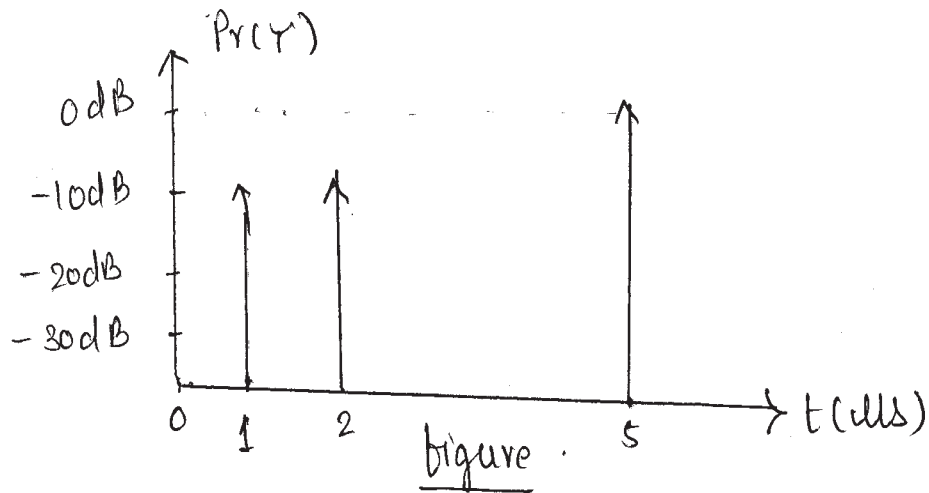
Q3) a) Derive the expression for radiation resistance of Infinitesimal Dipole. **[9]**

b) Derive the expression for radiation resistance of small dipole antenna. **[9]**

OR

Q4) a) Calculate the radiation resistance of a double turn and an eight turn small circular loop when radius of loop is $\lambda/10$ and the medium is free space. Calculate its efficiency if loss resistance is 25Ω. **[8]**

b) Derive mathematical expression for power density and radiation intensity of half wave dipole antenna and draw radiation pattern of half wave dipole antenna in E and H plane. **[10]**

Q5) a) Write a short notes on **[8]**

i) Pattern Multiplication.

ii) Binomial Array.

b) Design a broad side Dolph-Tschebhysheff array of five elements with half wavelength spacing between elements and with major to minor lobe ratio to be 19dB. Find the excitation coefficients & array factor. **[8]**

OR

Q6) a) Explain planar array. State its advantages and applications. **[6]**

b) An Endfire array with element spaced at λ/2 and with axes of elements at right angles to the line of array is required to have directivity of 36. Determine -the array length and the width of major lobe. **[5]**

c) Give the comparison of broadside and End fire antenna array. **[5]**

Q7) a) Give structure details, radiation pattern, specification and application of Super-turnstile Antenna. **[5]**

b) What is meant by Rhombic Antenna? Explain its construction and operating principle. **[5]**

c) Write a short notes on following antennas with respect to structural details, radiation pattern features and applications. **[6]**

   i) Hertz antenna

   ii) Lens Antenna

OR

Q8) a) Write short notes on the following antennas. **[12]**

   i) Whip antenna

   ii) Slot Antenna

   iii) Microstrip patch antenna

b) A paraboloidal reflector antenna with diameter 20m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.54. calculate the antenna gain in decibels. **[4]**

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T.E. (Electrical)

ADVANCE MICROCONTROLLER AND ITS APPLICATIONS

(2012 Course) (Semester - I) (303141) (End - Sem.)

Time : 2 ½ 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 side indicate full marks.*

    4)   *Use of Calculator is allowed.*

    5)   *Assume suitable data if necessary.*

Q1) a)   Compare CISC and RISC.   **[6]**

    b)   Explain any four instructions with example.   **[8]**

        i)   MOVFF

        ii)   SETF

        iii)   ADDWFC

        iv)   IORLW

        v)   BSF

        vi)   DECF

    c)   Assuming that clock pulses are fed into pin T0CKI, write a program for counter 0 in 8 bit mode to count the pulses and display the state of the TMR0L count on PORTB.   **[6]**

<div align="center">OR</div>

Q2) a)   Write a short note on oscillator modes of PIC18F458.   **[6]**

    b)   Explain CALL and RETURN instructions in PIC18.   **[7]**

    c)   State and explain SFR T0CON associated with timers. Find the value to be loaded in T0CON for following configuration.   **[7]**

    Timer 0 in 16 bit mode, prescaler of 128 and internal clock.

Q3) a) Explain the function of following pins associated with a 16×2 LCD controller RS, R/$\overline{\text{W}}$, E, DB0 - DB 7. **[8]**

b) With a neat diagram and flow chart explain the interfacing of 4×4 key pad with PIC 18 microcontroller. **[8]**

OR

Q4) a) Write a program to receive a bytes of data serially and continuously at a baud rate of 9600. Assume Crystal frequency of 10MHz. **[8]**

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

Q5) a) Explain capture mode of operation of PIC 18 and also explain SFR CCP1CON register in detail. **[8]**

b) Assume a pulse is being fed to the CCP 1 pin. Using Capture mode, write Assembly language program to measure the period of the pulse and puts the results on PORTB and PORTD. Use Timer 3 for Capture mode. **[8]**

OR

Q6) a) Create a 1.8KHz PWM frequency with 25% duty cycle on the CCP 1 pin. Assume XTAL = 10 MHz. **[8]**

b) How PWM is used for DC motor? Explain with the connection diagram and code. **[8]**

Q7) a) Explain features of on-board ADC of PIC 18F458. Write a program for it select analog channel 0, Fosc/64, right justified display result on PORT D. **[9]**

b) Explain with a flow chart flow measurement using PIC 18F458. **[9]**

OR

Q8) a) Explain interfacing of DAC with PIC 18F458. Write a program to generate triangular wave. **[9]**

b) Show interfacing of LM35 with PIC 18F458. Write a program to measure and display temperature. **[9]**

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T.E. (Electrical)
ELECTRICAL MACHINES-II
(2012 Course) (Semester-I) (End-Semester)

Time : 2¹/₂ Hours]   *[Max. Marks : 70*

Instructions to the candidates:
1) *Attempt Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume suitable data, if necessary.*

SECTION-I

Q1) a) With suitable diagrams explain Blondel's two reaction theory. **[6]**

     b) Explain parallel generator theorem. **[4]**

<div align="center">OR</div>

Q2) a) A 1200 kVA, 3300 volt, 50Hz, 3 phase, star connected alternator has armature resistance of 0.25Ω per phase. A field current of 40 Ampere produces a short circuit current of 209.95 Ampere and the same field current of 40 ampere produces an open circuit emf of 1100 volt.

        Find the voltage regulation of alternator on-

        i) Full load 0.8 lagging power factor.

        ii) Full load 0.8 leading power factor. **[8]**

     b) Draw equivalant circuit of synchronous generator and mark all parameters in it. **[2]**

Q3) a) A star connected synchronous motor is rated 10 HP 400 volt. The synchronous reactance of the motor is 10Ω per phase. The armature resistance is negligible. The motor operates at unity power factor. Find current taken by the motor and back emf. Assume motor efficiency as 85%. **[6]**

     b) Explain dark lamp method of synchronising the two alternators. **[4]**

<div align="center">OR</div>

Q4) a) Open circuit test and short circuit test is conducted on 3 phase alternator rated 6600 volt. Following observations are noted- **[8]**

Open circuit voltage (volt)	3100	5000	6600	7500	8300
Field current (ampere)	16	25	37.5	50	70

A field current of 20 Ampere produces full load current on short circuit plot occ. Calculate voltage regulation on full load at 0.8 power factor lagging. Use ampere turn (MMF) method.

b) State any four applications of synchronous motor. **[2]**

Q5) a) With suitable diagram explain speed control of slip ring induction motor by varying the rotor resistance. **[8]**

Draw speed torque characteristics for different values of rotor resistance.

b) With suitable diagram explain construction and working of parmanent magnet DC motor. **[8]**

OR

Q6) a) Explain speed control of three phase induction motor by cascade connection with suitable diagram. **[8]**

b) Explain construction and working of single phase induction type voltage regulator. **[8]**

Q7) a) Compare uncompensated AC series motor with compensated AC series motor. **[9]**

b) A 2 pole universal motor operates on AC supply drawing a current of 4.6 Ampere. It runs at 4500 rpm. It draws input power of 320 watt from supply of 100 volt. Evaluate the maximum value of flux per pole and armature reactance. Assume armature resistance of 3.6Ω. **[9]**

OR

Q8) a) Draw circle diagram of AC series motor. Mark respective voltage drop intercepts on the circle diagram. State the meaning of each intercepts. Also write how output power, efficiency is obtained from these intercepts. **[9]**

b) Explain operation of DC series motor on AC supply. State the modifications necessary to improve the performance of motor. **[9]**

Q9) a) With suitable diagram, explain construction and working of capacitor start-capacitor run motor. Draw its speed-torque characteristics. **[8]**

b) Explain construction and working of shaded pole motor with suitable diagrams. State applications of this motor. **[8]**

OR

Q10)a) A 200 watt, 230 volt, 50 Hz capacitor start motor has following winding parameters-

Main winding R = 4.5Ω, X_L = 3.7Ω

Starting winding R = 9.5Ω, X_L = 3.5Ω

Find the value of starting capacitance that will give maximum starting torque. **[8]**

b) Explain double field revolving theory for single phase induction motor with suitable diagrams. Also plot torque speed characteristics. **[8]**

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T.E. (Electrical)
POWER ELECTRONICS
(2012 Course) (End - Sem.) (Semester - I)

Time : 2½ Hours]   *[Max. Marks : 70*

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

Q1) a) What type of triggering is used in SCRs? Explain R & RC triggering.**[5]**

     b) Explain characteristics of GTO. **[5]**

OR

Q2) a) Explain over voltage & over current protections for SCR. **[5]**

     b) For 1ph full controlled bridge rectifier, calculate rectification efficiency, for Resistive load. **[5]**

Q3) a) Explain working of Triac as light dimmer switch. **[5]**

     b) What is current source converter? Explain its operation. **[5]**

OR

Q4) Explain operation of 3ph half controlled bridge converter feeding RL load. Draw output voltage waveform for $\alpha = 30°$ & write output voltage expression. **[10]**

Q5) a) Draw VI chara. of MOSFET & explain its control. **[8]**

     b) Draw step down chopper circuit & explain with expression for output voltage interms of control parameter. **[8]**

OR

Q6) a) Explain VI chara. of MCT & give applications. **[8]**

b) A step down chopper feeding load with R = 10Ω and L = 5 mH from 220V supply at 500 Hz and 30% duty. Calculate average output voltage and av. current. Find I_{max} & I_{min} if % ripple is 10%. **[8]**

Q7) a) Explain 1ph. full bridge voltage source inverter. Derive output voltage expression for RL load. Draw relevant waveforms. **[8]**

b) Explain Sinusoidal PWM Technique for Inverters. Using 5 pulses /half cycle. Comment on harmonics in output voltage. **[8]**

OR

Q8) a) Explain working of 1ph full bridge inverter generating quasisquare wave in output, across inductive load. Draw waveform & explain. **[10]**

b) Explain Multiple pulse PWM used in inverters. What is its advantage over single pulse PWM? **[6]**

Q9) a) Explain 3ph. 120º mode conduction VSI operation with control signals & output phase voltage waveforms for 3ph. resistive star connected load. **[10]**

b) Explain voltage control & harmonic elimination techniques used in inverters. **[8]**

OR

*Q10)*a) Explain cascaded Multilevel inverter using 3H- bridges connected to V input supply. Draw output voltage waveforms. **[10]**

b) Compare: **[8]**

i) Multipulse and Multi level inverters.

ii) VSI & CSI.

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T.E. (Electrical)

ELECTRICAL INSTALLATION, MAINTENANCE & TESTING

(2012 Course) (End - Sem.)

Time : 2 ½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

    1)   *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

    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)   Explain the following maintenance strategies: **[8]**

        i)   Corrective maintenance

        ii)   Predictive maintenance

    b)   Write a short note on Degree of polymerization.   **[6]**

    c)   State the Induction motor fault parameters.   **[6]**

OR

Q2) a)   What is condition based maintenance? State its advantages.   **[8]**

    b)   State the reasons for the Insulation Degradation.   **[6]**

    c)   Write a short note on Infrared Thermography in relation with condition monitoring of Induction motor.   **[6]**

Q3) a) Write a trouble shooting chart of transformer. **[8]**

b) State the various failure modes of power cables and explain any one fault diagnostic test to be conducted on power cables. **[8]**

OR

Q4) a) Explain the various abnormal condition in Induction Motor. **[8]**

b) Write a short note on testing of capacitor Bank. **[8]**

Q5) a) Differentiate between **[8]**

   i)   Feeder & Distributor

   ii)   Overhead Line & Underground line.

b) A 1Φ a.c distributor AB 300 m long is fed from end A and is loaded under **[10]**

   i)   100 A at 0.707 pf lagging 200m from pt. A.

   ii)   200 A at 0.8 pf lag 300m from pt. A.

   The load resistance and reactance of the distributor is 0.2Ω and 0.1Ω per KM. Calculate the total voltage drop in the distributor. The load pf refer to the voltage at the far end.

OR

Q6) a) Explain the general design consideration of the Distribution feeder. **[8]**

b) A two conductor cable 1Km long is required to supply a constant current of 200A throughout the year. The cost of cable including installation is Rs (20a+20)/ meter where 'a' is the area of the cross section of conductor in cm². The cost of energy is 5 paise/KWH and the interest and depreciation charges amount to 10%. Calculate the most economical conductor size. Assume resistivity of conductor material to be 1.73μΩcm. **[10]**

Q7) a) Explain the following terms with their equivalent circuit **[6]**

      i)   Touch potential

      ii)   Step potential

    b) Explain in detail the design of earthing grid of substation w.r.t IEEE standard 80-2000. **[10]**

OR

Q8) a) Write the general rules for the residential and commercial wiring work.**[6]**

    b) State the general factors that should be considered in estimation of HT or LT lines. **[10]**

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T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2012 Course) (End - Sem.) (311121)

Time : 2 ½ 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 indicates full marks.*

4) *Assume suitable data, if necessary.*

Q1) a)   Differentiate between Proprietary firm and partnership firm.   **[3]**

b)   Differentiate between Administration and Management.   **[3]**

c)   What is marketing research? State and explain methods of marketing research.   **[4]**

OR

Q2) a)   Define Management. What are the different functions of Management? State the importance of Management.   **[3]**

b)   Explain the contribution of F. W. Taylor in the field of Management.   **[3]**

c)   What is sales promotion? State its significance along with the advantages and its disadvantages.   **[4]**

Q3) a)   What are the different types of organization? Explain functional organization.   **[3]**

b)   Explain in brief following: **[4]**

i)   Pokka Yoke

ii)   Classification of technology

c) Define the concept of Financial Management. Elaborate the scope of financial management in a business organization. **[3]**

OR

Q4) a) What is Creation & Creativity. **[3]**

b) Explain in brief following: **[4]**

i) Quality circle

ii) Pareto Analysis

c) Differentiate between selling and marketing. **[3]**

Q5) a) State group dynamics theories. What are different types of conflicts?**[6]**

b) Define Motivation. Explain any five theories of motivation. **[6]**

c) Distinguish between X & Y Theory. **[4]**

OR

Q6) a) Define leadership. Describe its types. What are their importances? **[6]**

b) Define Entrepreneur. Explain the different traits of Entrepreneur. **[6]**

c) Differentiate between Team & Group. **[4]**

Q7) a) What is performance appraisal? State the objectives and types of performance Appraisal in details. **[9]**

b) What are the provisions of Labour Welfare as per Factories Act 1948?**[8]**

OR

Q8) a) Explain in brief following: **[9]**

i) HR Planning

ii) Training and Development

iii) Time Management

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

   i)   Halo effect

   ii) Professional and Business ethics

Q9) a) What is the Intellectual Property Rights (IPR)? Explain all its types. **[7]**

   b) Explain the Patent format and structure. **[7]**

   c) What is Trademark? How trademark is registered? **[3]**

<div align="center">OR</div>

Q10)a) State the Patent Laws, Trade mark and Copy Right Laws. **[9]**

   b) State the criteria for securing Patents. What are the guidelines of the common IPR policy on patents? **[8]**

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Total No. of Questions : 10]

SEAT No. :

P2392

[Total No. of Pages :2

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T.E. (Electrical)

ENERGY AUDIT AND MANAGEMENT

(2012 Course) (End - Sem.) (303150) (Semester - II)

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

Instructions to the candidates:

   1)   *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

   2)   *Neat diagrams must be drawn wherever necessary.*

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

   4)   *Use of calculator is allowed.*

   5)   *Assume Suitable data if necessary.*

Q1) a)   Explain concept of green building.   **[6]**

     b)   Explain importance of energy conservation in India.   **[4]**

OR

Q2) a)   Give salient features of Electricity Act 2003.   **[4]**

     b)   Explain responsibilities and duties of Energy Manager Under EC act - 2001.   **[6]**

Q3) a)   Differentiate SSM and DSM.   **[6]**

     b)   Explain DSM in agriculture sector.   **[4]**

OR

Q4) a)   Define energy management as per energy conservation act - 2001. Explain principles of energy management.   **[6]**

     b)   Explain features of automatic meter reading in utility energy management.   **[4]**

Q5) a)   Define energy audit as per EC act - 2001. Why energy audit is necessary? What are the types of energy audit?   **[10]**

     b)   Describe the "Sankey diagram" and its application in energy audit.   **[8]**

OR

Q6) a) Enlist and explain various instrumentation used in energy audit. **[10]**

b) Explain terms energy production relationship and specific energy consumption in detail. **[8]**

Q7) a) Explain energy conservation techniques in illumination and pumping system. **[8]**

b) What is cogeneration? Explain topping and bottoming cycles with block diagram. **[8]**

OR

Q8) a) Explain energy conservation techniques in transmission and distribution (T & D) sector of utility industries. **[8]**

b) Explain energy conservation potential in electric motors. What are the advantages of energy efficient motors. **[8]**

Q9) a) Define payback period and ROI methods used in economic analysis of energy conservation project. What are the limitations of these methods? **[8]**

b) Explain energy audit case study in Municipal corporations. **[8]**

OR

*Q10)*a) Explain time value of money concept and Net present value (NPV) method. **[8]**

b) Explain energy audit case study in educational institutes. **[8]**

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T.E. Electrical (Semester - II)

Power System - II

(2012 Pattern)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

Q1) a) A three phase 132 kV overhead line delivers 60 MVA at 132 kV and power factor 0.85 lagging at its receiving end. The constants of line are A = 0.98, α = 3° and B = 110, β = 75° ohm per phase. Find **[5]**

         i)   Sending end voltage and power angle.

         ii)   Sending end active and reactive power.

    b) Explain the advantages and drawbacks of EHVAC transmission. **[5]**

<div align="center">OR</div>

Q2) a) Explain the phenomenon of corona and state various methods to reduce it. **[5]**

    b) A 132kV three phase line has the following line constants : **[5]**

       A = 0.9 < 2.5°, B = 100 < 70° Ω, C = 0.0006 < 80° S.

       Draw the receiving end power circle for a load of 40 MW at 0.8 power factor lagging at the receiving end and determine the sending end voltage.

Q3) a) Explain the constant ignition angle control method in detail. **[5]**

    b) Find the disruptive critical voltage and visual critical voltage for local and general corona for a three phase line consisting of 21mm diameter conductors spaced in 6m delta configuration. Take temperature 25° C, pressure 73cm of mercury, surface factor 0.84, irregularity factor for local visual corona 0.72 and for general (decided) visual corona 0.82.**[5]**

Q4) a) What are the various components of HVDC system. **[5]**

b) Prove the reactive power is proportional to voltage drop (Q α Δ V) **[5]**

Q5) a) What is per unit system? Explain the advantages and applications of per unit system. **[8]**

b) Explain with flow chart Gauss Seidel method of load flow analysis. **[8]**

OR

Q6) a) Give in detail classification of bus for load flow analysis. **[8]**

b) For the given power system reactances are shown in the fig. find bus admittance matrix $[Y_{BUS}]$ **[8]**
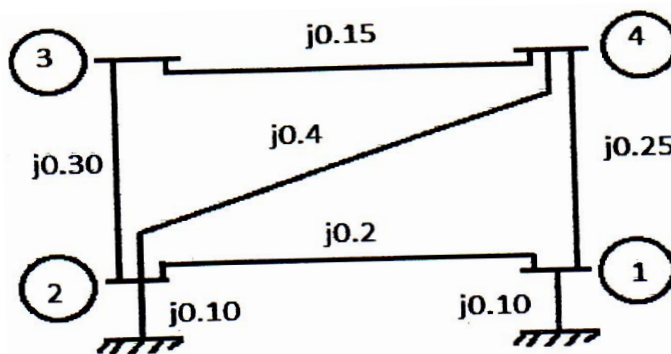
Q7) a) A one line diagram of a three phase power system is shown in fig. A three phase short circuit fault occurs at point shown in fig. Choose 13.8k V, the generator voltage as the base voltage and 25MVA as the base MVA, Find fault current at fault location. **[8]**
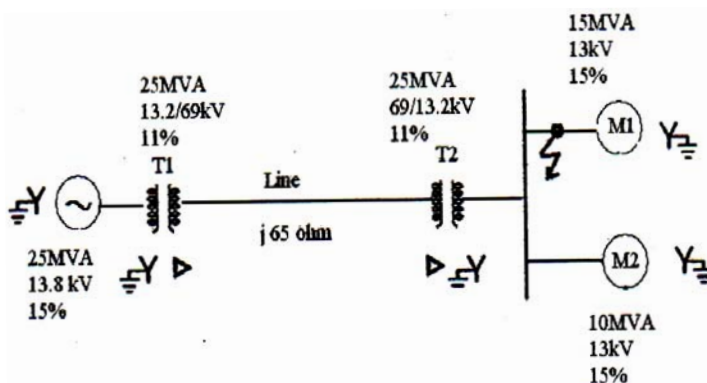
b) How the selection of circuit breaker is done in power system? What are the current limiting reactors? Explain its use in power system. **[8]**

Q8) a) Explain the concept of sub transient, transient and steady state current and impedances of unloaded alternator under symmetrical fault condition. **[8]**

b) Thr power system network shown in figure has the following equipment ratings. A three phase short circuit fault occurs on bus 1 of the network. Find fault current and fault MVA. Select Base power = 500 MVA & base voltage = 400k V on transmission line. **[8]**
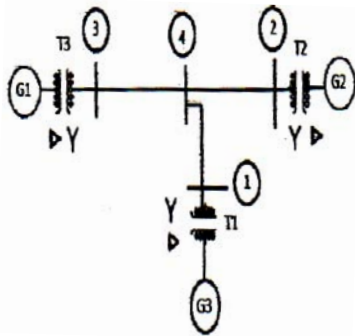
Generator G_1	500 MVA, 11 kV X" = 0.15 pu
Generator G_2	400 MVA, 11 kV, X" = 0.12 pu
Generator G_3	300 MVA, 11 kV, X" = 0.10 pu
Transformer T_1	500 MVA, 11/400 kV, star - delta, X = 0.08 pu
Transformer T_2	300 MVA, 11/400 kV, star - delta, X = 0.1 pu
Transformer T_3	300 MVA, 22/400 kV, star - delta, X = 0.1 pu
Transmission Lines	1 – 4 --- X = j 40 Ω, 2 – 4 ---- X = j 50 Ω, 3 – 4 --- X = j 30 Ω

Q9) a) A 20 MVA, 11kV, Y connected synchronous generator is no load and rated voltage. If $X_1 = X_2 = 12\%$, $X_0 = 6\%$. Estimate **[9]**

   i) Reactance X_n to limit SLG fault current, if the ratio of SLG fault current to three phase short circuit current is 1.

   ii) LLG fault current with X_n in neutral grounding circuit.

b) For the three phase transmission line with self impedances Z_s and mutual impedance Z_M, show that $Z_1=Z_2=Z_S- Z_M$ and $Z_0=Z_S+ 2 Z_M$. **[9]**

OR

Q10) a) Derive the expression for fault current in case of LLG fault considering the sequence network under this type of fault with suitable diagram. **[9]**

b) Draw zero sequence diagram for all types of combinations of transformer. **[9]**

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T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

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

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

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

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)   Explain in brief various modes of heat dissipation.   **[5]**

b)   Derive the output equation of a three phase transformer with usual notation.   **[5]**

c)   Estimate the P.U. regulation at full load & 0.8 p.f. lagging for 300KVA, 50 Hz, 6600/400v, three phase, delta-star, core type transformer. The data given as H.V. winding, - outside diameter = 0.36m, inside diameter = 0.29 m, area of conductor = 5.4 mm², L.V. winding, - outside diameter = 0.26m, inside diameter = 0.22m, area of conductor = 170 mm², length of coils = 0.5m, voltage/turn = 8v, resistivity = 0.21 ohms/m/mm². **[10]**

OR

Q2) a)   Explain the short time rating and continuous rating of Electrical Machines.   **[5]**

b)   Discuss mechanical forces developed under short circuit condition in a transformer and measures to overcome this effect.   **[5]**

c) A 200 KVA, 6600/400V, three phase transformer, delta/star connected, 50 Hz, core type transformer has the following particulars: Maximum flux density = 1.3 wb/m², current density = 2.5 A/mm², window space factor = 0.3,

Overall height = overall width and use three stepped core, stacking factor = 0.9, emf per turn = 10 volts. Width of largest stamping = 0.9d and net iron area = 0.6d². Calculate overall core dimensions. **[10]**

Q3) a) Derive output equation of a three phase induction motor with usual notation. **[6]**

b) Explain harmonic field effects on the performance of three phase induction motor. **[6]**

c) State different types of ac windings and explain any two. **[6]**

OR

Q4) a) 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. **[6]**

b) Discuss various constraints in the selection of suitable combination of stator and rotor slots. **[6]**

c) Find the main dimension of a 15kW, 3 phases, 400V, 50Hz, 2810 r.p.m. squirrel cage induction motor having an efficiency of 0.88 & a full load power factor of 0.9. Assume: specific magnetic loading = 0.5 Wb/m²; specific electric loading = 2500A/m. Take the rotor peripheral speed as approximately 20m/s at synchronous speed. **[6]**

Q5) a) Explain the factors should be considered when estimating the length of air gap of thre phase induction motor. Why the air gaps should be as small as possible? **[8]**

b) Estimate the stator core dimensions, number of stator slots and number of stator conductors per slot for a 100 KW, 3300V, 50Hz, 12 pole star connected slip ring induction motor, assume: average gap density = 0.4 wb/m², conductors per metre = 25000A/m, efficiency = 0.9, power factor = 0.9, and winding factor = 0.96, choose main dimensions to give best power factor. Slot loading should not exeed 500 ampere conductors.**[8]**

OR

Q6) a) What is unbalanced magnetic pull in a three phase induction motor and explain procedure of its estimation. **[8]**

b) A 11KW, three phase, 6 poles, 50Hz, 220V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.85. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the bar and the end ring section if the current density is 5A/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. **[8]**

b) A 80KW, 2 pole machine with sinusoidal flux distribution has the following data, axial length of core = 0.25m, stator bore = 0.52m, length of air gap = 5mm, peak magnetizing mmf per pole = 4800 A, Calculate **[8]**

   i) magnetic pull per pole when the rotor is symmetrical centered.

   ii) UMP per pole if rotor axis is displaced by 0.8mm,

   iii) ratio of UMP to useful force negleting saturation.

OR

Q8) a) Explain the procedure to calculate the no load current of a three phase induction motor. **[8]**

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 = 11 slots. **[8]**

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[4758]-554

T.E. (Electrical)

CONTROL SYSTEM -I

(2012 Course) (Semester - II) (303147) (End - Semester)

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 side indicate full marks.

   4) Use of calculator is allowed.

   5) Assume suitable data if necessary.

Q1) a) The transfer function of a system is given by **[6]**

$$T(s)= \frac{K(s+2)}{s(s+4)(s^2+2s+2)}$$

   Determine

   i) poles

   ii) zeros

   iii) Pole zero plot in s plane

   iv) Characteristic equation

   b) Write short note on synchro transmitter receiver. **[7]**

   c) Sketch the time response for standard second order under damped system, mark and explain different time domain specifications from that.**[7]**

OR

Q2) a) Define transfer function. Derive transfer function of following **[6]**
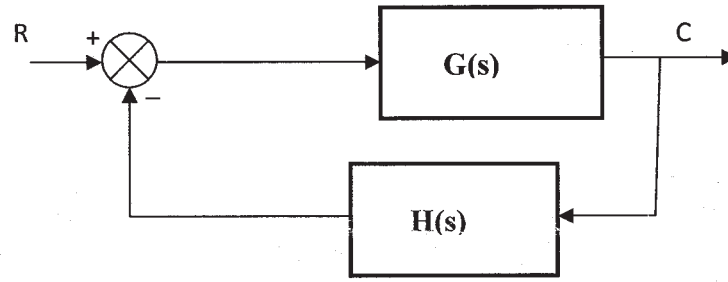
b) Determine transfer function of following electrical network. **[7]**
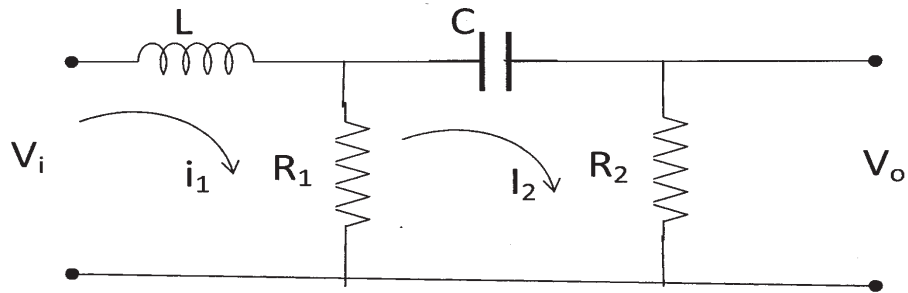
c) What is type and order of system. Explain effect of type of system on steady state error. **[7]**

Q3) a) Explain Routh Hurwitz stability criterion. **[6]**

b) Draw root locus for following system. Also find range of values of K for which system is stable. $G(s) = \dfrac{K}{s(s+3)(s^2+2s+2)}$ **[10]**

OR

Q4) a) Using Routh Hurwitz criterion for the unity feedback control system with open loop transfer function $G(s) = \dfrac{K}{s(s+1)(s+2)(s+5)}$ **[8]**

i) Find range of K for stability.

ii) Find the value of K for marginally stable and corresponding close loop poles.

b) State magnitude criterion and angle criterion for point to be on root locus. Explain any three rules for root locus. **[8]**

Q5) a) Draw bode plot for following system $G(s) = \dfrac{40}{s(s+3)(s+12)}$ Find gain margin and phase margin comment on stability. **[12]**

b) Explain Nyquist stability criterion. **[6]**

<center>OR</center>

Q6) a) Explain correlation between frequency domain and time domain. **[9]**

b) Draw nyquist plot for following open loop system $G(s) = \dfrac{50}{s(s+3)(s+6)}$ and check for stability. **[9]**

Q7) a) Explain P, PI, PID controller and their features. **[8]**

b) A feedback system which employs output rate feedback is shown. Determine the derivative feedback constant K_D which will increase the damping factor of the system to 0.6. What is the steady state error to unit ramp input. **[8]**
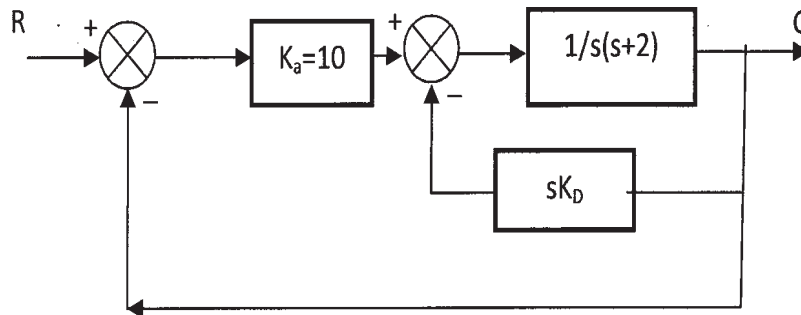
<center>OR</center>

Q8) a) Explain Ziegler Nichols method of tuning PID controller. **[8]**

b) Using Ziegler Nichols method design a PID controller for system with unity feedback and $G(s) = \dfrac{1}{s(s+1)(s+5)}$ **[8]**

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[4758]-555

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2012 Course) (Semester - II) (303148) (End - Semester)

Time :3 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) Describe the construction and working of core type induction furnace.**[6]**

   b) Explain the factors affecting quality of Electro-Deposition.   **[6]**

   c) A lamp of L is at the height of 10 meters from the horizontal plane. The point B is at the vertically down the lamp and B is away from the lamp on the same plane. Find the distance between AB if illumination at B = 0.1 of that of at A.   **[8]**

OR

Q2) a) With suitable diagram explain Dielectric heating. State application of dielectric heating.   **[6]**

   b) Explain electric circuit used in summer type Air conditioner.   **[6]**

   c) Define: **[8]**

      i) Illumination

      ii) Space height Ratio

      iii) Depreciation Factor

      iv) Reflection Factor.

P.T.O.

Q3) a) Explain advantages of Electric traction. **[8]**

b) Draw typical layout of traction substation. Label all parts and describe it in brief. **[8]**

OR

Q4) a) Write a note on following systems of track electrification: **[8]**

i) D.C System.

ii) Single phase low frequency A C system

b) State advantages of 25 kv AC system. **[8]**

Q5) a) Draw Trapezoidal speed - time curve and obtain expression for maximum velocity. **[8]**

b) A 250 tonne motor coach having four motors, each developing 5000 N-M torque during acceleration starts from rest. If up gradient is 25 in 1000, gear ratio is 5, gear transmission efficiency is 88%, wheel radius is 44 cm, train resistance is 50 N/tonne, addition of rotational inertia 10%. Calculate the time taken to reach a speed of 45 kmph. If the supply voltage were 1500 V DC and efficiency of motor 83.4%. Determine the current drawn per motor during notching period. **[8]**

OR

Q6) a) Define tractive effort. Elaborate the parts of total tractive effort with usual notations. **[8]**

b) The speed time curve of a train consists of uniform acceleration of 6 kmphps for 25 sec, free running for 10 minutes, uniform deceleration of 6 kmphps to stop the train, a stop of 5 minutes. Find the distance between stations, average speed and schedule speed. **[8]**

Q7) a) Explain suitability of D.C. series motor for traction service. **[6]**

b) Derive the expression for energy lost and efficiency for series parallel control of two DC series motors. **[6]**

c) Write a note on Anti - collosion system. **[6]**

OR

Q8) a) What is Transition? Explain shunt and bridge transition in detail. **[6]**

b) Two D.C. series motor coach have resistance of 0.1Ω each. These motors draw a current of 500 A from 600 V mains during series - parallel starting period of 20 sec. If the acceleration during starting period remains uniform, determine **[6]**

    i) Time during which the motors operate in series, parallel.

    ii) Speed at which the series connection are to be changed if the speed just after starting period is 70 kmph.

c) Explain how regenerative braking is used in electric traction. **[6]**

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T.E. (Electronics)
ELECTRICAL MACHINES & POWER DEVICES
(2012 Course) (Semester - I) (Theory) (End-Sem.) (304201)

Time :2 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 the V-I characteristics of the following.   **[6]**

   i)   Power BJT

   ii)   MOSFET

   iii)   IGBT

   b)   Draw and explain construction and operation of power BJT.   **[7]**

   c)   Explain switching characteristics of power MOSFET.   **[7]**

<div align="center">OR</div>

Q2) a)   Explain construction & operation 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)   Derive the EMF expression of a DC generator.   **[6]**

   b)   Explain the working and performance characteristics of a permanent magnet DC motor. State advantages, disadvantages and applications.**[6]**

<div align="right">***P.T.O.***</div>

c) A 230 V dc shunt motor takes 32A at full load. Find the back emf on full load if $R_a = 0.2\,\Omega$ and $R_{sh} = 1\,\Omega$ respectively. **[4]**

OR

Q4) a) Derive the expression for torque of a DC motor. **[6]**

b) Distinguish between self excited and separately excited DC generator. **[6]**

c) A 4 pole dc motor is having induced EMF 188 V across armature. Find the torque and gross mechanical power developed when the motor is drawing 25A and running at 1500 rpm. **[4]**

Q5) a) Explain the effect of slip on **[8]**

    i) Frequency

    ii) Induced EMF

    iii) Current

    iv) Power factor

    v) Reactance

    vi) Impedance

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) State various losses that occur in an induction motor. Explain how they vary with frequency, voltage and load. **[8]**

b) A 6 pole, 50Hz, 3-phase induction motor running on full load develops a useful torque of 160Nm when the rotor EMF makes 120 complete cycles per minute. Calculate the shaft power output. If the mechanical torque lost in friction and that for core loss is 10 Nm. Compute **[10]**

    i) the copper loss in the rotor winding

    ii) the input to the motor

    iii) the efficiency.

The total stator loss is given to be 800W.

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)   Explain the working principle of permanent magnet stepper motor with
          constructional diagram.   **[8]**

    b)   Explain the operation of a variable reluctance motor.   **[8]**

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[4758]-557

T.E. (Electronics)

DATA COMMUNICATION

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

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

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*

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

3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

4) *Assume suitable data, if necessary.*

Q1) a) List the factors to be considered for selection of transmission media. What are the major advantages of STP over UTP? **[7]**

b) Explain with suitable block diagram and waveforms, working principle of DPCM. **[7]**

c) Compare ARQ and FEC methods of error control. **[6]**

OR

Q2) a) A binary LBC has a generator matrix **[7]**

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Determine all its code words.

b) Describe constructional details of co-axial cable. Compare its characteristics with twisted pair cable. **[7]**

c) The fixed step delta modulator (DM) of 0.4V size is provided with input sinusoide message of 1KHz. If sampling frequency is four times the Nyquist rate, determine the maximum permissible amplitude of the message signal, if slope overload is to avoided. **[6]**

Q3) a) An information source is producing sequence of independent symbols X_1, X_2, X_3 and X_4 with probabilities $P(X_1) = 0.5$, $P(X_2) = 0.25$, $P(X_3) = P(X_4) = 0.125$. **[8]**

    i) Obtain an unambiguous binary code for the output of this source using Shannan-Fano scheme.

    ii) Compute its coding efficiency.

  b) Determine $I(X; Y)$ the mutual information of a binary symmetric channel with $p(x_0) = p(x_1) = 0.5$, $q = 0.5$. **[8]**
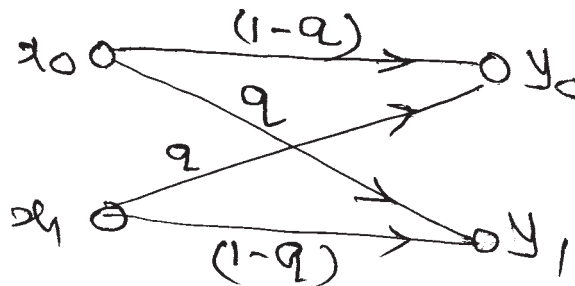
OR

Q4) a) Find the channel capacity of a BSC. Sketch channel Vs transitional probability curve. **[8]**

  b) Explain cyclic code with its properties. Why cyclic codes are well suited for error detection? **[8]**

Q5) a) Describe in detail QPSK signalling scheme. Show how is it a BW efficient scheme. **[8]**

  b) Draw the block diagram of QAM transmitter and explain its operation. **[6]**

  c) Compare the noise performance of KSK and PSK for fixed average transmitted power with same noise component. **[4]**

OR

Q6) a) Derive expression for probability of error for QPSK. **[8]**

  b) Explain any method of carrier recovery for a coherent bandpass signalling system. **[6]**

  c) What are the advantages and disadvantages of M- ary scheme. **[4]**

Q7) a) With suitable block diagram, explain working of BPSK/DS spread spectrum receiver. **[8]**

b) What are the properties of orthogonal codes. **[4]**

c) Compare throughputs of pure ALOHA and slotted ALOHA. **[4]**

OR

Q8) a) Explain CSMA /CD protocol and its efficiency considering typical local area network. **[8]**

b) Compare DS-SS and FH-SS. **[4]**

c) Assume a CSMA/CD system in which the transmission rate on the bus is 1mbps. The bus is 1km long and the propagation delay is 2 μsec/km .. packets are 1000 bits long. Obtain **[4]**

   i) A end - to -end delay e_d.

   ii) The packet duration Tp.

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T.E. (Electronics)
NETWORK SYNTHESIS
(2012 Pattern) (Semester - I) (End - Semester)

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

Instructions to the candidates:

    1)   ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***

    2)   ***Neat diagrams must be drawn wherever necessary.***

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

    4)   ***Use of electronic pocket calculator is allowed.***

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

Q1) a) Determine the range of 'k' so that, polynomial $P(s) = s^3 + 14s^2 + 56s + k$ is Hurwitz. **[6]**

    b) Synthesize the following function using Foster - II and Cauer - II form. **[6]**

$$Z(s) = \frac{s(s^2 + 9)}{(s^2 + 1)(s^2 + 16)}$$

    c) Realize the transfer function as an open circuited LC ladder network. **[8]**

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

OR

Q2) a) Explain the following basic removal operations? **[6]**

    i) Removal of a pole at $s = \infty$ from the function.

    ii) Removal of a pole at $s = 0$ from the function.

    b) An admittance function is given as: **[6]**

$$Y(s) = \frac{8s^2 + 10s}{s + 1}$$

Realize the network using Cauer - I and Cauer - II form.

c) What is constant Resistance Network? Also Synthesize the following transfer function for a constant resistance lattice with $1\,\Omega$ termination. **[8]**

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

Q3) a) State the properties of Butterworth Approximation? **[4]**

b) Find the transfer function of third order normalized low pass Butterworth filter and realize as a LC transfer impedance function terminated by $1\,\Omega$? **[8]**

c) Convert the low pass filter of Fig 1, into a band stop filter with $500\,\Omega$ impedance level, bandwidth (B.W) = 20 Krad/sec. and pass band center at $\omega_0 = 50$ Krad/sec. **[4]**
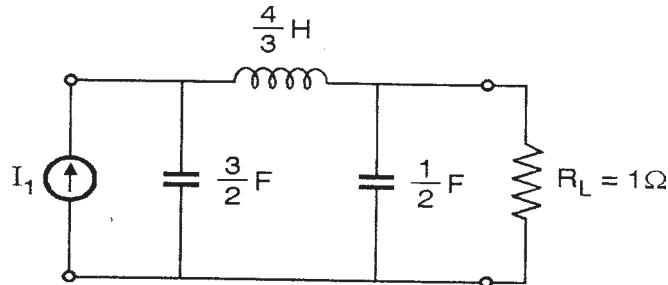
Figure 1

OR

Q4) a) Explain frequency and impedance normalization? **[5]**

b) Obtain a system function H(s) that exhibits the Chebyshev characteristics with not more than 1dB ripple in pass band and attenuation of 20dB at $\omega = 2$rad/sec. **[6]**

c) Explain in detail the properties of Chebyshev polynomials used in filter approximation? **[5]**

Q5) a) Synthesize second order low pass filter to have a pole frequency of 25 kHz and a pole Q is 10? Use Sallen and Key circuits based on positive feedback topology. **[10]**

b) What is cascade approach in active filter synthesis? Explain in brief and list the advantages of the approach? **[6]**

OR

Q6) a) Design third order low pass Butterworth filter with cut-off frequency $f_C = 2kHz$ (use positive feedback topology)? **[8]**

b) Design a second order Butterworth low pass filter having upper cut off frequency is 1.5kHz? Then using RC-CR transformation realize high pass filter with same frequency? **[8]**

Q7) a) Find the transfer impedance function $\dfrac{V_0}{I_{in}}$ for the passive RLC Circuit shown in fig. 2? Compute the sensitivities of ω_p, Q_p and K with respect to the passive elements R, L and C? **[6]**

Fig.2
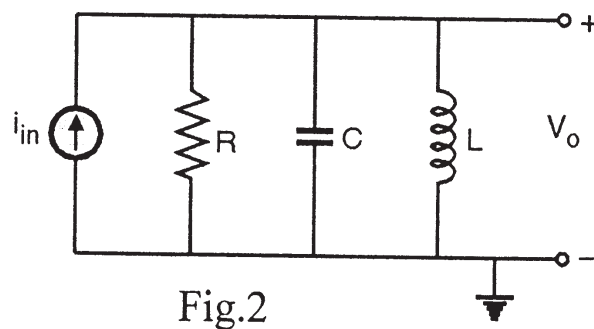
b) Explain the concept of gain sensitivity? Also explain the various factors affecting the gain sensitivity? **[6]**

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/sec, find the frequency at which the slew rate limiting occurs. **[6]**

Figure 3

OR

[4758]-558   3
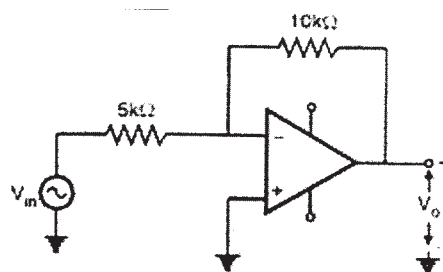
Q8) a) Define sensitivity? Why it is needed? Find sensitivity of resonating frequency of series resonating circuit with respect to the components R, L and C? **[6]**

b) Prove the following sensitivity relationships? **[4]**

i) $S_X^{\sqrt{P}} = \dfrac{1}{2} S_X^P$

ii) $S_{\sqrt{x}}^P = 2 S_X^P$

c) Discuss how the following parameters of op amp affect the filter performance? **[8]**

i) Dynamic range

ii) Slew rate

iii) Input Offset voltage

iv) CMRR

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[4758]-559

T.E. (Electronics Engineering)

MICROCONTROLLER AND APPLICATIONS

(2012 Course) (End - Semester) (304203) (Semester - I)

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

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

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 the Limitations of 8 bit microcontroller. **[4]**

b) Draw & explain the Internal RAM organization 8051 microcontroller.**[8]**

c) Explain the addressing modes of PIC 18FXXX Microcontroller with example. **[8]**

OR

Q2) a) Explain the Logic Analyzer. **[4]**

b) Explain any three addressing modes of 8051 microcontroller. **[8]**

c) Explain the memory organization of PIC 18FXX Microntroller. **[8]**

Q3) a) Draw an interfacing diagram and write an Embedded C Program to interface 16x2 LCD with PIC 18FXX Microcontroller to display the "WELCOME" message. **[8]**

b) Draw and Explain the interrupt structure for the PIC 18FXX microcontroller.. **[8]**

OR

Q4) a) Write an embedded C program to get a byte of data from port C. If it is less than 100, send it to port B otherwise send it to port D. **[8]**

b) Write a C18 program to toggle only the PORTB.4 bit continuously every 50ms. Use timer 0, 16 bit mode, the 1:4 prescaler to create the delay. Assume that XTAL = 10MHZ. **[8]**

Q5) a) Draw and explain Interfacing of RTC with PIC18FXXX? Also write embedded C Program to update date. **[8]**

b) Explain the MSSP with 12C master mode. **[8]**

OR

Q6) a) Explain the EEPROM with PIC 18FXX using SPI Protocol. **[8]**

b) Explain the MSSP with SPI mode. **[8]**

Q7) a) Explain in brief various steps involved in designing data acquisition system. **[10]**

b) Design a voltmeter to display range between 0v to 50v using internal ADC of PIC18FXXX. **[8]**

OR

Q8) a) Design frequency counter using PIC18FXXX for following specifications Frequency range Dc to 5 MHz. Design and draw interfacing circuit. Also explain required flow chart. **[12]**

b) Explain how the speed of the DC motor controlled by PWM. **[6]**

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[4758] -560

T.E. (Electronics)
ELECTROMAGNETICS & WAVE PROPAGATION
(2012 Course) (End - Sem.)

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

Instructions to the candidates:

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

Q1) a)   State & explain Coulomb's law. Write the derivation for Electric Field
Intensity.   **[4]**

   b)   Derive continuity equation for current.   **[6]**

<div align="center">OR</div>

Q2) a)   A region $y \geq 0$ consist of a dielectric medium and the region y <0 is a
conductor. For the surface of $4nc/m^2$ on the conductor and $\in r_1 = 3$ (for
the dielectric medium). Find $\bar{E}$ and $\bar{D}$ at the points.   **[6]**

   i)   M (4, –2, 1) &

   ii)   N(–3, 1,4)

   b)   Derive Boundary conditions between conductor & free space.   **[4]**

Q3) a)   Derive the equation for capacitance of spherical capacitor.   **[4]**

   b)   State Biot- Savart's law. Determine the magnetic field at any point due to
a straight filamentary conductor using Biot-Savart's law.   **[6]**

<div align="center">OR</div>

Q4) a)   Explain the concept of polarization interms of dielectrics.   **[4]**

   b)   State and prove how line integral of flux density can be converted into
surface integral.   **[6]**

Q5) a)   Explain Faraday's law with special case as 'Faraday's Disc generator'.**[8]**

b) What is poynting vector? What is it's significance? Derive an expression for poynting vector P. **[8]**

OR

Q6) a) In a material for which $\sigma = 5.0$ s/m and $\in_r = 1$, the electric field Intensity is E = 250 sin 10^{10} t V/m. Find the conduction and displacement current densities and the frequency at which both have equal magnitudes. **[8]**

b) State & explain Maxwell's equation in Point and Integral form. **[8]**

Q7) a) A plane electromagnetic wave having frequency of 10mHz has an average poynting vector of 1w/m². The medium as lossless with relative permeability of 2 & relative permitivity of '3' find **[8]**

    i) Velocity of propagation

    ii) Wavelength

    iii) Impedance of the medium

    iv) RMS electric field 'E'.

b) Define polarization & explain all types of polarization with expression. **[6]**

c) Explain effects of Earth's magnetic field on wave propagation. **[4]**

OR

Q8) a) Formulate the wave equation from Maxwell's equation. Solve it for perfectly conducting media. **[10]**

b) 'E' & 'H' waves, travelling in free space, are normally incident on the interface with a perfect dielectric with $\mu_r = 1$, $\in_r = 4$. Calculate the transmission & reflection coefficient. Also find E_t & E_r if $E_i = 1.5$ V/m. **[8]**

Q9) a) Explain the fundamental equations for the free space propagation and Friis Transmission equation. **[8]**

b) Explain Ground wave, sky wave & space wave propagation & effects of the earth's curvature on propagation. **[8]**

OR

Q10) a) Explain the characteristics of wireless channel. **[8]**

b) Explain

    i) Multi-hop propagation. **[4]**

    ii) Space-link Geometry. **[4]**

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T.E. (Electronics)
INSTRUMENTATION SYSTEMS
(2012 Course) (End-Sem.) (304209) (Semester - II)

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

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

Q1) a) Explain transit time type of ultrasonic flow meter.   **[5]**

  b) State the difference between active and passive transducers. Enlist three examples each of active and passive transducers.   **[5]**

<div align="center">OR</div>

Q2) a) Explain the different fundamental standards and units for common physical parameters.   **[5]**

  b) Explain capacitive and inductive principles used in proximity sensing.**[5]**

Q3) a) Explain the working principle of optical Pyrometer.   **[5]**

  b) Explain construction and working of electromagnetic flow sensor.   **[5]**

<div align="center">OR</div>

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,   **[5]**
    i)   Liquid is conducting
    ii) Liquid is not conducting

Q5) a) Explain with suitable block diagram LM75 semiconductor temperature sensor.   **[8]**

  b) Write short note on: **[8]**
    i)   Micro-machined hot wire anemometer.
    ii) Magnetic field sensors.

<div align="center">OR</div>

Q6) a) Explain the steps involved in surface micromachining of MEMS accelerometer. Draw a neat sketch of MEMS accelerometer. **[8]**

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

   i) I²C bus.

   ii) Foundation field bus.

OR

Q8) a) Explain with neat diagram I/P and P/I convertor. **[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: **[8]**

   i) Spring diaphragm actuator

   ii) Piston actuator

b) Explain principle of operation of stepper motor. State important selection criteria of stepper 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) Explain role of relay and solenoid valve with any one application. **[8]**

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T.E. (Electronics)
EMBEDDED PROCESSORS
(2012 Course) (End-Sem.) (Semester - II) (304211)

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

Instructions to the candidates:

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

Q1) a)   Describe complete memory map of LPC 2148.   **[4]**

     b)   Explain the PINSEL registers.   **[4]**

         i)   PINSEL0

         ii)   PINSEL 1

         iii)   PINSEL 2

         iv)   IODIR

     c)   Explain the following instruction (Any two).   **[2]**

         i)   MUL R_3, R_2, R_1

         ii)   LDR R_0, $[R_1]$

         iii)   SWPB R_2, R_1, $[R_4]$

<div align="center">OR</div>

Q2) a)   Describe CPSR and SPSR of ARM 7.   **[4]**

     b)   Draw interfacing diagram of temperature sensor (LM 35: 10mV/°C) and also write a program to display temperature on LCD.   **[6]**

Q3) a) Draw and explain interfacing of I2C EEPROM with LPC 2148. Write a embedded 'C' program for the same. **[6]**

b) Explain UART block in LPC 2148. **[4]**

OR

Q4) a) Write a embedded 'C' program for generation of square wave using on chip DAC of LPC 2148. **[6]**

b) Explain different operating modes in ARM 7. **[4]**

Q5) a) Compare cortex A, cortex R and cortex M processors. What are the improvement of ARM cortex M_3 over ARM 7. **[8]**

b) Explain CMSIS standard with structure in detail. **[6]**

c) Explain thread and handler with the help of state diagram. **[2]**

OR

Q6) a) Explain features of embedded operating system and explain need for developing complex application. **[8]**

b) Draw and explain block diagram of ARM cortex M_3. **[8]**

Q7) a) Draw interfacing diagram of RGB LED with LPC 1768 also write embedded 'C' program to generate different colours. **[6]**

b) Explain features of NVIC in LPC 1768. **[4]**

c) Describe system control block of LPC 1768. **[6]**

OR

Q8) a) Interface 7 segment display with LPC 1768 and also write embedded 'C' program to display 0 to 9. **[10]**

b) What are the different clock sources available with LPC 1768. **[6]**

Q9) Write a short note on following block in LPC 1768. (Any three).   **[18]**

    a)   Ethernet

    b)   SDCARD

    c)   USB

    d)   CAN

<div align="center">OR</div>

*Q10)*a)   Write application of CAN, Ethernet, USB with real world example.   **[4]**

    b)   Draw and explain interfacing diagram of DC motor using PWM of LPC 1768 also write embedded 'C' program for the same.   **[8]**

    c)   Draw and explain interfacing of TFT with LPC 1768.   **[6]**

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T.E. (Electronics)

POWER ELECTRONICS & APPLICATIONS

(2012 Course) (End -Semester)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Use of logarithmic tables and non programmable electronic pocket calculator is allowed.*

5) *Assume suitable data, if necessary.*

Q1) a)   Derive the expression for the average output voltage of 1φ full converter. Draw the variation of average output voltage with α. Also draw the output voltage waveforms.   **[6]**

b)   With the help of neat diagram and waveforms explain operation of 120° conduction mode of 3φ inverters for star connected balanced resistive load.   **[7]**

c)   How are choppers classified? Explain with a typical application.   **[7]**

OR

Q2) a)   Explain triggering circuit requirements for 3φ full converter.   **[6]**

b)   Explain modified sinusoidal PWM method for controlling output voltage and harmonic reduction in bridge inverter.   **[7]**

c)   State the advantages and disadvantages of SMPS over linear power supply.   **[7]**

Q3) a)   With the help of circuit diagram and waveforms, explain the operation of SLR DC-DC converter.   **[8]**

b)   Define power quality. State various power line disturbances and their sources.   **[8]**

OR

Q4) a) With the help of neat diagram and waveforms explain the operation of ZCS resonant switch DC-DC converter. **[8]**

b) What are advantages and disadvantages of resonant converters? **[8]**

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. **[10]**

OR

Q6) a) Compare offline and online UPS. **[6]**

b) Explain the operation of electronic ballast with the help of block diagram. **[6]**

c) Compare HVAC and HVDC transmission. **[6]**

Q7) a) State advantages, disadvantages and applications of PV. **[4]**

b) Explain with block diagram grid connected PV system. **[6]**

c) Distinguish between horizontal axis wind turbine generator and vertical axis wind turbine generator. **[6]**

OR

Q8) a) What is meant by MPPT? Explain in brief analog and digital methods used for MPPT. **[4]**

b) Explain with the help of neat diagram application of standalone PV system. **[6]**

c) Explain in brief isolated grid supply system with multiple wind turbines. **[6]**

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T.E. (Electronics Engineering)
INDUSTRIAL MANAGEMENT
(2012 Pattern) (Semester - II) (end - Sem.) (304213)

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

Instructions to the candidates:

1) *Attempt Q.1 or Q2, Q.3 or Q4, Q.5 or Q6, Q.7 or Q8.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Assume suitable data if necessary.*

Q1) a) What are the characteristics of management. **[6]**

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

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

i) CPM

ii) PERT

OR

Q2) a) Explain how management help in accelerating the productivity of the organization. **[7]**

b) Explain Kauzen. State the benefits of Kaizen. **[7]**

c) Explain the types of Capital. **[6]**

Q3) a) Explain the term HRM. What are the advantages of HRM? State the roles and responsibility of HR professionals. **[10]**

b) What are benefits of tanning? Explain with suitable example. **[7]**

OR

Q4) a) State the objectives of HRM. [6]

b) Explain the term "Talent Acquisition". [6]

c) Short note on Human resource Information system. [5]

Q5) a) Short note on "Woman Entrepreneurship". [6]

b) What are different types of businesses? [10]

OR

Q6) a) Explain the different sources of finance. [5]

b) What is difference between shares & debentures. [5]

c) Explain cooperative society with suitable example. [6]

Q7) a) What is DSS. Differentiate MIS & DSS. [7]

b) Write a short note on [10]

i) ERP

ii) BPR

OR

Q8) a) Explain the term MIS. What is the need of MIS. What are the objectives of MIS. [10]

b) What is e commerce. Explain the types of e commerce. [7]

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T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2012 Course) (End-Sem.) (Semester - II) (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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

4) *Assume suitable data, if necessary.*

Q1) a) An analog signal is represented as $x(t) = 5\cos(2\pi 2000t) + \cos(2\pi 5000\pi t)$ **[6]**

i) What is the Nyquist rate for the signal?

ii) Suppose, we sample this signal with a sampling frequency $F_s = 8kHz$, what is the folding frequency?

iii) Write the equation of sampled signal.

b) If the DFT of the sequence $x(n) = \{1\ 2\ 3\ 4\}$ is given by $X(k) = \{10\ -2+j2\ -2\ -2-j2\}$. What will be the DFT of time reversed sequence? **[4]**

OR

Q2) a) The analog signal is represented as

$x(t) = \sin(10\pi t) + 2\sin(20\pi t) - 2\cos(30\pi t)$ **[6]**

i) What is the Nyquist rate for this signal?

ii) If the signal is sampled with a sampling frequency of 20Hz, what is the discrete time signal obtained after sampling?

iii) What is the recovered signal?

b) Complete 4 - point DFT of the sequence $x(n) = \cos\dfrac{n\pi}{2}$ using DIF FFT algorithm. **[4]**

Q3) a) Compute the 4 - point DFT of the sequence $x(n) = \{4\ 3\ 2\ 1\}$ by linear transformation. **[4]**

b) A causal discrete time system is described by

$$y(n) - \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n).$$ **[6]**

i) Determine the system function $H(z)$.

ii) Compute the impulse response of the system.

OR

Q4) a) Find the z-transform of $x(n) = n^2 u(n)$. **[4]**

b) Compute $x_1(n) \,\text{(N)}\, x_2(n)$ if

$x_1(n) = \delta(n) + \delta(n-1) - \delta(n-2) - \delta(n-3)$

$x_2(n) = \delta(n) - \delta(n-2) + \delta(n-4)$ **[6]**

Q5) a) Design a bandpass linear phase FIR filter having cut-off frequencies of $\omega_{c_1} = 1$ rad/sample and $\omega_{c_2} = 2$ rad/sample. Use rectangular window function. **[6]**

b) Write a note on window functions. **[4]**

c) Show that symmetric FIR filter has linear phase response. **[7]**

OR

Q6) a) Using frequency sampling technique, determine the filter coefficients, length of filter is 17.

Specifications:

$$H_d(e^{j\omega}) = \begin{cases} e^{-j8\omega} & 0 \leq \omega \leq \pi/2 \\ 1 & \pi/2 \leq \omega \leq \pi \end{cases}$$ **[8]**

b) Obtain direct form I & cascade form realisation for the transfer function given by

$$H(z) = \left(1 - \frac{1}{4}z^{-1} + \frac{3}{8}z^{-2}\right)\left(1 - \frac{1}{8}z^{-1} - \frac{1}{2}z^{-2}\right)$$

[9]

Q7) a) An analog filter has the transfer function **[4]**

$$H(s) = \frac{1}{s+1}$$

Using bilinear transformation, determine the transfer function of digital filter H(z) and also write the difference equation of digital filter. Assume T= 1 sec.

b) Using bilinear transformation, design a butterworth filter which satisfies the following conditions. **[8]**

$$0.8 \leq \left|H(e^{j\omega})\right| \leq 1 \qquad 0 \leq \omega \leq 0.2\pi$$
$$\left|H(e^{j\omega})\right| \leq 0.2 \quad 0.6 \leq \omega < \pi \quad \text{Assume} T = 1 \text{sec}.$$

c) Realize the following second order system in direct form I & direct form II. **[5]**

$$y(n) = 2r\, \cos(\omega_0)\, y(n{-}1) - r^2\, y(n-2) + x(n) - r\cos(\omega_0)\, x(n{-}1)$$

OR

Q8) a) For the analog system transfer function

$$H(s) = \frac{1}{(s+1)(s+2)}, \quad \text{Assume } T = 1 \text{ second}$$

determine H(z) using impulse invariant technique. **[5]**

b) What are the effects of finite word length in digital filter IIR filters. **[5]**

c) Determine parallel realisation of the IIR digital filter transfer function **[7]**

$$H(z) = \frac{3(2z^2 + 5z + 4)}{(2z+1)(z+2)}.$$

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Q9) a) Explain the role of anti-aliasing filter in decimation. **[4]**

b) An audio signal is to be decimated by a factor of 30. Design a two stage decimator with factors 15 & 2, that satisfy the following specifications.**[6]**

Input sampling frequency f_s : 240 kHz

Highest frequency of interest : 3.4 kHz

Pass band ripple   : 0.05

Stop band ripple   : 0.01

c) Write notes on **[6]**

    i)   Multiply and Accumulate unit.

    ii)   Pipelining.

<div align="center">OR</div>

*Q10)*a) Write the help of block diagram and waveform explain sampling rate conversion by non-integer factor. **[8]**

b) Draw the architectural block diagram of TMS 320C67XX processor and explain five salient features. **[8]**

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T.E. (Instrumentation & Control)
INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS
(2012 Course) (Semester -I) (306262) (End Semester)

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, 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) Difference between Classical method and Instrumental method for chemical analysis on the basis of merits and demerits. **[6]**

b) Write a short notes on Hollow Cathode Lamp. **[4]**

OR

Q2) a) Explain Direct reading spectrophotometer with neat sketch. **[6]**

b) Write Short notes on Potentiometry. **[4]**

Q3) a) Explain with neat sketch Atomic Emission Spectroscopy. **[6]**

b) Write a Short notes on Multichannel Filter photometer. **[4]**

OR

Q4) a) Explain the principle & Working of Flame photometry with neat sketch.**[6]**

b) Classify various Instrumental methods of chemical analysis. **[4]**

Q5) a) What is chemical shift? Explain working of NMR spectrometer with neat diagram. How sensitivity can be enhanced in NMR spectrometer. **[10]**

b) Explain O_2 Analyzer With neat Sketch. **[8]**

OR

Q6) a) Derive the relationship between fluorescent power and sample concentration. **[10]**

b) Explain Spectrofluoriometer with neat sketch. **[8]**

Q7) a) Explain Magnetic depletion mass spectrometer with neat sketch. **[8]**

b) Explain Gas chromatography with neat sketch. **[8]**

OR

Q8) a) Explain Thermal conductivity detector (TCD) with sketch. **[8]**

b) Explain with neat sketch sample injection system & Chromatographic column used in GC. **[8]**

Q9) a) Explain with neat sketch Proportional counter. **[8]**

b) Explain Instrumentation for 'X-ray Spectroscopy'. **[8]**

OR

Q10) a) Explain with neat sketch Scintillation Counter. **[8]**

b) State and prove Bragg's law of X-ray diffraction. **[8]**

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T.E. (Instrumentation Engineering)
EMBEDDED SYSTEM DESIGN
(2012 Pattern)

Time : 2½ Hours]   *[Max. Marks : 70*
Instructions to the candidates:
    1) Answer any five questions.
    2) Neat diagram must be drawn wherever necessary.
    3) Figures to right indicate full marks.
    4) Assume suitable data if necessary.

Q1) a) Explain the following pins of 8051 microcontroller.   **[4]**
    i) $\overline{WR}$ ii) $\overline{RD}$
    iii) $\overline{PSEN}$ iv) $\overline{EA}$

    b) Explain the internal memory organization of 8051 microcontroller. **[6]**

OR

Q2) a) Describe the internal structure of the port pins of Port 2 for 8051 microcontroller. **[6]**

    b) What is the function of IT0 & IT1 bits in TCON register. **[4]**

Q3) a) Explain the function of TI and RI bits in SCON register. **[4]**

    b) With a neat sketch explain the interfacing of ADC0808 with 8051 μC.**[6]**

OR

Q4) a) Explain the IP (Interrupt Priority) register in 8051 microcontroller. **[4]**

    b) Explain with a neat diagram, interfacing of 16×2 LCD to 8051. **[6]**

Q5) A stepper motor is to be interfaced to 8051 microcontroller.

    a) Draw a interfacing diagram for the same. **[8]**

    b) Write a program to drive a motor continuously, in clockwise direction for 6 rotations and anti clockwise direction 6 rotations consecutively.**[8]**

Q6) a) With a neat schematic, explain the interfacing of RTC to 8051 microcontroller. **[8]**

b) With a neat diagram, explain the interfacing of Serial EEPROM with 8051 microcontroller. **[8]**

Q7) a) Enlist the architectural features of ATmega8535 microcontroller. **[10]**

b) What is a watchdog timer? Explain WDTCR ATmega8535 microcontroller. **[8]**

			WDTOE	WDE	WDP2	WDP1	WDP0

OR

Q8) a) Explain the function of watchdog timer for ATmega8535 controller with the help of suitable diagram. **[8]**

b) Explain the following instructions of AVR microcontroller : **[10]**
   i) ADD R17, R16
   ii) LD R16,Y
   iii) ST Z+,R16
   iv) SUBI R15,$10
   v) LPM

Q9) a) Explain Timer 0 operation of AVR microcontroller. **[8]**

b) Explain the role of UDR (USART Data Register) & the bits shown below of USART Control Register of AVR microcontroller. **[8]**

RXCIE	TXCIE	UDRIE	RXEN	TXEN			

OR

Q10) a) Explain in detail the TCCR1A of ATmega8535 microcontroller. **[8]**

COM1A1	COM1A0	COM1B1	COM1B0			PWM11	PWM10

b) Explain how the baud rate is defined with the help of UBRR (USART Baud Rate Register) in AVR microcontroller. **[8]**

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Total No. of Questions : 10]

P2406

SEAT No. :

[Total No. of Pages :2

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T.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2012 Course) (Semester - I) (End Semester)

Time : 2.5 Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Students have to answer 5 questions.*
2) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right side indicate full marks.*
5) *Assume suitable data if necessary.*

Q1) a) Explain in brief the application of temperature switch. **[4]**

b) With the help of a neat diagram explain pneumatic supply. **[6]**

OR

Q2) a) Explain the construction and working of Electromechanical Relay. **[5]**

b) Draw pneumatic circuit for implementing speed control of single acting cylinder. **[5]**

Q3) a) Explain any one protection circuit for motor. **[5]**

b) Explain application of selector switch and pushbutton. **[5]**

OR

Q4) a) Write the differences between a contactor and a relay. **[4]**

b) What purpose does a Quick exhaust valve serve in a pneumatic system? Explain with the help of an application. **[6]**

Q5) a) Give properties of good hydraulic oil to be used in hydraulic systems.**[8]**

b) Develop using standard symbols a hydraulic circuit for sequential operation of 2 cylinders. **[10]**

OR

P.T.O.

Q6) a) State the advantages and drawbacks of hydraulic systems. **[8]**

b) With the help of standard symbols draw hydraulic circuit for direction control of hydraulic motor. **[10]**

Q7) a) Explain the standard ISA sequences of alarm annunciator. **[8]**

b) List different types of feeders explain any one type. **[8]**

<div align="center">OR</div>

Q8) a) Explain the need of the following auxiliary components: **[8]**

    i) Circuit breaker

    ii) Damper

b) Explain the construction and working of HRC fuses. **[8]**

Q9) a) Explain applications of fluidic elements. **[8]**

b) Suggest suitable protection method for different types of hazardous areas. **[8]**

<div align="center">OR</div>

Q10) a) Explain the working of Tesla's tube and Coanda effect in fluidics. **[8]**

b) Compare any two protection methods based on safety level, maintenance, cost of installation, cost of instrument, and flexibility. **[8]**

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T.E. (Instrumentation and Control)
CONTROL SYSTEM DESIGN
(2012 Course) (Semester -I) (End-Sem.)

Time : 2 ½Hours]   *[Max. Marks : 70*

Instructions to the candidates:
    1)   *Solve Que.1 or 2, Que.3 or 4, Que .5 or 6, Que .7or 8, Que.9 or 10.*
    2)   *Neat diagrams must be drawn wherever necessary.*
    3)   *Figures to the right side indicate full marks.*
    4)   *Use of non-programmable Calculator is allowed.*
    5)   *Assume suitable data, if necessary.*

Q1) a)   An open loop transfer function of unity feedback system is   **[5]**

$$G(s)\,H(s) = \frac{K}{(s+p_1)(s+p_2)}$$

    If we add one zero in the system at $s = -z_1$ which is at left-side of $s = -p_1, -p_2$, explain its effect on the root locus and closed loop transient response of G(s) H(s).

   b)   A first order plant has a transfer function $\dfrac{y(s)}{r(s)} = \dfrac{K_p}{T_p s + 1}$

    where $y(s)$ is plant output and $r(s)$ is reference input. A proportional controller K_c is used control the $y(s)$. For step change in $r(s)$, explain the effects of the controller.   **[5]**

<div align="center">OR</div>

Q2) a)   With the help example explain the advantages and limitation of Lead compensator.   **[5]**

b) A first order plant has a transfer function $\dfrac{y(s)}{r(s)} = \dfrac{K_p}{s}$

where $y(s)$ is plant output and $r(s)$ is reference input. A proportional controller K_c is used control the $y(s)$. For step change in $r(s)$, explain the effects of the controller. **[5]**

Q3) a) Write your comments on effects of Proportional plus Integral controller for a first order plant. **[4]**

b) A first order plant has a transfer function $G_p(s) = \dfrac{3}{10s+1}$

and required closed output trajectory is $\dfrac{3}{5s+1}$

Determine the controller using direct synthesis. **[6]**

OR

Q4) a) Write your comments on effects of Proportional plus Derivative controller for a first order plant. **[4]**

b) A first order plant has a transfer function $G_p(s) = \dfrac{4}{s(s+1)}$

Design a PI controller so that closed loop poles are $s = -2.2 \pm 3i$ and $K_v = 40$. **[6]**

Q5) a) Determine the expression to convert state space model into transfer function model. **[6]**

b) Determine the state space model in observable canonical form for a

transfer function given as $G(s) = \dfrac{s+3}{(s+2)(s+4)(s+5)}$. **[10]**

OR

Q6) a) With an example explain Cayley Hamilton theorem. **[6]**

b) The state space model is [10]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -7 & -8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the transfer function model.

Q7) a) The state space model is [10]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the state transition matrix using Laplace transform method.

b) The state space model is [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the controllability and observability of the system.

OR

[4758]-569 3

Q8) Determine the output time response for the state space model given below.**[18]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$y = \begin{bmatrix} 2 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$u = 1$ for $t \geq 0$ initial condition is $x(0) = \begin{bmatrix} 2 & 0 \end{bmatrix}^{\mathrm{T}}$.

Q9) The transfer function model of the system is $\dfrac{1}{s^2 + 5s + 6}$. It is desired to place the system closed loop poles at $s_1 = -1$ and $s_2 = -2$. Determine state feedback gain matrix using Ackerman's method. **[16]**

OR

Q10) The transfer function model of the system is $\dfrac{1}{s^2 + 6s + 8}$. It is desired to place the observer poles at $s_1 = -1$ and $s_2 = -2$. Determine state observer gain matrix using Ackerman's method. **[16]**

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T.E. (Instrumentation & Control) (Semester - II)
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2012 Pattern)

Time :2½ Hours]
[Max. Marks :70

Instructions to the candidates:
1) *Solve Q 1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q1O.*
2) *Neat diagrams must be drawn whenever necessary.*
3) *Figures to right indicate full marks.*
4) *Assume suitable data, if necessary.*
5) *Use of Logarithmic table, slide rule, electronics pocket calculator and Steam table is allowed.*

Q1) Write short notes on —   **[10]**

   a)   SWOT analysis

   b)   Business expansion and diversion

OR

Q2) a)   Enlist various functions of management and explain any three of them.**[6]**

   b)   What are the norms under ISO 14000?   **[4]**

Q3) a)   What is purchasing? State its need and types.   **[5]**

   b)   Write a short note on 'lnventory Management'.   **[5]**

OR

Q4) a)   With reference to example explain supply chain concept.   **[5]**

   b)   Derive the equation for economic ordering quantity.   **[5]**

Q5) a) What is Job Description? Explain its need for HR manager. **[9]**

b) Define motivation. Explain Herzberg's motivational theory. **[9]**

OR

Q6) a) Classify the various training methods according to the personnel levels and briefly explain any three of them. **[9]**

b) What are the different skills required for 'LeadershiP'. **[9]**

Q7) a) Write a detailed note on 'Balance sheet'. **[8]**

b) What is the need and functions of money and capital market? **[8]**

OR

Q8) a) What are the different sources of finance? Briefly explain. **[8]**

b) Explain concept of budget, its objectives and types. **[8]**

Q9) a) What is the need of business and professional ethics in today's competitive market? **[8]**

b) Write a note on enterprise resource planning (ERP). **[8]**

OR

Q10) a) Write a note on IT and e-business. **[8]**

b) What is management information system? How it is advantageous to modern industries? **[8]**

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[4758] - 571

T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2012 Course) (Semester - II) (End Semester)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

    1)   *Write Five Questions.*

    2)   *Neat diagrams must be drawn wherever necessary.*

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

    4)   *Assume suitable data if necessary.*

Q1) a)   Compute the Cross correlation of the given two sequence.   **[6]**

      $X(n) = \{2, 1, 4, 1\}$ $Y(n) = \{3, 5, 7, 2\}$

  b)   Explain the various operations performed on signal.   **[4]**

<div align="center">OR</div>

Q2) a)   Find stability of the system whose impulse response $h(n) = (1/8)^n u(n)$. **[4]**

  b)   Determine & sketch the magnitude and phase response of the system **[6]**

      $Y(n) = 1/2 [x(n) + x(n–2)]$

Q3) a)   Find the Z-transform of the term $X(s) = 1/s(s+1)$.   **[4]**

  b)   Find DFT of a sequence for N = 4   **[6]**

      $X(n) = 1/2$ $0 \leq n \leq 2$

         $= 0$ otherwise

<div align="center">OR</div>

Q4) a)   Determine the Circular convolution of the given two sequence using DFT method.   **[6]**

      $X_1(n) = \{1, 2, 3, 1\}$, $X_2(n) = \{4, 3, 2, 2\}$

  b)   What is the relation between Z-transform and DFT.   **[4]**

Q5) a) Obtain the 8-point IDFT of a given sequence using DIT FFT Algorithm **[12]**

$$X(k) = \{4, 1 -j2.414, 0, 1-j0.414, 0, 1+j0.414, 0, 1+j2.414\}$$

b) What is FFT? Why FFT is needed. **[4]**

OR

Q6) a) Obtain the 8-point DFT of a given sequence using DIT FFT algorithm **[12]**

$$X(n) = \{2, 2, 1, 2, 3, 2, 1, 2\}$$

b) Sketch Signal flow graph of 4-point Decimal in Frequency (DIF) FFT Algorithm. **[4]**

Q7) Design a low pass filter with 11 coefficients for following specification Pass band frequency edge = 250 Hz, Sampling frequency = 1000Hz. Use Rectangular, Hamming and Hanning Window for Design. **[18]**

OR

Q8) a) Explain the different methods for designing FIR filter. **[6]**

b) Design a linear phase FIR filter using Hamming window for desired frequency response **[12]**

$$Hd(w) = e^{-j3w}, \quad 0 < |w| < \pi/4$$

$$0, \qquad \pi/4 < |w| < \pi \quad \text{for } N = 7$$

Q9) a) Apply Bilinear transformation to the given transfer function. **[6]**

$$H(s) = \frac{(s+0.1)}{(s+0.1)^2 + 9} \quad \text{where } Wr = \pi/4$$

b) Design a Chebyshev filter with a max pass band attenuation of 2.5 dB at $\Omega p = 20$ rad/sec & stop band attenuation of 30 dB at $\Omega s = 50$ rad/sec. **[10]**

OR

Q10)a) Compare the features of digital Butterworth and Chebyshev type - 1 filter in terms of **[6]**

    i)   Filter order

    ii)   Transition width

b) Design a Butter worth filter using Impulse invariance method for following specification. **[10]**

$$0.8 \leq \left|H(e^{jw})\right| \leq 1 \quad 0 \leq W \leq 0.2\Pi$$

$$\left|H(e^{jw})\right| \leq 0.2 \quad 0.6\Pi \leq W \leq \Pi$$

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T.E. (Instrumentation and Control Engineering)
INSTRUMENT AND SYSTEM DESIGN
(2012 Course) (Semester - II) (End-Sem.)

Time :3 Hours]

[Max. Marks : 70

Instructions to the candidates:
1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q 7 or Q8, Q9 or Q10.*
2) *Neat circuit diagrans should be drawn whenever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) Explain briefly control panel and its types. **[3]**

b) Design signal conditioning circuit for RTD with input from 0ºC to 250ºC. The output should be 0 to 2.5V. Supply voltage is 5V. Temperature coefficient of the given RTD is 0.0039 Ω/ºC. Also draw the circuit diagram. **[7]**

OR

Q2) a) With suitable waveforms explain the working of phase angle control IC 785. **[6]**

b) Explain the terms EMI and EMC. Also state the mechanisms to reduce them. **[4]**

Q3) a) What is NEMA standard? Explain Type 1, Type 2 and Type 3 standards. **[5]**

b) Explain with suitable diagram ALARM facility in IC AD 595. **[5]**

OR

Q4) a) Define and classify noise. Explain short noise and popcorn noise. **[6]**

b) Explain the functions of following pins in IC XTR 110- **[4]**

P.T.O.

i)   +Vref

ii) 16mA span

iii) Gate drive

iv) 4mA span

Q5) a)   Draw the internal diagram of IC CD4046 and explain in detail.   **[9]**

b)   What is IC MT 8870? Explain the functions of following pins in IC MT 8870-   **[9]**

i)   INH

ii) PWDN

iii) TOE

iv) OSC 2

OR

Q6) a)   Introduce the IC 7107. Enlist its features and applications. Explain the working with the help of three working phases.   **[9]**

b)   IC MCT 2E is to be used to derive a lamp which requires 10V, 100mA of current. The CTR of IC is 0.55 Design and draw the interfacing circuit.   **[9]**

Q7) a)   Give different types of soldering. Explain dip soldering with suitable figures.   **[8]**

b)   What are the board size constraints? Classify board types and briefly explain.   **[8]**

OR

Q8) a)   Give the different rules for the design of analog circuit PCBs.   **[8]**

b)   Write a note on 'Soldering metals and Soldering Flux'.   **[8]**

Q9) a) Explain the terms MTTF, MTBF and MTTR. **[6]**

b) Give the importance of documentation from repair and upgrade point of view. **[4]**

c) Give three main differences between reliability and quality. **[6]**

OR

Q10)a) Explain reliability and its modelling. **[8]**

b) With suitable example, explain bathtub curve and associated periods.**[8]**

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T.E. (Instrumentation)

UNIT OPERATIONS & POWER PLANT INSTRUMENTATION

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

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

Instructions to the candidates:

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

Q1) a)   Explain construction & working of centrifugal pump.   **[4]**

      b)   Explain in brief different mass transfer operations.   **[4]**

      c)   Explain in brief heat transfer operations.   **[2]**

OR

Q2) a)   Explain the components of shell & tube type heat exchanger.   **[5]**

      b)   Draw the neat sketch of evaporator & explain its working in brief.   **[5]**

Q3) a)   What is the difference between evaporation and drying?   **[5]**

      b)   Explain principle of nuclear power generation in brief.   **[5]**

OR

Q4) a)   With the help of neat sketch explain moderate solar power plant.   **[5]**

      b)   Explain the principle & types of Hydroelectric power plant.   **[5]**

Q5) a)   Explain air to fuel ratio control system with neat sketch.   **[8]**

      b)   Write note on boiler drum level control system.   **[9]**

OR

Q6) a) Explain BMS in detail. **[8]**

b) Explain pulverised coal protection system with neat sketch. **[9]**

Q7) a) Explain concept of excess air in detail. **[8]**

b) Explain turbine supervisory instrumentation in detail. **[9]**

OR

Q8) a) Explain steam pressure control system with neat sketch. **[8]**

b) Enlist different parameters to be monitored in turbine for its safety. Suggest suitable sensor for the same. **[9]**

Q9) a) Explain factors to be considered in site selection for thermal power plant. **[8]**

b) What is electrostatic precipitator? Why it is needed in thermal power plant? **[8]**

OR

*Q10)*a) Compare & contrast wind & nuclear power plant? **[8]**

b) Write note on pollution monitoring & control in power plant. **[8]**

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T.E. (Instrumentation & Control)
BIOMEDICAL INSTRUMENTATION
(2012Course) (Semester-II)(306271)(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.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) Draw & explain the equivalent circuit for two electrodes connected to skin for biopotential measurement. **[6]**

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

OR

Q2) a) Draw & Explain Einthoven Triangle. **[6]**

　　b) Write a short note on Micro electrodes. **[4]**

Q3) a) Explain the Plethysmography with neat diagram. **[5]**

　　b) Explain the transient protection circuit used in designing the biomedical equipments. **[5]**

OR

Q4) a) State the cause characteristics,duration & Frequency of generated heart sounds. **[5]**

　　b) Explain the ultrasonic blood flow measurement along with neat diagrm. **[5]**

Q5) a) What is EEG? State the EEG recording modes.List out the various waveforms generated during the EEG along with the frequency range,amplitude. State the significance of each waveform. **[10]**

　　b) Explain the 10-20 Electrode placement for the EEG recording. **[8]**

OR

Q6) a) What is Electromyograph? State the type of electrode used for its measurements.Explain electromyography in details. **[10]**

b) Define the following terms:

1.Efferent Nerve.

2.Afferent Nerve.

3. Biofeedback.

4.Evoked Potential. **[8]**

Q7) a) Draw & Explain the three main sections of human auditory system?Explain the Middle ear functioning. **[8]**

b) Explain the various errors in Vision & their method of correction with neat sketch.State the Functions of three layers of eyes. **[8]**

OR

Q8) a) Define a hearing Threshold.Explain the Bekesy Audiometer with neat diagram. **[8]**

b) Describe the working of Evoked Response Audiometry system with neat diagram. **[8]**

Q9) a) What is Spirogram? Draw & Explain the working of basic water sealed Spirometer for Respiration measurements. **[8]**

b) Draw & Explain the working of Nitrogen Analyzer. **[8]**

OR

*Q10)*a) What is Oxygenator?Explain the principle &working of Bubble type Oxygenator. **[8]**

b) Explain the following terms with respect to Respiration Measurements:-
1) IC, 2) VC, 3) IRV, 4) TV **[8]**

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T. E. Instrumentation & Control (END SEM)
PROCESS LOOP COMPONENTS
(2012 Pattern)

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

Instructions to the candidates:
　　i)　　*Solve Q. 1 or Q.2; Q.3 or Q.4; Q5 or Q6; Q.7 or Q.8; Q.9 or Q1O.*

　　ii)　　*Neat diagrams must be drawn wherever necessary.*

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

　　iv)　*Use of non-programmable calculator is allowed.*

　　v)　　*Assume suitable data, if necessary.*

Q1) a)　Draw the temperature control loop and define the following terms associated with the loop: **[8]**

　　　　i)　　Manipulated variable

　　　　ii)　controlled variable

　　　　iii)　Load Variable

　　b)　State the features of conventional transmitter. **[2]**

<div align="center">OR</div>

Q2) a)　Explain process characteristics in detail. **[6]**

　　b)　Draw the P & ID symbols for: **[4]**

　　　　i)　　High and Low level alarm

　　　　ii)　Pressure indicating and controller

　　　　iii)　High temperature switch

　　　　iv)　Hand operated valve

Q3) a)　Why antireset windup in necessary? Explain it with neat diagrams. **[8]**

　　b)　Give the limitations of relay based system. **[2]**

Q4) a) Explain the Proportional, Integral and derivative control mode with suitable response. **[8]**

b) In Z-N method, the critical gain was found to be 4.2 and the critical period was 2.21 min. Find the standard two mode controller settings. **[2]**

Q5) a) Explain the input and output modules of PLC with neat diagram. **[12]**

b) Develop a ladder diagram for a motor with following; **[6]**

START and STOP PB to start and stop the motor, Green light is on in running, When bearing Temperature is high motor stops and red light is on.

OR

Q6) a) Explain the following terms w.r. to Programmable Logic Controller. **[8]**

i)   Fixed and Modular PLC

ii) Timers

iii) Counters

iv) Scan cycle

b) Define Programmable Logic Controller. Develop the ladder diagram for: Flashing a LED for 10sec.and it should go off after 3 flashes. **[6]**

c) List out the different Input and Output field devices used in PLC. **[4]**

Q7) a) Explain the need of control valve. An equal % age valve has a maximum flow of 150 m^3/s and a minimum flow of 10m^3/s. If the full travel is 3cm. Find the flow at a 1cm opening. **[8]**

b) Explain the control valve accessories with neat diagrams **[8]**

i)   Positioner

ii) Reversing relay

OR

Q8) a) Draw and explain the installed and inherent valve characteritics. Draw the plug shapes for three basic charateristics. **[8]**

b) Explain the following terms w.r. to control valve: **[8]**

i) Fail safe action with suitable example

ii) Application of 03 way globe valve

Q9) a) Define valve coefficient (Cv). State its significance Find the proper valve size in inches for a pumping a liquid flow rate of 800gal/min with A maximum pressure difference of 65 psi. The liquid specific gravity is 1.5 Use following data. **[8]**

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 cavitation and flashing in detail. Draw the pressure profile diagram for the said conditions. **[8]**

OR

Q10) Write notes on: **[16]**

a) Control valve noise.

b) High temperature service valves.

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[4758] - 576

T.E. (Computer Engg.)
DATABASE MANAGEMENT SYSTEMS APPLICATIONS
(2012 Course)

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

Instructions to the candidates :

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

Q1) a) Explain R database model with suitable example.   **[5]**

b) Compare SQL and NOSQL databases.   **[5]**

OR

Q2) a) Define Transitivity dependency. Explain third normal form with suitable example.   **[5]**

b) Explain view and Index objects in SQL with example.   **[5]**

Q3) a) Explain Distinct between the terms serial schedule and serializable schedule with suitable example.   **[5]**

b) Explain MongoDB data modeling with suitable example.   **[5]**

OR

Q4) a) Describe croud-sourcing in MongoDB.   **[5]**

b) Explain different concurrency protocols in Database management systems.   **[5]**

Q5) a) Explain 3- tier web architecture with diagram for online shopping database system. **[5]**

b) Explain database administration in MongoDB. **[5]**

c) Describe Cassendra database architecture. **[7]**

OR

Q6) a) Describe advantages of Homogeneous and Heterogeneous distributed databases. **[5]**

b) Explain speedup and scale up in parallel databases in detail. **[5]**

c) Explain Database Connectivity using MongoDB with suitable Example.**[7]**

Q7) a) Consider following DTD for bid **[7]**

<?xml version= "1.0" encoding="UTF-8"?>

<!ELEMENT bids (bid_tuple*)>

<!ELEMENT bid_tuple (userid, itemno, bid, bid_date)>

<!ELEMENT userid (#PCDATA)>

<!ELEMENT itemno (#PCDATA)>

<!ELEMENT bid (#PCDATA)>

<!ELEMENT bid_date (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery.

i) List the item number and description of the item(s) that received the largest number of bids, and the number of bids it (or they) received.

ii) List item numbers and average bids for items that have received three or more bids, in descending order by average bid.

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

i) JSON

ii) Hive

OR

Q8) a) Consider following DTD for bibliography **[7]**

<!ELEMENT bib (book*)>

<!ELEMENT book (title, (author+ | editor+), publisher, price)>

<!ATTLIST book year CDATA #REQUIRED >

<!ELEMENT author (last, first)>

<!ELEMENT editor (last, first, affiliation)>

<!ELEMENT title (#PCDATA)>

<!ELEMENT last (#PCDATA)>

<!ELEMENT first (#PCDATA)>

<!ELEMENT affiliation (#PCDATA)>

<!ELEMENT publisher (#PCDATA)>

<!ELEMENT price (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

i) List books published by Addison-Wesley after 1991, including their year and title.

ii) Find pairs of books that have different titles but the same set of authors (possibly in a different order).

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

i) Map Reduce in Hadoop

ii) Cloudera

Q9) a) Explain BIS Components in detail **[5]**

b) Explain Recommendations algorithm in detial. **[5]**

c) Define Association Rule Mining. Explain Apriori Algorithm with suitable example. **[6]**

OR

Q10 a) Explain Regression analysis in data mining with suitable example. **[5]**

b) Define data Mining. Explain decision Tree classification algorithm with suitable example. **[5]**

c) Explain ETL Data Warehouse. **[6]**

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T.E. (Computer Engineering)
DATA COMMUNICATION AND WIRELESS SENSOR NETWORKS
(2012 Course) (Semester-I) (310243) (End Semester)

Time : 2 ¹/₂ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

    1)   *Questions 1, 2, 3, 4 (10 marks each). Solve either question 1 or question 2 and question 3 or question 4.*

    2)   *Question 5, 6, 7, 8 (16 marks each). Solve either question 5 or question 6 and question 7 or question 8.*

    3)   *Question 9 (18 marks).*

    4)   *Neat diagrams must be drawn wherever necessary.*

    5)   *Assume suitable data if necessary.*

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

Q1) a)   Explain Bluetooth frame format.   **[5]**

     b)   Explain various data link layer framing techniques, Apply bit stuffing on the given data string 01001111101111111011111111011.   **[5]**

<div align="center">OR</div>

Q2) a)   Why CSMA/CD is not used in Wireless Networks? How the problems are solved using CSMA/CA?   **[4]**

     b)   Draw following line codes for 1010 0000 0000 1011 0000 1011 0000 AMI, Pseudoternary, Manchester.   **[6]**

Q3) a)   A pure ALOHA network transmits 200-bit frame on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces   **[6]**

       i)   1000 frames per second

       ii)   500 frames per second

     b)   Explain Category-I type of sensor networks, list few applications of it.   **[4]**

<div align="center">OR</div>

Q4) a)   Explain typical sensing nodes architecture, how this sensing node is different from the nodes in other networks?   **[5]**

     b)   Explain various multiplexing techniques with their advantages and disadvantages. Justify now a days there is a need of TD-SCDMA and LTE-TDD technologies.   **[5]**

<div align="right">***P.T.O.***</div>

Q5) a) Explain with block diagram conceptual view of FEC techniques, also explain interleaving phase with one example. **[8]**

b) Explain S-MAC protocol for WSN in detail. **[8]**

OR

Q6) a) Why Naming and addressing is challenging in WSN, explain Content-based and geographic addressing with example. **[8]**

b) LEACH is a self organizing, adaptive clustering protocol and it distributes energy consumption at every node in the sensor network uniformly- justify. Also explain with diagram the organization of LEACH rounds. **[8]**

Q7) a) Explain flat based, hierarchical based and location based routing protocols used in WSN with at least one example each. **[8]**

b) How proactive and reactive routing protocols for ad hoc networks works? Also compare these protocols based on the way route is established, memory usage, network overhead, delay in establishing route, effect of node movement from route or link failure. **[8]**

OR

Q8) a) Explain Routing Challenges and Design Issues in WSNs, also discuss about data delivery models. **[8]**

b) What is the motivation behind designing SPIN routing protocol for WSN? Also discuss its various Deficiencies. **[8]**

Q9) Write short notes on (Any Three): **[18]**

a) The role of every sensor node in information driven sensor querying (IDSQ) method.

b) Trilateration method used to estimate the position of a sensor node.

c) Introduction to Internet of Things(IoT).

d) Comparison of TinyOS with other OS like MATE, MAGNET and MANTIS.

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T.E. (Computer Engineering)
COMPUTER FORENSIC & CYBER APPLICATIONS
(2012 Course) (Semester - I) (End - Sem.)

Time : 3Hours]   *[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 whenever necessary.

    3)   Assume suitable data if necessary.

    4)   Figures to the right indicate full marks.

Q1) a) Describe the layers of OSI model with suitable diagram. **[8]**

    b) What are the different digital investigation process models? Describe any one. **[6]**

    c) Explain how intruders make use of social engineering & reverse social engineering to achieve their motive. **[6]**

OR

Q2) a) Explain schedule selection & coordination in S-MAC. **[8]**

    b) What types of behaviors are observed in criminal motive. Describe them. **[6]**

    c) Write short note on Investigative Reconstruction in violent crime. **[6]**

Q3) a) Define cyber stalking & explain how cyber stalkers operates. **[8]**

    b) Explain the following terms with respect to Reconstruction. **[8]**

       i)   Functional Analysis.

       ii) Relational Analysis.

OR

Q4) a) Explain the following terms: **[8]**

       i)   Private Key Encryption.

       ii) Public Key Encryption.

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

       i)   File formats & carving

       ii) Digital Stratigraphy.

Q5) a) Describe NTFS File system. **[8]**

   b) Explain how to handle mobile devices as sources of evidence. **[8]**

                                    OR

Q6) a) Describe unix File system. **[8]**

   b) Explain in brief Intellectual Property Rights (IPR). **[8]**

Q7) a) Explain E-mail Forgery & Tracking in detail. **[9]**

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

      i)   Online Anonymity & self-protection.

      ii) Searching & Tracking on IRC.

                                    OR

Q8) a) How sniffer is placed & configured for preservation, collection & documentation of digital evidence at physical layer. **[9]**

   b) Explain different logs in TCP/IP related digital evidence. **[9]**

T.E. (Computer Engineering)
OPERATING SYSTEMS DESIGN
(2012 Course) (End - Sem.) (Semester - I) (310242)

Time : 2.30 Hours]

[Max. Marks :70

Instructions to the candidates:

1) *All questions are compulsory.*

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

Q1) a) Explain in short - BIOS, MBR and init( ) process. **[6]**

b) What is kernel? What facility kernel should provide? **[4]**

OR

Q2) a) What are different multithreading models? **[6]**

b) What is TLB? why it is used? **[4]**

Q3) a) Explain following algorithms of file management. **[6]**

    i)   iget   ii)   iput

b) Give the details of Uarea field. **[4]**

OR

Q4) a) Why is the principle of locality crucial to the use of virtual memory? Explain with example. **[4]**

b) If the page address stream is {2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2}, and frame size is 3. Identify the page faults occurred using FIFO, LRU. **[6]**

Q5) a) What are the problems in multiprocessor systems? provide solutions to overcome them. **[8]**

b) Explain IPC mechanisms used in System V. **[8]**

OR

Q6) a) What is process tracing? Mention its advantages and disadvantages.**[8]**

b) Explain in short - pipe, semaphore, signal and mutex. **[8]**

Q7) a) What is AWK scripting? Write an AWK script to print squares of numbers from 1 to 10. **[8]**

b) What is secure boot? State the difference between BIOS and UEFI. **[8]**

OR

Q8) a) What is grep Utility? What are the grep variations? Explain with example. **[8]**

b) What is make utility? Explain it with example. Consider your own make file. **[8]**

Q9) a) Enlist different characteristics of real time system and explain. **[6]**

b) Explain static priority-driven preemptive approach for real time scheduling. **[6]**

c) Compare Hard, soft and Firm real time systems. **[6]**

OR

Q10) a) Explain data structures used in Linux scheduling. **[6]**

b) Write short note on frame of references for handheld system. **[6]**

c) Compare Windows NTFS and ReFS file systems. **[6]**

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T.E. (Computer)
THEORY OF COMPUTATION
(2012 Course) (End-Sem.) (310241)

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

Instructions to the candidates:
   1) *Answer any five questions.*
   2) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
   3) *Figures to the right indicate full marks.*
   4) *Assume suitable data, wherever necessary.*

Q1) a) Explain Basic Machines. What are its limitations? How is Finite Automata more capable than Basic Machines? Justify with examples. **[6]**

   b) Write a CFG that generates language L denoted by,

   $(a+b)*.bbb.\ (a+b)*.$ **[4]**

OR

Q2) a) Convert the following finite automation into its equivalent regular expression using Arden's Theorem. **[6]**
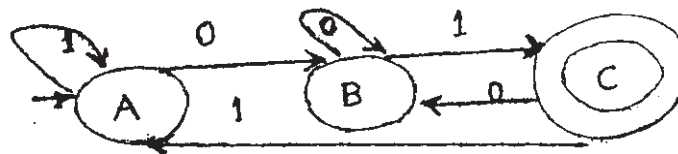
   b) If S={a,bb}, find the set of all strings in S* with string length less than or equal to 5. Also for given S, prove whether the following is true or false. $(S*)^+ = (S^+)*.$ **[4]**

Q3) a) Design Moore Machine and Mealy Machine to find one's complement of a binary number. **[6]**

b) Write the CFG for language $L = \{0^i 1^j 0^k \mid j > i + k\}$.

Show the derivation of the string '0111100'. [4]

OR

Q4) a) Define the following and give appropriate examples: [6]

i) Unrestricted Grammar

ii) CFG

iii) Derivation Graph

b) Construct FA for the regular expression: $(11)^*.010.(11)^*$. [4]

Q5) a) Design a Turing Machine to recognize an arbitrary string divisible by 4, given $\Sigma = \{0,1,2\}$. [10]

b) Design a Turing Machine that accepts a language $L = \{0^n 1^n 0^n \mid n >= 1\}$. [8]

OR

Q6) a) Construct a TM that accepts a language L, a* ba*b. [6]

b) How can Turing Machines be compared to computers? [6]

c) Prove that the halting problem in Turing Machines is undecidable. [6]

Q7) a) Construct transition table for PDA that accepts the language $L = \{a^{2n} b^n \mid n >= 1\}$. Trace your PDA for the input with $n = 3$. [10]

b) Define push down automata (PDA). What are the different types of PDA? Give the applications of PDA. [6]

OR

Q8) a) Give a grammar for the language L(M), where: [8]
$M = (\{q_0, q_1\}, \{0,1\}, \{z_0, x\}, \delta, q_0, z_0, \Phi)$.

And δ is given by:

$$\delta(q_0, 1, z_0) = (q_0, xz_0) \qquad \delta(q_0, \varepsilon, z_0) = (q_0, \varepsilon)$$

$$\delta(q_0, 1, x) = (q_0, xx) \qquad \delta(q_1, 1, x) = (q_1, \varepsilon)$$

$$\delta(q_0, 0, x) = (q_1, x) \qquad \delta(q_0, 0, z_0) = (q_0, z_0)$$

b) Construct PDA for the following regular grammar: **[8]**

S -> 0A | 1B | 0

A - > A 0 | B

B - > c| d

Q9) a) Justify that the SAT Problem is NP-complete. **[8]**

b) Explain in detail, the polynomial -time reduction approach for proving that a problem is NP- Complete. **[8]**

OR

Q10) a) Explain the Node-Cover Problem with a suitable example. **[8]**

b) Explain Tractable and In-tractable Problem. **[4]**

c) Justify whether the Traveling Salesman Problem is a class P or class NP problem. **[4]**

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[4758] - 581

T.E. (Computer)

PRINCIPLES OF CONCURRENT AND DISTRIBUTED PROGRAMMING

(2012 Course) (Semester - II) (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.5 or Q.6, Q.7 or Q.8, Q.9, or Q.10.*

   2)   *Neat diagrams must be drawn wherever necessary.*

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

   4)   *Assume suitable data if necessary.*

Q1) a)   Write and explain a typical program structure used in lex and yacc for lexical analysis and parsing. **[5]**

    b)   What is Data Flow Computer? Draw and explain data flow graph for the following instruction. **[5]**

$$A = \mathcal{G} * C + D / F$$

<p align="center">OR</p>

Q2) a)   With reference to concurrent Java, explain the following methods used for multithreading **[5]**

      i)   sleep ( )

      ii)   suspend ( )

      iii) wait ( )

      iv) notify ( )

      v)   notify All ( )

    b)   Write an algorithm for parallel quicksort. Explain with suitable example.**[5]**

Q3) a)   Write folk theorem 1.1 and 1.2 show the speedup of n processor parallel system is limited as $S <= n/\log 2^n$. **[5]**

    b)   Write a program in LISP to find the nth fibonacci number. **[5]**

<p align="center">OR</p>

Q4) Write short note on (any two): **[10]**

    a)   Concurrent yacc.

    b)   Parallelism with GPU.

    c)   Systolic Architectures.

Q5) a)   What is DCE? Explain the various components of DCE showing the interdependencies of DCE components. **[5]**

    b)   Explain the difference between Network operating system and Distributed operating system. **[5]**

    c)   Explain the important concepts that a distributed operating system design might use to improve reliability of the system. What are the main problems in matching a system highly reliable. **[7]**

<div align="center">OR</div>

Q6) a)   Explain Work station - Server model with diagram. Enlist Advantages and disadvantages of it. **[5]**

    b)   List major issues in designing distributed Operating System. Explain any two issues in detail. **[5]**

    c)   Suppose a component of a distributed system suddenly crashes. How will this event inconvenience the users when. **[7]**

        i)   The system uses the processor pod model and the crashed component is a processor in the model.

        ii)   The system uses the processor-pool model and the crashed component is a user terminal.

        iii)   The system uses the workstation-server model and the crashed component is a server machine.

Q7) a)   What is virtualization? Explain the advantages of using it. **[5]**

    b)   Differentiate between virtual machine and physical machine. **[4]**

    c)   Draw a diagram showing Xen architecture and explain the various components of it. **[7]**

<div align="center">OR</div>

Q8) a) Differentiate between para virtualization and full virtualization. **[5]**

b) List and explain methods for platform virtualization. **[4]**

c) Draw a diagram showing asymmetric XEN system stating the differences between symmetric and asymmetric virtual platform. **[7]**

Q9) a) Write a program in CUDA for vector addition. **[5]**

b) What is Warp? Explain branching and GPU utilization with respect to warp size in CUDA. **[5]**

c) Explain the task execution model in CUDA with diagram. Also explain threading on GPUs. **[7]**

OR

*Q10)*a) Explain the mobile computing principles. **[5]**

b) Describe alternative thread block layouts. Explain how to calculate X and Y thread indexes. **[5]**

c) Explain thread scheduling in GPU with hardware view. Draw a suitable diagram for scheduling cycles. **[7]**

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[4758] - 582

T.E. (Computer Engineering)
COMPUTER NETWORKS
(2012 Course) (Semester - II) (End Semester)

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

Instructions to the candidates:

1) Figures to the right indicate full marks.

2) Draw neat diagrams wherever necessary.

3) Assume suitable data, if necessary.

Q1) a)   Explain FTP in detail.   **[7]**

   b)   What is Qos. Explain Qos parameters.   **[8]**

   c)   What is significance of priority & flow label fields in Ipv6.   **[5]**

<p align="center">OR</p>

Q2) a)   Explain functionality of DHCP server, proxy server, file server, Web server.   **[8]**

   b)   Draw & explain three way handshake process of TCP.   **[4]**

   c)   Describe in short the importance & working of following commands:**[8]**

   i)   Ping

   ii)   Netstat

   iii) Traceroute

   iv)   IP config

Q3) a)   Explain WAP protocol stack.   **[8]**

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

   i)   Wirless LAN

   ii)   WML script

<p align="center">OR</p>

Q4) a) Explain all versions of 802.11 standard & compare. **[8]**

b) Explain WLAN architecture. **[8]**

Q5) a) Draw & explain VOIP network architecture. **[8]**

b) Explain VANET architecture? What are the challenges in Vehicular Network. **[8]**

OR

Q6) a) What is DTN? Explain different layers of DTN. **[8]**

b) Explain advantages & disadvantages of VOIP over traditional telephone network. **[8]**

Q7) a) Explain ATM architecture. **[8]**

b) Write short note on: (any 2). **[10]**

   i) Components of optical network

   ii) GMPLS

   iii) SDN

OR

Q8) a) What is virtualization? Explain its type. **[8]**

b) Explain SONET frame structure. **[6]**

c) What are different client layers of optical fiber. **[4]**

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T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Course) (Semester - II) (310250) (End-Sem.)

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, 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) With the help of a diagram explain the classification of real-time scheduling methods. **[6]**

b) Explain role of barrel shifter in the ARM. **[4]**

OR

Q2) a) Explain how does user space applications communicates with the hardware? **[4]**

b) Write an ARM assembly program to find value of expression $3X + 6Y + 9Z$, where $X = 4$, $Y = 5$, $Z = 3$. **[6]**

Q3) a) Write short notes on (any two): **[6]**

i) LSB

ii) OSDL

iii) Kernel command line processing.

b) Why Embedded Linux is popular as OS for embedded system development? **[4]**

OR

Q4) a) What are the steps involved in 'subsystem initialization'. **[4]**

b) Explain the steps involved in initialization flow of control on embedded Linux. **[6]**

Q5) a) Explain the role of bootloader in embedded systems. **[4]**

b) Give the general steps involved in PCI discovery process and probe function. **[7]**

c) Enlist device driver module utilities and explain the use of same. **[6]**

OR

Q6) a) What are the challenges for bootloader in embedded system? **[7]**

b) Explain the JFFS2 file system. **[5]**

c) Explain about U-boot configurable commands. **[5]**

Q7) a) Explain the tracing and profiling tools used in embedded application development. **[6]**

b) Write short note on (any two): **[6]**

i) GStreamer Media framework.

ii) OpenGLES.

iii) ssh

c) How to debug the kernel using 'printk'? **[5]**

OR

Q8) a) Draw & explain KGDB setup for kernel debugging. **[5]**

b) Write short note on (any two): **[6]**

i) DDD

ii) EGL

iii) Open GL

c) Explain the working of stepper motor? State any two applications of stepper motor in embedded systems. **[6]**

Q9) a) Give the latency components in Linux with neat diagram. **[8]**

b) Explain in detail, development process of Android applications. **[8]**

OR

Q10) a) What policies are used by Linux to schedule a real time task? **[8]**

b) Write short notes on (any two): **[8]**

    i) Dalvik VM

    ii) Zygote

    iii) Activity Manager

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T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING APPLICATIONS
(2012 Pattern) (310253) (Semester - II) (End - Sem.)

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

Instructions to the candidates:

1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Assume suitable data if necessary.*

Q1) a) Define two standard signals $u(n)$ and $\delta(n)$. Show that $u(n) = \sum_{k=0}^{\infty} \delta(n-k)$ by means of convolution operation. **[5]**

b) State Periodicity and Symmetry property of DFT. How can we compute N point Circular Convolution using DFT and IDFT? **[5]**

OR

Q2) a) Perform following circular shifting operations on a given DT signal **[5]** $x(n) = \{1, 2, 3, 4\}$ with N = 5 and N = 6

i) $x((n-3))N$

ii) $x((n+2))N$

b) Discuss the form of an Nth order difference equation used to describe a DT system. How can it be expressed as an FIR and IIR system? **[5]**

Q3) a) Derive the first stage of DIT FFT algorithm. How the computational efficiency is improved in FFT algorithm? **[5]**

b) Obtain the Z Transform of sequence $x(n) = a^n u(-n-1)$ and sketch the ROC. **[5]**

OR

Q4) a) How can we compute Linear Convolution using N point Circular Convolution? **[5]**

b) Define system function H(Z). Obtain it from the Nth order difference equation and express it for All Pole and All Zero System. **[5]**

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) A DT System described by means of system function H(Z) is given by- **[9]**

$$H(Z) = 3 + \frac{4Z}{Z - 1/2} - \frac{2}{Z - 1/4}$$

Obtain and Draw Direct Form - I and Direct Form - II IIR filter structure.

OR

Q6) a) Obtain and realize Linear Phase FIR filter structure for a DT system. **[9]**

$$H(Z) = \left(1 + \frac{1}{2}Z^{-1} + Z^{-2}\right)\left(1 + \frac{1}{4}Z^{-1} + Z^{-2}\right)$$

What are the advantages of this filter structure?

b) Derive the Direct Form - II IIR filter structure from system function H(Z) and represent it using multipliers, adders and delay elements. **[9]**

Q7) a) Draw the block diagram of basic DSP processor. What are the common features of DSP processor? **[8]**

b) Explain how SHARC DSP processor supports the multiprocessing capabilities. Give details about different types of ports used for multiprocessing. **[8]**

OR

Q8) a) What is OMAP? Explain the Hardware architecture of OMAP in brief. **[8]**

b) Compare between Harvard and Super Harvard Architecture of DSP Processor. List the number of DAGs and supporting memory pointer registers of SHARC DSP Processor. **[8]**

Q9) a) Explain the following terms associated with audio processing: **[8]**

i)   Timbre

ii) Loudness

iii) Pitch

b) What is image enhancement in digital image processing? Explain any two gray level transforms used for image enhancement. **[8]**

OR

Q10) a) What do you mean by Speech Synthesis and Recognition? Draw and explain Human Speech Model in brief. **[8]**

b) Explain the operation of CCD (Charge Coupled Device) used in electronic cameras. **[8]**

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[4758]-585

T.E. (Computer Engineering)
SOFTWARE ENGINEERING
(2012 Course) (Semester - II) (End - Sem.) (310252)

Time : 3 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.*
4) *All questions are compulsory.*

Q1) Discuss the differences between the agile development and clean room approaches in use today? **[7]**

OR

Q2) What is Software process framework? Explain in detail. **[7]**

Q3) What do you mean by CRC? Write the steps for identifying analysis classes using CRC modeling. **[7]**

OR

Q4) What tasks are to be carried out in software requirement engineering? Explain in detail. **[7]**

Q5) What do you understand by refactoring? Give the importance of refactoring in improving quality of software. **[6]**

OR

Q6) What do you mean by Archetypes? Explain various types of Archetypes. **[6]**

Q7) a) What are the main objective of basis path testing? Explain in detail. **[9]**

b) Differentiate between:- **[8]**

i) Black box & white box Testing

ii) Regression & Smoke Testing

OR

Q8) a) What do you understand by system testing? What are the different kinds of system testing that are usually performed on large software products?**[9]**

b) What is the difference between test stub and driver? What are the problems associated with Top down approach of testing? **[8]**

Q9) a) Explain in detail software process and project metrics. **[9]**

b) Explain the role of people, product and process in project management.**[8]**

OR

Q10)a) What is project decomposition? What are the work task for communication process using process decomposition. **[9]**

b) Explain Principles of Risk management in detail. **[8]**

Q11)a) What is the concept of Software Reliability? Explain different measures of software reliability and availability. **[8]**

b) What are different elements of distributed systems? Explain in detail.**[8]**

OR

Q12)a) Explain the concept of aspect oriented software engineering in detail.**[8]**

b) What is software Quality? What are the mechanism to address Quality Software? **[8]**

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[4758] - 586

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2012 Course) (End Semester) (Semester - I) (309341)

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)   Solve the following system of equations using gauss elimination method   **[5]**

$$2x + y + z = 10$$

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

$$x + 4y + 9z = 16$$

    b)   Apply Newton Raphson method to find a root of the equation $x^4 - x - 10 = 0$ correct up to four decimal places. Do two iterations only.   **[5]**

<div align="center">OR</div>

Q2) a)   Solve the following equations by gauss seidal method. (upto 2 iterations only)   **[5]**

$$4x + y + z = 5$$

$$x + 6y + 2z = 19$$

$$-x - 2y + 5z = 10$$

<div align="right">*P.T.O.*</div>

b) Solve the following equations using Thomas Algorithm. **[5]**

$x + 2y = 3$

$2x + 3y + z = 4$

$2y - z = 1$

Q3) a) Evaluate $\log_e 7$ (logarithm of 7 to base e) by Simpson's 1/3rd rule. **[5]**

b) Find the integration of $(4x + 2)$ in the limits 1 to 4 by Trapezoidal rule using six steps. **[5]**

OR

Q4) a) Using Lagrange's formula, find a unique polynomial P(x) of degree 2 or less such that $P(1) = 1$, $P(3) = 27$, $P(4) = 64$ and hence evaluate P(1.5).**[5]**

b) Prepare a Newton's backward difference table and hence calculate $y(2.2)$ for the following set of data. **[5]**

x	−2	−1	0	1	2	3
y	8	−3	0	−3	8	45

Q5) a) Solve the following differential equation using modified Euler's method for the given boundary condition $\frac{dy}{dx} = \sqrt{x + y}$, $y(0) = 0.36$ find $y(0.2)$ upto accuracy of 0.001. **[8]**

b) Use Taylor's series method, for the equation $\frac{dy}{dx} = 2y + 3e^x$ and $y(1) = 0$, to find the value of y at $x = 0.3$. Take step size $= 0.1$. **[8]**

OR

Q6) a) Using Euler's method solve the following differential equation $\frac{dy}{dx} = x + 2y$ for the given boundary condition that at $x = 1$, $y = 1$ find y at $x = 1.4$. Take step size $h = 0.1$. **[8]**

b) Using Runge-Kutta 4th order method solve $\frac{dy}{dx} - y = 0$. Given $y(0) = 2$, $h = 0.1$. Find y at $x = 0.2$. **[8]**

Q7) Using the finite difference method solve the boundary value problem

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 1 \text{ with } y(1) = 0, y(1.4) = 0.0566. \text{ Find } y(1.1), y(1.2), y(1.3). \textbf{[16]}$$

OR

Q8) Solve $\frac{\partial u}{\partial t} = \frac{\delta^2 u}{\delta x^2}$, for the following condition using crank-Nicolson method.

At $x = 0$ and $x = 3$, $u = 0$ for all values of t.

At $t = 0$, $u = x^2$ for $0 < x < 3$.

Take increment in x as 1 and increment in t as 0.1. Find all values of u for $t = 0$ to $t = 0.3$. **[16]**

Q9) Suppose that a gas processing plant receives a fixed amount of raw gas each week. The raw gas is processed into two grades of heating gas, regular and premium quality. These grades of gas are in high demand and yield different profit to the company. However there production involves both time and on-site constraints. For example only one grade can be produced at a time and the facility is open for only 80 hrs/week. Further there is limited on site storage for each of the products . All factors are listed below. Find optimal solution to maximize profit. **[18]**

Resource	Products		Resource Availability
	Regular	Premium	
Raw gas	7m³/tonne	11m³/tonne	77m³/week
Production time	10 hr/tonne	8 hr/tonne	80 hr/week
Storage	9 tonnes	6 tonnes	
Profit	150/tonne	175/tonne	

OR

Q10) a) Explain numerical methods for optimizing a function of one variable?**[10]**

b) What is the optimal solution & what are the six steps of optimization?**[8]**

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[4758]-587

T.E. (Chemical Engineering)
CHEMICAL ENGINEERING THERMODYNAMICS-II
(2012 Course) (Semester-I) (End-Semester)

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

Instructions to the candidates:

1) *Answer five questions.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicates full marks.*
4) *Use of logarithmic tables, slide rule, Mollier Charts, Electronic pocket calculator and steam table is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) For the binary system shows that any thermodynamic solution property is related with its component partial molar property **[6]**

$$\overline{M1} = M + x1\frac{dm}{dx1}$$

$$\overline{M2} = M - x1\frac{dm}{dx1}$$

b) Define and derive the equation for property changes of mixing. Write the equations for change of mixing in case of Gibbs energy, entropy, molar volume and enthalpy. **[4]**

OR

Q2) a) Derive the equation for modified Raoult's law in the case of vapor liquid equilibrium. **[4]**

b) The data for methyl ethyl ketone (1) /toluene(2) at 50°C is given as below. Calculate $\ln\gamma_1$, $\ln\gamma_2$ and G^E/RT **[6]**

P(N/m²)	12.30	15.51	18.61	21.63	24.01	25.92	29.96	30.12	31.75	34.15	36.09
x_1	0.00	0.09	0.20	0.32	0.42	0.51	0.61	0.71	0.79	0.91	1.00
y_1	0.00	0.27	0.46	0.59	0.68	0.74	0.80	0.86	0.90	0.96	1.00

Q3) a) Determine the fugacity coefficients for nitrogen and methane in a $N_2(1)/$ $CH_4(2)$ mixture at 200 k and 30 bar if the mixture contains 40 mole % N_2. Experimental virial-coefficient data are as follows: **[4]**

$B_{11} = -35.2$, $\qquad$ $B_{22} = -105.0$, $\qquad$ $B_{12} = -59.8$ cm³/mol

b) For the system methanol(1)/Methyl Acetate (2) the following equations provide a reasonable correlations for the activity coefficients: **[6]**

$\ln\gamma_1 = Ax_2^2$, $\ln\gamma_2 = Ax_1^2$, where, $A = 2.7771 - 0.00523T$

The Antoine equations are

$\ln P_1^{sat} = 16.59158 - [3643.31/(T-33.424)]$

$\ln P_2^{sat} = 14.25326 - [2665.54/(T-53.424)]$

where T is in K and the vapor pressures are in kPa. Assuming the validity of Raoult's law.

Calculate, P and y_i, for t/T = 45°C/318.15 K and $x_1 = 0.25$.

OR

Q4) a) Explain in detail Chemical potential as a criterion of phase equilibrium. **[5]**

b) Explain and derive the equation for Phase rule for non reaction system. **[5]**

Q5) a) Derive the following relationships for criteria of phase equilibrium **[8]**

$dS_{U, V} \geq 0$

$dA_{T, V} \leq 0$

$dG_{T, P} \leq 0$

b) Define and derive the equation for the osmotic pressure. **[8]**

OR

Q6) a) Explain in detail binary liquid-liquid equilibrium system with the help of T-X diagram. **[8]**

b) Deduce the Clapeyron equation using the criteria of equilibrium. **[8]**

Q7) a) Derive the relationship between mole fraction and reaction coordinate with stoichiometric coefficient of reaction components. **[6]**

b) Calculate the equilibrium constant for the vapor phase hydration of ethylene at 145°C from the data given below **[10]**

$C_p/R = A + BT + CT^2$

$C_2H_4 + H_2O \rightarrow C_2H_5OH$
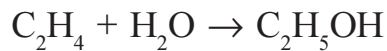
Component	$\Delta G°$ (25°C) (J/mole)	$\Delta H°$ (25°C)	A	B	C
C_2H_4	68460	52510	1.424	14.394×10^{-3}	-4.392×10^{-6}
H_2O	-228570	-241810	3.470	1.450×10^{-3}	-
C_2H_5OH	-168490	-235100	3.518	20.001×10^{-3}	-6.002×10^{-6}

OR

Q8) a) For the following reactions obtain the relation between mole fraction and reaction coordinate for 2 moles of CH_4 and 3 moles of H_2O initially present. **[8]**

$CH_4 + H_2O \rightarrow CO + 3H_2$

$CH_4 + 2H_2O \rightarrow CO_2 + 4H_2$
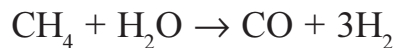
b) Derive the equation

$\Delta G° = -RT \ln k$ **[8]**

Q9) a) Explain and derive the relation between equilibrium constant and composition in case of liquid phase reactions. **[6]**

b) Derive the equation for phase rule in case of reacting systems. **[6]**

c) Explain fuel cell with its types. **[6]**

OR

Q10) a) Explain and derive the relation between equilibrium constant and composition in case of gas phase reactions. **[6]**

b) Acetic acid is esterified in the liquid phase with ethanol at 100°C & at atmospheric pressure to produce ethyl acetate & water according to the reaction **[8]**

$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$
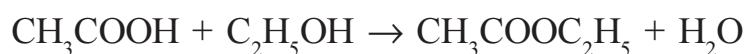
If initially there is 1 mole of each acetic acid and ethanol. Estimate the mole fraction of ethyl acetate in the reacting mixture at equilibrium with the help of following data.

Component	$\Delta H°f_{298}$ (j/mol)	$\Delta G°_{298}$ (J/mole)
CH_3COOH	–484500	–389900
C_2H_5OH	–277690	–174780
$CH_3COOC_2H_5$	–463250	–318280
H_2O	–285830	–237130

c) Explain the Duhem's Theorem for reacting systems. **[4]**

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[4758] - 588

T.E. (Chemical)
CHEMICAL PROCESS TECHNOLOGY
(2012 Course) (Semester - I) (End - Sem.)

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

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

Q1) Describe 'Unit operations' and 'Unit processes' by giving four examples with schematic representations. **[10]**

OR

Q2) Explain any two: **[10]**

    a) Differentiate between Solvay and Dual Process.

    b) Explain production of Bromine from sea water.

    c) What do you mean by process Flow diagrams and Major Engineering problems?

Q3) Discuss production of urea with its major Engineering problems. **[10]**

OR

Q4) a) Explain the preparation of wood pulp by sulphate process.

    b) Explain starch and give its manufacturing process from maize.

[10]

Q5) a) Explain destructive distillation of coal and carbonization processes.

    b) Explain oils and fats. Also discuss about Chemical composition & physical properties of vegetable oils.

[10]

OR

Q6) Explain hydrogenation of oil by neat PFD and give its major engg. problems. **[10]**

Q7) a) Explain production of water gas & producer gas.

b) Explain polymerization and Reforming.

[20]

OR

Q8) a) Explain Alkylation and Isomerisation.

b) Explain Fuel cell and Hydro alkylation.

[20]

Q9) a) Explain production of cumene.
b) Explain manufacturing of acetone.

[20]

OR

*Q10)*a) Explain manufacturing of formaldehyde.
b) Explain production of vinyl chloride.

[20]

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[4758]-589

T.E. (Chemical)

INDUSTRIAL ORGANISATION AND MANAGEMENT

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

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

Instructions to the candidates:

  1) *Neat diagrams must be drawn wherever necessary.*

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

  3) *Assume suitable data, if necessary.*

  4) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

Q1) a)   Explain Joint Stock Company with advantages and disadvantages.   **[6]**

  b)   Write a note on Partnership Deed.   **[4]**

OR

Q2) Explain in detail Selection Process.   **[10]**

Q3) a)   Explain different types of Wages.   **[6]**

  b)   Explain in detail Merit Rating.   **[4]**

OR

Q4) Explain in detail: **[10]**

  a)   Comparative Statement.

  b)   Job Evaluation.

Q5) a)   Write an explanatory note on Marketing Mix.   **[8]**

  b)   Explain any two Pricing Strategies in detail.   **[8]**

OR

Q6) a) Explain in detail Sales Promotion. **[8]**

b) Write an explanatory note on Advertising. **[8]**

Q7) a) Write notes on: **[8]**

i) ISO

ii) International Trade

b) Explain in detail Quality Circle. **[8]**

OR

Q8) a) Explain Total Quality Management of a process industry. **[8]**

b) Explain in detail various factors affecting international trade. **[8]**

Q9) Write short notes on: **[18]**

a) FERA and FEMA.

b) Monopolies Restrictive Trade Practices (MRTP).

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 SIMO Charts. **[6]**

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[4758] - 590

T.E. (Chemical)
MASS TRANSFER - I
(2012 Course) (Semester - I) (End Semester) (Theory) (309342)

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, 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) State & explain Ficks law of diffusion.   **[4]**

b) Ammonia gas (A) is diffusing through a uniform tube 0.10m long containing Nitrogen gas (B) at 1.0132×10^5 Pa pressure & 298K. At point one $P_{A1} = 1.013 \times 10^4$ Pa & at point two $P_{A2} = 0.507 \times 10^4$ Pa. **[6]**

The diffusivity $D_{AB} = 0.23 \times 10^{-4} m^2/sec$. Calculate the flux at steady state.

($R = 8.314$ kPa m^3/kmol K).

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) A tube 1cm in inside diameter that is 20cm long is filled with carbon dioxide (A) & hydrogen (B) at 2 atm total pressure at 0° C. The diffusion coefficient under these conditions is 0.275cm²/sec. If the partial pressure of carbon dioxide is 1.5 atm at one end & 0.5 atm. at the other end. Find the rate of diffusion for steady state diffusion of carbon dioxide through stagnant hydrogen? **[6]**

b) Give significance of Schmidt Number and Sherwood Number in mass transfer. **[4]**

<div align="center">OR</div>

Q4) a) Explain Absorption & Stripping? What is significance of minimum liquid to gas ratio for absorption? **[6]**

b) Describe Higbie penetration theory of mass transfer. **[4]**

Q5) a) Define following terms, **[10]**

    i) Absolute humidity

    ii) Wet bulb Temperature

    iii) enthalpy

    iv) humid volume

    v) Percentage saturation humidity

b) Moist air at 310K has WBT of 300K. The latent heat of vaporization of water at 300K 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 6.33 kPa at 310K. Psychrometric ratio $h_G/k_Y = 1000$J/kg K. **[6]**

<div align="center">OR</div>

Q6) a) Derive the relation for the determination of height of packing of counter current cooling tower. **[8]**

b) Write Short notes on **[8]**

    i) Lewis Relation

    ii) Adiabatic Saturation Curve

Q7) 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]**

OR

Q8) 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]**

Q9) 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) Draw and explain the Rate of Drying Curve. **[6]**

c) Define moisture content in the solid on wet and dry basis. **[4]**

OR

Q10) a) Describe the mechanism of moisture movement within the solids during drying. **[4]**

b) Derive the equation for determination of constant rate and falling rate of drying period. **[8]**

c) Describe the Rotary Dryer with neat sketch. **[6]**

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[4758] - 591

T.E. (Chemical)
TRANSPORT PHENOMENA
(2012 Course) (309349) (End Semester) (Semester - II)

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

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

Q1) a) Find the radius of the capillary from the following data: **[5]**

Length of capillary = 50.02 cm

Kinematic viscosity of fluid = 4.03×10^{-5} m² sec⁻¹

Density of fluid = 955.2 kg/m³

Pressure drop across (horizontal capillary) tube = 4.829×10^5 Nm⁻² = 4.766 atm

Mass rate of flow through tube = 2.997×10^{-3} kg sec⁻¹

b) Derive Newton's law of viscosity. Write a short note on Newtonian and Non-newtonian fluids along with examples. **[5]**

OR

Q2) a) Explain thermal energy balance equation. **[4]**

b) A copper wire has a radius 2mm and length 5m. For what voltage drop would the temperature rise at the wire axis be 10ºC if the surface temperature of the wire is 20ºC. For copper, Lorenz number is 2.23×10^{-8} volt²K⁻². **[6]**

Q3) Derive expression of concentration profile and molar flux of A for homogeneous chemical reaction. **[10]**

OR

Q4) a) Explain Ellis model of non-Newtonian fluids. **[4]**

b) State boundary conditions used in heat transfer problems. **[3]**

c) Explain Fick's law of diffusion. **[3]**

Q5) a) Derive equation of motion in a Cartesian co-ordinate system for a flow of fluid through a control volume of size $\Delta x \, \Delta y \, \Delta z$. **[12]**

b) What do you mean by partial time, total time and substantial time derivative. **[6]**

OR

Q6) a) Derive the equation of continuity in three dimensional Cartesian coordinate system through a control volume of size $\Delta x \, \Delta y \, \Delta z$. **[12]**

b) What are scale factors. What do you mean by dynamic similarity between systems. **[6]**

Q7) a) Derive expression of fanning friction factor for flow of fluid in a tube.**[8]**

b) Derive Ergun equation for flow of fluid in a packed column. **[8]**

OR

Q8) a) An incompressible fluid flows turbulently in a circular tube of cross sectional area S_1 which empties into a large tube of cross sectional area S_2. Use macroscopic balances and derive expression for pressure rise and friction loss due to the sudden expansion. **[12]**

b) Explain macroscopic mass balance equation. **[4]**

Q9) a) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60 °C. The vapor pressure of water at 21 °C is 0.0247 atm. Assume Pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3}$ mol s^{-1} cm^{-2}. **[8]**

b) Explain Martinnelli's analogy. **[8]**

OR

Q10) a) Derive the correlation of binary mass transfer coefficient in one phase at low mass transfer rates. **[8]**

b) Explain in detail about Reynold's, Prandtl's and Chilton-colburn J-Factor Analogy. **[8]**

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[4758] - 592
T.E. (Chemical) (Semester - VI)
CHEMICAL REACTION ENGINEERING - I
(2012 Pattern)

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

Instructions to the candidates:
1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or 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) Derive the temperature dependency of rate constant from collision theory. **[6]**

b) Using the integral method of analysis, obtain a relationship for determining 'k' for a first order irreversible reaction. **[4]**

OR

Q2) In a homogeneous isothermal liquid polymerization, 20% of the monomer disappears in 34 minutes for initial monomer concentration of 0.04 and also for 0.8 mol/liter. What rate equation represents the disappearance of the monomer.

Q3) a) Derive the relation for constant volume irreversible second order reaction $A + B \rightarrow$ product using integral method of analysis. **[6]**

b) Compare. MFR and PFR. **[4]**

OR

Q4) An aqueous feed containing A (1 mol/liter) enters a 2-liter plug flow reactor and reacts away (2 A $\rightarrow$ R, $-r_A = 0.05\ C_A^2$ mol/liter.s.) Find the outlet concentration of A for a feed rate of 0.5 liter/min. **[10]**

Q5) a) Derive an expression for the concentration in the Nth reactor, if N equal sized stirred tank reactors are assembled in series. Assume first order reaction. **[8]**

b) An aqueous reactant stream (4 mol A/liter) passess thought a mixed flow reactor followed by a plug flow reactor. Find the concentration at the exit of the plug flow reactor if in the mixed flow reactor $C_A = 1$ mol/liter. The reaction is second-order with respect to A, and the volume of the plug flow unit is three times that of the mixed flow unit. **[8]**

OR

Q6) a) Give the qualitative discussion about product distribution in parallel reaction. **[8]**

b) At present the elementary liquid-phase reaction A + B → R + S takes place in a plug flow reactor using equimolar quantities of A and B. Conversion is 96%, $C_{A0} = C_{B0} = 1$ mol/liter. If a mixed flow reactor ten times as large as the plug flow reactor were hooked up in series with the existing unit, which unit should come first and by what fraction could production be increased for that setup? **[8]**

Q7) a) Discuss optimum temperature progression (OTP) needed for optimum reactor performance. **[8]**

b) For aqueous reaction A ↔ R, between the temperature range 0° to 100°C, determine the equilibrium conversion as a function of temperature in graphical form. What should be the maximum temperature so that the conversion of A achieved is 75% or higher? **[8]**

For $C_R^\circ = C_A^\circ = 1$ mol/liter,

$\Delta G^\circ_{298} = -3375$ cal/mol

$\Delta Hr_{298} = -18,000$ cal/mol.

OR

Q8) a) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. **[8]**

b) Derive the relation between conversion and temperature for an adiabatic reactor using the energy balance and explain how you determine the reactor size for adiabatic operation of a plug flow and a stirred tank reactor. **[8]**

Q9) a) Explain E, F and C curve and find the relationship between them. **[10]**

b) Calculate the mean residence time and the variance for a vessel from the following data : **[8]**

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
E, min^{-1}	0	0.02	0.10	0.16	0.20	0.16	0.12	0.08	0.06	0.044	0.03	0.01	0

OR

Q10) a) A reactor with a number of dividing baffles is to be used to run the reaction $A \rightarrow R$ with $-r_A = 0.05\ C_A$ mol/liter. min

A pluse tracer test gives the following output curve : **[10]**

Time, min	0	10	20	30	40	50	60	70
Concentration reading	35	38	40	40	39	37	36	35

i) Calculate the variance of the E curve.

ii) Calculate X_A assuming plug flow.

iii) Calculate X_A assuming the tanks - in series model.

b) Write notes on - Tank in series model, and Dispersion model. **[8]**

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[4758] - 593

T.E. (Chemical) (End - Semester)
CHEMICAL ENGINEERING DESIGN - I
(2012 Pattern)

Time : 3 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 are the various types of roof used for storage vessels?   **[5]**

   b)   What are wind girders? Sketch different structure of wind girders.   **[5]**

OR

Q2) A tall vertical vessel 1.5 m in diameter and 13 m in high is to be provided with skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to diameter of the vessel. Height of skirt is 2.2 m. Wind pressure acting over vessel is 100 kg/m². Seismic coefficient=0.08, permissible tensile stress of skirt material=960 kg/m², permissible compressive stress is 1/3 of yield stress of material. Yield stress is 2400 kg/m². Estimate the thickness of the skirt support.   **[10]**

Q3) Describe construction and working of double pipe heat exchanger. Also mention advantages and disadvantages.   **[10]**

OR

Q4) Write short note on (Any two)   **[10]**

   a)   Horton sphere

   b)   Types of vessel support

   c)   Fouling in Heat exchanger

Q5) a) Explain various methods of feeding for multiple effect evaporators. **[8]**

b) A single effect evaporator is to be operated at absolute pressure of 0.13 bar. Estimate the heat transfer area necessary to concentrate 4500 kg/hr of caustic soda solution from 10% to 40% (by weight) using saturated steam at 117 °C as heating media. The overall heat transfer coefficient may be taken as 1.25 KW/m²⁰C.

Data : Specific heat of feed=4000 J/kg °C, Specific heat of product=3260 J/kg °C, Feed temperature = 18 °C, BPR=30°C, Density of boiling liquid =1390 kg/m³, The liquid level in the evaporator is 1200 mm above the heating surface. **[10]**

OR

Q6) a) Write short note on types of reboiler. **[8]**

b) Suggest a suitable thermal design for a condenser to be used for condensing 4.2 kg/s of steam. Steam will be condensed at pressure of 4.13 KN/m² Steam has a dryness fraction of 0.92. Cooling water is available at 17°C and for economic reason temperature rise has to be limited upto 1.2 m/s through the tubes. The exchanger has two passes on tube side. Tubes of 19.05 mm OD and 15.75 mm ID can be used. Estimate the number of tubes, their length, tube bundle diameter and the shell diameter. Overall heat transfer coefficient based on external areas of tubes=3400 W/m²⁰K. **[10]**

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/m³ and viscosity 100 cP. The tank diameter is 1m and the ratio of agitator diameter to tank diameter is 0.4. Find the power required for mixing. **[8]**

N_{Re}	1000	2000	3000	4000
N_P	1.1	1.2	1.3	1.4

Q8) a) Explain different types of jacket with neat sketch. **[6]**

b) A jacketed agitator reactor consists of a vertical cylinder 1.5 m in diameter with a hemispherical base and a flanged flat top. Jacket is fitted to the cylindrical section only and extends to height of 1m. The spacing between the jacket and the vessel wall is 75 mm. the jacket is fitted with a spiral baffle. The pitch between the spirals is 200 mm. the jacket is used to cool the reactor contents with chilled water at 10 °C @32,500 kg/h and exit temperature 20 °C. Estimate the heat transfer coefficient at the outside wall of the reactor and the pressure drop in the jacket.
The value of jh=3.2×10^{-3}.
Physical Properties at mean temperature 15°C.
Density=999kg/m³, viscosity=1.136mN.S/m², M_{Pr}=7.99,
K_f=595×10⁻³ W/m °C. **[10]**

Q9) a) What safety devices are used in pressure vessel to prevent pressure build up? Explain any one in details. **[8]**

b) Design a decanter to separate light oil from water. Oil is dispersed phase. Oil flow rate is 1000 kg/h, density of oil is 900 kg/m³, viscosity of oil is 3 mNs/m². Water flow rate is 5000 kg/h, density of water is 1000 kg/m³ viscosity of water is 1 mN s/m². **[8]**

OR

Q10 a) Write about reflux drum; knock out drums and role of demister pads.**[8]**

b) Design steam water separator for the following conditions **[8]**

Steam flow rate : 2000 kg/h
Water flow rate : 1000 kg/h
Density of water : 926.4 kg/m³
Density of vapour : 2.16 kg/m³
Operating pressure : 4 bar

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[4758]-594

T.E. (Chemical)

PROCESS INSTRUMENTATION & CONTROL

(2012 Pattern) (Semester - II) (End - Sem.) (309352)

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

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*

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

3) *Your answers will be valued as a whole.*

4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

5) *Assume suitable data, if necessary.*

6) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

Q1) a) Explain static and dynamic characteristics of measuring instruments. **[6]**

b) Distinguish between self operated and power operated instrument. **[4]**

OR

Q2) a) Explain the importance of Instrumentation the process industries. **[6]**

b) Differentiate between Analog and Digital instrument. **[4]**

Q3) a) Write short notes on: **[6]**

i) Thermocouple

ii) RTD

b) Explain with diagram, construction and working Bourdon Pressure Guage. **[4]**

OR

P.T.O.

Q4) a) Explain Seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram.**[6]**

b) Describe working of LVDT. **[4]**

Q5) a) Explain the principle, construction and working of orifice meter. **[8]**

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

    i) Ultrasonic Level method.

    ii) Radiation Method.

<div align="center">OR</div>

Q6) a) Explain construction and working of Rotameter with Industrial applications. **[8]**

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

    i) Air Purge Method.

    ii) Sight Glass Method.

Q7) Write short notes on: **[16]**

    a) pH meter

    b) Liquid chromatography.

    c) HPLC

    d) Refractometry.

<div align="center">OR</div>

Q8) a) Explain principle, construction and working of Gas Chromatography.**[8]**

b) Write a short note of Mass spectroscopy. **[8]**

Q9) a) State differences between first order and second order system. **[9]**

b) Give classification of process variable with respect to process control. **[9]**

OR

Q10) a) With the help of block diagram explain working of feedback control system. **[9]**

b) Explain features of controller action. **[9]**

    i) Auto/Manual Switch.

    ii) Direct/Reverse action.

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[4758]-595

T.E. (Chemical Engg.)

MASS TRANSFER - II

(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)   Assume suitable data, if necessary.

   3)   Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.

Q1) a)   What is distillation? What are the types of distillation? Discuss steam distillation in brief. **[5]**

   b)   In A feed of 50-mole% n-heptane and 50-mole% n-octane is fed into a pipe still through a pressure reducing valve and then into a flash disengaging chamber. The vapor and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of feed converted to vapor is 0.5, find the compositions of top and bottom products the equilibrium data is as follows **[5]**

X-	1.00	0.69	0.40	0.192	0.045	0.00
Y-	1.00	0.932	0.78	0.538	0.1775	0.00

OR

Q2) a)   For a mixture of n-heptance (A) and tolune (B) at 273°K and 101.3 kN/m², PA° = 106 KN/m², PB° = 73.7 kN/m², find the compositions in vapor and liquid phase. **[3]**

   b)   Explain relative volatility. **[2]**

   c)   What do you mean by reflux ratio? Derive Fenske equation for number of theoretical plates at total reflux. **[5]**

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 i) 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. **[5]**

OR

Q4) A solution of nicotine in water containing 1 % nicotine is to be extracted with kerosene at 293 °K (20°C) Water and Kerosene are essentially insoluble. The equilibrium data is **[10]**

X = 0   0.001011   0.00246   0.00502   0.00751   0.00998   0.0102

Y = 0   0.000807   0.001961   0.00456   0.00686   0.00913   0.00935

Where

Y = kg nicotine / kg kerosene

X = kg nicotine / kg water

a) Determine the percentage extraction of nicotine if 100 kg of a feed solution is extracted with 150 kg of solvent (Kerosene)

b) Repeat for three theoretical extractions using 50 kg solvent each time.

Q5) a) Oil is to be extracted from meal by means of benzene using continuous countercurrent extraction unit. The unit is expected to treat 1000kg 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. **[14]**

Experimental data on the extraction of oil from meal are as

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) Give factors affecting the rate of leaching. **[2]**

<p style="text-align:center">OR</p>

Q6) 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) Give detail graphical procedure with material balance equations, for finding the number of stages in multistage counter current leaching. **[8]**

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

    i) Break through curve,

    ii) Adsorption isotherm.

b) Write principles of ion exchange process and rate of ion exchange. **[8]**

<p style="text-align:center">OR</p>

Q8) a) A solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The original solution has an adsorptive carbon in a contact filtration plant. The original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.96. Calculate the necessary dosage of the fresh carbon per 1000 kg solution for a single stage process. 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) State equilibrium in ion exchange. **[2]**

Q9) a) A Solution contains 2500 kg of water and 500 kg Na_2SO_4 salt. It is cooled from 333 K to 283 K in an agitated mild steel vessel. Weight of the vessel is 750 kg. 2.0% water is lost by evaporation during cooling and crystals of $Na_2SO_4 \cdot 10\,H_2O$ are formed. Calculate the yield of crystals and the heat to be removed? **[10]**

Data: Solubility At 283K: 8.9 kg/100 kg water.

Heat capacity of solution: 3.6 kJ / kg K.

Heat capacity of M.S: 0.5 kJ / KgK.

Heat of Solution: 78.5 MJ / kMol.

Latent heat of Vaporization: 2395 kJ /kg.

b) Explain working and construction of Swenson walker crystallizer. **[8]**

OR

Q10) a) What are different membrane modules? Define membrane fouling. **[5]**

b) Explain reverse osmosis for water purification. **[5]**

c) A saturated solution of $MgSO_4$ at 353°K is cooled to 303°K in a crystallizer. During cooling 4% of the water is lost by evaporation. Estimate the quantity of original saturated solution to be fed to the crystallizer per 1000kg of $MgSO_4$ $7H_2O$ crystals. Data: solubility of $MgSO_4$ at 353°K = 64.2kg/100kg, water solubility of $MgSO_4$ at 303°K = 40.8kg/100kg water. At wt Mg = 24, S=32, H=1, O=16. **[8]**

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T.E. (I.T.)

DATABASE MANAGEMENT SYSTEMS

(2012 Course) (Semester - I) (End-Sem.) (314443)

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, Q9 or Q10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of Calculator is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a)   Explain ACID properties.   **[4]**

   b)   Construct an E-R diagram for a car insurance company that has a set of
         customers each of whom owns one or more cars. Each car has associated
         with it zero to any number of recorded accidents.   **[6]**

OR

Q2) a)   Explain different anamolies with example.   **[6]**

   b)   What is cursor? Explain cursor in PL/SQL with suitable example.   **[4]**

Q3) a)   Consider a relational database   **[8]**

         Supplier (Sid, Sname, address)

         Parts (Pid, Pname, color)

         Catalog (Sid, Pid, cost)

         Write SQL queries for the following:-

         i)   Find the names of suppliers who supply some red parts.

ii) Find the names of all parts whose cost is more than Rs. 250.

iii) Find name of all parts whose color is green.

iv) Find number of parts supplied by each supplier.

b) Write short note on Embedded SQL. **[2]**

OR

Q4) When do dead lock happen? How to prevent them, how to recover if dead lock takes place. **[10]**

Q5) a) Why it is necessary to have client-server architecture for database management system. **[6]**

b) Explain and state difference between centralized and client-server architecture. **[8]**

c) Explain different issues in design of parallel system. **[4]**

OR

Q6) a) Explain need of partitioning techniques used in I/O parallelism. Explain techniques in detail. **[8]**

b) What is distributed database. Discuss different approaches used for data storage in distributed database. **[8]**

c) What are internet databases. **[2]**

Q7) a) Explain with example DTD. **[6]**

b) Discuss HBase data Model. **[5]**

c) Explain with syntax JSON data type and object. **[5]**

OR

Q8) a) Write a short note on. **[6]**

    i)   X path

    ii)   X Query

  b) What is Hadoop Framework and on what concept the Hadoop Framework works. **[8]**

  c) Explain NOSQL databases. **[2]**

Q9) a) What is data preprocessing? Explain data preprocessing techniques. **[8]**

  b) Explain architecture of data mining system. **[8]**

<div align="center">OR</div>

Q10) Write a short note on **[16]**

    i)   Machine learning for Big data

    ii)   Mobile databases

    iii)   Data Mart

    iv)   KDD

<div align="center">✧   ✧   ✧</div>

T.E. (Information Technology)

SOFTWARE ENGINEERING

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

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

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.9 or Q.10.*

2) *Draw neat diagrams wherever necessary.*

3) *Assume suitable data if necessary.*

Q1) a)   Explain different aspects of software process model.   **[5]**

b)   Elaborate how software engineering is a layered technology.   **[5]**

OR

Q2) a)   What is extreme programming? List the drivers which are treated as XP
values.   **[5]**

b)   Explain agile process model.   **[5]**

Q3) a)   Describe the steps of scenario based modeling with a suitable example.**[5]**

b)   What is requirements engineering.   **[5]**

OR

Q4) a)   Explain activities and the steps used for negotiating software requirements.
[5]

b) What is data modeling? Explain following term in data modeling. **[5]**

    i)   Data objects

    ii)   Data attributes

    iii) Relationships

Q5) **a)** Explain following concepts in the context of software design. **[8]**

    i)   Abstraction

    ii)   Modularity

    iii) Information Hiding

    iv) Functional Independence

b) Illustrate how requirements model is translated to design model. **[8]**

OR

Q6) **a)** Explain software design model with reference to process and abstraction dimension. **[8]**

b) What is data-centered architecture? Explain with an example. **[8]**

Q7) **a)** Discuss the user-centered design process. **[8]**

b) Explain Shneiderman's Golden Rules of UI design. **[8]**

OR

Q8) **a)** Discuss in details. **[8]**

    i)   Fitt's law.

    ii)   Hick's law.

b) Explain the analysis and design process of user-interfaces. **[8]**

Q9) a) What is the goal of cleanroom testing? Discuss in brief the statistical use testing. How do we certify a software component in cleanroom testing**[10]**

b) What is software configuration management repository? Discuss role and features of SCM repository. **[8]**

OR

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

a) CASE tools

b) Technology evolution

c) Test driven development

d) Model driven development

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T.E. (I.T.)

COMPUTER NETWORK TECHNOLOGY

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

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) *Your answers will be valued as a whole.*
4) *Assume suitable data, if necessary.*

Q1) a) What is the significance of ARP and RARP Protocols? **[6]**

     b) Explain operation of ICMP with suitable example. **[4]**

OR

Q2) a) For a given class B network 144.155.0.0 with default subnet mask, how can you divide it into 8 subnets? Write the **[6]**

         i) range of each subnet

         ii) network IP for 7th subnet

         iii) broadcast IP for the 7th subnet

         iv) subnet mask in subnets.

     b) What is silly window syndrome problem. **[4]**

Q3) a) Describe 3-way handshake for connection establishment in TCP. **[6]**

     b) Explain email architecture & its services. **[4]**

OR

Q4) a) What is FTP? Where & when is it used? Why does it require two ports. **[6]**

     b) Describe SMTP header format. **[4]**

Q5) a) Explain architecture of 802.11. [10]

b) Describe bluetooth protocol stack. [8]

OR

Q6) a) Explain in detail architecture of Bluetooth. [10]

b) What are different technical issues to implement WLAN? [8]

Q7) a) Explain different design constraints of WSN. [8]

b) Explain the difference between Pure ALOHA & slotted ALOHA. [8]

OR

Q8) a) Which are different task & characteristics of transceiver? [8]

b) What are different design issues of MAC protocol of WSN? [8]

Q9) a) Differentiate between content based & geographic routing. [8]

b) Describe SPIN routing protocol. [8]

OR

Q10) Write short note on (Any two): [16]

a) Addressing in WSN.

b) 100 Gigabit Ethernet.

c) Software defined networking.

T.E. (Information Technology)

WEB ENGINEERING & TECHNOLOGY

(2012 Course) (Semester - I) (314445) (End - Semester)

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

Instructions to the candidates:

    1)   *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

    2)   *Neat diagrams must be drawn wherever necessary.*

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

    4)   *Assume suitable data, if necessary.*

Q1) a)   Write difference between software engineering and Web engineering.**[5]**

    b)   How to Publish a Web Site? Explain process of Web Publishing.   **[5]**

OR

Q2) a)   Write HTML code which include table. What's the difference between <tr> and <td>?   **[5]**

    b)   Explain how frames are constructed in HTML document.   **[5]**

Q3) a)   Differentiate between HTTP versus FTP.   **[4]**

    b)   Explain in detail HTTP protocol, purpose and operation?   **[6]**

OR

Q4) a)   Give the list with definition of HTML components. How CSS can be used to change the view.   **[5]**

    b)   Explain Image Map with example.   **[5]**

Q5) a) Explain PHP GET and PHP POST variables. **[8]**

b) Explain Session management technique in PHP. **[8]**

OR

Q6) a) What are Cookies? Explain Cookies in PHP. **[8]**

b) Explain PHP - Two-dimensional Arrays using example. **[8]**

Q7) a) How to create arrays in JavaScript? **[8]**

b) Difference between java and JavaScript? **[8]**

OR

Q8) a) How to access the value of a textbox using JavaScript? **[8]**

b) Explain how can you access a database from a JSP page? Give the database connectivity issues in details. **[8]**

Q9) a) Write a short note on - WordPress. **[9]**

b) What is WordPress Caching and why is it Important? **[9]**

OR

Q10) a) Write a short note on - Drupal. **[9]**

b) What are the advantages and limitations of content management system? **[9]**

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T.E. (I.T.)

SYSTEMS PROGRAMMING

(2012 Course) (314450) (Semester - II) (End - Semester)

Time : 3 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)   *Your answers will be valued as whole.*

   5)   *Assume suitable data, if necessary.*

Q1) a)   For the 'C' code given below, give the different tables that would be generated as output of lexical analysis. **[8]**

```
main ( )

{

    int i, sum, n;

    float avg;

    n=10;

    sum=¢;

    for(i= 1; i<=10 ;i++)

        sum =sum + i;

    avg = sum / (float)n ;

}
```

    b)   Define macroprocessor and assembler and give examples for each. **[2]**

<div align="center">OR</div>

Q2) a)   Give the various data structures in the design of pass-1 of a Two-pass direct linking loader. **[4]**

    b)   What are the assembler directives? Explain how assembler directives LTORG, ORIGIN and EQU are processed in first pass. **[6]**

Q3) a) For the following piece of assembly language code, show the contents of symbol table, literal table and pool-tab. Assume size of instruction equal to one. **[5]**

START 202

MOVER AREG, ='5

MOVEM AREG, A

LOOP MOVER AREG, A

MOVER CREG, B

ADD CREG, = '1'

MOVEM CREG, B

SUB CREG, A

BC ANY, NEXT

LTORG

ADD CREG,B'

BC LE LOOP

NEXT SUB AREG, = '1'

BC LT, BACK

STOP

ORIGIN 219

MULT CREG, B

A DS 1

BACK EQU LOOP

B DS 1

END

    b) Define loader and enlist the basic functions of loader. **[5]**

<div align="center">OR</div>

Q4) a) Explain the first three phases of compiler w.r.t. the following statement:**[6]**

r = a – 10 / (c*d^e)

Note: ∧ is exponentiation operator

    b) Explain different parameter passing mechanisms in macro-processor.**[4]**

Q5) a)   Consider the grammar   **[4]**

    E →E-E

    E →E*E

    E →id

   Perform shift Reduce parsing of i/p string "id-id * id"

b)   Define table driven predictive parser. For the following grammar.   **[10]**

    S → AaBb
    A →€
    B →€

   Construct table-driven predictive parser and parse the string "ab".

c)   Compare bottom up and top down parser.   **[4]**

<div align="center">OR</div>

Q6) a)   Consider the following grammar   **[10]**

    S →(L)|a

    L →L, S|S

   Construct SLR parser and parse for the string (a,(a,a))

b)   Explain YACC file structure.   **[4]**

c)   Explain problem of left factoring in top down parser.   **[4]**

Q7) a)   Optimize the following code   **[8]**

    a = x^2

    b = 3

    c = x

    d = c*c

    e=b+2

    f = a+d

    g = e* f

b)   Write short note on activation record.   **[4]**

c)   Explain in brief run time storage allocation.   **[4]**

<div align="center">OR</div>

Q8) a) Explain any one technique of machine dependent code optimization.**[6]**

b) Comparison between static, stack & heap allocation. **[6]**

c) Explain machine dependent optimization issues. **[4]**

Q9) a) Design dependency graph for the following grammar. **[4]**

S → T List
T → int
T → float
T → char
T → double
List → List 1/id

b) Translate the following C fragment into the three address code. **[6]**

int i;
int a[10][10];
i = 0;
while (i< 10)
{
    a[i][i]=1;
    i++;
}

c) Write quadruple and triple for the expression. **[6]**

-(a*b)+(c+d)-(a+b+c+d)

OR

*Q10)*a) For the following statement, Generate intermediate code in the format:**[8]**

i)   Postfix notation
ii) Quadruple
iii) Parse tree
iv) Triple

S = (a+b) / (c–d)

b) Explain concept of type checking. **[4]**

c) Generate three address code for **[4]**

while (i<10)
{
    x=0;
    i=i+1;
}

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T.E. (Information Technology) (Semester - II)
OPERATING SYSTEMS
(2012 Pattern)

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

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

Q1) a)   Describe the evolution of Operating Systems.   **[5]**

   b)   Explain fork and execve system calls. Also state their relationship.   **[5]**

OR

Q2) a)   Differenciate between kernel-level and user-level threads.   **[5]**

   b)   Explain Traditional UNIX Scheduling with example.   **[5]**

Q3) a)   How can a programming language be used to provide mutual exclusion?
        Explain with example.   **[5]**

   b)   What are different requirements for mutual exclusion?   **[5]**

OR

Q4) a)   Write and explain the deadlock-free solution for a dining Philosophers
        Problem.   **[5]**

   b)   Explain any two ways of creating unnamed pipes in Linux with example.**[5]**

Q5) a) What are the distinctions among logical, relative, and physical addresses? **[6]**

b) Why is the capability to relocate processes desirable? Explain in detail. **[6]**

c) Explain two-level page table organization for implementing virtual memory. **[6]**

OR

Q6) a) Write a short note on Buddy system. **[6]**

b) For the following page reference string 5, 6, 7, 8, 5, 6, 9, 5, 6, 7, 8, 9, show and count the number of page faults that occur with three frames using FIFO, LRU and optimal page replacement methods. **[12]**

Q7) a) Define following terms. **[6]**

   i)   Seek time

   ii) Rotational Latency

   iii) Transfer time

b) Assume the disk head is initially positioned over track 100. For the disk track request 27, 129, 110, 186, 147, 41, 10, 64, 120 how disk scheduling is done for FIFO Scan algorithms. Calculate average seek length and show the tracing of request. **[6]**

c) Explain different I/O buffering techniques. **[4]**

OR

Q8) a) List and briefly define any two file allocation methods. **[6]**

b) What are the functions of a file management system? **[6]**

c) What are typical operations that may be performed on a directory? **[4]**

Q9) a) Write a pseudo - code for simple kernel module and explain procedure of inserting a new module in existing kernel with all necessary steps. **[8]**

b) With neatly labelled diagram explain architecture of embedded OS. **[8]**

OR

Q10) Write features of the following (any three) **[16]**

a) NACH OS

b) Ubuntu EDGE

c) Embedded Linux

d) Android OS

e) Service Oriented OS

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[4758]-603

T.E. (Information Technology)

MULTIMEDIA TECHNOLOGIES

(2012 Course) (Semester - II) (314452) (End - Sem.)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

  1) *All questions are compulsory.*

  2) *Neat diagrams must be drawn wherever necessary.*

  3) *Figures to the right indicates full marks.*

  4) *Assume suitable data, if necessary.*

Q1) a)   Explain the concept of "Distributed Multimedia System" alongwith suitable applications.   **[5]**

  b)   For each of the media types: audio, graphics, images and video; briefly discuss how sampling affects the quality of the data.   **[5]**

OR

Q2) a)   Why is data compression necessary for multimedia activities? Explain why lossy data compression is sometimes preferred over lossless. Give suitable example to justify your answer.   **[5]**

  b)   Explain the Shanon Fano Encoding method with example.   **[5]**

Q3) a)   Explain Reflection, Diffraction and Interference with respect to sound wave.   **[5]**

  b)   Draw and explain different chunks of WAVE file format.   **[5]**

OR

Q4) a) List two psychological phenomena that are exploited in MPEG audio compression. Briefly explain their meanings. **[5]**

b) GIF and JPEG are two commonly used image representations. Do they usually use lossless or lossy compression? State the major compression algorithm (for lossless) or the lossy steps of the algorithm (for lossy) for each. **[5]**

Q5) a) What are different types of frames in MPEG? How are these frames encoded? **[8]**

b) Explain the advantages of YC format over RGB format in video transmission also describe how RGB signals are converted into YC signals using register bridges. **[8]**

OR

Q6) a) Explain H .261 and H.263 video file formats. **[8]**

b) State and explain in brief Multimedia supported video formats on android. **[8]**

Q7) a) What are the 12 principles of animation? Explain any 3 in detail. **[8]**

b) What is OpenGL? State and explain an essential GLUT functions of OpenGL. **[8]**

OR

Q8) a) Explain OpenGL rendering pipeline with key stages. Draw suitable diagrams. **[8]**

b) What is animation? How it differs from the video? Enlist some tools used to create the animation. **[8]**

Q9) a) What is virtual reality? Describe the input and output devices used in Virtual Reality. **[6]**

b) Explain GStreamer Based Multimedia Framework with suitable diagram. **[6]**

c) Explain the following terms briefly: **[6]**

   i) Multimedia over IP

   ii) Media on Demand

<div align="center">OR</div>

*Q10)*a) What is multimedia synchronization? State and explain important parameters associated with multimedia synchronization. **[6]**

b) Differentiate between the Virtual Reality and Augmented Reality by taking example. **[6]**

c) Briefly explain following broadcast schemes for video on demand. **[6]**

   i) Staggered broadcasting

   ii) Pyramid broadcasting

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T.E. (Information Technology)

INFORMATION TECHNOLOGY PROJECT MANAGEMENT

(2012 Pattern) (Semester - II) (314453) (End-Semester)

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

Instructions to the candidates:

1) *Answers 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.*

Q1) a) Explain Macgregor's theory of X and Y for motivation.   **[4]**

b) Explain Maslow's need hierarchy theory of motivation.   **[6]**

OR

Q2) a) What is the difference between programmed and non programmed decision?   **[4]**

b) What are various career fields possible for engineering graduates? **[6]**

Q3) a) Explain the process of requirement analysis and specification process with the help of diagram.   **[4]**

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

i) ISO 9000

ii) Six sigma

OR

Q4) a) State the difference between: **[4]**

i) High level design and detailed design.

ii) Unit testing and integration testing.

b) List contents of project proposal.   **[6]**

P.T.O.

Q5) a) Explain four major sections of project management plan. **[8]**

b) Explain in short importance of cost management and time management in project execution. **[8]**

OR

Q6) a) Explain configuration management process in detail. **[8]**

b) Explain activities tracking, defect tracking and issues tracking with respect to project tracking. **[8]**

Q7) a) What are the various functional modules of an ERP system? Explain.**[8]**

b) Explain any two implementation strategies for ERP in an organisation.**[8]**

OR

Q8) a) Explain ERP implementation Life Cycle. **[8]**

b) List down 4 advantages and 4 myths of an ERP system. **[8]**

Q9) a) Write short note on: **[12]**

i) Trends in SCM

ii) Software maintenance

iii) Reverse engineering

b) What is software project auditing process and why it is essential? **[6]**

OR

Q10) a) Write short note on: **[12]**

i) Reengineering

ii) Business process management

iii) Project management tools.

b) What is Software Process Improvement? **[6]**

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T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHMS

(2012 Pattern) (Semester - II) (end - Sem.) (314449)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

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

2) *Neat diagrams must be drawn wherever necessary.*

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

4) *Assume suitable data if necessary.*

Q1) a) Solve following recurrence relation: **[5]**

$T(n) = T(n/2) +1$

$T(1) = 1$

b) Analyze merge sort and find time complexity of merge sort.   **[5]**

OR

Q2) a) Write an algorithm to find factorial using recursion. Find the time complexity.   **[5]**

b) Consider following instance for simple knapsack problem. find the solution using greedy method.   **[5]**

N=8

P = {11, 21, 31, 33, 43, 53, 55, 65}

W = {1, 11, 21, 23, 33, 43, 45, 55}

M =110

P.T.O.

Q3) a) Write Kruskal's algorithm to find minimum spanning tree. **[5]**

b) Write Floyd's algorithm for all pairs shortest path and find time complexity. **[5]**

OR

Q4) a) Solve the following job sequencing problem using greedy algorithm. **[5]**

N(Number of jobs) = 4

Profits associated with jobs $(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$. Deadline associated with jobs $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$.

b) What is Principle of optimality? Differentiate between greedy and dynamic method. **[5]**

Q5) a) Write recursive backtracking algorithm for sum of subset problem. **[8]**

b) Write an algorithm for 0/1 knapsack problem using backtracking method. **[8]**

OR

Q6) a) What is backtracking? Write general iterative algorithm for backtracking. **[8]**

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

i) State space tree

ii) Live node

iii) Expanding node (E-node)

iv) Bounding function

Q7) a)　Explain the term:　　　　　　　　　　　　　　　　　　　**[10]**

　　i)　Least cost branch and bound.

　　ii)　Compare backtracking and branch and bound method.

b)　Consider 0/1 Knapsack instance n=4 with capacity 10 kg. such that **[8]**

Item	Profit (in Rs.)	Weight (in kg)
1	40	4
2	42	7
3	20	5
4	12	3

Find maximum profit using first in first out branch and bound (FIFOBB) method. Use fixed size formation for state space tree.

OR

Q8) What is travelling salesman problem? Find the solution of following travelling salesman problem using branch and bound method. **[18]**

Cost Matrix =

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

Q9) a) Prove that Clique problem is NP complete. **[8]**

b) Explain how parallel computations are possible using complete binary tree. **[8]**

OR

Q10) a) Specify one example of NP-hard problem. Also mention that why it is NP hard. **[8]**

b) Explain in detail models for parallel computing. **[8]**

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