T.E. (Civil) (Semester – I) Examination, 2011
INFRASTRUCTURE ENGINEERING AND CONSTRUCTION
TECHNIQUES
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions *:1) Answers to the **two** Sections should be written in **separate***
books.
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
4) Use of logarithmic tables slide rule, Moillier charts,
*electronic pocket calculator and steam tables is **allowed.***
*5) Assume suitable data, if **necessary**.*
*6) Solve **Q. 1** or **2**, **Q. 3** or **4**, **Q. 5** or **6** from Section **I** and*
***Q. 7** or **8**, **Q. 9** ot **10**, **Q. 11** or **12** from Section **II**.*

SECTION – I

1. a) Give the classification of railway lines based on speed as adopted by Indian
Railways.   6

   b) What are the main causes of failure of a railway embankment (formation) ?
Discuss the remedial measures for the same.   6

   c) Write a short note on Minimum Depth of Ballast cushion.   4

                          OR

2. a) State the Comparison of wooden sleepers & concrete sleepers.   6

   b) Write a short note on Organisational set up of Indian Railways.   4

   c) List out the various gauges prevailing in India with their gauge widths. What
factors govern the selection of a suitable gauge.   6

3. a) What is Track Maintenance ? Explain in brief concept of Directed Track
Maintenance (DTM).   4

   b) What is meant by grade compensation for curvature ? To what extent
should a ruling gradient of 1 in 150 on a broad gauge line to be downgraded to
accommodate a 3° curve.   6

                                                                P.T.O.

   c) Write the stepwise procedure of calculating the safe speed and cant on curve by simplified method. **6**

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

4. a) Calculate the superelevation and the maximum permissible speed for a 2° BG transitioned curve on a high speed route with a maximum sanctioned speed of 110 kmph. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 80 kmph and booked speed of goods train is 50 kmph (Take G = 1750 mm) Assume chord length of 30 m. **8**

   b) Explain the following terms : **4**

     1) Pusher Gradient

     2) Negative Superelevation

     3) Facing and Trailing Direction

     4) Cant deficiency.

   c) Write a short note on Modernization in Indian Railways. **4**

5. a) Discuss the points to be considered when determining the shape and size of tunnel. **6**

   b) Explain in brief NATM method of Tunnelling. **6**

   c) Define Mucking. State various methods of Mucking. Explain any one in brief with neat sketch. **6**

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

6. a) State the comparison between open cut & Tunnel. **6**

   b) What is Jetty ? How does it differs from Wharf ? **4**

   c) Differentiate between : **4**

     1) Harbour and Port

     2) Dry Dock and Wet Dock.

   d) Explain in brief merits and demerits of water Transportation. **4**

SECTION – II

7. a) Explain high rise structures considering the following points about them :

   i) Construction techniques for high rise structures

   ii) Construction difficulties in high rise structures. **6**

   b) Explain the production techniques and quality control in construction for prefabricated elements. **6**

   c) What is the importance of joints in precast construction ? Draw typical joint connections in prefabricated structures for

   i) column-beam &

   ii) beam-slab. **5**

                   OR

8. a) How will you classify the various construction cranes ? Give the working operation of cranes for erection purpose. **6**

   b) Explain in brief the following : **6**

   i) autoclave curing

   ii) fire insulation in construction.

   c) 'Construction activity plays an important role in the national & global development'. Justify the sentence giving examples. **5**

9. a) How will you differentiate the working operation of power shovel & back hoe. Give the uses of power shovel and back hoe. **6**

   b) What do you mean depreciation of an equipment ? Explain any one method of depreciation in detail. **6**

   c) Write short note on preventive maintenance and repair of an equipment. **5**

                   OR

10. a) What are the various factors that are considered for selection of an equipment for a particular work ? Explain the factors giving examples. **6**

   b) What are the types of scraper ? Explain the working operation of scraper. **6**

   c) Explain the work cycle output estimation for operation of an equipment. **5**

11. a) What are the methods of underwater concreting ? Explain any two methods of underwater concreting. **6**

   b) Write short notes on : **6**
     i) Jet grouting technique
     ii) Industrial flooring.

   c) In which circumstances concrete pumps are used ? Give the factors that influencing the performance and concrete pumps. **4**

OR

12. a) Explain the various methods of dewatering systems. **6**

   b) Draw sketches of a primary and secondary crushers. Explain the difference between them. State the various other components of a crusher plant. **6**

   c) Draw a schematic layout of an RMC plant and state its advantages. **4**

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T.E. Civil (Semester – II) Examination, 2011
PROJECT MANAGEMENT AND ENGINEERING ECONOMICS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *:1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain the project life cycle.   **4**

   b) Explain with a suitable example the line and staff organization.   **4**

   c) What are the different relationships in a precedence network ?   **8**

                              OR

2. Listed below are the activities of a small construction project along with their durations and relationships between the activities.

Activity	Predecessor	Duration (in weeks)
A	-	14
B	-	10
C	A	20
D	A	10
E	B	16
F	B	12
G	C	10
H	C	8
I	D, E	20
J	F	10
K	G	16
L	H	18

   a) Draw a network and calculate total project duration. Highlight the critical path.   **8**

   b) Calculate EST, EFT, LST, LFT and total float for the activities.   **8**

3. The following table gives the cost duration data for the various activities of a small construction project.

Activity code i-j	Normal		Crash	
	Duration (weeks)	Cost (Rs.)	Duration (weeks)	Cost (Rs.)
1-2	4	20000	2	30000
1-3	16	30000	10	42000
2-4	8	40000	6	48000
3-4	2	14000	2	14000
3-5	4	16000	2	30000
4-6	10	20000	6	32000
5-6	12	24000	4	72000

The overhead costs are Rs. 6,000 per week.
 i) Draw the network, find the project duration and show the critical path, based on the normal durations. Also find the corresponding total project cost. **6**
 ii) Carry out stage by stage compression and find **10**
   a) The minimum total cost of the project and the corresponding optimal duration
   b) The all crash solution and the corresponding total cost **2**
 iii) Draw the graph of cost verses time.

OR

4. a) Manpower requirement for various Activities of a project are given below :

Activity (i-j)	Duration (Days)	Number of Men required
1-2	7	12
2-3	7	7
2-4	8	12
2-5	7	8
3-5	12	8
4-5	8	6
5-6	9	6

   i) Draw a squared network, and manpower loading diagram for EST solution. Find the EFR and IFR for EST solution. **6**
   ii) Carry out resource levelling and find the optimal number of men required. Draw the squared network and manpower loading diagram, as well as find the EFR and IFR for the optimal solution. **8**

 b) What are the circumstances under which updating is carried out ? **4**

5. a) What are the objectives of material management ? **6**

   b) Carry out A-B-C analysis for the following construction items. The estimated annual consumption of each item in terms of its cost are given below. Represent the results in a graphical form also. **10**

Se.No	Item Description	Amount (Rs.)
1	Cement	3,89,800
2	Sand	80,000
3	Aggregate (course)	1,10,000
4	Steel reinforcement	1,50,000
5	Bricks	1,40,000
6	Timber	60,000
7	Mosaic Tiles	85,000
8	PVC fittings	25,000
9	Wash basin	16,000
10	Stoppers for door	1,000
11	Electrical items	3,000
12	Admixtures	10,000

OR

6. Explain in brief **(any 4)** : **16**

   a) Factors affecting EOQ

   b) Lead time, safety stock

   c) Advantage of A-B-C analysis

   d) Advantages of centralisation of stores and purchasing

   e) Qualities of a materials manager.

SECTION – II

7. a) A highway of length 7.5 km is to be constructed. Draw a site layout to facilitate various operations. **8**

   b) What safety measures will you adopt during the construction of a tunnel ? **8**

OR

8. a) What are the factors affecting the selection of a site layout ? **6**

   b) What are the causes of accidents on a dam site ? **6**

   c) What are the various personal protective equipment ? **4**

9. a) Define Economics. State its importance from civil engineering point of view. **6**

   b) Explain "Law of Demand" and "Law of supply". Explain with examples how they are interrelated. **6**

c) i) What is time value of money ? **2**

ii) One person wants to borrow Rs. 15 lac to buy a flat. He approaches a bank for a home loan which has an interest rate of 12.5%. He has the capacity to pay an EMI of Rs. 20,000/- per month. What will be the maturity period of the loan ? **4**

OR

10. a) Define "Elasticity of Demand". What are the different cases of elasticity. **6**

b) Differentiate between cost, price and value with an example. **6**

c) What does "Law of Diminishing Marginal Utility" mean ? Explain with an example. **6**

11. a) What are the methods of Project Appraisal ? **6**

b) Following data pertains to two projects. Rank the projects based on B/C ratio and NPV value. **10**

Particulars	Project X	Project Y
Investment in Rs.	110000	110000
Cash inflow in Rs.		
Year 1	31000	71000
Year 2	40000	40000
Year 3	50000	40000
Year 4	70000	20000
Interest Rate (%)	14	14

OR

12. a) Discuss the various types of costs involved in a construction project. **4**

b) Following data pertains to two projects A & B. Suggest which one is to be selected based on

i) NPV @ 10% interest

ii) IRR **12**

Particulars	Project A	Project B
Initial Investment (Rs.)	4,00,000	3,50,000
Annual Income (Rs.)		
Year 1	1,50,000	1,00,000
Year 2	2,00,000	3,00,000
Year 3	80,000	50,000
Year 4	1,00,000	90,000
Year 5	20,000	60,000

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T.E. Civil (Semester – II) (2008 Pattern) Examination, 2011
ENVIRONMENTAL ENGINEERING – I (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Attempt Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *in*
Section ***I*** *and Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.****12***
in Section ***II****.*

2) Answer ***any 3*** *questions from* ***each*** *Section.*

3) Answer ***3*** *questions from Section* ***I*** *and* ***3*** *questions from*
Section ***II****.*

4) Answers to the ***two*** *Sections should be written in* ***separate***
books.

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

6) Black figures to the ***right*** *indicate* ***full*** *marks.*

7) Use of logarithmic tables, slide rule, Moillier charts,
electronic pocket calculator and steam tables is ***allowed****.*

8) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Define intake. What are the various factors which govern the selection of
   site for locating an intake ?   **6**

   b) Draw a flow diagram of a public water supply scheme and explain each
   component.   **6**

   c) The population of a town obtained from census report is as given below :

Year	1911	1921	1931	1941	1951	1961	1971	1981	1991
Population	8,000	12,000	17,000	22,500	29,000	37,500	47,000	57,000	66,500

   Estimate the population in the year 2031 by incremental increase method ?   **6**

                    OR

2. a) Define design period of a water supply scheme. Enlist the factors affecting the design period and the design period in years for various components in a water supply project.   **6**

   b) What are the various types of water demands ? Discuss them briefly.   **6**

   c) State the permissible limits for drinking water as per Indian standards for the following :   **6**

     i) pH   ii) Alkalinity   iii) Hardness

     iv) Chlorides   v) Turbidity   vi) Residual chlorine

3. a) A settling tank is designed for an overflow rate of 5,000 lit /m^2/hr. What percentage of particles of diameter (i) 0.06 mm and (ii) 0.03 mm will be removed in this tank. Temperature of water is 20°C and specific gravity of particles is 2.65.   **6**

   b) What is meant by coagulation ? Enlist the common coagulants used. Describe any one coagulant along with the chemical reactions.   **6**

   c) Draw a flow diagram of river water treatment plant for a city. Explain the purpose of any two units used for water treatment.   **4**

                   OR

4. a) Explain the purpose and limitations of Aeration.   **4**

   b) A water treatment plant clarifies 40 MLD of water. The quantity of alum required at the plant is 18 mg/l. If the raw water is having an alkalinity equivalent to 5 mg/l as $CaCo_3$, determine the quantity of alum and quick lime (containing 85% CaO) required per year by the plant ?   **6**

   c) Explain the working of a circular clariflocculator. Draw the typical cross-section of a circular clariflocculator, showing various components.   **6**

5. a) Design a rapid sand filter for producing a filtered water flow of 250m^3/hr with the following data : D_{10} = 0.5 mm, $\beta = 4 \times 10^{-4}$, h_L = 2.5m. Quantity of back wash water = 3% of filter output.

   Time lost during backwashing = 30 min/d.

   Design filtration rate = 5000 lit/hr./m^2.   **8**

   b) Explain break point chlorination with a sketch.   **4**

   c) Compare rapid sand and slow sand gravity filter.   **4**

                   OR

6. a) Explain the working of a rapid sand filter with a neat sketch ? **6**

   b) Chlorine usage in a water treatment plant having 25000 m^3/d capacity is 9 kg/d. The residual chlorine after 10 min. Contact time is 0.2 mg/l. Calculate chlorine dosage and chlorine demand in mg/l. **4**

   c) Explain the various operational troubles associated with rapid sand gravity filter. **6**

SECTION – II

7. a) What are the causes for bad taste and odour in water ? Enumerate the methods of their removal. **8**

   b) What do you understand by desalinnation ? Why it is important ? Explain in short Electrodialysis for desalination. **8**

OR

8. a) Explain with necessary chemical reactions 'Lime Soda Process' of water softening. Also explain advantage and disadvantages of this method. **8**

   b) What do you know about fluoridation ? Why it is necessary ? Explain any three methods of removing excess fluorides from water. **8**

9. a) Explain the purpose of providing ESR in water distribution system. Explain the methods of calculating balancing capacity. **8**

   b) A town with a population of one million has a continuous water supply. Water is supplied at the rate of 250 lpcd.

   Break up of the water demand is as follows :

Time	Lit/capital/day
4 am to 11 am	93
11 am to 4 pm	50
4 pm to 9 pm	75
9 pm to 12 am	22
12 am to 4 am	10

   Water is supplied from the treatment plant at uniform rate for all 24 Hrs. Find the balancing capacity of the reservoir required by mass curve method. **8**

OR

10. a) Explain the importance of the Rain water harvesting. Also enlist various benefits of rain water harvesting. **4**

   b) Describe in detail rain water harvesting method for recharging the Aquifer. **4**

   c) What is service reservoir ? What are its functions ? Explain anyone with neat sketch. **8**

11. a) What sound pressure level results by combining the following four levels ? **6**
   i) 70 dB   ii) 63dB   iii) 75 dB &   iv) 76 dB

   b) Explain the following terms in brief
   i) Frequency   ii) Sound pressure level
   iii) Wave length of sound   iv) Threshold of hearing   **6**

   c) Write in tabular form maximum permissible noise levels during day and night for various types of areas. Also brief about ill effects of noise on human health. **6**

                    OR

12. a) Describe with sketches, how different atmospheric conditions give rise to different atmospheric conditions give rise to various kinds of plumes. **8**

   b) Explain how SPM is determined by using High Volume Sampler. **4**

   c) Explain how air pollution affect the following materials. **6**
   i) Paints   ii) Papers

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T.E. (Civil) Examination, 2011
FOUNDATION ENGINEERING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer Q.* **1** *or Q.* **2**, *Q.* **3** *or Q.* **4**, *Q.* **5** *or Q.* **6** *from*
Section – ***I*** *and Q.* **7** *or Q.* **8**, *Q.* **9** *or Q.* **10**, *Q.* **11** *or Q.* **12**
from Section – ***II***.
2) Answer to the ***two*** *Sections should be written in* ***separate***
books.
3) ***Neat*** *diagrams must be drawn* ***whenever*** *necessary.*
4) Figure to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of Pocket Calculator is* ***allowed***.
6) Assume ***suitable*** *data,* ***if necessary***.

SECTION – I

1. a) Define Boring. Explain in detail about wash boring.   **6**

   b) What is significant depth ? How would you decide the depth of exploration ?   **6**

   c) What are the factors that effect the sample disturbance ?   **5**

2. a) Explain electrical resistivity method in accordance with :   **6**

      i) Principle

     ii) Procedure and sketch

    iii) Limitation.

   b) Describe various types of soil samples. What is area ratio ? State its significance.   **6**

   c) Differentiate between SPT and DCPT.   **5**

3. a) Explain with neat sketches, modes of shear failure in soil.   **6**

   b) Write down Assumption made in Terzaghi theory and state Terzaghi Bearing
   capacity equation.   **6**

   c) Compute the safe bearing capacity of square footing 1.5 m × 1.5 m located
   at a depth of 1.0 m below the ground level in a sandy soil of average
   density 20 KN/m³, Q = 20°, Nc = 17.7, Nq = 7.4 and Nr = 5.0. Assume
   factor of safety = 3.0 and water table is very deep (Terzaghi analysis).   **5**

4. a) Explain Housel's perimeter shear concept.   **6**

   b) Explain with neat sketch plate load test and state the limitation of plate load test.   **6**

   c) Two plate load test with square plates were conducted on a soil deposit for a 30 mm settlement following loads were obtained

Width of plate (mm)	Load (KN)
300	38.2
600	118.5

   Determine width of square footing which would carry a load of 1500 KN for a limiting settlement of 30 mm.   **5**

5. a) Define following terms :   **6**

   i) Elastic settlement

   ii) Pressure bulb

   iii) Contact pressure.

   b) Explain with a neat sketch square root of time fitting method for determination of coefficient of consolidation.   **6**

   c) Determine the elastic settlement of a footing 3m × 3m resting on the sandy soil with E = 45000 KN/m^2, μ = 0.3, I_s = 0.82 at centre (rigid) if footing carries a load of 2,000 KN.   **4**

6. a) Explain with sketches spring analogy method of consolidation process.   **6**

   b) Define the following :   **6**

   i) Compression Index

   ii) Normal consolidation

   iii) Coefficient of consolidation.

   c) An Oedometer test gives time for 90% consolidation as 16 minutes on a 20 mm thick specimen. Determine the time for 50% consolidation for a clay bed 3.0 m thick with single face drainage.   **4**

SECTION – II

7. a) Enlist the circumstances under which pile foundation are used. **4**

   b) With suitable example explain : **6**

   a) Displacement piles

   b) Non-displacement piles.

   c) A precast concrete pile 0.305 m × 0.305 m in Cross-section is driven by hammer. Estimate the allowable pile capacity using modified EMR formula.

   Given,

   Weight of hammer = 35.6 KN

   Total length of pile = 20 m

   Hammer efficiency = 0.8

   Coefficient of restitution = 0.45

   Weight of pile cap = 3.2 KN

   Number of blows for last 25.4 cm of penetration = 5

   Height of fall = 100 cm

   F.O.S. = 5 **7**

8. a) What do you understand by 'Tilt' and 'Shift' of well ? What are remedial measures to rectify tilt and shift ? **6**

   b) What are the advantages and disadvantages of pneumatic caissons over open caissons ? **6**

   c) Differentiate between piers and piles. **5**

9. a) With suitable sketch explain 'Approximate analysis method to determine depth of embedment in cantilever sheet pile wall. **6**

   b) With neat sketches enlist different types of cofferdams. **6**

c) An anchored sheet pile wall is to retain soil to a height of 5.5 meter. The anchor rod is to be provided at a depth of 1.8 meter below the top level of the fill. The soil including that in to which the pile is driven is cohesionless with $\phi = 30°$ and $\gamma = 20.8$ KN/m^3 the surface of soil is horizontal and level with top of wall. Determine minimum penetration depth of the sheet pile to achieve free earth support. **5**

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

b) Define swelling pressure. Enlist the factors affecting the swelling pressure. **6**

c) Write a short note on 'construction of under reamed pile'. **5**

11. a) What do you understand by 'Reinforced earth' ? What are advantages of reinforced earth structures ? **6**

b) Explain use of Geotextile in : **6**

a) Earthen dam

b) Road works

c) Write a short note on 'types of earthquake'. **4**

12. a) Enlist and explain different types of seismic waves. **6**

b) State and explain important factors affecting liquifaction of soil. **6**

c) Explain use of Geotextile for bearing capacity improvement. **4**

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T.E. (Mechanical-Sandwich) (Semester – I) Examination, 2011
(Elective – I) (2008 Pattern)
(Self Study)
B) BEHAVIOURAL SCIENCE (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*
*2) Answers to the **two** Sections should be written in **separate**
books.
*3) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. What are the different forms of business organisation ? Explain in detail the formation and functions of joint stock company. Also describe its merits and demerits. **16**

2. a) Suggest a suitable organisational structure for a big steel industry. **6**

   b) Explain the function of management. **6**

   c) Explain the concept of management by objectives. **4**

3. a) Explain the following theories of motivation **10**

      i) Maslow's hierarchy of needs

      ii) Herberg's two factory theory.

   b) Explain in brief trade union. **6**

4. Write a short note on **(any three)** : **18**

   a) Personality traits

   b) Incentive scheme

   c) New industrial policy in India

   d) Classical and Neo classical theory.

SECTION – II

5. a) Explain Theory X and Theory Y in detail with some relevance. **8**

   b) What is leadership behavior ? Explain any two types of leaders. **8**

6. a) What is transitional analysis ? Where it is used? **8**

   b) Explain the theory of motivation. What is brainstorming ? **8**

7. a) What is upward communication ? What is its purpose and ways to improve it. **8**

   b) What is Conflict ? Explain nature and causes of conflicts. **8**

8. Write short note on **(any three)** : **18**

   I) Grapevine characteristics

   II) Management of change

   III) Indirect interview techniques

   IV) Group Dynamics

   V) Role of self assessment.

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T.E. (Electrical Engineering) (Semester – I) Examination, 2011
ENGINEERING ECONOMICS AND MANAGEMENT (New)
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

*Instructions : 1) Answer **any one** question from **each** Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Black figures to the **right** indicate **full** marks.*

SECTION – I

Unit – I

1. Define organization. State various types of business ownerships. Give suitable
   examples of each type of business ownership.   **16**

OR

2. Write short notes :

   a) Elasticity of Demand   **4**

   b) Elasticity of Supply   **4**

   c) Role of Government in Macro Economics   **4**

   d) Break-Even Point (BEP)   **4**

Unit – II

3. a) Explain various functions of Management.   **8**

   b) State the contribution of Henry Fayol in the field of Management. **8**

OR

4. a) Explain various type of plant layout.   **8**

   b) Explain ABC analysis in detail.   **8**

P.T.O.

Unit – III

5. a) Define Marketing. Explain various functions of Marketing. **9**

   b) Elaborate the components of 'Promotion Mix in Marketing'. **9**

OR

6. Write short notes :

   a) Financial Management **6**

   b) Methods of costing **6**

   c) Merger and Acquisition. **6**

SECTION – II

Unit – IV

7. a) Explain Maslow theory of need hierarchy. **8**

   b) State monetary and non-monetary motivational factors. **8**

OR

8. Write short notes :

   a) Team work **4**

   b) Leadership styles **4**

   c) Entrepreneurship **4**

   d) Group Theories. **4**

Unit – V

9. Define Human resource management ? Explain functions, scope and importance of human resource management. **16**

OR

10. Write short notes :

    a) Stress management **4**

    b) Professional and business ethics **4**

    c) Personality development **4**

    d) Process of learning. **4**

Unit – VI

11. a) Define and explain the concept of Disaster management in detail. **9**

    b) Explain role of disaster management machinery in India. **9**

OR

12. Prepare a disaster management plan for Earthquake. **18**

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T.E. (Electrical) (Semester – I) Examination, 2011
MICROCONTROLLER APPLICATIONS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Your answers will be valued as a **whole**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Compare Microprocessor and Microcontroller.   **8**

   b) Draw and explain Internal RAM organization of 8051.   **8**

                                    OR

2. a) What are the advantages and disadvantages of using Harvard architecture in 8051 ?   **8**

   b) Explain PSW SFR. Give the application differences between carry and overflow flags.   **8**

3. a) What is the jump range ? Enlist all jump instruction.   **5**

   b) Enlist stack and stack related instructions.   **5**

   c) Write a program to clear memory locations from D500H to D8FFH.   **6**

                                    OR

4. a) Explain the functioning of PC, SP and DPTR, if following instructions are executed.   **8**

      i) CALL   ii) JMP

   b) Write a program to copy an array of 10 elements from a location 40H onwards to external location D050H onwards.   **8**

P.T.O.

5. a) Explain SPI protocol, hence draw block diagram for master and 3 co-operative slave. **9**

   b) Write steps in executing interrupts. Explain IE. **9**

OR

6. a) Explain SCOH for mode 1, standard UART and its Bond Rate Evaluation methods. **8**

   b) Explain Autoreload mechanism of timer operation. **5**

   c) What do you mean by multiprocessor communications. **5**

SECTION – II

7. a) Explain in detail microcontrolled based development system. **8**

   b) Explain Simulator, Emulator, Assembler. **8**

OR

8. a) Explain Role of programmers and cross Assembler. **8**

   b) Interface 16 KB of EPROM with 8051 with starting address 0000H and 8 KB of RAM with starting address 8000H. Give memory mapping. **8**

9. a) Draw interfacing diagram for stepper motor interfaced with internal port pins 2.4 – 2.7. Driver circuit consist of transistor darlington pair. **9**

   b) If clockwise step sequence of above stepper motor is 33h, 66h, cch and 99h. Write a program to rotate stepper motor in clockwise and Anticlock wise direction. **9**

OR

10. a) Interface DAC 0808 with 8051 hence write a program for square waveform. **9**

    b) Discuss various types of presser sensors and transducers, hence explain pressure monitoring with microcontroller. **9**

11. a) Draw pin diagram of LCD 44780 and explain its interfacing with 8051. **8**

    b) Explain r.m.s. voltage measurement using 8051. **8**

OR

12. a) With neat circuit diagram explain how a 4×4 key pad is interfaced with 8051. **8**

    b) Write a short note on 8051 based DC motor control. **8**

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T.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL MACHINES – II
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from*
                        *Section **II**.*
                    *2) Answers to the **two** Sections should be written in **separate***
                        ***books**.*
                    *3) **Neat** diagrams must be drawn **wherever** necessary.*
                    *4) Black figures to the **right** indicate **full** marks.*
                    5) Use of logarithmic tables, slide rule, Mollier charts,
                        *electronic pocket calculator and steam tables is **allowed**.*
                    *6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Compare salient pole type construction with non salient pole type
      construction for three phase alternator.   **6**

   b) A 3 phase, 4 pole star connected alternator has 60 slots and 2 conductors
      per slot. The pitch of coil is 3 slots less than pole pitch. The flux per pole is
      120 mwb. Calculate no load voltage for the frequency of 50 Hz.   **6**

   c) A 3 phase, star connected alternator supplies a load of 10 MW at power
      factor 0.85 lagging and at 11kV. The resistance per phase is 0.1 ohm and
      synchronous reactance is 0.66 ohm per phase. Calculate the line value of
      e.m.f. generated.   **6**

              OR

2. a) Elaborate the effect of power factor on armature reaction in case of alternator. **6**

   b) Open circuit and short circuit tests were conducted on 866 volt, 100 kVA, Y connected alternator and following observations are obtained.

Field current (Amp)	1	2	3	4	5	6	7
Open circuit voltage (volt)	174	311	486	605	730	790	840
Isć (Amp)	25	-	-	-	-	-	-

   Armature resistance is 0.15 ohm per phase. Calculate full load regulation at 0.8 power factor lagging. **8**

   c) What is meant by short circuit ratio in case of alternator ? Elaborate its significance. **4**

3. a) Explain Blondel's two reaction theory for salient pole machines. Draw respective phasor diagram. **6**

   b) A 1000 kVA, star connected 2300 volt, 3 phase salient pole alternator has direct axis reactance of 1.95 ohm and quadrature axis reactance of 1.40 ohm. The armature resistance is negligibly small. Find the emf for operation at rated kVA at 0.6 p.f. lagging. **6**

   c) Explain the role played by synchronising power during parallel operation of alternator. **4**

                    OR

4. a) Explain one dark and two bright lamp method used for synchronising of alternators. **4**

   b) Explain any two methods of starting synchronous motor. **6**

   c) A synchronous motor takes input power of 20 kW at 400 volt from the supply. The synchronous reactance is 4 ohm per phase and armature resistance is negligible. The back emf is 550 volt. Calculate power factor and the current drawn by motor. The motor is star connected. **6**

5. a) Explain constructional details and working of 3 phase synchronous induction motor. **8**

   b) Explain V/f method of controlling speed of induction motor. **8**

                    OR

6. a) Explain constructional details and working of 3 phase induction generator. **8**

   b) State the applications of synchronous motor and compare synchronous motor with induction motor. **8**

                 SECTION – II

7. a) What are the problems in a d.c. series motor with a.c. supply ? What are the corrective actions to be taken ? **8**

   b) What is the necessity of using a compensating winding ? What are the different types of compensating windings ? What are their functions ? **8**

                    OR

8. a) Draw the phasor diagram of a plain series motor and show the different drops with transformer and rotational emfs. **8**

   b) Draw the circle diagram of a plain series motor to find the torque only. **8**

9. a) Define harmonics and why do they appear. **4**

   b) Explain harmonic induction torque and harmonic synchronous torques and what are their effects on an Induction motor. **12**

                    OR

10. a) What is the principle of working of a stepper motor ? **4**

    b) Describe in detail the operation of a variable-reluctance type stepper motor. **12**

11. a) Draw the equivalent circuit of a single phase induction motor, neglecting core loss, at no-load condition and explain. **8**

    b) Why capacitor start motor is better than the resistance-split phase type, explain with the help of phasor diagram and torque speed characteristic ? **10**

                    OR

12. a) Which type of single-phase induction motor has got starting torque and why ? How to change the direction of rotation of this type of motor. **8**

   b) The ratings of a single phase induction motor are as follows : 1 kW, 230 V, 50 Hz, 6-pole and the parameters are given below :

   i) resistance of main stator winding : 6 ohms

   ii) reactance of main stator winding : 4Ω

   iii) reactance of magnetizing branch referred to stator 100Ω

   iv) rotor resistance referred to stator at standstill: 6Ω

   v) rotor reactance referred to stator at stand still : 3.5 ohms

   The core losses are 45 watts while mechanical losses are 20 watts. The motor is operating with 4% slip. Calculate :

   i) Input current

   ii) Power factor

   iii) Shaft power

   iv) Efficiency. **10**

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T.E. (Electrical) (Semester – II) Examination, 2011
POWER SYSTEM – II (New)
(2008 Pattern)

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 100

Instructions : 1) Answer **any 3** questions from **each** Section Unitwise.

　　　　　　　　2) Answer **3** questions from Section **I** and **3** questions from Section **II** Unitwise.

　　　　　　　　3) Answers to the **two** Sections should be written in **separate** books.

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

　　　　　　　　5) Black figures to the **right** indicate **full** marks.

　　　　　　　　6) Your answers will be valued as a **whole**.

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

SECTION – I

1. a) Derive powerflow equation using generalised constants for transmission line. **8**

　　b) A long transmission line delivers a load of 60 MVA at 124 KV, 50 Hz, at 0.8 p.f. lagging. The constants at transmission line are A = D = 0.986 $\angle 0.32°$, B = 70.3 $\angle 69.2°\Omega$, C $= 4.44 \times 10^{-3} \angle 90°$ Ω

　　Determine :

　　i) Receiving end active power

　　ii) Sending end voltage and current

　　iii) Sending end active power

　　iv) Line losses. **8**

　　　　　　OR

2. a) Explain procedure to draw receiving end circle diagram. What information can be obtained from power circle diagram ? **8**

   b) Prove that apparent power $S = V \cdot I^*$. Hence explain concept of complex power. **8**

3. a) Explain advantages and disadvantages of E.H.V A.C. transmission. **8**

   b) A three phase, 220KV, 50 Hz transmission line consists of 1.2 cm radius of conductor spaced 2 m at corner of an equilateral triangle. Calculate disruptive critical voltage between the lines. Irregularity factor = 0.96, temperature = 20°, barometric pressure = 72.2 cm of Hg. Dielectric strength of air = 21.1 KV (rms)/cm. Hence calculate corona power loss. **8**

                    OR

4. a) Explain phenomenon of corona. Also explain visual critical voltage of corona. **8**

   b) A three phase, 220KV, 50 Hz transmission line consists of 1.2 cm radius of conductor spaced 2 m at corner of an equilateral triangle. Calculate disruptive critical voltage between the lines. Irregularity factor = 0.96, temperature = 20°, barometric pressure = 72.2 cm of Hg. Dielectric strength of air = 21.1 KV (rms)/cm. Hence calculate corona power loss. **8**

5. a) A 100 MVA, 33 KV, three phase generator has a reactance of 15%. The generator is connected to three motors through transmission line and transformers as shown in fig. Motors have rated input of 40 MVA, 30 MVA, 20 MVA at 30 KV with 20% reactance each. Draw per unit diagram. Assume base 100 MVA, 33 KV on generator. **10**
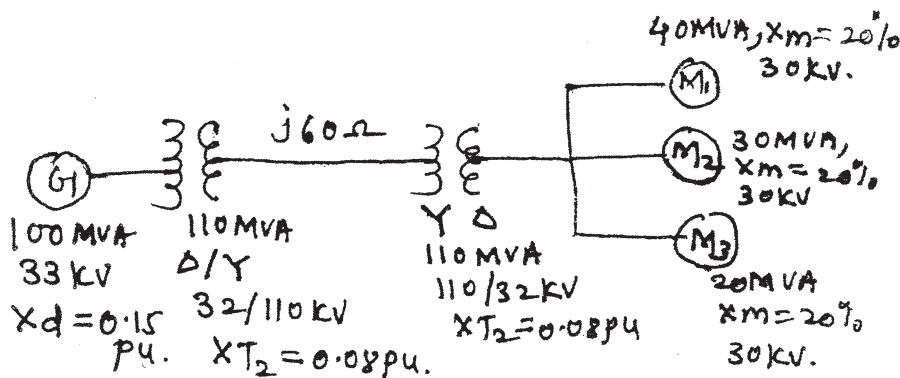
Fig 5(a)

   b) Write short note on current limiting reactor. **8**

                    OR

6. a) Two generators G_1 and G_2 are rated 15 MVA, 11 KV and 10 MVA, 11 KV respectively. The generators are connected to a transformer as shown in fig. Calculate the subtransient current in each generator when three phase short circuit fault occurs on high voltage side of transformer. **10**

15MVA, 11KV
$Xg_1'' = 0.1 pu$
G_1

15 MVA
11/66 KV
$X_T = 0.06 pu$

Fault

G_2
10 MVA, 11 KV
$Xg_2'' = 0.1 pu$

Fig 6 (a)
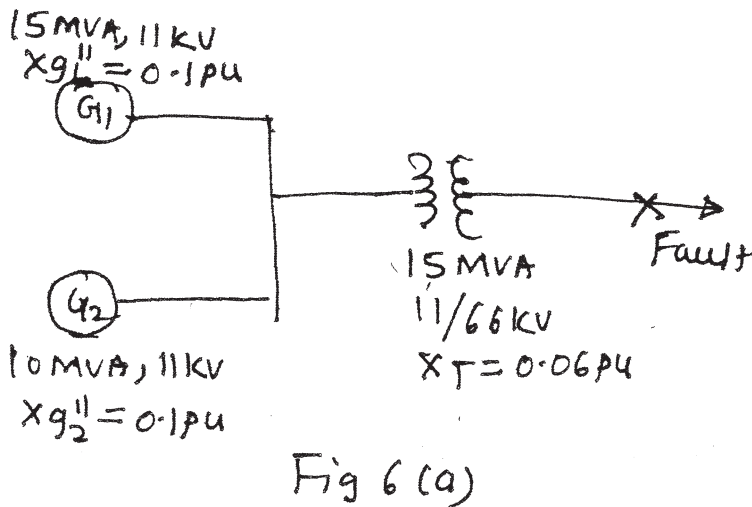
b) Explain subtransient, transient and steady state current when sudden short circuit occurs at unloaded alternator terminals. **8**

SECTION – II

7. a) Draw zero sequence diagram for all types of combinations of transformers. **8**

b) Show that fault current $I_f = \dfrac{3E}{z_1 + z_2 + z_0}$ when L-G fault occurs at the terminals of solidly grounded star connected alternator. **10**

OR

8. a) For a three phase transmission line with self impedance z_s and mutual impedance z_m, show that $z_1 = z_2 = z_s - z_m$ and $z_0 = z_s + 2z_m$. **6**

   b) A delta connected load is connected across an unbalanced three phase supply as shown in fig. Find symmetrical components of all line currents and phase currents. **12**

Fig 8 (b)
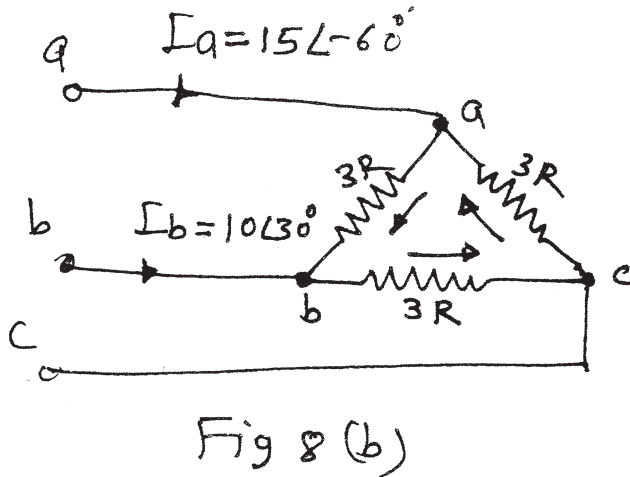
9. a) Derive static load flow equations for n bus system. **9**

   b) Give the classification of bus for load flow analysis. **7**

OR

10. a) Explain formulation of Y-bus using bus incidence matrix. **9**

    b) Compare Newton Raphson with Gauss Seidal method of load flow analysis. **7**

11. a) Give advantages and disadvantages of HVDC transmission system. **8**

    b) Explain components of HVDC transmission system with single line diagram. **8**

OR

12. Write short note on (any two) : **16**

    i) Bipolar and mono-polar HVDC transmission system

    ii) Constant current control

    iii) Constant extinction control.

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T.E. (Electronics) (Semester – I) Examination, 2011
DATA COMMUNICATION
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

N.B. : i) Answer **any three** questions from **each** Section.
       ii) Answers to the **two** Sections should be written in **separate**
          books.
       iii) **Neat** diagrams must be drawn **wherever** necessary.
       iv) Figures to the **right** indicate **full** marks.
       v) **Use** of electronic non-programmable calculator is **allowed**.
       vi) Assume suitable data, **if necessary**.

SECTION – I

1. a) Define and explain the concept of continuous and discrete time random
     variable with example.   **4**

   b) List the various standard probability models. Write their PDF and CDF.
     Explain their significance and applications.   **6**

   c) Probability Density Function (PDF) of a random variable X is given by

$$f_X(x) = \begin{cases} K(1-x^2) & .. \ 0 \le x \le 1 \\ 0 & ... \text{ otherwise} \end{cases}$$

     then find

     i) K   ii) CDF   iii) $P(0 \le x \le 2)$ **6**

OR

2. a) Derive an expression for $\dfrac{S}{N}$ ratio of integrate and dump filter and explain

     its operation.   **6**

   b) Show that impulse response of the matched filter is time reverse and delayed
     version of input signal.   **6**

   c) Find out the CDF of the Gaussian random variable.   **4**

3. a) Draw the following line code formats for bit stream : 11001001

    i) Bipolar NRZ

    ii) Split Phase Manchester

    iii) Polar RZ

    iv) AMI.

    Sketch power spectral density function for (i) and (iii) above and compare them. **8**

   b) Explain the operation of Costas Loop synchronization for carrier recovery. **4**

   c) Explain significance of "Eye Pattern". **4**

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

4. a) Describe early-late bit synchronization with the help of neat diagram. **4**

   b) Write a note on "Frame Synchronization". **4**

   c) Sketch PSD for polar NRZ and bipolar NRZ formats. **8**

5. a) Consider a (7, 4) linear block code whose generator matrix is given below :

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & \vdots & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & \vdots & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & \vdots & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & \vdots & 0 & 1 & 1 \end{bmatrix}$$

    i) Find all code vectors of this code

    ii) Find the parity check matrix of this code

    iii) Find maximum weight of this code. **10**

   b) Compare FEC and ARQ systems of error control. Compare different types of ARQ systems on the basis of their operation and performance. **8**

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

6. a) A convolutional encoder is shown in the following figure with a rate $= \frac{1}{2}, K = 3$.
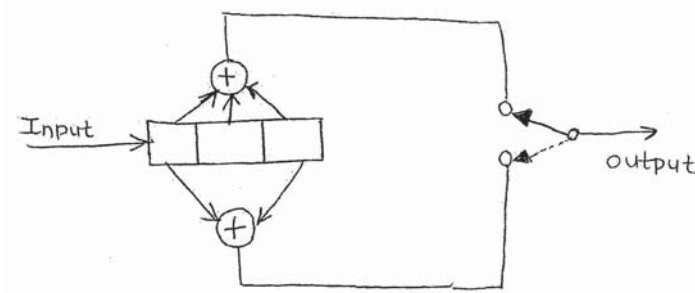
    i) Draw the tree diagram, trellis diagram and the state diagram for above encoder

    ii) If the received signal at the decoder for eight message bit is,

       Y = (00 01 10 00 00 00 10 01)

       Trace the decision on trellis or code tree diagram and find out message bit sequence. **10**

  b) Explain the various decoding methods of convolutional codes. **8**

SECTION – II

7. a) State and explain Shanon-Hartley theorem for Gaussian channel. **4**

  b) For an AWGN channel with 4 KHz bandwidth and noise power spectral density $\frac{N_0}{2} = 10^{-12}\ \text{W}/\text{Hz}$, the signal power required at the receiver is 0.1 mW. Calculate capacity of this channel. **4**

  c) Derive an expression for the channel capacity of an ideal AWGN channel with infinite bandwidth. **4**

  d) A source emits four symbols with probabilities, $P_0 = 0.4$ $P_1 = 0.3$ $P_2 = 0.2$ and $P_3 = 0.1$. Find amount of information obtained. **4**

OR

8. a) State and explain source coding theorem. **4**

   b) Prove the following relationship **6**
      $$I(X; Y) = H(X) - H(X/Y)$$
      $$I(X; Y) = H(Y) - H(Y/X)$$

   c) If M is the number of messages emitted by the source, prove that the upper bound on entropy is given by $H_{max} \leq \log_2 M$. **6**

9. a) Explain the transmission and reception of BPSK with mathematical expression. **6**

   b) The bit stream 1011100011 is to be transmitted using DPSK. Determine the encoded sequence and transmitted phase sequence. **4**

   c) With the help of block diagram and waveforms explain DPSK transmitter and receiver. **8**

                          OR

10. a) Derive an expression for error probability of BPSK. **8**

    b) Explain the difference between MSK and QPSK. **6**

    c) Explain QPSK modulator with neat block diagram. **4**

11. a) The power spectrum of DS-SS signal shows that at f = 0, power is 1 mW and spectrum goes through zero at 20.47 MHz away from a carrier of 1000 MHz. If the spacing between spectral lines is 0.01 MHz, determine the received power, the chip rate and number of shift registers used to generate PN sequence. **6**

    b) Explain in detail the operation of CDMA and compare performance parameters of FDMA, TDMA and CDMA. **6**

    c) Explain the operation of FH-SS with the help of block diagram and waveform. **4**

                          OR

12. a) A direct sequence spread spectrum system has a processing gain of 500. What is interference margin against a continuous tone interference if desired error probability is 10^{-5}. **6**

    b) Explain the difference between slow frequency hopping and fast frequency hopping. **6**

    c) Write short note on slotted ALOHA. **4**

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T.E. (E&TC) (Semester – I) Examination, 2011
NETWORK SYNTHESIS AND FILTER DESIGN (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
5) Your answers will be valued as a whole.
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Explain the following basic removal operations.   **6**

   1) Removal of a pole at $s = \infty$ from the function.

   2) Removal of a pole at $s = 0$ from the function.

   b) Test whether following function is a P.R. function.   **4**

   $$Y(s) = \frac{2s^3 + 2s^2 + 3s + 2}{s^2 + 1}$$

   c) Obtain the transfer function of the network shown in Fig. 1. Comment on the nature of the transfer function. Give an application of this circuit.   **6**

Fig. 1

OR
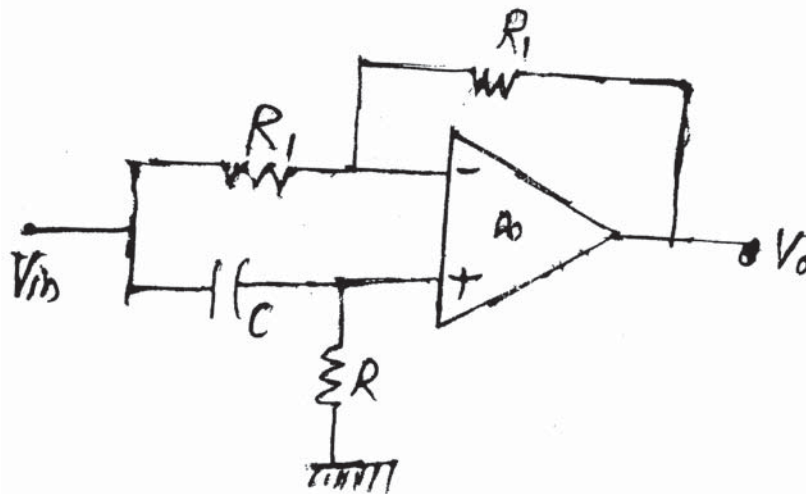
2. a) Explain the following basic removal operations. **6**

    1) Removal of a conjugate imaginary axis poles from a function.

    2) Removal of a constant from the function.

  b) Show that for $F(s) = \dfrac{s+a}{s^2 + bs + c}$ to be a P.K. Function the necessary conditions

    are **4**

    1) a, b, c ≥ 0 2) b $\geq$ a

  c) Comment on the pole positions and the stability of a systems. **6**

3. a) Explain the properties of a driving point admittance function $Z_{LC}(s)$ of a L-C network. **4**

  b) Input impedance of the network shown in Fig. 2 is $Z_{in} = \dfrac{2s^2 + 2}{s^3 + 2s^2 + 2s + 2}$ **6**

    If Z_0 is an L-C function

    1) Find the expression for Z_0

    2) Synthesize Z_0 into Foster – I form.
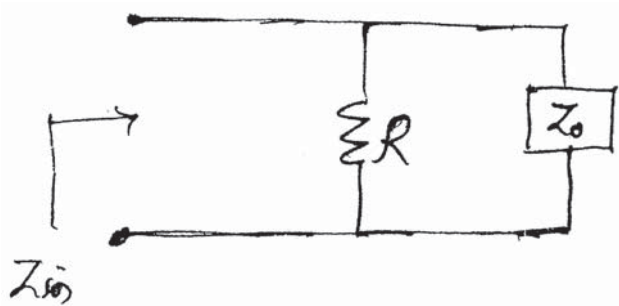
Fig. 2

  c) Synthesize following function into a network. **5**

$$Z(s) = \dfrac{s^2 + 2s + 2}{s^2 + s + 1}$$

  d) Give the properties of an R-L-C impedance function. **3**

OR

4. a) Explain the properties of a driving point admittance function $Y_{RL}(S)$ of an R-L network. **4**

   b) Realize the function $Z(s) = \dfrac{s^4 + 10s^2 + 9}{s^3 + 4s}$ into a Cauer-I form by explaining all

     the operations of the removal of a pole at $S = \infty$. **6**

   c) Give the essential properties of the R-L-C admittance function. **3**

   d) Pole-zero diagram of an impedance function is shown in Fig. 3. If $Z(-4) = \dfrac{3}{8}$

     obtain the function and realize it into a Cauer – II from. **5**
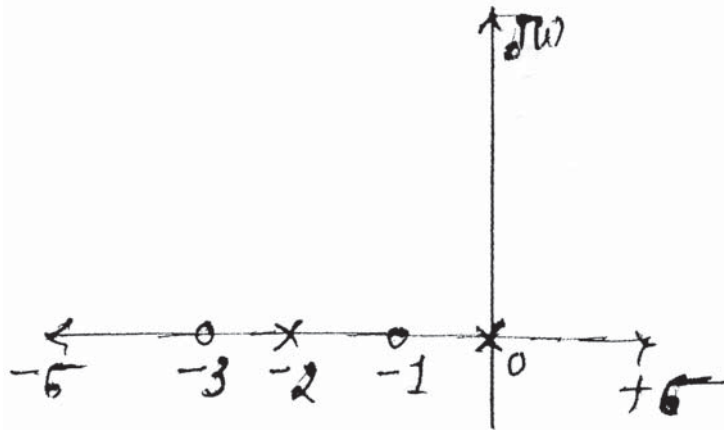
Fig. 3

5. a) What is meant by ZOT ? **3**

   b) What is a residue condition ? Show that it is valid for the network shown in Fig. 4. **6**
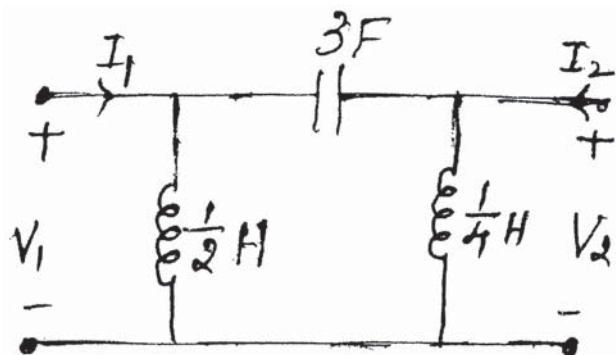
Fig. 4

c) What is a constant resistance network ?   **2**

d) Realize following transfer function H(s) in the form of a R-C ladder network.   **5**

$$H(s) = \frac{ks}{(s+4)\,(s+2)}$$

OR

6. a) Prove that the residue condition holds good for the network shown in Fig. 5.   **5**
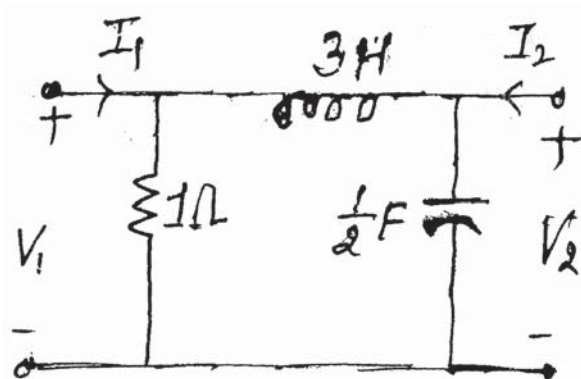
Fig. 5

b) Give the properties of the Transfer Function T(s).   **3**

c) Explain the meaning of an constant resistance network.   **2**

d) Realize the following voltage ratio Transfer Function.   **6**

$$H(s) = \frac{V_o}{V_s} = \frac{ks^2}{(s+4)\,(s+2)}$$

SECTION – II

7. a) Give the basic properties of a butterworth filter. Obtain the transfer function of a 3rd order normalized low pass filter. **7**

   b) Normalized third order low pass filter is shown in Fig. 6. Design the corresponding high pass filter with its cutoff frequency $W_c = 10^6$ rad/sec. and the impedance level of 500Ω. **4**
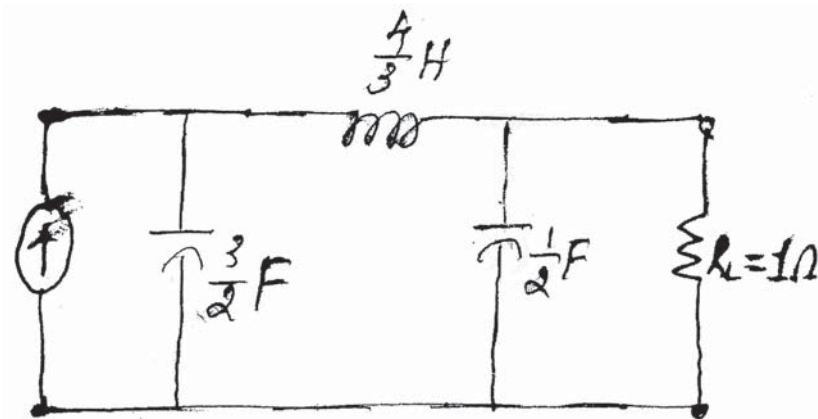
Fig. 6

   c) Explain frequency and magnitude normalization. **5**

OR

8. a) Give the basic properties a Chebyshev filter. Obtain the transfer function of a 3rd order normalized low pass Chebyshev filter. **7**

   b) Explain the frequency and Network transformation. **4**

   c) Consider the low pass filter of Fig. 7. Convert this into a Band pass filter with 1 ohm impedance level with Band width (B) = 6×10^4 r/sec. and the band pass is centered at $W_0 = 4 \times 10^4$ rad/sec. **5**
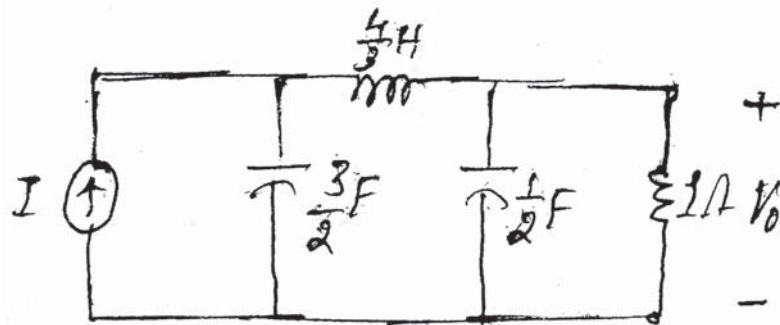

Fig. 7

9. a) Compare an active filter with passive filter.   **4**

   b) Synthesize following high-pass filter function by using RC to CR transformations.   **7**

   $$T_{HP}(s) = K \frac{s^2}{s^2 + s + 16}$$

   c) What is an gyrator ? Explain how an grounded inductor can be simulated by using gyrator. Also draw the circuit of an OP-AMP that realizes the gyrator.   **7**

                    OR

10. a) Write a short note on $RC \rightarrow CR$ transformation.   **4**

    b) Synthesize the given real pole transfer function using active RC circuits with no more than two OP-AMPs.   **8**

    $$T(s) = \frac{V_o}{V_{in}} = \frac{-(s+8)}{(s+3)(s+4)}$$

    c) Explain the cascaded approach, coupled structure approach and direct approach of an active network synthesis.   **6**

11. a) Define sensitivity in general. Give some of its important properties.   **4**

    b) For the parallel L-C network shown in Fig. 8 find the Transfer function $\frac{V_o}{I_{in}}$ and compute the sensitivities of K, W_p and Q_p with respect to the passive elements R, L and C.   **8**
    Assume $V_{in} = R\ I_{in}$.
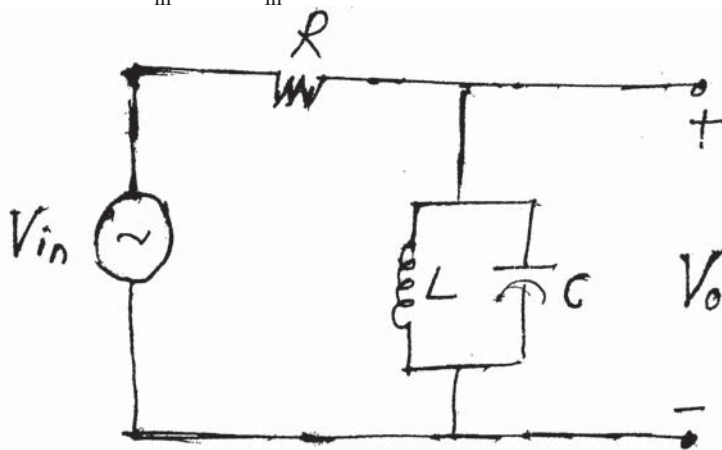

Fig. 8

    c) Write a short note on multi element deviations.   **4**

                    OR

12. a) What is gain sensitivity ? Explain various factors affecting gain sensitivity.

4

b) For the series R-L-C circuit shown in Fig. 9, calculate the sensitivity of the resonant frequency (W_0), the quality factor (Q_0) with respect to R, L and C. Comment on the results obtained.
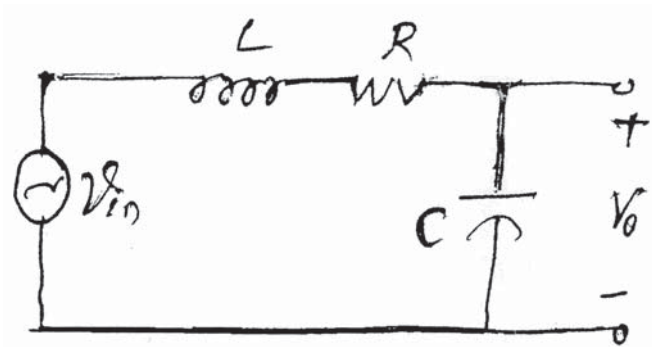
6

Fig. 9

c) What is frequency compensation ? Why is it required ? Explain various techniques used for frequency compensation.

6

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
**PROCESS LOOP COMPONENTS**
(New) (2008 Course)

Time : 3 Hours   Total Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Moillier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Develop an operational amplifier circuit that can provide an output voltage related to input voltage by the equation $V_{out} = 3.4\ V_{in} + 5$.   **8**

   b) Explain the following P & ID symbols giving application and specific the location of the instruments.   **10**

   i.

   ii. ST

   iii. TSL

   iv. PY

   v. FR

OR
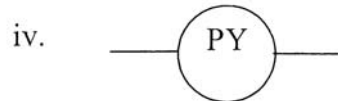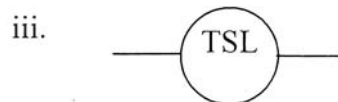
2. a) State the advantages of SMART over conventional transmitter. **6**

   b) Explain with the help of neat block diagram two wire RTD temperature transmitter. **8**

   c) Compare two wire and four wire transmitters. **4**

3. a) Explain the significance of the following process characteristics in the selection of type of controller.
   i) Capacity
   ii) Distance lag. **8**

   b) Explain the following with respect to controller
   i) Reverse and Direct control
   ii) Antireset windup. **8**

                      OR

4. a) Draw responses of P, PI, PD and PID controllers to ramp and step input. **10**

   b) 'Time proportional controller is better than ON/OFF controller's justify. **6**

5. a) Compare transducer, transmitter and converter. **6**

   b) Define tuning of controller. Explain Ziegler-Nichols method of tuning.

   In an application of Ziegler-Nichols method, a process begins oscillating at 35% proportional band in a 10 min period. Find nominal three mode controller settings. **10**

                      OR

6. a) Compare position with velocity algorithm. **8**

   b) State the advantages of PLC over relay based system. **8**

                      SECTION – II

7. a) Explain the classification of instructions for PLC programming. **8**

   b) Develop ladder diagram for Alarm annunciator for two inputs. **10**

                      OR

8. a) Explain the following with respect to PLC.
   i) Rack and Slot configuration
   ii) Programming languages.
   iii) Programming Devices. **12**

   b) Develop PLC ladder diagram for stirred tank system. **6**

9. a) Explain with suitable example air failure to open and air failure to close valve. **8**

   b) Explain the working and features of angle valve. **8**

             OR

10. a) Explain the function of following control valve parts.
    i) Stuffing box
    ii) Valve trim
    iii) Guide
    iv) Actuator. **8**

   b) Compare linear and equal percentage control valve characteristics. **8**

11. a) Define and give the significance of valve coefficient. Give the equations of valve coefficient for gas, liquid and vapor services. **8**

   b) Compare cavitation and flashing. **8**

             OR

12. Write short notes (**any two**) :
   a) High temperature services valves
   b) Control Valve Noise
   c) Control Valve Dynamic Specification. **16**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
INSTRUMENTATION SYSTEM DESIGN
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer* **3** *questions from Section* **I** *and* **3** *questions from*
                        Section **II**.
                  2) Answers to the **two** *Sections should be written in* **separate**
                        books.
                  3) **Neat** *diagrams must be drawn* **wherever** *necessary.*
                  4) Black figures to the **right** *indicate* **full** *marks.*
                  5) Assume **suitable** *data,* **if necessary**.

SECTION – I

1. a) What is significance of "Index of Protection". Explain IP-54.   **8**

   b) Explain "Proto Typing and Testing". Also explain the role of this for product
      designing.   **8**

OR

2. a) To reduce the probability of failure of instrumentation system, explain the
      proper design techniques.   **8**

   b) Compare ANSI with NEMA standard.   **8**

3. a) Explain how electronic circuit or equipment can be protected against EMI.   **8**

   b) Explain the contact noise and popcorn noise.   **8**

OR

4. a) Explain series and parallel type single point ground system with following.   **8**

    i) Figure/circuit diagram

    ii) Mathematical expression

    iii) Explanation

    iv) Application.

   b) Explain the control panel layout with neat diagram.   **8**

P.T.O.

5. a) What are the features of instrumentation amplifier AD 620 IC ? Using the AD 620 IC design amplifier for the gain of 100 using supply voltage ±15 V. Draw the circuit diagram for this amplifier. Also specify output of above amplifier for the input voltage 1V. **9**

   b) Explain the features, operation of analog opto coupler HCNR 200 with the help of neat diagram. Also specify the typical application where analog opto coupler is required. **9**

OR

6. a) What is output voltage of AD595 when 300°C temperature is applied to pin 1 and 14 through chromel Aluminium thermocouple, while the output voltage of thermocouple is observe to be 12.207 mV. **6**

   b) Using AD595 how set point controller can be designed. **8**

   c) Find the servo gain (K_1), when forward current $I_f = 20$ mA, and servo photo current $I_{p1} = 80$ μA at temperature 25°C for IC 300. **4**

SECTION – II

7. a) What is concept of optical isolation ? Explain the practical application of MCT2E. **9**

   b) Discuss the use of phase locked loop IC CD 4046B as frequency multiplier. **9**

OR

8. Explain test circuit diagram and timing diagram of ICM 7217A with the following function **18**

   1) Scan   2) $\overline{Zero}$

   3) $\overline{Equal}$ 4) Display count

   5) BCD I/O   6) LC and LR

9. a) Explain the Drag and wave soldering.   **8**

   b) Explain the flexible and multilayer PCB.   **8**

<p style="text-align:center">OR</p>

10. a) How to solder SMD ? Why thermo regulation is required while soldering SMDS ?   **8**

    b) Why flux is required for soldering ? Explain types of fluxes used in soldering.   **8**

11. a) What is necessity of calibration ? Explain the basic elements of calibration process.   **8**

    b) With the help of neat diagram Bath Tub curve.   **8**

<p style="text-align:center">OR</p>

12. a) Explain MTTF and MTBF.   **8**

    b) Explain with the example scan test, function test and built tests.   **8**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
CONTROL SYSTEM DESIGN (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answer* **3** *questions from Section* **I** *and* **3** *questions from Section* **II**.
2) *Answers to the* **two** *Sections should be written in* **separate** *books.*
3) **Neat** *diagrams must be drawn* **wherever** *necessary.*
4) *Black figures to the* **right** *indicate* **full** *marks.*
5) **Use** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* **allowed**.
6) *Assume* **suitable** *data,* **if necessary**.

SECTION – I

1. a) The open-loop transfer function of feedback control system is given :

   $$G(s)H(s) = \frac{K}{s(s+5)}$$

   The specifications are as follows :

    i) % overshoot for a unit step input = 25%

   ii) e_{ss} for unit ramp input : ≤ 0.25 rad.

   iii) Peak time : $t_p = 1.71$ sec.

   Design a phase-lead compensator.   **14**

   b) What is the effect of addition of poles on the root locus ?   **4**

   OR

2. a) Design a suitable compensator for the system whose open-loop transfer function is

   $$G(s)H(s) = \frac{16}{s(s+4)}$$

   so that the static velocity error constant K_υ is 20 sec^{-1} without appreciably changing the original location of poles.   **14**

   b) What is the effect of addition of zeros on the root locus ?   **4**

3. The open-loop transfer function of the uncompensated system is

$$G(s)H(s) = \frac{5}{s(s+2)}$$

   Design a suitable compensator for the system so that the static velocity error constant K_υ is 20 Sec^{-1}, the phase margin is atleast 55° and the gain margin is atleast 12 dB. **16**

<center>OR</center>

4. Apply Bode plot method to design a lag compensator for unity feedback system having

$$G(s) = \frac{K}{s(s+2.5)(s+25)}$$

   such that P.M. $\approx$ 35°, G.M. $\geq$ 12.5 dB and e_{ss} = 0.05 rad for unit ramp input. **16**

5. The following transfer function is obtained from step response of the system.

$$G(s) = \frac{4e^{-3.5s}}{(21s+1)}$$

   Find the parameters for P, PI and PID using Ziegler-Nicholas method. **16**

<center>OR</center>

6. The transfer function of unity feedback system is given below :

$$G(s) = \frac{K}{s(s+1)(s+3)}$$

   Find the parameters for P, PI and PID using Ziegler-Nicholas method. **16**

<center>SECTION – II</center>

7. a) The open loop transfer function of unity feedback control system is given below

$$G(s) = \frac{10}{s(s+1)(s+3)}$$

   Design a PD controller such that P.M. = 35° at ω = 2 rad/sec. **9**

b) Design a controller for the following first order system :

$$G(s) = \frac{2}{(3s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is :

$$Q(s) = \frac{1}{(5s+1)}$$

9

OR

8. a) The open loop transfer function of unity feedback control system is given below

$$G(s) = \frac{100}{(s+1)(s+3)}$$

Design a PI controller such that P.M. = 35° at ω = 8 rad/sec.   **9**

b) Design a controller for the following first order system :

$$G(s) = \frac{2}{(s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is :

$$Q(s) = \frac{1}{(2s+1)}$$

9

9. a) State and explain concept of controllability. Determine the state controllability of the system

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -3 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u$$

8

b) State and explain concept of observability. Determine the state observability of the system.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -3 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

8

OR

10. a) Apply Cayley-Hamilton theorem to determine the state transition matrix having given :

$$\begin{bmatrix} 1 & 3 \\ -2 & -4 \end{bmatrix}$$

8

b) Derive the necessary and sufficiency condition for complete state controllability.

8

11. Consider a system with state space model

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -3 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

Verify that the system is controllable, if so, design a state feedback controller using Ackerman's method such that closed closed-loop poles are at $s_1 = -4.8$, $s_2 = -4.8 + j6$, $s_1 = -4.8 - j6$.

16

OR

12. $$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix} u$$

$$y = \begin{bmatrix} 2 & -4 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Verify that the system is observable. If so determine the observer gain matrix using coefficient comparison method to place the observer poles at $s_{1,2} = -1 \pm j2$ and $s = -10$.

16

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T.E. Chemical (Semester – I) Examination, 2011
CHEMICAL ENGINEERING THERMODYNAMICS – II
(New) (2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) Answer **three** questions from Section **I** and **three** questions
from Section **II**.
2) Answers to the **two** Sections should be written in **separate**
books.
3) **Neat** diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) Use of logarithmic tables, slide rule, Mollier charts, electronic
pocket calculator and steam tables is **allowed**.
6) Assume suitable data, if **necessary**.

SECTION – I

1. a) Determine the ratio of fugacity in the final state to that in the initial state for steam
undergoing the isothermal change of state
   a) From 9000 kPa and 673.15 k to 300 kPa
   Data – At 9000 kPa and 673.5 k
   H = 3121.2 J/gm, S = 6.2915 J/gm.k
   At 300 kPa and 673.5k
   H = 3275.2 J/gm, S = 8.0338 J/gm.k.   **8**

   b) Explain the concept of ideal solution and derive equations for G^{id}, s^{id}, v^{id} and H^{id}.   **8**

                        OR

2. a) From the following data calculate the fugacity of nitrogen at 1000 bar and 273 k.

P, bar	50	100	200	400	800	1000
PV/RT	0.9846	0.99	1.0365	1.2557	1.7959	2.0641

10

   b) Explain chemical potential as criteria of phase equilibrium.   **6**

3. a) At 298 k and atmospheric pressure the volume change of mixing of binary liquid mixtures of species 1 and 2 is given by the equation $\Delta V = x_1 x_2 (45x_1 + 25x_2)$ where ΔV is in cm³/mol. At these conditions V_1 = 110 and V_2 = 90 Cm³/mol. Determine the partial molar volume $\overline{V_1}$ and $\overline{V_2}$ in a mixture containing 40 mol% of species 1. **10**

   b) Explain the effect of pressure on activity coefficient. **6**

                    OR

4. a) The van Laar constants A and B for the system 1-propanol(1) – chlorobenzene (2) are 1.1239 and 1.2589 respectively. Calculate γ_1 and γ_2 when x_1 = 0.2, 0.4 and 0.6. **8**

   b) Derive Gibbs-Duhem equation and discuss its various forms. **8**

5. a) The system acetone (1)/autonitrile (2)/nitromethan (3) at 363 k and 110 kPa has the overall composition z_1 = 0.45, z_2 = 0.35 z_3 = 0.20. Assuming the Raoult's law is applicable to this system, determine moles of liquid, moles of vapor and liquid and vapor phase mole fractions. The vapor pressures of the pure species at 363k are P_1^{sat} = 195.75, P_2^{sat} = 97.84, P_3^{sat} = 50.32kPa . **10**

   b) Explain the effect of temperature on p-x-y diagram. **8**

                    OR

6. a) For the system ethyl ethanoate(1)/n-heptane(2) at 343 k – $\ln \gamma_1 = 0.95x_2^2$, $\ln\gamma_2 = 0.95x_1^2$ P_1^{sat} = 79.80kPa, P_2^{sat} = 40.50 kPa

   Assuming the validity of Raoults law

   a) Make a BUBLP calculation for T = 343 k and x_1 = 0.05

   b) Make a DewP calculation for T = 343 k and y_1 = 0.05

   c) What is the azeotrope composition and pressure at T = 343 k. **12**

   b) State the Duhems theorem. What is its significance in establishing the state of the system ? **6**

SECTION – II

7. a) Explain osmotic pressure and osmotic equilibrium. **8**

   b) Show that at constant T and P the condition for stability for a single phase binary system is given as $\dfrac{d\ln\gamma_1}{dx_1} > -\dfrac{1}{x_1}$. **10**

   OR

8. a) The following isothermal VLE data for 1-propanol (1)/chlorobenzene (2) at 95°C is given below. Test whether the data is thermodynamically consistent or not.
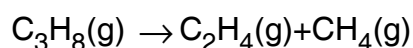
   $P_1{}^{sat} = 681.77$ kPa, $P_2{}^{sat} = 248.48$ kPa

P, kPa	X_1	Y_1
350.00	0.0550	0.3500
446.00	0.1290	0.5110
574.00	0.3130	0.6500
609.00	0.4300	0.6970
665.00	0.6380	0.7590
691.00	0.8720	0.8830

   12

   b) Explain in brief the different criteria of phase equilibrium. **6**

9. a) For the cracking reaction

   $$C_3H_8(g) \rightarrow C_2H_4(g)+CH_4(g)$$

   the equilibrium conversion is negligible at 300k, but becomes appreciable at temperature above 500k. For a pressure of 1 bar calculate

   a) The fractional conversion of propane at 625 k if k = 1.52.

   b) The temperature at which the fractional conversion is 85% and

   $\Delta G = 4972.3$ ^{J}/mol. **10**

   b) Derive the relationship between mole fractions of species and extent of reaction. **6**

   OR

10. a) For the catalytic dehydrogenation of 1-butene to 1, 3-butadiene

   $$C_4H_8(g) = C_4H_6(g) + H_2(g)$$

   carried out at 900 k and 1 atm and with a ratio of 10 mol of steam per mole of butene, determine the extent of reaction at equilibrium. Also determine the extent of reaction in the absence of steam. At 900 k the value of ΔG = 8318 J/mol.   **10**

   b) Write a note on multireaction equilibria.   **6**

11. a) Carbon black is produced by the decomposition of methane $CH_4(g) \rightarrow C(s) + 2H_2(g)$. For equilibrium at 923k and 1 bar

   a) What is the gas phase composition if pure methane enters the reactor and what fraction of methane decomposes ?

   b) Repeat part (a) if the feed is equimolar mixture of methane and nitrogen. The equilibrium constant at 923 k is 4.24.   **10**

   b) Explain in brief phase rule for non reacting systems.   **6**

                OR

12. The feed gas to a methanol synthesis reactor is composed of 75 mol % H_2, 15 mol% CO, 5 mol% CO_2, and 5mol % N_2. The system comes to equilibrium at 550 k and 100 bar with respect to following reactions.

   $$2H_2(g) + CO(g) \rightarrow CH_3OH(g)$$

   $$H_2(g) + CO_2(g) \rightarrow Co(g) + H_2O(g)$$
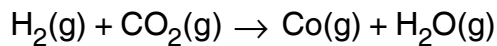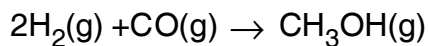
   Assuming ideal gases, determine the composition of the equilibrium mixture if the equilibrium constants are given as k_1 = 6.749×10^{-4}, k_2 = 0.01726.   **16**

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T.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL ENGG. DESIGN – I
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. a) Discuss on non metals as materials of construction for Chemical plants.   **8**

   b) Write a note on materials of construction for low temperature services.   **8**

OR

2. a) Discuss in details methods of optimization.   **8**

   b) Write a note on post weld heat treatment.   **8**

3. a) Discuss the proportionating of pressure vessels.   **6**

   b) A vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange for the design data given

   Design pressure = 170 Kg/cm²

   Design temperature = 121°C

   Allowable bolt stress at gasket seating and operating conditions = 1306 Kg/cm².

   Allowable flange stress at gasket seating and operating conditions = 1190 Kg/cm².

   Inside diameter of gasket = 34.4 cm.

   Width of gasket = 2.5 cm.

   m = 3, Ya = 680.3 Kg/cm²,
   Bolt circle diameter = 56.2 cm 16 bolts of 50 mm diameter are used.   **10**

OR

4. a) A pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 Kg/cm². If the vessel is fabricated as class C vessel, with welded joint iff is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint iff is 100% calculate the vessel thickness under these different condition and find out how much is the percentage material saving by welding a strip along the longitudinal joint.

Allowable stress of material = 1020 Kg/cm² and corrosion allowance = 1 mm. **10**

   b) Explain the method for calculating the thickness of toris spherical head subjected to internal pressure. **6**

5. a) A high pressure vessel fabricated by shrink fit construction has three concent shells. The ratio of outer radius to inner radius for all the shells is 1.4. The vessel is subjected to an internal pressure of 150 Kg/cm² pressure outside the vessel is atmospheric.

   Estimate :

    i) The maximum combined stress at the interfaces of concentric shells.

    ii) Interface pressure resulting from internal pressure and shrinkage stresses.

   Data : Modulus of elasticity, E = 2×10⁶ Kg/cm
   Internal diameter of vessel= 400 mm. **12**

   b) Write in brief about various types of losses during storage of volatile grids. **6**

                OR

6. a) Write a note on Hortonspheres. **6**

   b) Explain detailed design procedure for design of cylindrical storage vessel with cone roof. **12**

SECTION – II

7. a) A tall vertical vessel 1.5 m in diameter and 13 m high is to be provided with the skirt support. Weight of the vessel with all its attachments is 80,000 Kg. Diameter of skirt is equal to the diameter of the vessel. Height of skirt is 2.2 m. wind pressure acting over the vessel is 100 Kg/m^2. Siesmic coefficient = 0.08, permissible tensile stress of skirt material = 960 Kg/m^2, permissible compressive stress is $\frac{1}{3}$rd yield stress of material. Yield stress is 2400 Kg/cm^2 estimate the thickness of skirt support. **10**

   b) Explain saddle support with neat sketch and show various proportions for saddle support. **6**

OR

8. a) Discuss on the stresses in the shell of a tall vertical vessel. **6**

   b) Write notes on : **10**
      i) Selection of supports
      ii) Ring stiffness

9. 12000 Kg/hr of water available at 93°C is to be cooled to 50°C in a shell and tube heat exchanger. This heat is to utilized for preheating of water from 15°C to 45°C. Cold water is to circulated through the tubes, while hot water on shell side. Tubes of inside diameter 20 mm are to be used and the maximum velocity through the tubes should not be more than 0.5 m/sec. Due to space limitations the tube length is to be restricted to 3.2 m. Overall heat transfer coefficient for the H.E is 1450 w/m^2 °K. Flowing resistance and metal wall resistance may be neglected. Suggest a suitable design for the shell and tube heat exchanger. **16**

OR

10. a) Discuss the design of double pipe heat exchanger. **8**

    b) Discuss briefly on : **8**
       i) LMTD
       ii) Shell side and tube side heat transfer coefficients in a shell and tube HE.

11. a) Write note on fowing film evaporators. **6**

b) A looped flow arrangement plate heat exchanger is used to cool visions used from 95° C to 60° C. The water is available at 18° C and outlet temperature of water is 45° C the mass flow rate of visions fluid is 2.6 kg/sec. plates made up of stainlen steel. Plate thickness = 1 mm. Projected heat transfer area of plate = 0.2 m². Effective width between plates = 0.4 m. Distance between centres if inlet and outlet port = 0.8 m, ceasket the transfermers 3 mm.

	Hot fluid	**Water**
Viscosity, 11.5/m²	0.1230	0.78×10^{-3}
Specific heat, J/Kg°K	2512	4180
Thermal conductivity, W/m°K	0.1731	0.62

Neglecting the viscosity correction factors, finding the overall heat transfer coeff. for the exchanger. **12**

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

12. a) Write a note on types of reboilers. **6**

b) Comment on condensation of mixtures fnad pressure drop in condensers. **6**

c) Write a note on evaporizers. **6**

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T.E. (Petroleum Engg.) (Semester – II) Examination, 2011
PETROLEUM EQUIPMENT DESIGN AND DRAWING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answers* ***3*** *questions from* ***each*** *Section. Que* ***5*** *and Que* ***10*** *are* ***compulsory***.

2) *Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

3) ***Neat*** *diagrams must be drawn* ***whereever*** *necessary.*

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

5) ***Use*** *of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator and steam table is* ***allowed***.

6) *Assume* ***suitable*** *data,* ***if necessary***.

SECTION – I

1. a) Write note on Stress concentration and factor of safety.   **5**

   b) List the different theories of failure. Explain maximum principle stress theory and shear stress theory in brief along with their applications.   **6**

   c) Discuss the design fundamentals applied to petroleum equipment.   **5**

OR

2. a) What are the advantages and disadvantages of chain drive over belt drive ?   **6**

   b) Discuss Factor of Safety and factors on which factors of safety depends.   **6**

   c) Discuss the role of design engineer in design of any equipment.   **4**

3. a) An open belt 100 mm wide connects two pulleys mounted on parallel shafts with their centers 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 r.p.m., find the maximum power that can be transmitted.   **10**

P.T.O.

b) Two parallel shafts whose center line are 4.8 m apart are connected by an **CROSS** belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley is 1 m. The Initial tension in belt when belt is stationary is 3 KN. The mass of belt is 1.5 kg/m length. The coefficient of friction is 0.3. Taking centrifugal tension in account, calculate the power transmitted, when smaller pulley rotates at 400 rpm. **8**

OR

4. a) Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used. **10**

Shear stress for shaft, bolt and key material = 400 KgF/Cm²

Crushing stress for bolt and key = 800 KgF/cm²

Shear stress for cast iron = 80 KgF/cm²

b) The load on a member consists of an axial pull of 20 KN, with shear force of 10 KN, find the diameter of member according to **8**

1) Max$^{m\,N}$ Normal stress theory

2) Max Strain energy theory

3) Max Principle strain theory.

5. a) A Pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm². If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these different conditions and find out how much is the % material saving by welding a strip along the longitudinal joint. **6**

Allowable stress of the material = 1020 kg/cm². Corrosion allowance mm.

b) Explain Area for Area method of Nozzle Compensation. Draw the necessary. **10**

SECTION – II

6. a) Write Functions of Baffles and Tie rods in Shell and tube heat exchanger. Draw its neat sketch. **8**

   b) Discuss advantages and disadvantages of fixed tube, floating head and U tube heat exchangers. **8**

   ### OR

7. a) Discuss with neat sketches different types of head and closure used in Shell and tube heat exchangers. **6**

   b) For the heat exchanger data find out diameter and thickness of shell : **10**

   Data :

   i) Number of tubes = 64

   ii) Number of passes = 2

   iii) Outside diameter of tube = 20 mm

   iv) Pitch (square) = 25 mm

   v) Proportionality Factor (β) = 0.8 (Triangular Pitch)

   $\quad\quad\quad\quad\quad\quad\quad\quad$ E $\;$ = 0.7 (Square Pitch)

   vi) Internal shell pressure (Pi) = 0.55 N/mm^2

   vii) Material is Carbon Steel

   viii) Permissible stress of the material = 130 N/mm^2

   ix) Welding efficiency = 85%

   Also find the diameter of shell if triangular pitch is selected.

8. a) What are the different losses that can occur in storage tank ? Explain the breathing loss in details. **6**

   b) Discuss the design of flat bottom cylindrical storage tanks. What are the formulae used to get the shell thickness at different height. Also mention the plate thickness for bottom plates of this cylindrical tank. Also give design of conical roof with considering slope 1 in 5. **10**

                    OR

9. a) Write and explain the formulae to calculate the thickness of torispherical and Elliptical head/closure. **4**

   b) A cylindrical storage tank has diameter 30 m and the tank height is 15 m. Liquid stored in the tank has a density 810 kg/m^3. Material of construction is carbon steel having permissible stress 1300 kg/cm^2. Density of material used for fabrication is 7700 kg/m^3.

   The plates of size 3 m × 1.2 m in varying thickness are available for fabrication. Welded joints efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of the tank at different height. Also estimate the total number of plates required. **12**

10. Write short notes on : **18**

   a) IS code for design of equipment

   b) ASME and TEMA CODES

   c) Different Drives for agitators

   d) Baffles and its need in mixing

   e) Welded joints.

———————

T.E. (Petrochemical) (Semester – II) Examination, 2011
MASS TRANSFER – II
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. Attempt **any three** from the following :   **18**

    i) Write down Kremser-Brown-Souders equations for absorption and stripping operations.

    ii) Write a brief note on : Choice of Solvent for Liquid-Liquid Extraction.

    iii) Write a brief note on : Azeotropic and Extractive distillation.

    iv) Derive Raleigh's equation.

    v) Write a brief note on : "Optimum reflux ratio for distillation".

                                OR

2. Some experiments are made on the absorption of CO_2 air mixture is 2.5 N caustic soda using a 250 mm diameter tower packed to a height of 3 m with 19 mm Rasching rings. In one experiment at 1 atm, the following results were obtained :

    gas rate = $G' = 0.34$ kg/m^2.s

    Liquid rate = $L' = 3.94$ kg/m^2.s

    The CO_2 in the inlet gas is 3.15 PPM and in the exit gas 31 PPM. Estimate the value of overall gas transfer coefficient, k_{Ga}.   **18**

3. a) Vapor pressures of chlorobenzene and water are given below :

Data :

Pressure, mm Hg	100	50	30	26
Temperature C, Chlorobenzene	70.4	53.7	42.7	34.5
Temperature C, Water	51.7	38.5	29.9	22.5

If steam is blown into the still containing a mixture of these two components and the total pressure is 120 mm Hg, estimate the temperature of boiling and the composition of the distillate. The two components are immiscible in the liquid. **8**

b) A feed of 50-mole % hexane and 50-mole % octane is fed into a pipe still through a pressure-reducing valve and then into a flash disengaging chamber. The vapour and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of the feed converted to the vapour is 0.5, find the compositions of the top and bottom products. The following table gives the equilibrium data for this system.

Mole fractions of hexane in liquid, x	1.00	0.69	0.40	0.192	0.045	0.00
Mole fractions of hexane in vapour, y	1.00	0.932	0.78	0.538	0.1775	0.00

8

OR

4. A continuous fractionating column is to be designed for separating 100000 kg per hour of a liquid mixture containing 35 mole percent methanol and 60 mole percent water into an overhead product containing 98 mole percent methanol and a bottom product having 98 mole percent water. A mole reflux ratio of 2.5 is used.

Calculate

 i) Moles of overhead product obtained per hour and

ii) Number of ideal plates and location of the feed plate if the feed is at its bubble point.

Equilibrium data :

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.41	0.57	0.66	0.72	0.78	0.82	0.87	0.91	0.95

Where x = mole fraction of methanol in liquid

And y = mole fraction of methanol in vapor.   **16**

5. a) A continuous rectification column is used to separate a binary mixture of A and B. Distillate is produced at 100-kmol/hr containing 98 mole % A. The mole fractions of A in the liquid and in the vapour, x and y respectively, from two adjacent ideal plates in the enriching section are as follows.

	y
0.65	0.85
0.55	0.75

If the latent heat of vaporization is the same for all mixtures and if the feed is a saturated liquid, calculate :

a) The reflux ratio

b) Vapour rate in the stripping section in kmol/hr.   **8**

b) Derive Fenske equation to determine total number of plates at total reflux. Mention clearly assumption. **8**

OR

6. a) State with reasons whether the following statements are correct or not, give appropriate equations wherever possible.

   a) Raoult's law applies to the solute and Henry's law applies to the solvent.

   b) In a rectification column, the heat requirement in the re-boiler gets fixed if the reflux ratio is fixed.

   c) Murphree plate efficiency can be above 100%. **8**

   b) Explain in brief the principles of following distillation methods.

   i) Vacuum and Steam Distillation

   ii) Azeotropic and Extractive distillation. **8**

SECTION – II

7. a) A solute is recovered from an aqueous solution containing 35% of the solute by weight using kerosene as the solvent. The distribution of the solute in water and kerosene may be described by $x' = 5.5 \, y'$ where x' is the kg of solute per kg of water and y' is the kg of solute per kg kerosene. Calculate the following :

   i) The final concentration in the final raffinate if the extraction is done in 3 simple equilibrium contacts using 5 kg solvent per kg of initial solution in each stage.

    ii) The number of equivalent theoretical contacts necessary to obtain the concentration of solute in the final raffinate as 2.5% by weight with the extraction done by counter current stage contacting using 6 kg of kerosene per kg of aqueous solution. **10**

  b) Discuss the ternary diagram for liquid-liquid extraction by taking suitable example. **8**

$$OR$$

8. a) 150 kg of Nicotine-Water solution containing 1% nicotine is to be extracted with 250 kg of kerosene at 273 K. Water and kerosene is essentially immiscible in each other. Determine the percentage of extraction of nicotine after one stage operation.

At the dilute end of the system, the equilibrium relationship is given by :

$Y^* = 0.798\ X$

Where, $Y = \dfrac{\text{kg of nicotine}}{\text{kg of kerosene}}$ and $X = \dfrac{\text{kg of nicotine}}{\text{kg of water}}$. **12**

  b) Discuss the factors, which govern the selection of solvents to be used for liquid-liquid extractions. **6**

9. a) Develop material balance equation for countercurrent extraction operations. Show graphical representations of the final equations developed. **8**

  b) Classify the commercial extraction equipments. State working principles of Pulse columns. **8**

$$OR$$

10. a) Discuss the process principles involved in PSA and TSA by giving suitable examples. **10**

   b) Write a note on : Adsorption Isotherms. **6**

11. The adsorption of ethane as Linde molecular sieve 5A, was studied by Glessner and Myers (1969) at 35°C. Using the data given below.

   a) Determine if the Langmuir equation can be used to model the data.

   b) Calculate the total surface solid, if Density of Ethane = 0.35 gm/cc.

   Data :

P, [mm Hg]	Uptake, V[cm^3 (STP/gm)]
0.17	0.059
0.95	0.318
5.57	1.638
12.09	3.613
111.32	24.236
220.87	34.278
300.05	38.340
401.25	41.779
500.18	44.037
602.74	45.693

16

OR

12. Write short notes on : **16**

    a) Classification of membrane separation processes.

    b) Ultrafiltration, Nanofiltration and Microfiltration : Principles and Applications.

    c) Membrane modules for membrane processes.

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T.E. (Petrochemical) (Semester – II) Examination, 2011
PROCESS EQUIPMENT DESIGN AND DRAWING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from **each** Section. Que **5** and Que **10**
         are **compulsory**.*
      *2) Answers to the **two** Sections should be written in **separate**
         books.*
      *3) **Neat** diagrams must be drawn **wherever** necessary.*
      *4) Figures to the **right** indicate **full** marks.*
      *5) **Use** of logarithmic tables, slide rule, Mollier Charts, electronic
         pocket calculator and steam table is **allowed**.*
      *6) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) What is role of design engineer in design organization ? How it is
       interconnected with other department in organization ? Draw necessary sketch.   **6**

   b) What is importance of codes and standard ? Write names of organization
       which creates these standards.   **6**

   c) Discuss the process of design in details.   **4**

               OR

2. Write a note on :   **16**

   a) Types of belt drives and their selection criteria

   b) Advantages and disadvantages of chain drives over belt drive

   c) Different theories of failure. (minimum three)

   d) Stress concentration and methods to reduce it.

P.T.O.

3. a) Two parallel shafts, whose center lines are 4.8 M apart, are connected by an Open belt drive. the diameter of larger pulley is 1.5 M and that of smaller pulley is 1 M. The initial tension in belt when belt is stationary is 3 KN. The mass of belt is 1.5 Kg/m length. The coefficient of friction is 0.3. Taking centrifugal tension in account, calculate the power transmitted, when smaller pulley rotates at 400 rpm. **10**

   b) The stress induced at a critical point in a machine component made of steel are as follows :

   $\sigma_x = 100$ N/mm^2 $\sigma_y = 40$ N/mm^2

   $\tau_{xy} = 80$ N/mm^2

   Calculate factor of safety by :

   1) Max^m Normal stress theory

   2) Max^m shear stress theory

   Assume $S_{yp} = 380$ N/mm$^2 = \sigma_{permissible}$. **6**

   OR

4. Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used. **16**

   Shear stress for shaft, bolt and key material = 400 KgF/Cm^2

   Crushing stress for bolt and key = 800 KgF/cm^2

   Shear stress for cast iron = 80 KgF/cm^2

5. a) Discuss the area for area method of nozzle compensation with neat sketch. **6**

   b) A Pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm^2. If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these different conditions and find out how much is the % material saving by welding a strip along the longitudinal joint.

   Allowable stress of the material = 1020 kg/cm^2. Corrosion allowance is 1 mm. **12**

SECTION II

6. a) Why plate heat exchangers are superior to shell and tube heat exchangers ? Explain in brief the design considerations of plate heat exchanger. **10**

   b) Explain the causes of vibrations in a shell and tube heat exchangers and their effect on the performance of heat exchangers. **6**

   OR

7. a) Explain the classification of heat exchangers and the techniques for performance evaluation. **6**

   b) A heat exchanger with installed heat transfer surface area of 8.1 m² is to be used for heating process liquor available at 16.5 °C. The heating is to be performed with water available at 93 °C from another part of the plant. The arrangement of the unit is such that the fluids flow in true counter current manner. The flow rates of the process liquor and water are 3.1 kg/sec and 1.1 kg/sec. respectively. Previous experience indicates that an overall heat transfer coefficient of 450 W/m² K is suitable. Estimate the exit temperatures of the two fluids and determine the effectiveness of the heat exchanger. **10**

8. a) Explain the different types of roofs which are commonly used in storage tank. How it is decided to choose any particular roof ? **6**

   b) A cylindrical storage tank has diameter 30 m and the tank height is 15 m. Liquid stored in the tank has a density 810 kg/m³. Material of construction is carbon steel having permissible stress 1300 kg/cm². density of material used for fabrication is 7700 kg/m³.

   The plates of size 3 m × 1.2 m in varying thickness are available for fabrication. Welded joints efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of the tank at different height. Also estimate the total number of plates required. **10**

   OR

9. a) How are the optimum proportion of a storage tank determined when the shell thickness is independent of diameter and height and when the shell thickness dependent on diameter and height ? **8**

   b) Comment on Pipe stress analysis and design considerations. **8**

10. Write short notes on : **18**

   a) Pipeline Design considerations

   b) IS Code for design of equipment

   c) Importance of factor of safety

   d) Types losses in storage tanks.

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T.E. (Polymer Engg.) (Semester – I) Examination, 2011
DESIGN OF EQUIPMENT AND MACHINE ELEMENTS
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions :1) *Attempt Q. No.* ***1*** *or* ***2***, *Q. No.* ***3*** *or* ***4***, *and Q. No.* ***5*** *or* ***6***
   from Section ***I***. *Attempt Q.No.* ***7*** *or* ***8***, *Q.No.* ***9*** *or* ***10***
   and Q. No. ***11*** *or* ***12*** *from Section* ***II***.

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

3) *Answers to the* ***two*** *Sections must be written in* ***two***
   separate *answer books.*

4) *Use of scientific calculator, log paper etc. is* ***allowed***.

5) *Assume suitable design data, if* ***required***.

SECTION – I

1. a) The normal stresses on two planes at right angles to each other are 'P$_1$'
   MPa tensile and 'P$_2$' MPa compressive. This is accompanied by a shear
   stress of 'T' MPa. Explain with neat sketches the procedure to find out
   maximum and minimum principle stresses using Mohr Circle diagram. Also
   write the maximum shear stress value. **7**

   b) Design a cast iron sleeve or muff coupling which is used to connect two
   steel shafts transmitting 35 kW at 350 rpm. Design also the key for the
   coupling. Take permissible shear stress of cast iron coupling as 15 MPa.
   Take permissible shear stress for shaft and key material as 50 MPa. Take
   crushing stress for key and shaft as 90 MPa. **7**

   c) With neat sketches explain any four types of keys with their applications. **4**

P.T.O.

2. a) Write short notes on **any two** of the following. Give designations as per B is

    i) High speed tool steels

    ii) Cast iron and its types

    iii) Aluminium alloys. **6**

   b) Draw a neat sketch of 'Marine type flange coupling'. Give design procedure. **6**

   c) Write in short about distortion energy theory. How will you apply it for design of shaft ? **6**

3. a) A hollow steel shaft transmits 650 kW at 600 rpm. The maximum permissible shear stress is 65 MPa. Find the outside and inside diameter of the shaft, if the outer diameter is twice the inside diameter, assuming that the maximum torque is 20% greater than the mean torque. **4**

   b) An electric motor drives an exhaust Fan. A flat leather belt is to be used. The following data is known.

	Motor pulley	Fan pulley
Diameter (mm)	400	1600
Angle of wrap (radian)	2.0	3.5
Speed (rpm)	700	–
Power transmitted (kW)	22	–

The belt is 6 mm thick and permissible stress for belt material is 2.5 N/mm². Calculate width of belt. **6**

c) Derive an expression for ratio of driving tensions for a V-belt drive

$$\frac{T_1}{T_2} = e^{\mu\theta \cos ec\, \beta}$$

where 2β = included angle of V-belt

θ = angle of contact

μ = coefficient of friction

T_1, T_2 = tensions on tight and slack side.   **6**

4. a) Explain following concepts with respect to flat belt drive

   i) Slip of belt

   ii) Centrifugal force on belt

   iii) Initial tension in a belt

   iv) Creep of belt   **6**

  b) A shaft is supported on two bearing which are 1 meter apart as shown in Fig. 1. Diameter of both pulleys is 500 mm with 180° overlap. The belt directions are as shown in Fig. 1. The tension on tight side of both the belts is 2500 N and the ratio of tension is 2.0. Taking permissible shear stress of shaft material as 110 N/mm^2, calculate shaft diameter.   **10**

5. a) A generator shaft of 250 mm diameter running at 1600 rpm generates a load of 200 kN. Calculate.

   i) Length of bearing if allowable bearing pressure is 1.6 N/mm^2.

   ii) Amount of heat generated if viscosity of oil at 60°C is 0.04 kg/m-sec. and diametral clearance is 0.3 mm.   **6**

  b) Discuss design features of Pivot bearing and Collar bearings.   **6**

  c) Write in short about advantages and dis-advantages of rolling contact bearing over sliding contact bearings.   **4**

6. a) A case hardened steel spur pinion gear rotating at 500 rpm drives a cast iron spur gear with velocity ratio of 5 :1. Allowable static stresses for pinion and gear material are 85 MPa and 105 MPa. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. Face width of both gears is ten times the module. Find power that can be transmitted from the standpoint of strength.

Take velocity factor $Cv = \dfrac{3}{3+v}$ and tooth form factor $y = 0.154 - \dfrac{0.912}{T}$. **8**

b) Write short notes on :

i) Wedge film journal bearing

ii) Squeeze film journal bearing

iii) Properties of bearing material

iv) Bearing characteristic number. **8**

SECTION – II

7. a) Calculate the thickness of a flanged torispherical head for a vessel having an internal diameter of 6000 mm. Design pressure of vessel is 3.4 kg/cm^2. Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm. Permissible stress of the material is 1190 kg/cm^2. Welded joint efficiency is 100%. **6**

b) List the various factors to be considered while selecting material of construction for the pressure vessel. **4**

c) Give a design formulae for shell design of reaction vessel with half coil and design of shell with channel jacket. **6**

8. a) Calculate the shell thickness, head thickness, thickness of nozzle and reinforcement design for nozzle for a vessel pressurised with 3.5 kg/cm^2 internal pressure

   Data

   1 : Shell
      i) Internal diameter : 1200 mm
      ii) Material : stainless steel
      iii) Permissible stress : 130 N/mm^2
      iv) Vessel weight (with contents) : 35000 N

   2 : Flanged and shallow dished
      i) External diameter : 1200 mm
      ii) Crown radius : 1200 mm
      iii) Material : Stainless steel
      iv) Torque : 500 N-m

   3 : Nozzle
      i) Internal diameter : 150 mm
      ii) Thickness : 3 mm
      iii) Material : stainless steel

   Consider joint efficiency equal to 100%. **10**

   b) Explain various methods used for nozzle reinforcement. **6**

9. a) Explain basic hydraulic circuit for carrying out linear motion. **4**

   b) With a neat sketch, explain piston type hydraulic accumulator. **4**

   c) With a neat sketch, explain lobe pump operating on external gear pump principle. **4**

   d) Give hydraulic symbols for spoot center conditions for following types of 4-way directional control valves.
      i) Closed type
      ii) Tandem type
      iii) Float type
      iv) Open type. **4**

   e) Give hydraulic symbol for – Pressure and Temperature compensated Flow Control Valve. **2**

10. a) Draw a neat sketch of back pressure valve and discuss the functioning. **6**

　　b) Draw a neat sketch of counter balance valve and explain its use to prevent free falling of vertical cylinder due to gravity with the help of a hydraulic circuit. **6**

　　c) Draw a neat circuit showing accumulator charging and pump unloading. Explain the functioning of the circuit. **6**

11. a) With reference to direct locking hydraulic systems, explain following terms.

　　　i) Maximum Daylight

　　　ii) Minimum mould height

　　　iii) Maximum opening stroke

　　　iv) Actual opening stroke. **8**

　　b) Draw a bar chart showing major operations of injection moulding cycle in case of a sequential machine. **4**

　　c) Explain why toggle machines are said to be positive locking and explain why in toggle machines opening stroke is independent of actual mould height. **4**

12. a) Explain the use of pre-fill tank and prefill valve in case of open tank direct locking hydraulic machines. **5**

　　b) Explain different safety features built into hydraulic machines to prevent damage to the mould in case of mis-alignment. **5**

　　c) Discuss sharp edge orifice equation and explain how pressure drop across each flow path through proportional valve is same while using a symmetrical spool to control an equal area actuator. **6**

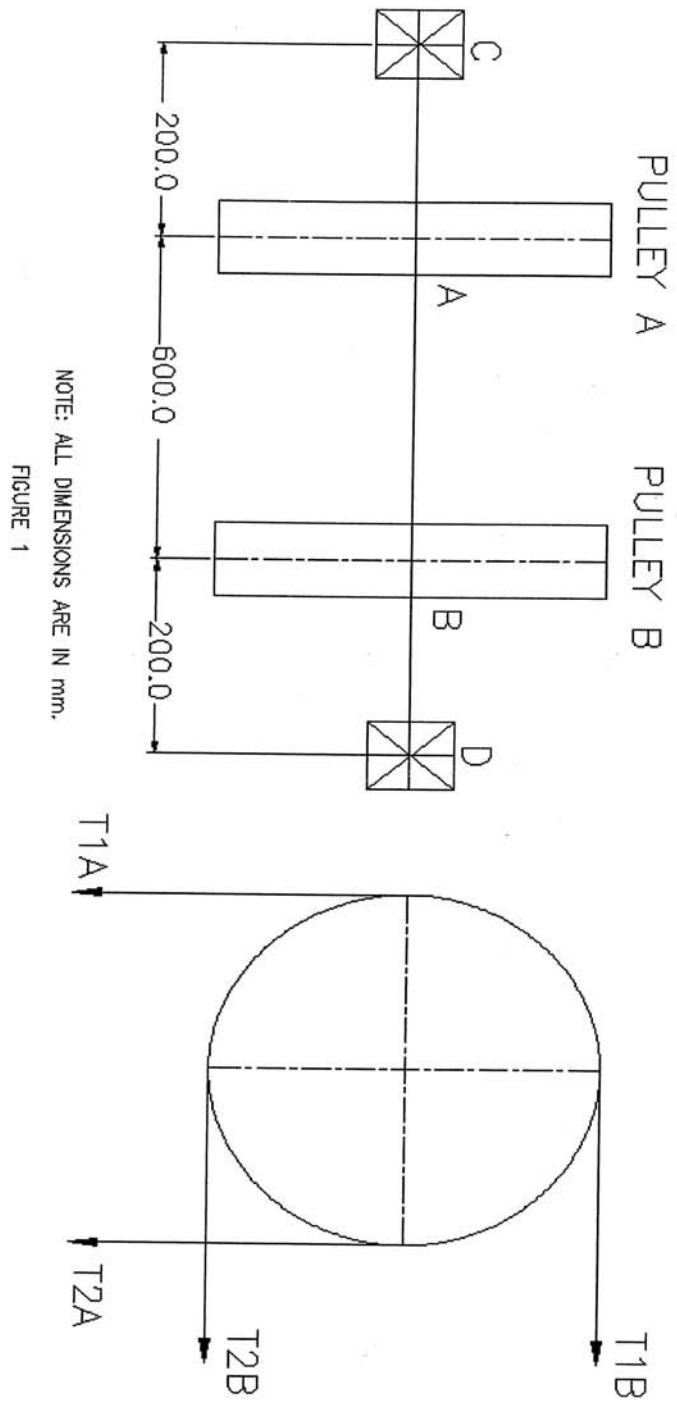NOTE: ALL DIMENSIONS ARE IN mm.

FIGURE 1

Fig.4(b)

T.E. (Semester – I) (Polymer Engineering) Examination, 2011
MASS TRANSFER & REACTION ENGINEERING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answers to the **two** Sections should be written in*
                          ***separate** books.*
                    2) *Draw neat diagrams **wherever** necessary.*
                    3) *Numbers to the right indicate **full** marks.*
                    4) *Assume suitable data, if necessary.*
                    5) *Use of logarithmic table, electronic pocket calculators is*
                          allowed.

SECTION – I

1. a) Derive the necessary expression for Diffusion of Gases A and B when whole fluid is moving in bulk or convective flow.   8

   b) Discuss in detail various relations between mass-transfer coefficients.   10

   OR

2. a) Find $D_{N2\text{-Gas mix}}$ if the gas mixture composition by volume % is as follows :

   $N_2 = 67\%$, $CO_2 = 16\%$, $CO = 11\%$, $O_2 = 6\%$ at 373 °K, 1.5 atm. pressure.

   Data : $D_{N2\text{-}O2} = 18.15 \times 10^{-6}$ m²/sec at 373 °K, 1.5 atm pressure.

   $D_{N2\text{-}CO} = 19.15 \times 10^{-6}$ m²/sec at 373 °K, 1.5 atm pressure.

   $D_{N2\text{-}CO2} = 15.15 \times 10^{-6}$ m²/sec at 373 °K, 1.5 atm pressure.   6

   b) Explain the term Mass transfer operation with two important applications.   6

   c) Oxygen A) is diffusing through Carbon monoxide B) under steady state condition, with the Carbon monoxide as non-diffusing. The total pressure is 1×10^5 N/m² and temperature 0°C. The partial pressure of Oxygen at two planes 2 mm apart is 15000 N/m² and 8500 N/m² respectively. The diffusivity for the mixture is $(D_{A\text{-}B}) = 1.87 \times 10^{-5}$ m²/sec. Find the rate of diffusion of oxygen through each square meter of the two planes.   6

3. a) Explain Raoult's Law and calculate the vapor liquid compositions in equilibrium at 368 °K for benzene-toluene using the vapor pressure data at 101.32 kPa. Vapor pressure of Benzene = 155.7 kPa and vapor pressure of Toluene = 63.3kPa.　　　　　　　　　　　　　　8

b) Discuss the term relative volatility and calculate the variation in relative volatility for benzene-toluene system at 85°C and 105°C.

Vapor pressure of Benzene = 116 kPa and Vapor Pressure of Toluene = 46 kPa at 85° and at 105°C Vapor Pressure of Benzene = 204 kPa and Vapor Pressure of Toluene = 86 kPa.　　　　　　　　　　8

OR

4. a) Differentiate between Tray tower and Packed tower.　　　　　　　6

b) a mixture of 100 mole containing 50 mole% n-pentane and 50 mole% n-heptane is distilled under simple distillation at 101 kPa until 40 mole is distilled. Find out the average composition of the total vapor distilled and the composition of the liquid left.

The equilibrium data are as follows :　　　　　　　　　　　　　　10

| x | 1 | 0.867 | 0.594 | 0.398 | 0.254 | 0.145 | 0.059 | 0 |
| y | 1 | 0.984 | 0.925 | 0.836 | 0.701 | 0.521 | 0.271 | 0 |

5. a) Explain the necessary terms used in polymer drying with neat diagram.　　10

b) Explain in detail the term Constant Rate Drying.　　　　　　　　6

OR

6. a) Discuss in brief the classification of polymer Dryers.　　　　　　8

b) Discuss in detail with neat diagram Drying of emulsion PVC polymer.　8

SECTION – II

7. a) Write short note on classification of chemical reactions.   8

b) The decomposition of acetaldehyde is of second order   8

$$CH_3CHO \rightarrow CH_4 + CO$$
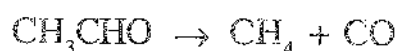
Rate at certain temperature is 0.18 mol/(liter. Second) when the concentration of CH_3CHO is 0.1 mol/1

i) What is the rate expression for this reaction ?

ii) What is the value of rate constant ?

iii) At the concentration of 0.2 mol/1 of CH_3CHO , what is the rate of reaction ?

OR

8. a) By differential method of interpretation of reactor data find out the rate equation from the following data for the reaction $2A \rightarrow 2B$.

Time (min)	0	20	40	60	80	100	120	140
Concentration of A, 'C_A' (kmol/1)	0.5	0.4	0.34	0.28	0.225	0.185	0.15	0.125

8

b) By integral method of analysis derive the following relation for first order uni-molecular irreversible reaction.

$A \rightarrow$ Product
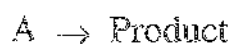
$$-\ln(1 - X_A) = k*t$$

X_A = conversion of A, k = reaction rate constant, t = time.   8

9. a) The following data is obtained on the decomposition of reactant A in a constant volume batch reactor the stoichiometry of reaction

$2A \rightarrow R + S$.

What size (in liter) of PFR (plug flow reactor) operating at 100°C and 1 atm can treat 100 mol A/hour in a feed consisting of 20% inert to obtain 95% conversion of A.

t(sec)	0	20	40	60	80	100	140	200	260	330	420
P_A (atm)	1.00	0.80	0.68	0.56	0.45	0.37	0.25	0.14	0.08	0.04	0.02

P_A = partial pressure of A and t = time. **14**

   b) In the above problem if same size CSTR (Continues stirred tank reactor) is used, other conditions remain unchanged, what will be the conversion of A ? **4**

OR

10. a) Define ideal batch reactor and derive performance equation for ideal batch reactor. **8**

   b) One liter per minute of liquid containing A and B (C_{AO} = 0.10 mol/liter, C_{BO} = 0.01 mol/ liter) flow into a mixed flow reactor of volume V = 1 liter. The material reacts in complex manner for which the stoichiometry is unknown. The outlet stream from the reactor contains A, B and C (C_{Af} = 0.02 mol/ liter, C_{Bf} = 0.03 mol/liter, C_{Cf} = 0.04 mol/liter). Find the rate of reaction of A, B, and C for the conditions within the reactors. **8**

   c) Define residence time and space-time. **2**

11. a) Differentiate between batch reaction, mixed flow reactor, plug flow reactor. **8**

   b) Reactant A ($A \rightarrow R$ C_{Ao} = 26 mol/m³) passes in steady flow through 4 equal size mixed flow reactors in series (t_{total} = total space time = 2 min) when steady state is achieved the concentration of A is found to be 11, 5, 2, 1 mol/m³ in the four units. For this reaction what must be t_{plug} (space time for plug flow reactor) so as to reduce C_A from C_{Ao} = 26 mol/m³ to C_{Af} = 1 mol/m³. **8**

OR

12. a) Derive the relation for plug flow reactors in series. **8**

   b) Write short note on Best arrangement of ideal reactors for given reaction. **8**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *:1) Answers to the **two** Sections should be written in **separate**
          books.*
       *2) Draw **neat** diagrams **wherever** necessary.*
       *3) Numbers to the **right** indicate **full** marks.*
       *4) Assume suitable data, if **necessary**.*
       *5) Use of logarithmic table, electronic pocket calculators is
          allowed.*

SECTION – I

1. a) A thermometer is calibrated from 25°C to 200°C. The accuracy of the
      thermometer is specified to be within : i) within $\pm 0.25\%$ of span
      ii) within $\pm 0.125\%$ of actual reading of 100°C. What is the maximum
      static error in both the cases ?   **6**

   b) The dead zone of certain pyrometer is 0.125% of span and accuracy
      specified to be within $\pm 0.025\%$. What temperature change might occur
      before it is detected and what is the maximum static error in units. The
      pyrometer is calibrated from 800 to 1800°C.   **6**

   c) Explain the term Sensitivity.   **4**

                         OR

2. a) Discuss any four terms used to describe the dynamic characteristics of any
      instrument.   **8**

   b) Discuss the followings with one example. Transducer, Signal Conditioner
      and Display element.   **8**

3. a) List various temperature measuring instruments & describe in detail any one with neat diagram. **12**

   b) Write short note on strain Gauge. **6**

   OR

4. a) What is LVDT and explain its construction and working. **8**

   b) Describe the thermocouple table and give its utility. **6**

   c) Explain the term Gauge Factor. **4**

5. a) Differentiate between Differential Pressure flow meters Vs Variable Area Flow meters. **8**

   b) Explain in detail capacitance liquid level indicator system. **8**

   OR

6. a) Draw the diagram and explain construction, working, advantages and disadvantages of Orifice meter. **10**

   b) Write short note on viscosity measurement system. **6**

SECTION – II

7. a) Define the term transfer function and derive applicable Transfer Equation for U tube Manometer. **10**

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

   i) Set Point

   ii) Error

   iii) Time constant

   iv) Dead time

   v) Load.

   OR

8. a) State any three benefits that can be achieved via process control system. **8**

   Explain the following terms with one example.

   Input Variable, Output Variable, Manipulated Variable, Disturbances.

   b) A thermometer (first order system) with time constant of 15 sec is placed in temperature bath and after it reaches steady state of 60°C, it is placed into hot fluid which is at 80°C. Find out the response of thermometer and find out the temperature at time = 15 sec. **10**

9. a) Explain the following terms with applicable diagram; Set Point, Load Variable, Error and Controlled Variable. **10**

   b) Write a note on Servo and Regulator problem control system. **6**

   OR

10. a) Discuss with neat diagram the behavior of feedback control system using different kinds of control action when it is subjected to disturbance. **8**

    b) Write a note on Controller Tuning. **8**

11. a) Discuss with neat diagram the mode of Proportional (P) control action. **8**

    b) Discuss the importance of advanced process control. **8**

    OR

12. Write a note on : **16**
    i) Programmable Logic Control
    ii) Digital Control System.

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T.E. (Computer Engineering) (Semester – I) Examination, 2011
MICROPROCESSORS AND MICROCONTROLLERS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) In Section **I**, attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or*
*Q. No. **4**, Q. No. **5** or Q. No. **6**.*
*2) In Section **II**, attempt Q. No. **7** or Q. No. **8**, Q. No. **9** or*
*Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*3) Answers to the **two** Sections should be written in **two separate***
books.
*4) **Neat** diagrams must draw **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume **suitable** data **if necessary**.*

SECTION – I

1. a) What is the function of each of the following pins ?   **6**
   i) $\overline{\text{AZOM}}$ ii) PWT   iii) INJT

   b) With the help of neat diagram explain architecture of pentium processor.   **8**

   c) Describe on chip cache organisation of pentium.   **4**

                                    OR

2. a) Describe the floating point unit in pentium.   **6**

   b) Which features makes pentium, a superscalar processor ? Explain in detail. **6**

   c) What is the function of prefetch buffer and Branch target buffer in pentium
   processor ?   **6**

3. a) How pipelined bus cycles are different than non-pipelined bus cycles ? Explain
   with timing diagram.   **6**

   b) Describe different addressing modes of pentium with suitable examples.   **6**

   c) Describe following instructions.   **4**
   i) XADD   ii) SWAPB   iii) BTC   iv) WBINVD

                                    OR

P.T.O.

4. a) Draw and explain timing diagram of non-pipelined read bus cycle of pentium. **8**

   b) What is the purpose of control registers ? Explain significance of CRO in working of cache and paging unit. **8**

5. a) Describe call gate mechanism in details. Draw the related descriptor formats. **8**

   b) Describe logical to linear address translation mechanism in pentium. Draw the required data structures. **8**

                          OR

6. a) What are privilege level checks performed by pentium when FAR JMP or FAR CALL instruction is executed ? Under what circumstances privilege level is changed by pentium ? Explain with the help of diagram. **8**

   b) How pages can be protected in pentium ? Give details. **8**

                    SECTION – II

7. a) What are contents of TSS ? Discuss the use of TSS in multitasking ? **8**

   b) What is I/O permission bit map ? Under what circumstances is it referred by pentium ? **6**

   c) Differentiate between real mode and virtual mode. **4**

                          OR

8. a) How interrupts are handled in protected mode ? Explain with the help of neat diagram. **8**

   b) What is difference between interrupt, Fault, Trap and Abort ? **6**

   c) Explain nested task in pentium. **4**

9. a) What are different addressing modes in 8051 ? Explain with suitable example. **8**

   b) Draw the memory map of 8051 microcontroller. What is bit addressable area ? How many bits are addressable ? What are uses of SFRs ? **8**

                          OR

10. a) Explain following instructions of 8051 microcontroller with example. **8**

    i) MOVC   ii) MOVX   iii) SETB   iv) RETI

   b) Write assembly language program for 8051 microcontroller to find average of 10 numbers stored in external data memory starting at address 3000H. Store the result in register R_0 of Banko. **8**

11. a) Describe different timer modes of 8051 microcontroller. **8**

   b) Draw and explain architecture of 8096 microcontroller. **8**

OR

12. a) What are different sources of interrupts in 8051 ? Explain interrupt structure of 8051 microcontroller. **8**

   b) Describe serial port of 8051 with the help of SCON. **8**

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T.E. (Computer Engg.) (Semester – II) Examination, 2011
PRINCIPLES OF PROGRAMMING LANGUAGES (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

***Instructions** :1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What are characteristics of good programming languages ? Explain with example.   **8**

   b) What do you mean by type checking ? Explain static and dynamic type checking.   **4**

   c) Explain different parameter passing methods with example.   **6**

   OR

2. a) What are various programming language paradigms ? Explain in brief with suitable examples.   **8**

   b) Define the term binding. With proper example in particular language explain which binding are done at.   **6**

   I) Translation time

   II) Execution time

   c) Justify the statement "Scope of variable ≠ life time of variable".   **4**

3. a) Explain block oriented and statement oriented program structure of
PASCAL. **8**

b) What is variant record ? How variant record is implemented in PASCAL ?
Explain pointers in PASCAL. **8**

OR

4. a) What are the desirable and undesirable characteristics of procedural
programming ? **8**

b) Explain current instruction pointer (CIP) and current Environmental Pointer
(CEP). How does it use for recursive programs ? **8**

5. a) How multiple inheritance is implemented in JAVA ? Explain with example. **4**

b) Explain polymorphism in JAVA with respect to following. **6**

I) Compile time polymorphism

II) Run time polymorphism

c) Explain with respect to JAVA **6**

I) An object and object reference

II) An object and a class

III) Object and methods

OR

6. a) What is thread ? How thread is implemented in JAVA ? **8**

b) Compare JAVA applications and JAVA applets. Draw Typical Applet life
cycle. **8**

SECTION – II

7. a) What is Microsoft ·NET technology ? What are web services and their importance from business perspective ? List web services protocols supported by industry. **10**

   b) What is assembly and delegates in C# ? Explain with suitable example. **8**

   OR

8. a) Explain following with respect to .NET. **8**

      I) JIT

      II) MSIL

      III) CTS

      IV) BCL

   b) Describe the structure of C# program. **4**

   c) What is the significance of name space and explain it with respect to C#. **6**

9. a) What is relation between resolution and unification ? How resolution and unification algorithm works to match the proper pair in database to achieve the goal ? Explain with suitable example. **8**

   b) Explain rules, facts and queries in prolog with example. **8**

   OR

10. a) What is backtracking and recursive structure in Prolog ? **6**

    b) What is the use of CUT operator with Prolog ? **4**

    c) Explain application of logic programming. **6**

11. a) Explain reduction rules in functional programming language. **8**

    b) Write a LISP program for sorting element of array using bubble sort. **8**

    OR

12. a) Explain following expression evaluation techniques with proper examples. **8**

   I) Innermost evaluation

   II) Selective evaluation

   III) Outermost evaluation

   IV) Short circuit evaluation.

   b) Write outputs of the following primitive function of LISP. **8**

   I) (car (cdr (cdr (A B C))))

   II) (member 'B' (A C D E))

   III) (cons (car (A B)) (cdr (A B)))

   IV) (NULL ? (car (C) B C)).

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T.E. (Computer Engineering) (Semester – II) Examination, 2011
COMPUTER NETWORKS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) What is the difference between persistent and non persistent HTTP ? Also explain HTTP message format.   **8**

   b) Consider you are accessing a web page. Explain what different things happen at client and server side, at each layer. Assume that both are using TCP/IP protocol stack.   **8**

OR

2. a) Explain connection oriented and connection-less service. Which protocols at each layer in TCP/IP protocol stack supports these services ?   **8**

   b) What is DNS ? Explain its various resource records with one example.   **8**

3. a) Write a pseudo code for client and server to setup a connectionless service between them.   **8**

   b) State which transport layer protocol is used by the following protocols-HTTP, FTP, DHCP, DNS, ICMP, TFTP, IP, SMTP.   **4**

   c) Explain pros and cons of TCP over UDP.   **4**

OR

4. a) Explain TCP congestion control algorithm with respect to additive-increase, multiplicative-decrease, slow start mechanism and reaction to timeout events. **8**

   b) Explain Three-way handshake in TCP. **4**

   c) Explain what will happen if transport layer is removed from TCP/IP protocol stack. **4**

5. a) Explain Resource Reservation Protocol in detail. **8**

   b) What is QoS ? Explain various parameters for QoS in a network. **5**

   c) Explain Leaky Bucket algorithm, which quality parameter is ensured by Leaky Bucket algorithm. **5**

OR

6. a) Differentiate between class based and flow based QoS. Explain differentiated services for QoS. **8**

   b) Explain various congestion prevention policies for maintaining the QoS in the networks. **5**

   c) What is traffic shaping ? How is it used in congestion control ? **5**

SECTION – II

7. a) Compare IPv6 and IPv4. Draw and explain IPv6 header format. **8**

   b) Divide the network 220.125.5.192/26 into 4 sub networks. How many hosts can be connected in each network ? Show their IP range, network address and broadcast address. **8**

OR

8. a) Compare IP and ICMP. Explain header format of ICMP V6 protocol. **8**

   b) Identify class, subnet mask, network address and broadcast address of following IP addresses : **8**

     1) 214.25.6.3

     2) 191.5.8.9

     3) 5.6.45.4

     4) 230.45.89.63

9. a) Explain hierarchical routing. How is it implemented in Internet ? **8**

   b) Classify routing algorithms. **4**

   c) Compare link state and distance vector routing algorithm. **4**

OR

10. a) A router has following CIDR entries in its routing table - **8**

Address/Mask	Next Hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
Default	Router 2

   For each of the following IP addresses, what does the router do if a packet with that address arrives ?

   1) 135.46.63.10

   2) 192.53.56.7

   b) Explain various network layer design issues. **4**

   c) Write short note on OSPF protocol. **4**

11. a) Explain various internetworking devices. State at which layer they work ? **8**

   b) What is the minimum overhead to send an IP packet using PPP ? Count only the overhead introduced by PPP itself, not the IP header overhead. **5**

   c) Illustrate various services offered by Data Link layer. **5**

OR

12. a) How link virtualization is achieved in MPLS ? **8**

   b) If all the physical links were to provide the reliable delivery service, would the TCP reliable delivery service be redundant ? Yes/No ? Justify. **5**

   c) Compare and contrast between HDLC and PPP. **5**

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T.E. (Computer Engineering) (Semester – II) Examination, 2011
SOFTWARE ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*
*2) Answers to the **two** Sections should be written in **separate***
books.
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Explain the generic framework activities in a software engineering process and
also mention the umbrella activities.   **8**

   b) Differentiate between prescriptive and evolutionary process models. Explain
'Prototyping' paradigm with a neat diagram.   **8**

   OR

2. a) State the myths that are believed by the developer and explain the reality with
respect to each myth.   **8**

   b) Explain the phases of the unified process and how it supports incremental and
iterative development.   **8**

3. a) Explain in brief the collaborative requirement gathering activity.   **8**

   b) What is scenario based modeling ? Describe the steps of scenario based
modeling with a suitable example.   **8**

   OR

4. a) What do you mean by CRC ? Write the steps for identifying analysis classes using CRC modeling. **8**

b) Draw the data flow diagram upto level 1, for a 'temperature monitoring system'
in an intensive care unit of a hospital. **8**

5. a) Describe the design model with a neat diagram and give the traceability of each layer of design model to analysis model. **8**

b) What do you understand by refactoring ? Give the importance of refactoring in improving the quality of software. **6**

c) What are the deployment level design elements ? **4**

OR

6. a) Explain data centered and layered architectures with neat diagrams. **8**

b) Explain any four Webapp design principles. **6**

c) What do you mean by archetypes ? **4**

SECTION – II

7. a) Explain the approaches in integration testing. **8**

b) Explain security and performance testing. **6**

c) What are the debugging tactics ? **4**

OR

8. a) Draw the flow graph for finding maximum of three numbers and derive the testcases using cyclomatic complexity. **8**

b) Explain equivalence partioning testing. **6**

c) Differentiate between alpha and beta testing. **4**

9. a) What is process decomposition ? What are the work tasks for communication process using process decomposition ? **8**

   b) Explain metrics for object oriented projects. **8**

                        OR

10. a) Explain COCOMO II model. **8**

    b) What is LOC-Based estimation ? Explain with a suitable example. **8**

11. a) What is time line chart ? Explain with a suitable example. **8**

    b) What is Risk identification ? What are the different categories of risks ? **8**

                        OR

12. a) Compare software measurement and metric. State the measurement principles.

       8

    b) What is software SCM repository ? Explain the features of tool set supporting SCM repository. **8**

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T.E. (Information Technology) (Semester – I) Examination, 2011
THEORY OF COMPUTATION
(2008 Course) (New)

Time : 3 Hours   Max. Marks : 100

Instructions :   1) *Answer Question **1** or **2**, **3** or **4** and **5** or **6** from Section – **I** and*
                      *Question **7** or **8**, **9** or **10** and **11** or **12** from Section – **II**.*
                   2) *Answers to the **two** Sections should be written in **separate** answer*
                      books.
                   3) *Neat diagrams must be drawn **wherever** necessary.*
                   4) *Figures to the **right** indicate **full** marks.*
                   5) *Assume suitable data if **necessary**.*

SECTION – I

1. a) Define and explain :   **8**
      i) Language
     ii) Cartesian Product
    iii) Regular Expression
     iv) Kleene Closure.

   b) Design a Finite State Machine for divisibility by 5 tester of a given decimal number.   **8**

                      OR

2. a) Construct NFA from the following regular expressions :   **8**
      i) 0*1*2*
     ii) (00 +)* (10)*.

   b) Obtain regular expression for the following FA.   **8**
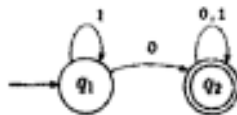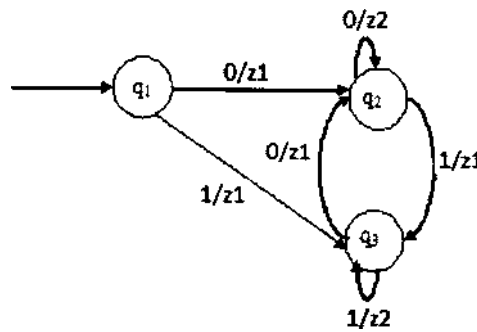

3. a) Convert the following NFA to its equivalent DFA.   **8**
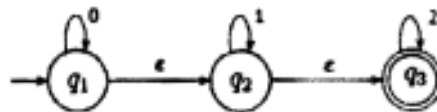

P.T.O.

b) Design a Moore Machine for checking divisibility by 3 of a given decimal number (residue of 3). **4**

c) Consider the following Mealy machine, construct a Moore machine equivalent to it. **4**

OR

4. a) Convert the following NFA-ε to its equivalent DFA. **8**

b) Construct the NFA for the language of all strings that begin and end with same symbol over the alphabet $\Sigma = \{0, 1\}$. **4**

c) Design a DFA which accepts the odd number 1's and any number of 0's over $\Sigma = \{0, 1\}$. **4**

5. a) Show that the following grammar is ambiguous **6**

   S $\rightarrow$ aSbS

   S $\rightarrow$ bSaS

   $S \rightarrow \varepsilon$.

b) Convert the following grammar to Chomsky Normal Form (CNF) **6**

   G = ({S}, {a, b}, P, S)

   P = {S $\rightarrow$ aSa | bSb | a | b | aa | bb}

c) Obtain a grammar to generate the language **6**

   L = {$a^{n+2}b^n$ | n $\geq$ 0 and m > n}

OR

6. a) Obtain the unambiguous grammar for the following grammar **6**

$E \rightarrow E + E \mid E - E$

$E \rightarrow E * E \mid E / E$

$E \rightarrow (E) \mid I$

$I \rightarrow a \mid b \mid c$

b) Consider the following grammar **4**

$S \rightarrow aAS \mid a$

$A \rightarrow SbA \mid SS \mid ba$

Derive the string aabbaa using
 i) Leftmost derivation
 ii) Rightmost derivation.

c) Convert the following grammar to GNF **8**

$G = (\{A_1, A_2, A_3\}, \{a, b\}, P, A_1)$

$P = \{A_1 \rightarrow A_2 A_3$

$A_2 \rightarrow A_3 A_1 \mid b$

$A_3 \rightarrow A_1 A_2 \mid a\}$

SECTION – II

7. a) Convert the following right linear grammar to left linear grammar **4**

$S \rightarrow 0A$

$A \rightarrow 1A$

$A \rightarrow \varepsilon$

b) Obtain a grammar to generate a string consisting of any number of a's and b's with at least one a. **4**

c) State and prove Pumping lemma theorem for Context-Free Languages. **8**

OR

8. a) Show that CFLs are closed under Union, Concatenation and Kleene closure. **8**

b) By using Pumping Lemma, prove that following language **8**

$L = \{ww \mid w \in \{a, b\}^*\}$ is not a context-free language.

9. a) Obtain a PDA to accept the language 8

   L = {a^{n}b^n | n ≥ 1} by a final state.

   b) Obtain PDA for the following grammar 8

   S → aABC

   A → aB | a

   B → bA | b

   C → a.

   OR

10. a) Construct PDA which accepts language consisting of even length palindrome of strings of a's and b's. 8

    b) Define post machines and explain its elements. 4

    c) Define acceptance by PDA 4
       i) By final state
       ii) By empty stack.

11. a) Construct a Turing Machine to accept the following language 8

    L = {x ∈ {a, b}* | x contains the substring aba}

    b) Write short notes on : 10
       i) Limitation of Turing Machine
       ii) Halting Problem of Turing Machine.

    OR

12. a) Design a Turing Machine to add two unary numbers. 8

    b) Write short notes on : 10
       i) Universal Turing Machine
       ii) Multi-tape Turing Machine.

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T.E. (Information Technology) (Semester – I) Examination, 2011
COMPUTER NETWORK TECHNOLOGY
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION– I

1. A) What are different ways by which networks can differ ? Explain it in brief. **10**

   B) Why there is a limitation on the size of packet ? State the reasons. **6**

                        OR

2. A) Explain in detail link state routing algorithms with example. **8**

   B) Differentiate between Virtual circuit subnet and Datagram subnet. **8**

3. A) Compare between IPv4 and IPv6. Draw header diagram. **8**

   B) For a given class B network 144.155.0.0 with default subnet mask, how can you divide it into 8 equal subnets ? How many hosts can be accommodated in each sub-network ? **10**

   1) Give the range of each subnet

   2) Give the network IP for 7th subnet

   3) Give the First usable host of 7th subnet

   4) Give the Last usable host of 7th subnet

   5) Give the Broadcast IP for the 7th subnet

                        OR

4. A) Explain stepwise the procedure carried out by DHCP client and DHCP server. Draw diagrams showing the above communication. **8**

   B) What is ICMP ? Explain the operating of ICMP with suitable example. Explain any four error messages of ICMP. **10**

5. A) How Nagle's algorithm helps in TCP transmission policy ? Explain the Clark's solution to overcome the silly window syndrome. **8**

   B) What is a Socket ? Explain various socket primitives used in client-server interaction (for both TCP and UDP). Explain different types of Sockets with example. **8**

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

6. A) Explain the three way handshake algorithm for TCP connection establishment. **8**

   B) What are the different quality of service parameters present at transport layer ? **8**

<div align="center">SECTION – II</div>

7. A) What is the purpose of SMI and MIB in relation to SNMP ? **8**

   B) Differentiate between POP3 and IMAP. **8**

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

8. A) Explain how name resolution happens in DNS. **6**

   B) Enlist all the resources records and its functions. **6**

   C) Write a short note on SMTP. **4**

9. A) What is meant by interactivity for streaming stored audio/video ? What is meant by interactivity of real time interactive audio/video ? **8**

   B) What is the essence of RSVP ? Explain the suitable example. **8**

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

10. A) What is the need of sheduling and policing techniques in multimedia networking ? **8**

    B) What is the need of RTCP protocol along with RTP protocol in multimedia communication ? **8**

11. Write a short note on **any three** : **18**

    1) Frame Relay

    2) B-ISDN

    3) Bluetooth and Limitations of Bluetooth

    4) X.25

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

12. A) Explain WAN architecture in detail. **8**

    B) Write a short note on : **10**

       1) Hidden Station Problem

       2) Gigabit Ethernet.

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T.E. (Information Technology) (Semester – II) Examination, 2011
DESIGN AND ANALYSIS OF ALGORITHMS
(New) (2008 Course)

Time : 3 Hours   Max. Marks : 100

N.B. : 1) *Answer **three** questions from **each** Section.*
           2) *Answer to the **two** Sections should be written in **separate** answer-books.*
           3) ***Neat** diagrams must be drawn **whenever** necessary.*
           4) *Figures to the **right** indicate **full** marks.*
           5) *Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Consider the following algorithm :   **8**

   int sq(n)

   If n = 0 then return 0

    Else return 2n + sq(n – 1) – 1

   Prove by mathematical induction that the above code always return a square of numbers.

1. b) How do we analyze and measure the time complexity of algorithm ? What are the basic components, which contribute to space complexity ? In what way the asymmetry between Big-Oh notation and Big-Omega notation helpful ?   **10**

                    OR

2. a) Prove by mathematical induction that "$n^3 < 2^n$".   **8**

2. b) Reorder the following complexity from smallest to largest   **10**

    i) $n\log_2(n)$, $n + n^2 + n^3$, 2^4, $sqrt(n)$

    ii) n^2, 2^n, $n\log_2(n)$, $\log_2(n)$, n^3

    iii) $n\log(n)$, n^8, $n^2/\log n$, $(n^2 - n + 1)$

    iv) $n!$, 2^n, $(n + 1)!$, 2^{2n}, n^n, $n^{\log n}$

3. a) Consider the binary search algorithm so that it splits the input not into two sets of almost equal sizes, but into three sets of sizes approximately one third, write down the recurrence for this ternary search algorithm and find the asymptotic complexity of this algorithm. **10**

3. b) Obtain a set of optimal huffman codes for the messages $(M_1 \ldots M_7)$ with relative frequencies $(q_1, \ldots, q_7) = (4, 5, 7, 8, 10, 12, 20)$ draw the decode tree for this set of codes. **6**

OR

4. a) Design and analyze a divide and conquer algorithm for finding minimum and maximum number in the array of n-numbers that uses $(3n/2) - 2$ comparison for any n. **10**

4. b) Write algorithm to compute shortest distance between source and destination vertices of a connected graph. Will your algorithm for weights may be negative ? **6**

5. a) Consider 0/1 knapsack problem $N = 3$, $w = (4, 6, 8)$, $p = (10, 12, 15)$ using dynamic programming devise the recurrence relations for the problem and solve the same. Determine the optimal profit for the knapsack of capacity 10. **10**

5. b) What is principle of optimality in dynamic programming ? Give suitable example for this property of optimality in dynamic programming. **6**

OR

6. a) $N = 3$ and $\{a_1, a_2, a_3\} = \{do, if, while\}$ let $p(1:3) = (0.5, 0.1, 0.05)$, $q(0 : 3) = (0.15, 0.1, 0.05, 0.05)$. Compute and construct OBST for the above values using dynamic programming. **10**

6. b) What are the common steps in the dynamic programming to solve any problem ? Compare dynamic programming with greedy approach. **6**

SECTION – II

7. a) What is backtracking method for algorithmic design ?

Solve the sum of subset problem using backtracking algorithmic strategy for the following data

N = 4 (w$_1$, w$_2$, w$_3$, w$_4$) = (11, 13, 24, 7) and M = 31. **12**

7. b) Discuss and analyze the problem of finding Hamiltonian cycle using backtracking. **6**

OR

8. a) What is backtracking method for algorithmic design ?

Solve the sum of subset problem using backtracking algorithmic strategy for the following data

N = 4 (w$_1$, w$_2$, w$_3$, w$_4$) = (11, 13, 24, 7) and M = 31. **12**

8. b) Consider the following instance for knapsack problem using backtracking n = 8

P = (11, 21, 31, 33, 43, 53, 55, 65) W = (1, 11, 21, 23, 33, 43, 45, 55) M = 110. **6**

9. a) Explain the branch and bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch and bound. **10**

9. b) Differentiate between backtracking and branch and bound. Illustrate with example of 4-Queens problem. **6**

OR

10. Explain the 8-Queen problem and explain the following with respect to 8-queen problem : **16**

1) State space tree

2) Solution state

3) State space

4) Answer state

5) Static tree

6) Dynamic tree

7) Live node

8) Bounding function.

11. a) What do you mean by NP hard and NP complete ? Show that Knapsack's problem is NP-Complete. **10**

11. b) What are the advantages of proving the relation P = NP ? **6**

OR

12. a) Explain the following : **10**

i) Computational complexity

ii) Decision problems

iii) Deterministic and non-deterministic algorithms

iv) Complexity classes

v) Intractability

12. b) State the Cook's theorem and prove it. **6**

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T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL ANALYSIS – II
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions: 1) *Answer **any 3** questions from **each** Section.*
                2) *Answer to the **two** Sections should be written in **separate** books.*
                3) ***Neat** diagrams must be drawn **wherever** necessary.*
                4) *Black figures to the **right** indicate **full** marks.*
                5) *Your answers will be valued as a **whole**.*
                6) *Assume suitable data, **if necessary**.*
                7) *Solve Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6** from Section **I**, Q. **7** or **8**, Q. **9** or **10**, Q. **11** or **12** from Section **II**.*

SECTION – I

1. a) If AB is the intermediate span of the continuous beam, derive the slope deflection equations for this beam AB subjected to some arbitrary loading and if support 'B' sinks down by 'δ'. Explain the meaning of each notation that you use in the equations. **8**

   b) Using Slope Deflection method, determine the support moments and hence plot the BMD on tension side for the beam ABC if beam is loaded and supported as narrated below.
Support A is fixed and support B and C are vertical roller.
Span AB = 3m, Span BC = 6m. Downward udl on span AB = 50 kN/m, Downward Concentrated load of 100 kN at the centre of span BC.
EI = constant for span AB and BC. **10**

              OR

2. Using Slope Deflection Method, plot BMD and then SFD for rigid jointed plane frame ABC. A frame has vertical column AB and horizontal beam, BC, are rigidly connected at point, B.
Support A is fixed and support C is vertical roller.
Height of column, AB = span of beam, BC = 5m
A frame is subjected to horizontal force (left to right) at point B = 100 kN and downward udl of 50 kN/m on span BC. Assume constant EI for beam and columns. **18**

3. Using Moment Distribution Method, plot BMD and SFD for 8m long beam, AB, which is fixed at both support A and B ? This beam is subjected to udl of 50 kN/m on full span AB whose cross section changes at intermediate point 'O' such that Portion AO has flexural rigidity = EI, portion OB has = 2EI.
Partly span AO=OB=4m. **16**

OR

4. Using Moment Distribution Method, draw BMD and SFD for the frame loaded and supported as shown in fig 1. EI is constant. **16**
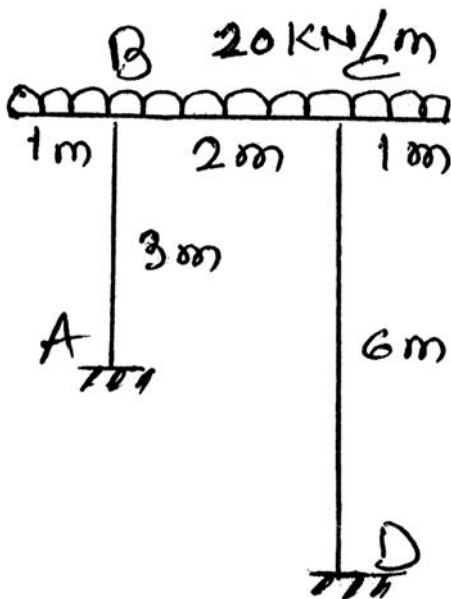

Fig. 1, Q. 4

5. a) Plot BMD for three hinged parabolic arch, hinged at crown and at the springing level. Arch has horizontal span, 30 m, central rise, 5m and carries udl, 50 kN/m over the left half span. **8**

   b) Derive the expression for horizontal trust for two hinge parabolic arch supported at A and B, with horizontal span, L and subjected to point load, P such that distance of load P is 'a' from support A and 'b' from support B. **8**

OR

6. a) A three hinged parabolic arch, hinged at crown and at the springing level has a horizontal span, 40 m and central rise, 8m. It carries the downward point load 100 kN at 10m from the left support, A. Determine the horizontal thrust at supports and radial Shear and normal thrust at section 10m from right support, B. **8**

   b) A two hinged parabolic arch of span 20 m, rise 4m and carries the udl of 50 kN/m over the length of 5m from left support A. Determine the horizontal thrust. **8**

SECTION – II

7. a) Derive flexibility coefficient matrix for the horizontal cantilever beam of uniform cross section, and span 10m. The beam is subjected to vertically downward point loads, A_1 at the center and action A_2 at the free end. **9**

b) Using Flexibility Matrix Method, determine the reactions for the continuous beam ABC subjected to downward point load, 50 kN at the centres of span AB and clockwise moment, 100 kNm at the centres of span BC. Span AB = half of Span BC = 6m. Assume constant EI for ABC. **9**

OR

8. a) Taking any simple example, prove that product of flexibility and stiffness matrix is unity. **9**

b) A propped cantilever beam of span 6m is subjected to udl 100 kN/m over the full span. Using Flexibility Matrix Method, analyse the beam and hence BMD and SFD. Assume constant EI. **9**

9. a) 1) State the properties of matrix derived using matrix methods of analysis. **6**

2) State any four points of comparison between flexibility and stiffness matrix methods. **4**

b) Derive the stiffness matrix and write the equilibrium equations in matrix form for the frame loaded and supported as shown in fig 2. **6**
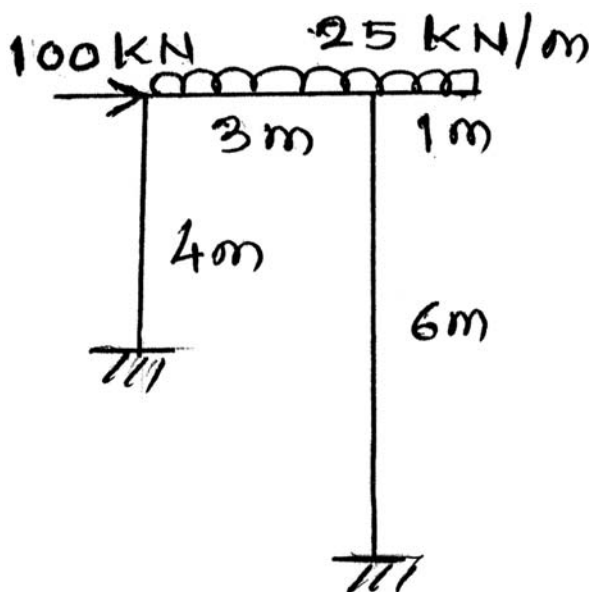

Fig. 2, Q. 9(b)

OR

10. A uniform cantilever beam of span, 3m is simply supported (propped) at free end by the spring support. A beam is subjected to udl, 100 kN/m over full span. Analyse the beam using Stiffness Matrix Method. Plot BMD and SFD. Assume stiffness of the spring, K is EI/2 kN/m. **16**

11. a) A rigid jointed 2 bay - 2 story frames is shown in the fig 3. Using Cantilever method, determine support reactions and moments. Area of column
ABC = A and Area of column DEF & GHI = 2A. **8**
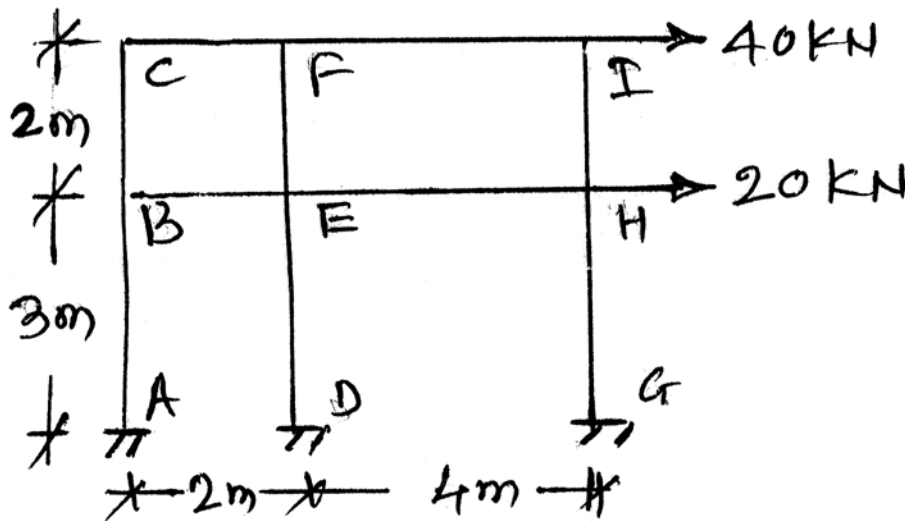
Fig. 3, Q. 11(a)

b) Using finite difference method, determine the displacement at the quarter span of simple supported beam AB of span 4 m subjected to central point load of 100 kN. Assume 1 m interval and constant EI for beam AB. **8**

OR

12. a) A rigid jointed 2 bay – 2 story frames is shown in the fig. 3. Using portal method, determine support reactions and moments. Area of column
ABC = A and Area of column DEF and GHI = 2A. **8**

b) A continuous beam ABCD of multistory frame is to be analysed for gravity loads and lateral load. State the loading combination for the maximum span and maximum support moments if the beam is subjected to Dead load, W_D and Live load, W_L. Explain with suitable diagram. If support moments due to gravity loads and lateral loads are known, how will you find the final design moments at mid span and at support. Explain with suitable diagram. **8**

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T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL DESIGN – I (2008 Pattern) (New)

Time : 4 Hours   Max. Marks : 100

Instructions : *1) Attempt Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4*** *from Section* ***I*** *and*
                            Q. ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8*** *from Section –* ***II****.*
                    2) Answers to the ***two*** *Sections should be written in*
                        separate *answer books.*
                    3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
                    4) Figures to the ***right*** *indicate* ***full*** *marks.*
                    5) Assume suitable data, ***if*** *necessary and clearly state.*
                    6) ***Use*** *of cell phone is* ***prohibited*** *in the examination hall.*
                    7) ***Use*** *of electronic pocket calculator, IS : 800 - 2007 and*
                        steel table are ***allowed****.*

SECTION – I

1. a) State the advantage and disadvantage of steel as structural materials.   **10**

   b) Design a double angles tension members connected on each side of 10 mm
      thick gusset plate to carry an axial force of 340 kN. Also design connection
      using M_{20} black bolts of 4.6 Grade. Take $f_y = 250$ MPa.   **15**

                    OR

2. a) Explain the classification of cross section and hence classify the following
      section.

   a) ISLB 450 @ 65.3 kg/m

   b) ISMC 300 @ 35.8 kg/m

   c) ISA 90 × 60 × 8 mm @ 8.9 kg/m

   d) ISA 150 × 150 × 12 mm @ 27.2 kg/m.   **12**

   b) Determine the design tensile strength of a member of roof truss consists of
      2 - ISA 90 × 90 × 12 mm connected to both side of 12 mm thick gusset
      plate by fillet weld. Assume $f_y = 250$ MPa.   **13**

                                                                                        P.T.O.

3. a) Design a single angle discontinuous strut which is carrying factored load of 100 kN. Unsupported length of member is 3 m. Assume f_y = 250 MPa. **12**

   b) A column ISHB 350 @ 67.4 kg/m carries an axial compressive factor load of 1700 kN. Design a suitable bolted gusseted base rest on M_{20} grade of concrete pedestal. Use 20 mm diameter bolts of grade 4.6 for the connection. Assume f_y = 250 MPa. **13**

OR

4. a) Design a column using I-section of length 5 m subjected to an axial compressive force of 1175 kN resulting from dead load and live load. One end of the column is fixed and other end is pinned. Assume f_y = 250 MPa. **8**

   b) Design a built-up column 8 m long to carry a factored axial load of 1800 kN. The column is restrained in position but not in direction at both ends. Design the column section using two channels placed face to face and suitable lacing with welded connection. Draw the design sketches. Assume f_y = 250 MPa. **17**

SECTION – II

5. a) An ISLB 600 @ 99.5 kg/m has been used as a simply supported beam over 7.2 m span. Determine the safe uniformly distributed load w so that the beam can carry in flexure. Assuming compressive flange is restrained throughout the span against lateral buckling and Fe 410 steel. **12**

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

   Maximum bending moment, M = 150 kNm,

   Maximum shear force, V = 210 kN,

   Grade of steel Fe 410. **13**

OR

6. a) A floor beam in a building has a span of 6 m. It is simply supported over supports and carries a uniformly distributed load of 40 kN/m, inclusive of self weight. Design the beam if the compression flange is unrestrained throughout the span against lateral buckling and Fe 410 steel. **15**

b) An ISLB 300 @ 37.7 kg/m transmit an end reaction of 385 kN, under factor load, to the web of ISMB 450 @ 72.5 kg/m. Design a bolted framed connection. Steel of grade Fe 410 and Bolts are of grade 4.6. Assume f_y = 250 MPa. **10**

7. a) A truss shown in Fig. 7 is used for an industrial building situated in Pune. The truss is covered with A C sheet . Calculate the panel point dead, live and wind load. Design the members L_0L_1, U_1L_1 and L_0U_1 assuming k_1 = 1, k_2 = 0.98 and k_3 = 1 and $(c_{pe} - c_{pi})$ = ± 0.8, f_y = 250 MPa. Draw the design sketches. **25**
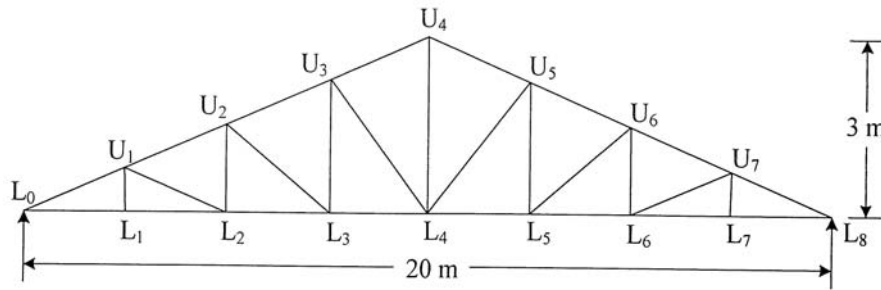
Fig. 7

OR

8. a) Design the cross section, end bearing stiffener and connection of a welded simply supported plate girder for an effective span of 24 m. The girder is loaded with a uniformly distributed load of the intensity 35 kN/m due to dead load and live load. Assume compression flange is laterally supported throughout the span and yield stress of steel is 250 MPa. Draw sectional plan and elevation with design details. **25**

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T.E. (Civil) (Semester – I) Examination, 2011
FLUID MECHANICS – II
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

Instructions : *i)* *Answer* **one** *question from* **each** *Unit. There are* **six** *Units.*

            ii) *Answer* **three** *questions from Section* **one** *and* **three** *questions from Section* **two.**

        iii) *Answer to the* **two** *Sections should be written in* **separate** *answer booklet.*

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

          v) *Black figure to the* **right** *indicate* **full** *marks.*

         vi) *Your answer will be valued as a* **whole.**

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

       viii) *Assume suitable data if* **necessary.**

SECTION – I

UNIT – I

1. a) Discuss about drag and lift on a cylinder.   **6**

    b) A kite has a planform area of 0.30 m². It is flying in wind and the wind velocity is 40 Km/hr. The self weight of the kite is 1.8 N. The string attached to the kite is inclined at an angle 25 degree to the vertical. The tension in the string was found to be 6.66 N. Evaluate the coefficient of Lift and Drag. Take the air density as 1.21 Kg/m³.   **6**

    c) Why Surge Tanks are used in Hydroelectric Power Plants ? Draw the neat sketch of a surge tank.   **6**

2. a) A 3 mm sphere made of stainless steel is (RD = 7.8) is observed to have a fall velocity of 10 mm/sec in a liquid of density 1260 Kg/m³. Estimate the kinematic viscosity of the liquid.   **6**

b) What is 'Water Hammer Action' ? Describe in detail the condition of water Hammer for pipe considering the closure as gradual. What is the difference between gradual and sudden closure ? How it is explained mathematically ? **6**

c) A 100 cm diameter steel pipe having 8 mm thickness and it carries water at a rate of 2.0 m³/s. Determine the increase in the pressure of the valve at the end of the 3000 m long pipe line, if it is closed in 3 seconds.

$E_{steel} = 2.07 \times 10^{11}$ N/m²

$K_{water} = 2.075 \times 10^{9}$ N/m². **6**

UNIT – 2

3. a) Discuss about inlet and outlet velocity triangles. Draw the neat sketch of velocity triangles. **8**

b) What is the minimum starting speed of a centrifugal pump ? What is cavitation ? What do you mean by multistage pumping ? **8**

4. a) Draw the neat sketch of a centrifugal pump and label all the parts. What do you mean by NPSH ? **8**

b) Derive the expression of force and work done by the impact of jet on a moving curved vane. **8**

UNIT – 3

5. a) A Pelton wheel is working under a head of 45 metres and the rate of flow of water through the nozzle is 800 litres/second. The mean bucket speed of the wheel is 14 metres/sec. Find the efficiency and Horse Power produced by the wheel if the jet is deflected by the buckets through an angle of 165°. **8**

b) Draw the neat sketch of a Hydroelectric Power Plant and show all the elements. **8**

6. a) Design a Pelton Wheel required to run at 300 rpm under an effective head of 150 metres. The ratio of nozzle diameter to the diameter of the Pitch Circle is 1/12. Assume that the overall efficiency is 84%. Find the

   vi) Size of the wheel

   vii) Size of the jet

   viii) Discharge of water required

   ix) Minimum numbers of buckets required

   x) Power developed. **8**

   b) What do you mean by 'Specific Speed' of a Turbine ? Derive it. **8**

SECTION – II

UNIT – 4

7. a) What are the various Geometric elements in Open Channel Flow ? Discuss about each of them. **6**

   b) Derive the Continuity Equation for open channel flow. **6**

   c) What are the factors which affect the Manning's roughness coefficient ? **6**

8. a) Design the most Economic trapezoidal channel Section having one side vertical and the other side with side slope of 1.5 (H) : 1.0 (V) to carry the discharge of 10 m^3/s. The Manning's 'n' is taken as 0.015 and the bed slope is 1:3500. **6**

   b) Discuss about Velocity Distribution in an open channel flow. **6**

   c) Derive the condition for most economic trapezoidal channel section. **6**

UNIT – 5

9. a) Draw the neat sketch of Specific Energy Diagram for three discharges Q_1, Q_2 and Q_3 and show all the critical points and join them. Q_1 is greater than Q_2 and Q_2 is greater than Q_3. State your comment about the angle made by the locus of the critical points with the X-axis. **8**

   b) The pre jump Froude Number is 7.5 and the pre jump depth is 0.22 metre. Find the other parameters related to the Hydraulic Jump. **8**

10. a) There is a rectangular channel. The base width is 6.6 metres and the depth of flow is 2.2 metres. Manning's 'n' is taken as 0.022. The bed slope is 1:3600. Find the specific energy and the height of the hump required to create critical flow in the channel ? **8**

b) In a Hydraulic jump the pre jump Froude Number is 9.6 and the pre jump depth is 0.33 metre. From this data find all the technical terms related to Hydraulic jump. **8**

UNIT – 6

11. a) Derive the Dynamic Equation of Gradually Varied Flow and use Manning's formula. Derive in terms of normal depth, critical depth and depth of flow and bottom slope S_0. Obtain the expression
$dy/dx = S_0 [1 – (Yn/Y)^{3.33}] / [1 – (Yc/Y)^3]$. **8**

b) A rectangular channel carries a discharge of $10 m^3/s$ per metre width over a bed slope of 0.0004. If the depth of flow at a section is 6m, how far upstream or downstream the flow depth will be within 9% of the normal depth. Take Manning's 'n' as 0.015, use direct step method and take only two steps. Sketch the profile and classify it. **8**

12. a) What is the basic difference between 'Backwater Curve' and 'Drawdown Curve' ? State whether S2 is a backwater curve or drawdown curve along with valid logic. Draw M1,M2, S2 and S3 Curves. **8**

b) A rectangular channel carries a discharge of $10 m^3/s$ per metre width over a bed slope of 0.0002. If the depth of flow at a section is 5 m, how far upstream or downstream the flow depth will be within 10% of the normal depth. Take Manning's 'n' as 0.014, use direct step method and take three steps. Sketch the profile and classify it. **8**

T.E. (Civil) (Semester – I) Examination, 2011
ADVANCED SURVEYING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. a) Explain the precision in Triangulation for Ist order, IInd order and IIIrd order in tabular form. **6**

   b) Define triangulation, state the object of triangulation and state its applications. **6**

   c) State the characteristics of a good signal. **6**

   ### OR

2. a) What do you understand by Global Positioning System ? Give an overview of GPS. **6**

   b) Describe briefly various applications of Global Positioning System. **6**

   c) Discuss the method used for three dimensional position location via intersection of multiple spheres. **6**

3. a) Define :

   i) Spherical excess

   ii) Accidental and systematic errors

   iii) Condition equation. **8**

   b) Determine the most probable values of the angles of a triangle ABC given by the following data.

   $$\angle A = 62^{\circ}\ 14'\ 12''\ \text{weight} = 1$$
   $$\angle B = 48^{\circ}\ 12'\ 14''\ \text{weight} = 3$$
   $$\angle C = 69^{\circ}\ 33'\ 28''\ \text{weight} = 2$$

   Cube method of correlates. **8**

   ### OR

4. a) Explain method of least square used in adjustment of a quadrilateral. **8**

   b) Angles were measured on a station and the observations were recorded as follows.

Angle	Value	Weight
A	45° 30′ 10′	2
B	40° 20′ 20″	3
A&B	85° 50′ 10″	1

   Find the most probable values of angles A+B Cube method of differences. **8**

5. a) 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. **8**

   b) Describe the methods of setting out of culverts. Also state as to why these cannot be used in the case of setting out of a bridge, explain with a sketch. **8**

   OR

6. a) Describe the procedure for setting out of pipelines and sewers, explain with a sketch. **8**

   b) Two points A and B are 9 Km apart with respective reduced levels as 104.5m and 290.5 m. The signal height at A is 1.5 m and that at B is 3.10 m. The instrument height at both stations was 1.5 m. If 30.88 m on the earth's surface substends 1″ of arc at the earth's centre and the effect of refraction is $\frac{1}{7}$ of that of the curvature, determine the observed angles from A to B and B to A. **8**

   SECTION – II

7. a) Describe with sketches the field work of a survey with a phototheodolite. Explain, how you would plot the survey ? **12**

   b) Explain with a sketch flight planning in aerial photogrammetry. **6**

   OR

8. a) The ground length of a line AB is known to be 545 m and the elevations of A and B are respectively 500 m and 300 m above m.s.l. On a vertical photograph taken with a camera having focal length of 20 cm include the images a and b of these points and their photographic co-ordinates are.

   $(x_a = + 2.65$ cm, $y_a = +1.36$ cm$)$

   $(x_b = – 1.92$ cm, $y_b = +3.65$ cm$)$. The distance ab scaled directly from the photograph is 5.112 cm. Compute the flying height above mean sea level. **12**

   b) Write a note on digital photogrametry. **6**

9. a) Explain with the help of a neat sketch, an idealized remote sensing system. **8**

   b) What do you understand by GIS and what are the essentials of a Geographical Information System ? **8**

                               OR

10. a) Write a detailed note on applications of remote sensing. **8**

    b) Write a note on linkage of GIS to remote sensing. **8**

11. a) Explain how will you plan and execute the shore line survey for stretch of 30 Km. **8**

    b) Explain three points problem and its applicability in hydrographic surveying. **8**

                               OR

12. a) State various sounding equipments and explain any three in detail. **8**

    b) State step by step procedure to determine mean sealevel (msl) **8**

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T.E. (Civil Engineering) (Semester – II) Examination, 2011
HYDROLOGY AND WATER RESOURCE ENGINEERING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* *Answer **three** questions from Section – **I** and **three** questions from Section – **II**.*

2) *Answers to the **two** Sections to be written in **separate** answer books.*

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

4) *Draw neat diagrams **wherever** necessary.*

5) ***Use** of calculators is **allowed**.*

6) *Assume suitable data if **necessary**.*

SECTION – I

1. a) What are the design applications of the depth area duration relation ? Explain the procedure for developing these relations. **10**

   b) Describe the principle of rainfall measurement using RADAR with neat sketch, also state its advantages over other rainguages. **8**

OR

2. a) What is evapotranspiration ? How will you measure it ? Draw neat labelled sketch of field method to measure evapotranspiration. State methods to control evaporation loss from reservoir. Explain any one method in detail. **10**

   b) What is stream gauging ? Explain area-velocity method with sketch and explain its application in water resources engineering. **8**

3. a) Explain extreme value (Gumbel's) distribution. **8**

   b) State various formulae to estimate flood and explain rational method in detail. **8**

OR

4. a) What do you understand by return period ? Give few formulae to determine return period. **8**

   b) The ordinates of a 4 h UH of a basin of area 300 Km² measured at 1 hour intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17,13, 9.6, 3 and 1.5 m³/s respectively. Obtain the ordinates of a 3 h UH for the basin using the S-curve technique. **8**

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

   b) What is design life period of storage reservoir ? How do you account for sediment deposition in the reservoir while fixing its storage capacity ? **8**

   OR

6. a) Define trap efficiency of reservoir. Describe how the time required to for the reservoir to fill up with the sediments is calculated. **8**

   b) Write a note on Benefit-Cost studies for reservoir. Explain any two methods. **8**

SECTION – II

7. a) Explain various methods of assessing canal revenue. **8**

   b) Explain drip irrigation with a neat layout sketch and state the advantages of drip irrigation over other methods of irrigation. **8**

   OR

8. a) Explain the relation between duty, delta and base period. Derive the relation between them and states the methods to improve duty of water. **8**

   b) Define : i) kor watering   ii) kor depth iii) Paleo irrigation iv) crop period
      v) base period vi) intensity of irrigation vii)   gross command area
      viii) culturable command area. **8**

9. a) Explain Dupits and Thiems theory and state the assumptions made.   **8**

   b) Enlist different types of tube wells and dug wells and explain strainer type with a neat sketch.   **8**

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

10. a) Explain pumping and recuperation test. What should be the diameter of an open well to give safe yield of 4.8 lit/sec ? Assume the working head at 3.75 m and the subsoil consists of fine sand. (For fine sand specific yield = 0.5/hour).   **8**

    b) In an artesian aquifer of 8 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.05 m respectively, compute the transmissivity and the hydraulic conductivity of the aquifer.   **8**

11. 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.   **12**

    b) Write a note on warabandi.   **4**

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

12. a) What are co-operative water distribution society's ? State the rules and regulation laid down by these societies for equitable distribution of water to farmers.   **8**

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

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T.E. (Civil) (Semester – II) Examination, 2011
STRUCTURAL DESIGN – II (New)
(2008 Pattern)

Time : 4 Hours   Max. Marks : 100

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

SECTION – I

1. a) What is partial safety factor used in the design of RCC section ? Why they are called as partial ? Give the Partial safety factors for stresses in Steel and concrete.   **6**

   b) Explain with sketches, why do continuous T- beam at support have to be design as rectangular section ? Draw the cross section of continuous T-beam at support and at midspan.   **9**

   c) A singly reinforced concrete beam having cross section, 230 mm wide and 400 mm effective depth. Use M 20 concrete and Fe 415 steel. Using L.S.M.   **10**

      a) Calculate Mu_{max} and Ast_{max} for balanced section.

      b) If the depth of N.A. is limited to 0.32 d what will be the values of Mu and Ast.

      c) If the section is reinforced with 0.38% steel, determine the depth of N.A. Hence calculate Mu.

      d) Determine the depth of N.A. and A_{st} to resist Mu = 70 KNm.

      e) Check whether Mu = 130 KNm can be allowed on this section. If not suggest an alternative.

               OR

2. a) Derive from first principle, the values of design parameters (K, j, R) for the balanced section for concrete of grade M 30 and steel of grade Fe 415 in W.S.M. **6**

   b) Draw the stress-strain diagram for singly reinforced, doubly reinforced and flanged section in W.S.M and L.S.M. Also state the merits and demerits of both methods. **9**

   c) A R.C. Beam section of size 230 mm wide and 430 mm deep has 4-20Φ bars. The effective span of beam is 4.50 m and clear cover to the reinforcement is 30 mm; find the safe load the beam can carry by W.S.M. and L.S.M. Use M 20 and Fe 415. **10**

3. The center line plan of a typical floor of building is as shown in Fig. 1. Design the floor slabs only for flexure. Draw neat sketches showing details of main reinforcement and torsional reinforcement. Use M 20 and Fe 415. **25**
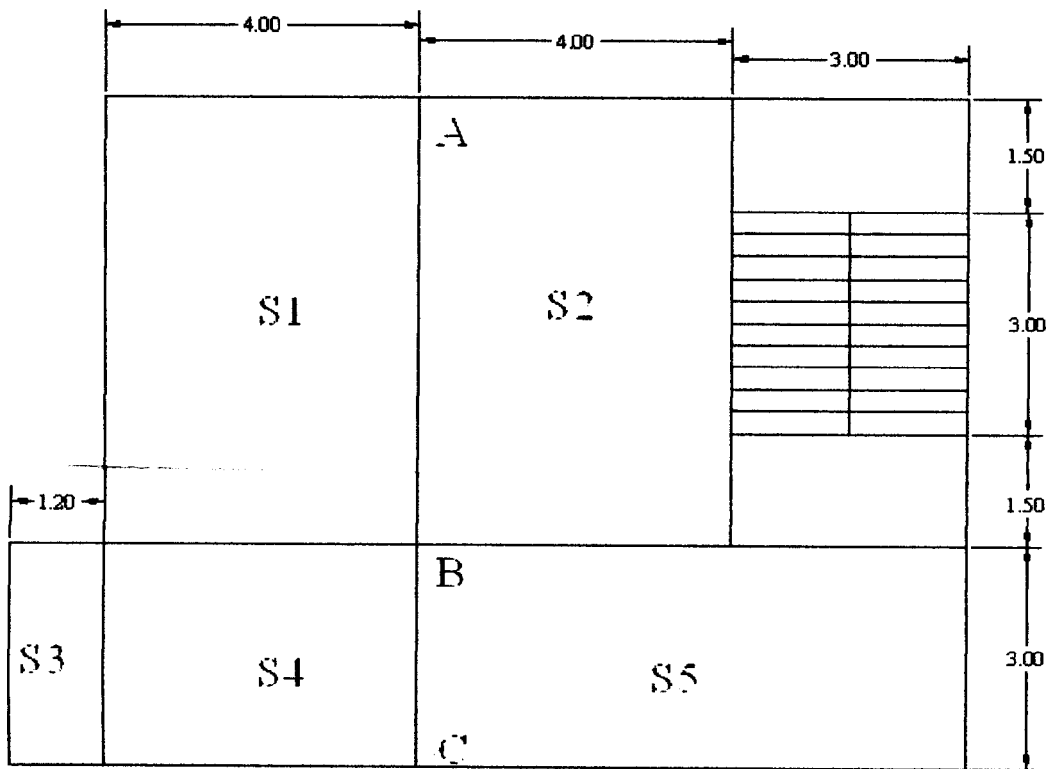
Fig 1

OR

4. Design I and II flights of a dog legged staircase as shown in Fig. 1 for the following data: **25**
   i) Floor to floor height = 3.3 m;
   ii) Rise = 150 mm; Tread = 300 mm;
   iii) Width of landing = 1.25 m;
   iv) Material M 20, Fe 500.

   Show detailed load calculations and draw BMD for both flights and reinforcement details in sectional elevation for both flights. At ground floor, plinth beam is provided below 1st step. Assume suitable data if required.
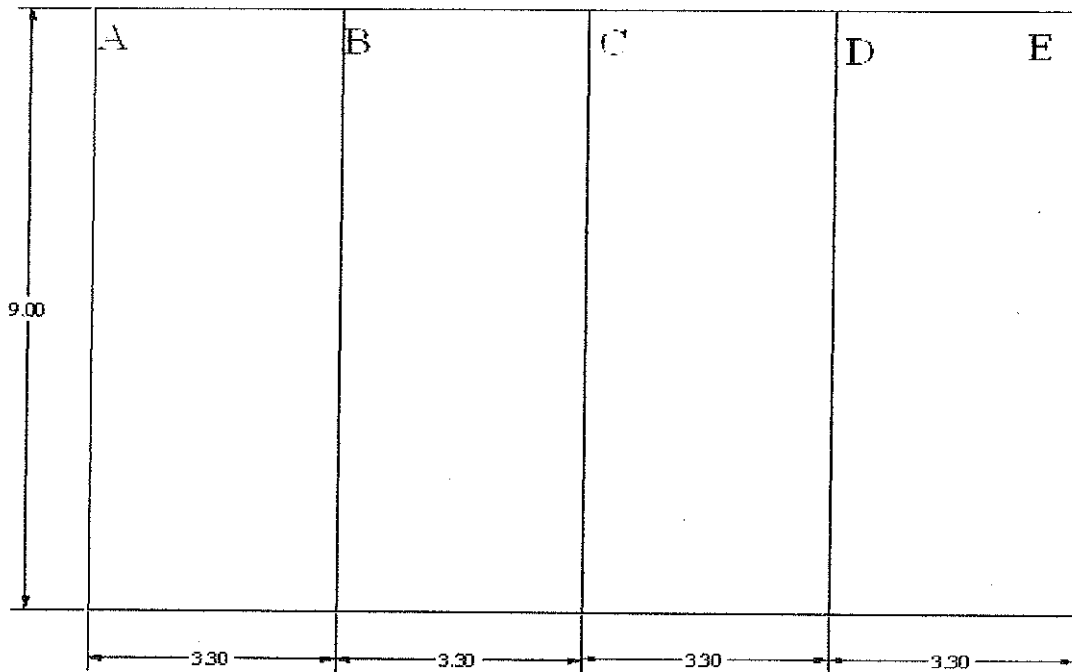
Fig 2

SECTION – II

5. Design a continuous floor beam ABC as shown in figure No. 1 for flexure and shear using 15% redistribution of moments using LSM. Thickness of the all floor slab is 150 mm, live load and floor finish load on all slabs are 2.5 KN/m² and 1.0 KN/m² respectively and wall thickness is 230 mm. Use M 20 and Fe 415 steel. Show details of load calculations, bending moment envelop and main and shear reinforcement. **25**

OR

6. a) Design a continuous floor beam ABCDE for a reading hall as shown in figure No. 2 for flexure and shear using IS Code method for the following data : **20**

   i) Thickness of the all floor slab = 175 mm,

   ii) Live load on all slabs = 4.00 KN/m,

   iii) Floor finish load = 1.5 KN/m,

   iv) Wall thickness = 230 mm,

   v) Materials = M 20 and Fe 500.

   Show the reinforcement details in L-section and cross section at support and at mid span of 1st and 2nd span.

   b) What is the purpose of redistribution of moments ? Explain in brief the formation of plastic hinge. **5**

7. Design a rectangular short column at B as shown in Fig. 1 in ground floor and below plinth with isolated footing of G + 2 building with the following details : **25**

   L.L on all floor slabs = 2.5 KN/sqm, F.F.L. = 1.2 KN/sqm, L.L. on roof slabs = 1.0 KN/sqm, WPL on roof slab = 2.00 KN/sqm, Parapet wall = 150 mm×900 mm, Thickness of all slabs = 150 mm, Thickness of all walls = 230 mm, size of all beams = 230 mm×500 mm, Floor to floor height = 3.00 m, SBC of soil = 250 KN/sqm, Material M 20 and Fe 415. Show detailed load and design calculations and draw reinforcement details in plan and sectional elevation.

                    OR

8. Design a rectangular column subjected to a working moment of 55 KN-m about an axis bisecting the depth along with working load of 650 KN. The unsupported length of a column is 3.0 m. Assume column effectively held in position but not restrained against rotation. Also design its footing for above moment. Take SBC of soil is 200 KN/sqm. Show detailed design calculations and reinforcement details. Material M 25 and Fe 415. Use charts for design of column. **25**

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T.E. (Mechanical) (Semester – I) Examination, 2011
MACHINE DESIGN – I (New)
(2008 Pattern)

Time : 4 Hours   Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Neat diagram must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule and electronic pocket calculator is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I
UNIT – I

1. A steel shaft made of 40C8 is used to drive a machine. The pulleys X, Y and bearings A, B are located as shown in Fig. 1 Belt tensions are also shown. Determine diameter of the shaft using ASME code. Take S_{yt} of the shaft material as 330 N/mm² and S_{ut} = 600 N/mm². Assume K_b = 1.5 and K_t = 1.2.

   If the rectangular key is made of the same material, design the key.   **16**

Fig. 1

OR
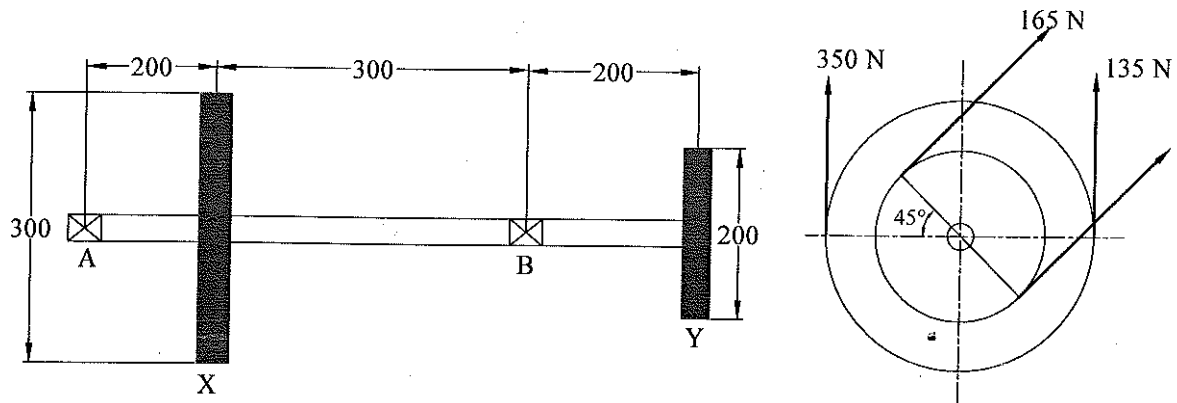
2. a) Compare the weights of equal length of hollow shaft and solid shaft to transmit a given torque for the same maximum shear stress. The material for both shafts is same and inside diameter is 2/3 of outside diameter for hollow shaft. **6**

b) A protected type rigid flange coupling is used to transmit 25 kW power at 500 RPM from an engine to a machine. Design a coupling for an overload capacity of 25%. Assume following permissible stresses for the component of a coupling. Assume number of bolts as 6. **10**

	C.I. (Flange)	M.S. (Shaft & Key)	Plain Carbon Steel (Bolt)
Allowable tensile stress, N/mm²	20	60	60
Allowable shear stress, N/mm²	12	35	28
Allowable compressive stress, N/mm²	60	60	60

UNIT – II

3. a) Derive the expression for maximum efficiency of square threads. **8**

b) A shaft straightener is as shown in fig. 2. The axial load on the screw member is 35 kN. Find the forces required at the rim of the hand wheel of 300 mm. diameter. Assume coefficient of friction in the threads as 0.12. Determine the maximum compressive stress, bearing pressure and shear stresses in the screw. Determine the efficiency of the arrangement, neglecting collar friction. Ignore the effect of bending due to force at the hand wheel. **8**

SQ.75,
Pitch : 6 mm

W = 35 kN
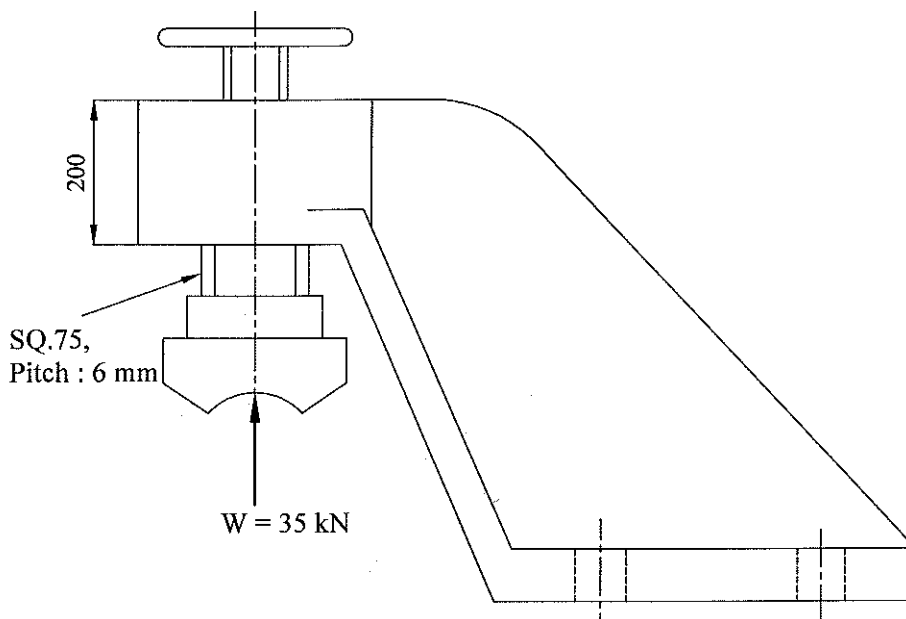
Fig. 2

OR

4. a) What are different types of screw threads used for power screws ? Give advantages and limitations of each type. **8**

   b) A power screw of a screw press is required to transmit a maximum load of 100 kN at 60 RPM. The coefficient of friction for screw threads is 0.12. The torque required for collar friction and journal bearing is about 10% of the torque required to drive the load considering the screw friction. The maximum permissible compressive stress for screw is 100 MPa, while the screw has single start square threads. Determine : **8**

   i) The screw dimensions.

   ii) The screw efficiency; and

   iii) The motor power required to drive the screw.

UNIT – III

5. a) Derive the condition for avoiding joint separation in case of bolted joints. **4**

   b) An off-set column is fixed to steel column as shown in Fig. 3 by means of four bolts. The bracket is subjected to an inclined pull of 10 kN. Determine the diameter of bolts by assuming allowable tensile stress in bolt to be 150 N/mm^2. **14**
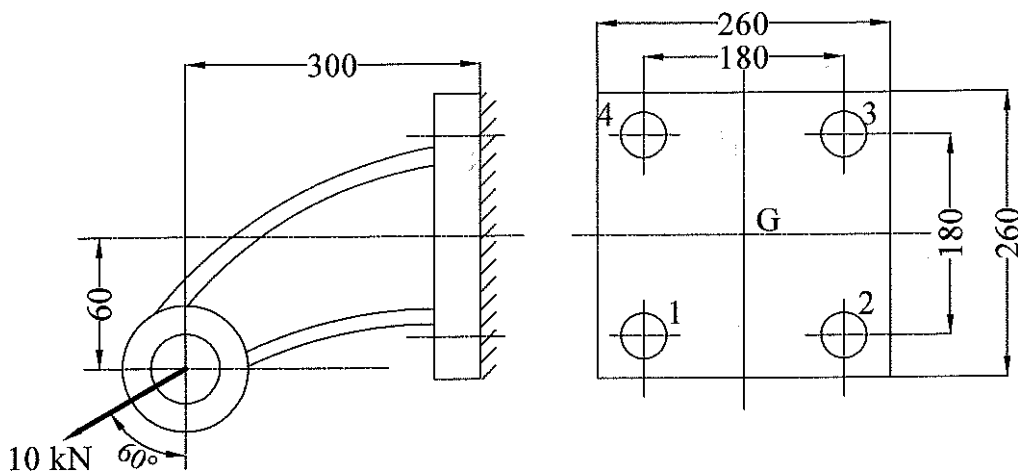
Fig. 3

OR

6. a) Give welding symbol system standardized by the American Welding Society (AWS). **6**

   b) A welded connection as shown in Fig. 4, is subjected to a torsional moment of 12 kN-m about the centre of gravity of welds. If the permissible shear stress in weld deposit is 35 N/mm², calculate the throat and leg dimensions of weld. **12**
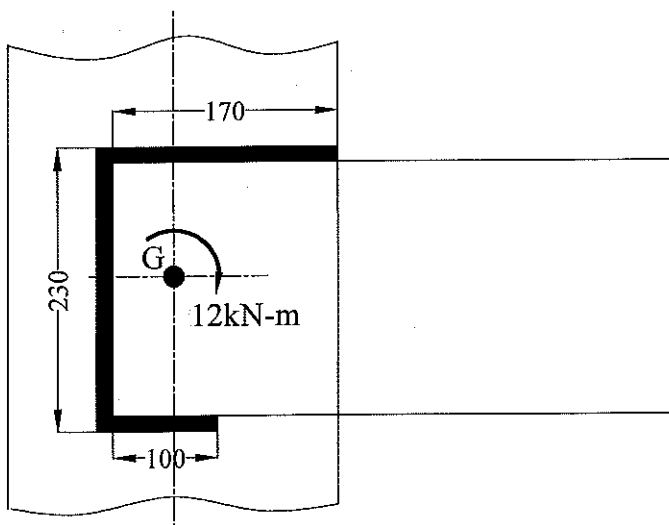
Fig. 4

SECTION – II

UNIT – IV

7. a) Discuss the following in case of Flywheel :

   i) Coefficient of fluctuation of speed.

   ii) Coefficient of fluctuation of energy. **6**

   b) The T- θ diagram for a four stroke gas engine can be assumed to be consists of four triangles. The areas measured are : 600, 50, 30 and 150 mm² for power, exhaust, suction and compression strokes respectively. The scale for

the T - θ diagram is 1 mm^2= 10 Joules. The engine is running at a mean speed of 500 RPM. The load torque is constant throughout the cycle. A rimmed flywheel made of gray cast iron FG 150 (ρ = 7000 kg/m^3) is used to limit the fluctuation of speed to 3 % of the mean speed. The mean diameter of the flywheel rim is limited to 1 m. The rim contributes 90% of the required mass moment of inertia. The rim has a rectangular cross section with width to thickness ratio of 2. The number of arms are 6 having elliptical cross section with major axis twice the minor axis. If the factor of safety is 5, design the flywheel and find the power developed by engine.   **12**

The allowable shear stress for the flywheel shaft is taken as 40 N/mm^2.

                    OR

8. a) Compare solid disk flywheel with rimmed flywheel.   **4**

   b) A machine is driven by a constant torque electric motor running at a mean speed of 720 RPM. The load torque of the machine is given by $1000 + 400 \sin\theta$, where θ is the angle of rotation of the shaft. A rimmed flywheel made of gray cast iron FG200 (ρ = 7050 kg/m^3) is used to limit the coefficient of fluctuation of speed to 0.02. The rim contributes 90% of the flywheel effect. The rim has a rectangular cross section with width to thickness ratio of 1.5. The numbers of arms are 6 having elliptical cross section with major axis twice the minor axis. The factor of safety is 8. Design the flywheel and draw its dimensional sketch. Also find the required power rating of an electric motor.

   The allowable shear stress for the flywheel shaft is taken as 115 N/mm^2.   **14**

UNIT – V

9 a) Explain nipping of Leaf springs. **4**

b) A concentric spring comprising two closed coil helical spring of equal free length and made of same material are compressed by 15 mm under the action of 2.5 kN force. Calculate loads on individual springs f spring index for both the springs is 5.

Calculate the main dimensions, if permissible shear stress in spring material is 240 N/mm^2 and G = 80000 N/mm^2. **12**

OR

10. a) What is surging of springs ? What remedial measures you will suggest to avoid the surging ? **6**

b) It is required to design a helical compression spring with plain ends, for carrying a maximum pure static force of 1000 N. The allowable shear stress and modulus of rigidity for spring material are 400 N/mm^2 and 85 N/mm^2 respectively. The spring rate is 48 N/mm. If spring index is 5, determine :

i) Wire diameter;

ii) Total number of coils;

iii) Free length; and

iv) Pitch. **10**

Draw neat sketch of spring and give necessary dimension.

UNIT – VI

11. a) How wire ropes are designated ? Discuss their construction and applications. **8**

b) A fan running at 4720 RPM is driven by an electric motor running at 1440 RPM through the 8 mm×250 mm flat leather belt. The centre distance is 1370 mm. The coefficient of friction between the belt and pulley is 0.35 and the belt mass is 957 kg per cubic meter. If the allowable tensile stress for the belt material is 2 N/mm^2, determine :

i) The tensions in the belt;

ii) The maximum power transmitting capacity of the belt;

iii) The diameter of the pulleys; and

iv) The required initial tension in the belt. **8**

OR

12. a) Explain the procedure for the selection of wire ropes from manufacturer's catalogue. **6**

   b) Four V-belts are to be used to transmit a power from an electric motor running at 2880 RPM to a machine running at 720 RPM. The centre distance between the input and output shafts is 750 mm. The sheave groove angle is 38° and the coefficient of friction between the belt and sheave is 0.5. The density of the belt material is 1000 kg/m^3 and the allowable tensile stress for the belt material is 1.75 N/mm^2. If the cross sectional area of each belt is 612 mm^2, determine :

   i) The maximum power the belt can transmit;

   ii) The pulley pitch diameter ; and

   iii) The initial tension required in each belt. **10**

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T.E. (Mechanical) (Semester – I) Examination, 2011
HEAT TRANSFER
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

SECTION – I

1. a) Write a short note on :
      i) Variable thermal conductivity
      ii) Isotropic and anisotropic material
      iii) Insulating materials.   **9**

   b) A surface having an area of 1.5 m² and maintained at 300°C exchanges heat by radiation with another surface at 40°C. The value of factor due to the geometric location and emissivity is 0.52. Determine :
      i) Heat lost by radiation
      ii) The value of thermal resistance, and
      iii) The value of equivalent convection coefficient.   **7**

                    OR

2. a) Write three dimensional heat conduction equations in cylindrical and spherical coordinates and reduce it to one dimensional form.   **8**

   b) The variation of thermal conductivity of a wall material is given by
      $k = k0 (1 + \alpha t + \beta t^2)$.
      If the thickness of the wall is L and its two surfaces are maintained at temperature T1 and T2, find an expression for the steady state one-dimensional heat flow through the wall.   **8**

3. a) Derive an expression for temperature distribution in plane wall under steady state state heat conduction with heat generation for asymmetrical boundary condition.   **8**

   b) Heat is conducted through a tapered circular rod of 200 mm length. The ends A and B having diameters 50 mm and 25 mm are maintained at 27°C and 227°C respectively. k(rod material) = 40 W/m°C. Find :
      i) Heat conducted through the rod
      ii) The temperature at the mid-point of the rod. Assume one dimensional steady state conduction.   **8**

                    OR

P.T.O.

4. a) Derive an expression for critical radius of insulation for sphere. **6**

   b) A plane wall is 1 m thick and it has one surface (x = 0) insulated while the other surface (x = L) is maintained at a constant temperature of 350°C. The thermal conductivity of the wall is 25 W/m K and a uniform heat generation per unit volume of 500 W/m³ exists throughout the wall. Determine the maximum temperature in the wall and the location of the plane where it occurs. **10**

5. a) Derive an expression for instantaneous heat flow rate and total heat transfer under unsteady state heat conduction. **10**

   b) A heating unit is made in the form of a vertical tube fitted with rectangular section steel fins. The tube height is 1.2 m and its outer diameter is 60 mm. The fins are 50 mm in height and their thickness is 3 mm. The total number of fins used is 20. The temperature of the base of the fin is 80°C and surrounding temperature is 18°C. The HTC on the fin surface and tube surface to the surrounding air is 9.3 W/m2K. K(fin material) = 55.7 W/m°C. Calculate the rate of heat transfer from the tube with and w/o fin. **8**

                    OR

6. a) Derive the formula for rate of heat transfer, efficiency and effectiveness for a short fin. **10**

   b) An egg with mean diameter of 40 mm and initially at 20°C is placed in a boiling water pan for 4 minutes and found to be boiled to the consumer's taste. For how long should a similar egg for same consumer be boiled when taken from a refrigerator at 5°C. Take the following properties for egg :

   k = 10 W/mK, ρ = 1200 kg/m³, c = 2 kJ/kgK and h = 100 W /m²K. Use lump theory. **8**

SECTION – II

7. a) Explain how the concepts of radiosity and irradiation are used to obtain surface resistance and space resistance. **4**

   b) Derive and expression for Wien's displacement law. **6**

   c) The effective temperature of a body having an area of 0.12 m² is 527°C. Calculate the following :

   i) The total rate of energy emission,

   ii) The intensity if normal radiation, and

   iii) The wavelength of maximum monochromatic emissive power. **6**

   OR

8. a) The radiation shape factor of the circular surface of a thin hollow cylinder of 10 cm diameter and 10 cm length is 0.1716. What is the shape factor of the curved surface of the cylinder with respect to itself ? **8**

   b) Calculate the net radiant heat exchange per m2 area for two large parallel plates at temperatures of 427°C and 27°C respectively $\in$ (hot plate) = 0.9 and $\in$ (cold plate) = 0.6. If a polished aluminium shield is placed between them, find the % reduction in the heat transfer; $\in$ (shield) = 0.4. **8**

9. a) Lubricating oil at a temperature of 60°C enters 1 cm diameter tube with a velocity of 3 m/s. The tube surface is maintained at 40°C. Assuming that the oil has the following average properties. Calculate the tube length required to cool the oil to 45°C. ρ = 865 kg/m³; k = 0.14 W/mK; c_p = 1.78 kJ/kg K. Assume flow to be laminar (and fully developed). Nu = 3.657. **8**

   b) Differentiate between internal flow and external flow. **4**

   c) Differentiate between Reynold's number and Grashoff number. **4**

   OR

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

   i) Heat transfer coefficient

   ii) Initial rate of cooling the plate in °C/min

   iii) Time required for cooling plate from 180°C if the heat transfer is due to convection only. Mass of the plate is 20 kg and c_p = 400 J/kg K.

   Assume 0.5 m side is vertical and that the heat transfer coefficient calculated in i) above remains constant and convection takes place from both sides of the plate. Take properties of air at 75°C as c_p = 1000 J/kg°C, ρ = 1.07 m²/s; k = 0.029 J/kg K; ν = 19.1 × 10⁻⁶ m²/s. **8**

   b) Explain with velocity and temperature distribution, the mechanism of natural convection heat transfer. **4**

   c) Explain the term convective heat transfer coefficient and its relation with thermal boundary layer thickness. **4**

11. a) Derive an expression for effectiveness by NTU method for the counter flow heat exchanger. Hence derive an expression for condenser and evaporator and typical regenerators. **10**

   b) A parallel flow heat exchanger has hot and cold water streams running through it and has the following data :

   m_h = 10 kg/min; m_c = 25 kg/min; c_{ph} = c_{pc} = 4.18 kJ/kg°C; T_{hi} = 70°C; T_{ho} = 50°C; T_{ci} = 25°C. Individual HTC on both sides = 60 W/m²°C. Calculate the following :

   i) The area of the heat exchanger

   ii) The exit temperature of hot and cold fluids if hot water flow rate is doubled. **8**

                         OR

12. a) Discuss pool boiling curve. What is the significance of critical heat flux in design of evaporators ? **10**

   b) Write a short note on :

   i) Filmwise and dropwise condensation

   ii) Heat pipe. **8**

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T.E. (Mechanical) (Semester – I) Examination, 2011
THEORY OF MACHINES – II
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*

*2) Answers to the **two** Sections should be written in **separate***
books.

*3) Neat diagram must be drawn **wherever** necessary.*

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

*5) **Use** of logarithmic table, electronic pocket calculator is*
***allowed**.*

*6) **Assume** suitable data, if necessary.*

SECTION – I

Unit – I

1. a) Derive an expression for frictional torque of conical pivot bearing, assuming
   uniform wear theory.   **6**

   b) i) Explain friction circle in turning pairs.   **2**

   ii) Explain friction axis of a link.   **2**

   c) A single plate clutch transmits 25 kW at 900 rpm. The maximum pressure
   intensity between the plates is 85 kN/m². The outer diameter of the plate is 360 mm.
   Both the sides of the plate are effective and the coefficient of friction is 0.25.
   Determine :

   i) The inner diameter of the plate,

   ii) The axial force to engage the clutch.   **8**

              OR

2. a) Write short note on Epicyclic Train Dynamometer. **6**

   b) Explain 'self energizing' and 'self-locking' effect on block brakes. **4**

   c) In a simple band brake applied to a shaft carrying a flywheel of mass 250 kg and radius of gyration 300 mm. One end of the band is attached to the fulcrum and the other at a distance of 80 mm from the fulcrum. The force is applied to the brake lever at a distance 280 mm. The angle embrace by band is 225° and drum diameter is 200 mm. $\mu = 0.25$ and the shaft speed is 200 rpm. Find :

   i) Braking torque when a force of 120 N is applied.

   ii) The number of turns of flywheel before it comes to rest.

   iii) Time taken by flywheel to come to rest. **8**

Unit – II

3. A F1 at faced follower is operated by uniformly rotating cam. The follower is raised through a distance of 25 mm in 120° rotation of cam, remains in rest for the next 30° and lowered through further 120° rotation of cam. The raising is by SHM and lowering with uniform acceleration and deacceleration. The least radius of cam is 25 mm which rotates at 300 rpm.

   Draw the cam profile and determine the value of maximum velocity and acceleration for rise and return. **16**

OR

4. a) Explain the phenomenon of jump in cam system. **4**

   b) What is kinematic equivalent system ? Draw kinematic equivalent system for circular arc cam with oscillating roller follower. **4**

   c) What is polynomial curve CAM ? Derive the expression for displacement, velocity and acceleration for 2-3 polynomial D-R-D cam. **8**

Unit – III

5. a) Explain following terms related to Governor. **8**

   1) Sensitiveness

   2) Stability

   3) Isochronous

   4) Hunting.

   b) In a Hartnell governor the length of the ball arm is 55 mm, that of the sleeve arm is 45 mm, and mass of each ball is 1.5 kg. The total movement of sleeve is 24 mm. In mid position of sleeve, the sleeve arms are horizontal and perpendicular to governor axis and the balls rotate at 80 mm radius. Equilibrium speed at the top stop of the sleeve is 425 rpm. and at bottom stop is 440 rpm. Find :

   a) Stiffness of spring and spring compressive forces at bottom stop.

   b) If topstop equilibrium speed is required to be 12 rpm. greater than the bottom speed, what will be the spring force at bottom stop ?

   c) What bottom stop spring force will make the governor isochronous ? **8**

   OR

6. a) What is stabilization of ship ? Why is it necessary ? How it is achieved ? **6**

   b) A two wheeler vehicle and its rider together weigh 2.2 KN and their combined centre of gravity is 600 mm above the ground level when the vehicle is upright. Each road wheel of 600 mm diameter and has a moment of inertia of 10 Nm^2. The rotating parts of the engine have a moment of inertia of 1.7 Nm^2. The engine rotates at 5.5 times the speed of the road wheels and in the same sense.

   Determine the angle of heel necessary when the vehicle is rounding a curve of 30m radius at a speed of 55 Km/hr. **10**

SECTION – II

Unit – IV

7. a) State and explain law of gearing. **6**

   b) Two gear wheels mesh externally giving velocity ratio 3:1. The teeth are of involute form with module 8 mm, 20° pressure angle and addenda for both the wheels equal to one module. The pinion rotates at 120 rpm. Determine :

   1) Number of teeth on pinion to avoid the interference, also find corresponding number of teeth on wheel.

   2) Length of path of contact.

   3) Length of Arc of contact.

   4) Contact ratio.

   5) Maximum velocity of sliding. **12**

                   OR

8. a) Derive an expression for the velocity of sliding between a pair of involute teeth. **6**

   b) Two meshing gears have 40 and 60 involute teeth of module 10 mm and 16° pressure angle. The addendum of each wheel is to be made of such a length that the line of contact on each side of the pitch point has 60% of maximum possible length. Determine the addendum height for each gear wheel, length of path of contact, arc of contact and contact ratio. **12**

Unit – V

9. a) Derive an expression for number of teeth on equivalent spur gear. **6**

   b) A two start worm rotating at 900 rpm driving a 20 teeth worm gear. The worm has a pitch diameter of 60 mm and pitch of 18 mm. coefficient of friction is 0.08.

   Determine :

   1) Helix angle of worm

   2) Speed of gear

   3) Centre distance

   4) Lead angle for maximum efficiency

   5) Efficiency and maximum efficiency. **10**

   OR

10. a) Derive the expression for various forces acting on bevel gear with sketch. **6**

   b) Two spiral gears of same hand having normal pitch of 14 mm drives a machine tool. The gears are of same size and their center distance is approximately 150 mm. the angle between the shaft is 70° and speed ratio 2. Take friction angle 8°.

   Determine :

   1) Spiral angle of each wheel

   2) Number of teeth on each wheel

   3) Efficiency of the drive

   4) Maximum efficiency. **10**

Unit – VI

11. a) Discuss types of gear trains. **4**

   b) In a reverted gear train (Fig. 1) two shafts A and B are in same straight line and are geared together with intermediate shaft C. The gears connecting shaft A and C have a module of 2mm and those connecting shaft C and B have a module of 4.5 mm. The speed of shaft A is to be about but greater than 12 times the speed of shaft B, and the ratio at each reduction is same. Find suitable number of teeth for gears. The number of teeth of each gear is to be a minimum but not less than 16. Also find the exact velocity ratio and the distance of shaft C from A and B. **12**
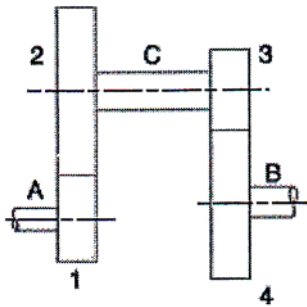
Figure 1

OR

12. An epicyclic gear train (Fig. 2) 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 wheels is such that the planet carrier C rotates at $1/3^{rd}$ of the speed of the sun wheel S. The minimum number of teeth on any wheel is 20. The driving torque on the sun wheel is 200 Nm. Determine :

1) Number of teeth on different wheels of the train.

2) Torque necessary to keep the internal gear stationary. **16**

Figure 2

_____
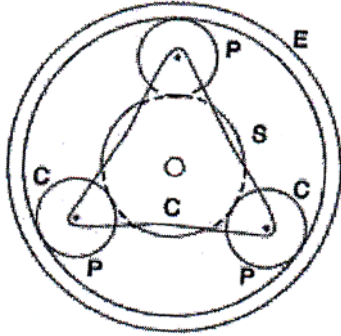
T.E. (Mechanical) (Semester – I) Examination, 2011
INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT
(New) (2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions :   1) Answer **three** questions from Section **I** and **three** questions
                            from Section **II**.
                      2) Answers to the **two** Sections should be written in separate
                            books.
                      3) Neat diagrams must be drawn **wherever** necessary.
                      4) Black figures to the **right** indicate **full** marks.
                      5) **Use** of logarithmic tables slide rule, Mollier charts, electronic
                            pocket calculator and steam tables is **allowed**.
                      6) Assume suitable data, if **necessary**.

SECTION – I

1. a) Define the management functions in terms of business or organisation of your
      choice.   **8**

   b) Explain concept of Maslow's hierarchy of needs.   **4**

   c) Briefly discuss various leadership styles adopted in industry.   **4**

                          OR

2. a) Explain various types of layout ? State their advantages and dis advantages. Justify
      your type giving appropriate application.   **8**

   b) Define the unit load concept used in material handling. Explain the different
      configurations that a unit load may take.   **4**

   c) Explain Vroom's expectancy theory.   **4**

3. a) Define and explain what do you understand by industrial engineering ? What is its
      importance ?   **8**

   b) Explain Method Study. What are its objectives ?   **4**

   c) Briefly explain procedure and methods for job evaluation and merit rating.   **4**

                          OR

4. a) Describe with suitable examples following : **8**

   1) Operation process chart

   2) Flow process chart

   3) Two handed process chart

   4) Models

  b) What is productivity ? What are the different techniques used for it ? **4**

  c) Explain the concept of following : **4**

   1) Qualified worker

   2) Basic time

   3) Contingency allowance

   4) Skill of operator.

5. a) A diesel engine manufacturing company has planned its production schedule for the next year based on the forecasted demand, back orders, and plant capacity. Instead of manufacturing piston the company has decided to out source it from Indian Pistons Ltd. The number of pistons required at the rate of 60 per day. Ordering cost is estimated at Rs. 50/- per order and carrying cost fraction is 0.15. The company can take advantage of quantity discount at following levels. The year is having 300 working days. **6**

Quantity ordered	Unit price (Rs.)
0-1999	65
2000-4999	60
5000-9999	55
above 10000	50

  Find out :

   a) What is optimal quantity ?

   b) What is minimum inventory cost ?

  b) What do you understand by Break-even analysis ? Explain. **6**

  c) What is critical path in PERT 1 CPM ? How it is determined ? Explain. **6**

        OR

T.E. (Mech.) (Semester – I) Examination, 2011
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*

*2) Answers to the **two** Sections should be written in **separate***
books.

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

*4) Black figures to the **right** indicate **full** marks.*

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

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Solve using Newton Raphson method the equation sinx – x cos x = 0.

   Assume initial guess value for $x = \dfrac{3\pi}{2}$, accuracy of function should be within

   0.00001.   **8**

   b) Draw flow-chart for numerical integration using Simpson's 1/3 rd rule, of
   given function y = f(x) between the limits a & b.   **8**

                 OR

2. a) Solve by Trapezoidal rule.

   $$\int_{0}^{1}\int_{0}^{1} x^2 y^2 \, dx \, dy$$

   Taking step length in x and y as 0.25.   **8**

   b) Draw flow chart for solution of roots of equation using successive
   approximation method.   **8**

P.T.O.

3. a) What are cubic splines ? State the conditions for a spline to be cubic.   **6**

   b) The velocity distribution of a fluid near a flat surface is given below

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

   x is the distance from the surface (cm) and v is the velocity (cm/sec.) Using
   Newton's forward difference method obtain the velocity at x = 0.2, 0.4, 0.6
   and 0.8.   **10**

                    OR

4. a) Explain the terms Interpolation', 'Extrapolation' and 'Inverse interpolation'.   **4**

   b) Draw flow-chart for interpolation using Newton's Backward difference
      formula.   **12**

5. a) Solve the following tridiagonal system with the Thomas algorithm   **8**

$$\begin{bmatrix} 2.04 & -1 & & \\ -1 & 2.04 & -1 & \\ & -1 & 2.04 & -1 \\ & & -1 & 2.04 \end{bmatrix} \begin{Bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \end{Bmatrix} = \begin{Bmatrix} 40.8 \\ 0.8 \\ 0.8 \\ 200.8 \end{Bmatrix}$$

   b) Draw a flow chart for Gauss Seidal method with relaxation.   **10**

                    OR

6. a) Using Gauss-Seidel 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 four iterations in the tabular form.   **8**

   b) Draw a flow chart for Gauss -Elimination method.   **10**

SECTION – II

7. a) The pressure (P) and volume (V) of a gas are related by the equation $PV^W = C$, where C & W being constants : Fit this equation to the following set of observations.

P	0.5	1	1.5	2	2.5	3
V	1.62	1	0.75	0.62	0.52	0.46

Derive the fomulaes used. **10**

b) State the various criteria used for curve fitting. Why least square technique is preferred ? **6**

OR

8. a) The volume of a cone having base circle radius r and height h is calculated as $V = \frac{\pi}{3} r^2 h$, If $r = 3.5 \pm 0.01$ and $h = 12.5 \pm 0.01$, then compute the absolute accuracy. **6**

b) Draw a flow-chart to fit an equation, $y = ax + b$. **6**

c) Explain :
   i) Round off errors ii) Truncation errors. **4**

9. a) Solution of equation $\frac{dy}{dx} = 1 + xy$ is tabulated as,

x	0	0.1	0.2	0.3
y	1	1.1	1.211	1.3352

Use Adam-Bash forth-Moulton method to find y at x = 0.4 and 0.5. **8**

b) Draw a flow-chart for modified Euler's method. **8**

OR

10. a) Solve the equation

$$2\frac{d^2y}{dx^2} = 3x\frac{dy}{dx} - 9y + 9$$

Subject to the conditions $y(0) = 1$, $y'(0) = -2$, using Runge-Kutta 2nd order method and compute y for x = 0.1 and 0.2.   **8**

   b) Draw a flow-chart for Runge Kutta 4th order method.   **8**

11. a) Initial temperature within an insulated cylindrical metal rod of 4 cm length is given by, T = 50(4 – x), 0<x<4, where x is distance from one end in cm. Both the ends are maintained at 0° C. Find the temperature as a function of x and t ($0 \le t \le 1.5$) if the heat flow is governed by $\dfrac{\partial T}{\partial t} = 2\dfrac{\partial^2 T}{\partial x^2}$, $\Delta x = 1$ and $\Delta t = 0.25$.   **10**

   b) Draw a flow-chart for soln of 1D unsteady heat conduction equation.   **8**

                    OR

12. a) Solve the boundary value problem $\dfrac{d^2y}{dx^2} - 64y + 10 = 0$. Initial conditions, y(0) = 1, y(1) = 1, take step size, h = 1/3 compute $y(\tfrac{1}{3})$ and $y(\tfrac{2}{3})$.   **10**

   b) Draw a flow-chart for solution of wave equation.   **8**

_____

T.E. (Mechanical) (Semester – II) Examination, 2011
MACHINE DESIGN – II
(2008 Pattern) (New)

Time : 4 Hours   Max. Marks : 100

Instructions : 1) _Answer **3** questions from Section **I** and **3** questions from_
   Section **II**.
   2) _Answers to the **two** Sections should be written in **separate**_
   books.
   3) _Neat diagrams must be drawn **wherever** necessary._
   4) _Your answers will be valued as a **whole**._
   5) _**Use** of electronic pocket calculator is **allowed**._
   6) _Assume suitable data, **if necessary.**_

SECTION – I

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

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

Element No.	Element time	Fr (KN)	Fa (KN)	Radial factor	Thurst factor	Rate rotating	CS	Speed rpm
1	30%	5	1.5	0.56	1.1	Inner	1.25	960
2	40%	3.7	0.73	0.56	1.3	outer	1.4	1440
3	30%	–	–	–	–	outer	–	720

OR

2. a) Derive Stribeck's equation for state capacity of a rolling contact bearing.   **7**

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

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

3. a) Write a short note on selection of hydrodynamic bearing design variables. **6**

b) Derive with usual notations. **5**

$$\epsilon = 1 - \frac{ho}{C}$$

c) Discuss in detail the lubrication regimes. **5**

OR

4. Following data is given for a 360° hydrodynamic bearing.

radial load = 10 kN

Journal speed = 1440 rpm

unit bearing pressure = 1000 kPa

clearance ratio (r/c) = 800

viscosity of lubricant = 30 mPa-s.

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

 i) dimensions of bearings

 ii) coefficient of friction

 iii) power list in friction

 iv) total flow of oil

    v) side leakage

    vi) temperature rise

    vii) average temperature (inlet temperature is 40°C)

    viii) Find maximum pressure (P_{max}).

    + use the data given in table No. 1. **16**

5. a) Define :
    i) Notch sensitivity
    ii) Endurance limit
    iii) Theoretical stress concentration factor. **6**

   b) Write short notes on :
    i) Modified Woodman diagram.
    ii) Stress concentration and methods of reducing it. **10**

            OR

6. A transmission shaft carries a pulley midway between the two bearings. The bending moment at the pulley varies from 200 Nm to 600 Nm as the torsional moment in the shaft varies from 70 Nm to 200 Nm. The frequencies of variation of bending and torsional moments are equal to the shaft speed. The shaft is made of steel (σ_{ut} = 540 N/mm² and σ_{yt} = 400 N/mm²). The corrected endurance limit of the shaft is 200 N/mm². Determine the diameter of the shaft using a factor of safety of '2'. **16**

<div align="center">SECTION – II</div>

7. a) Draw a neat labelled sketch of a multiplate clutch. **4**

   b) A cone clutch is used to transmit 15 kW power at 1440 rpm coefficient of friction between the contacting surfaces is 0.3. The permissible intensity of pressure is 0.23 N/mm². The semicone angle is 12.5°. The mean radius of friction surface is twice the face width. Assuming uniform pressure condition.

   Determine :
    i) Dimensions of the friction surfaces
    ii) The axial force required
    iii) Force required to disengage the clutch. **12**

            OR

8. a) Explain the parameters to be considered for the selection of friction lining for brakes. **4**

   b) A motorcycle with the rider has total mass of 110 kg. The moment of inertia of each wheel about a transverse axis through its centre of gravity is 0.22 kg-m². The rolling radius of the wheel is 0.35 m. The motorcycle is driven at 60 km/hr, and is made to brake in a manner which brings it to a stop within 12 m after application of the brake. The rotating and reciprocating parts of the engine and the transmission system are equivalent to a moment of inertia of 0.7 kg-m² and gear ratio between the engine and wheel is 3. Assuming the both the wheels have a brake and they are simultaneously applied, the motorcycle travels on a plain road. Calculate

   i) the energy absorbed by each brake.

   ii) the torque capacity of the brake. **12**

9. A spar gear pair is to be used to transmit 20 kW power from an electric motor running at 1440 rpm to the machine tool expected to run exactly at 600 rpm. The pinion and gear are to be made of alloy steel 40 Ni2 Cr1 M028 (σ_{ut} = 800N/mm²) and palin carbon steel 55 C8 (σ_{ut} = 700 N/mm²) respectively. The service factor and factor of safety are 1.5 and 1.35 respectively. The face width is 12 times the module for which load distribution factor is 1.4. The tooth system is 20° full depth involute. The gears are to be machined to meet the specification of grade-7. The pinion and gear are to be case hardened to 400 BHN and 350 BHN respectively. Design the gear pair by using velocity factor and Buckingham's equation for dynamic load. Use following data :

   Lewis form factor $Y = 0.484 - \dfrac{2-87}{Z}$

   Velocity factor $C_v = \dfrac{6}{6+v}$

   Load-stress factor, $k = 0.16 \left(\dfrac{BHN}{100}\right)^2 \ N/mm^2$

   For grade – 7, $e = 11.00 + 0.9\,(m + 0.25\ \sqrt{D})\mu m$

   $F_d = \dfrac{21v(b.c + Ft)}{21v + \sqrt{bc + Ft}}$

   First preference module (mm) – 1, 1.25, 1.5, 2, 3, 4, 5, 6, 8, 10, 12, 16.

   Take helix angle = 25°. **17**

   OR

10. A helical pinion having 14 teeth made of alloy steel (σ_{ut} = 800 N/mm²) is mesh gear made of plain carbon steel (σ_{ut} = 720 N/mm²). The gear pair is required to transmit 30 kW power from an electric motor running at 720 rpm to machine at 225 rpm. The service factor is 1.43 while the factor of safety is 2.0. The tooth system is 20° full depth involute. The determation factor for gear pair is 11000.e N/mm. Design the gear pair by using the velocity factor and Buckingham's equation for dynamic load. Also suggest surface hardness for gear pair. Use following data :

Lewis form factor $Y = 0.484 - \dfrac{2-87}{Z'}$

Velocity factor $C_v = \dfrac{5-6}{5-6+\sqrt{v}}$

For grade $-7 - e = 11.00 + 0.9(M_N + 0.25\sqrt{D})\mu m$

$F_d = \dfrac{21.v(bc\cos^2\psi + Ft)\cos\psi}{21.v + \sqrt{bc\cos^2\psi + Ft}}$

Load-stress factor $K = 0.16 \left(\dfrac{BHN}{100}\right)^2 N/mm^2$

standard module in mm $\rightarrow$ 1, 1.25, 2, 3, 4, 5, 6, 8, 10, 12, 16.　　　**17**

11. a) Compare straight bevel, spiral bevel hypoid bevel gear with sketch.　　**6**

　　b) A pair of straight bevel gear with 20° full depth involute tooth system consist of 24 teeth pinion meshing with 48 teeth gear. The axis of pinion and gear intersect at right angle. The module at large end of teeth is 6 mm while the face width is 50 mm. The gear pair is made of gray cast iron with permissible banding stress 73.33 MPa. The overload factor and factor of safety are 1.5 and 2.0 respectively. The pinion speed is 300 rpm. Assuming the velocity factor accounts for dynamic load determine.

　　　1) Beam strength

　　　2) Wear strength

3) Maximum static load that the gear can transmit.

4) Rated power that the gear can transmit use following data.

Lewis form factor $Y = 0.484 - \dfrac{2-87}{Z'}$

Velocity factor $C_v = \dfrac{6}{6+v}$

Assume surface hardness of gear pair is 230 BHN. **11**

OR

12. a) Derive an expression for efficiency of worm gear pair. **5**

b) A double start worm made of case hardened alloy steel 16 Ni 80 Cr 60 ($\sigma_{ut} = 700 \text{N/mm}^2$) is to mesh with worm gear to be made of phosphor bronze ($\sigma_{ut} = 240 \text{ N/mm}^2$). The gear pair is required to transmit 5 kW power from an electric motor running at 1500 rpm to a machine running at 75 rpm. The service factor is 1.25 while the factor at safety required is 2.0. The face width of the worm gear is 0.73 times the pitch circle diameter of worm. The worm gear factor is 0.685N/mm^2 while the diameterial quotient is 10. The normal pressure angle is 14.5°. If the coefficient of friction between worm and worm gear teeth is 0.03 design the gear pair and find the power lost. Would you recommend a form for the gear box ? Assume the permissible temperature rise is 50°C. Use following data :

Lewis form factor – $Y = 0.39 - \dfrac{2.15}{Z_g}$

Velocity factor – $C_v = \dfrac{6}{6+vg}$

Area of housing – $A = 1.14 \times 10^{-4} \ (a)^{1.7} \ \text{m}^2$

where a = centre distance. **12**

Table No-1   *Dimensionless performance parameters for full journal bearing with side flow*

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max}}\right)$
∞	0	1.0	∞	(70.92)	∞	π	0	—
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0626	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.9	0.1	0.0115	31.62	0.756	0.411	0	0.358
	0.97	0.03	—	—	—	—	0	—
	1.0	0	0	0	0	0	0	0
1	0	1.0	∞	(85)	∞	π	0	—
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0
$\left(\frac{1}{2}\right)$	0	1.0	∞	(88.5)	∞	π	0	—
	0.1	0.9	4.31	81.62	85.6	3.43	0.173	0.523
	0.2	0.8	2.03	74.94	40.9	3.72	0.318	0.506
	0.4	0.6	0.779	61.45	17.0	4.29	0.552	0.441
	0.6	0.4	0.319	48.14	8.10	4.85	0.730	0.365
	0.8	0.2	0.0923	33.31	3.26	5.41	0.874	0.267
	0.9	0.1	0.0313	23.66	1.60	5.69	0.939	0.206
	0.97	0.03	0.00609	13.75	0.610	5.88	0.980	0.126
	1.0	0	0	0	0	—	1.0	0
$\left(\frac{1}{4}\right)$	0	1.0	∞	(89.5)	∞	π	0	–
	0.1	0.9	16.2	82.31	322.0	3.45	0.180	0.515
	0.2	0.8	7.57	75.18	153.0	3.76	0.330	0.489
	0.4	0.6	2.83	60.86	61.1	4.37	0.567	0.415
	0.6	0.4	1.07	46.72	26.7	4.99	0.746	0.334
	0.8	0.2	0.261	31.04	8.8	5.60	0.884	0.240
	0.9	0.1	0.0736	21.85	3.50	5.91	0.945	0.180
	0.97	0.03	0.0101	12.22	0.922	6.12	0.984	0.108
	1.0	0	0	0	0	–	1.0	0

Table No-I for Q. 4

T.E. (Mech., Mech. S/W) (Semester – II) Examination, 2011
TURBOMACHINES
(New) (2008 Pattern)

Time : 3 Hours   Marks : 100

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

SECTION – I
Unit – I

1. a) A circular jet of water having velocity of 60 m/s impinges tangentially on a series of curved vanes moving uniformly at 25 m/s. The jet makes an angle of 30 degrees with the direction of motion of the vanes. Relative to a vane, the jet turns through an angle of 100 degrees as it flows over the vane. The flow speed along the vane drops by 15% due to frictional loss. Draw neat inlet and outlet velocity triangles showing all the relevant details and determine :

   i) Vane tip angles at inlet and outlet for smooth flow,

   ii) Absolute velocity of water leaving the vanes,

   iii) Work done on the series of vanes per unit mass of water,

   iv) Power delivered to the vanes if the jet mass flow is 50 kg/s,

   v) Hydraulic efficiency.

   What is the pressure of water jet while it is flowing along the vane ? Justify your answer.   **10**

b) Consider a single, symmetric 2D curved vane having centrally impinging 2D water jet. Jet cross-section area is A and density of water is ρ. Velocity of the jet is V and the vane moves at velocity u in the same direction as the jet. The turning angle of the vane on each side is θ. Derive the expression for hydraulic efficiency η of the vane in terms of the speed ratio u/V and the half angle of the vane θ. Then derive the condition for maximum efficiency for given angle θ. Hence obtain the maximum efficiency for :

  i) a semicircular vane,

  ii) a flat plate perpendicular to the flow and

  iii) a flat plate aligned with the flow. **6**

OR

2. a) A horizontal-single-jet Pelton wheel works at a hydro-electric power station where the head race level is vertically 450 m above the nozzle centreline. The length of the penstock is 5 km and its diameter is 1 m. Friction factor for the penstock may be taken to be 0.032. Velocity coefficient for the nozzle is 0.97 and other head losses (in fittings and bends) up to the nozzle exit amount to 10 m of water. Relative flow speed at the bucket exit is 90% of that at the bucket inlet on account of bucket friction. Clearance angle is 15 degrees and speed ratio is 0.47. Average velocity of water in the penstock is 2 m/s and the density of water is 1000 kg/m³. Mechanical efficiency, accounting for the mechanical friction losses in bearings, is 95% and the generator efficiency is unknown. If the turbine develops an electrical power output of 5 MW while rotating at 375 rpm, determine :

  i) Rate of work done by the jet on the wheel,

  ii) Mean diameter of the bucket pitch circle,

  iii) Hydraulic efficiency,

  iv) Generator efficiency. **12**

b) Draw a neat schematic of the Pelton-wheel bucket and explain clearly the functions of the following :

  i) Twin-bucket construction,

  ii) Splitter edge,

  iii) Bucket-tip notch,

  iv) Clearance angle φ. **4**

Unit – II

3. a) A vertical-shaft mixed-flow Francis turbine (Modern Francis turbine) works between the head race and the tail race having vertical level difference of 150 meters. Frictional head losses in penstock, casing, wicket gates, runner and draft tube are 10 m, 1 m, 0.5 m, 0.5 m and 2 m of water respectively. Water discharges from the draft tube at a velocity of 2 m/s into the tail race. The turbine develops shaft power of 102.041 MW while running at a speed of 300 rpm. Mechanical efficiency of the system is 95% and the electrical generator is 98% efficient. Outer diameter and axial width of the runner at the inlet are 2.5 m and 0.625 m respectively. Blockage caused by the runner blades to the flow is negligible. Discharge from the runner is axial and whirl-free. Density of water may be taken to be 1000 kg/m³. Determine :

   i) Overall efficiency of the plant,

   ii) Discharge through the turbine in m³/s,

   iii) Runner blade angle at the inlet and

   iv) Wicket gate (or inlet guide vane) angle.

Draw neat inlet velocity triangle showing all the important details. **12**

b) A reaction turbine with a straight divergent draft tube operates under a net head of 30 m of water and develops electrical power of 50 MW. Generator and mechanical efficiencies are 98% and 95% respectively. Inlet of the draft tube is located 3 m above the tail race level where the diameter of the draft tube is 5 m. Frictional head loss in the draft tube is 1 m of water and the efficiency of the draft tube is 64.85%. Density of water may be taken to be 1030 kg/m³. Determine :

   i) Diameter of the draft tube at its exit,

   ii) Gauge pressure head at the draft tube inlet (or runner exit). **6**

OR

4. a) A vertical-shaft Kaplan turbine operates under a net head of 25 m of water and develops hydraulic power of 150 MW. Outer diameter of the tip circle of Kaplan blades is 5 m and the boss (or the hub) diameter is 2 m. Blockage factors, accounting for the thickness of aerofoil-shaped Kaplan blades, are 0.9 and 0.93 at inlet and outlet respectively. The discharge from the turbine is purely axial and hence whirl-free. On inlet side of the runner, the product of the whirl velocity and the blade velocity is constant with respect to the radius

(i.e. free-vortex type whirl distribution at inlet to the runner). Rotational speed of the turbine is 150 rpm and density of water is 1000 kg/m³. Draw inlet and outlet velocity triangles at the tip and root (i.e. at the hub) of a Kaplan blade and determine :

   i) Inlet blade angles at the blade tip and the blade root and

   ii) Outlet blade angles at the blade tip and the blade root.   **14**

b) Why is the draft tube necessary in the case of hydraulic reaction turbines ? Explain with neat sketches. Explain the advantage of elbow-type divergent draft tube over a straight divergent draft tube.   **4**

Unit – III

5. The initial pressure and temperature of steam entering a reaction turbine of axial type are 100 bar and 550°C respectively. The steam flows at 120 kg/s and the exit angle of first stage of nozzle blades is 70 degrees. The turbine is a single-stage machine with 50% degree of reaction at the mean blade height. The stage efficiency is 85%. Assuming maximum blade efficiency, determine :

   i) Rotor blade angles at inlet and outlet,

   ii) Absolute steam velocity at rotor inlet,

   iii) Power developed,

   iv) Final state of the steam after expansion.

Mean diameter of rotor is 105 cm and the speed of rotation is 3200 rpm. All angles are measured with respect to axial direction only.   **16**

OR

6. a) For a certain stage of a 50% reaction axial steam turbine, the mean rotor diameter is 1.35 m and the speed ratio is 0.69. The rotor speed is 3000 rpm and the outlet blade angle is 55 degrees. Determine :

   i) Inlet blade angle,

   ii) Blade efficiency,

   iii) Maximum blade efficiency.

All angles are measured with respect to axial direction only.   **10**

b) State various methods employed in practice for governing of steam turbines. Discuss any two methods in detail along with a neat schematic.   **6**

SECTION – II

Unit – IV

7. a) A gas-turbine power plant has an output of 100 MW at the generator terminals. The technical details of the plant are as follows :

   Air compressor inlet pressure : 1.013 bar

   Air compressor inlet temperature : 310 K

   Compressor pressure ratio : 8

   Compressor efficiency : 82%

   Turbine inlet temperature : 1350 K

   Turbine efficiency : 88%

   Turbine inlet pressure = 0.98* Compressor exit pressure

   Turbine exit pressure = 1.03 bar

   Calorific value of fuel = 42 MJ/kg

   Combustion efficiency = 99%

   Mechanical efficiency = 95%

   Generator efficiency = 97%

   Neglecting kinetic heads and taking $\gamma_a = 1.4$, $C_{pa} = 1.005$ kJ/kgK for air and $\gamma_g = 1.33$, $C_{pg} = 1.157$ kJ/kgK for exhaust gases, determine :
   i) Gas flow rate,
   ii) Fuel-air ratio,
   iii) Thermal efficiency of the plant,
   iv) Overall efficiency of the plant,
   v) Ideal Joule-Brayton cycle efficiency. **10**

b) For an actual Joule-Brayton cycle without any pressure drops, derive the condition for maximum plant output in terms of isentropic temperature ratio and compressor and turbine efficiencies. **6**

OR

8. a) A turbojet engine takes in 50 kg of air every second and propels an aircraft with a uniform flight speed of 910 km/hr. The isentropic enthalpy change in the nozzle is 188.5 kJ/kg and its velocity coefficient is 0.98. The fuel to air ratio is 1.3%, the combustion efficiency is 85% and the calorific value of the fuel is 44 MJ/kg. Determine :
   i) Thrust Specific Fuel Consumption in kg/N-hr,
   ii) Thrust power,
   iii) Propulsive power,
   iv) Propulsive efficiency. **8**

b) Describe briefly the construction of a turbofan engine along with a schematic. Also draw an indicative graph comparing the propulsive efficiencies of turboprop, turbofan and turbojet engines. **8**

Unit – V

9. a) A centrifugal pump discharges 3000 lpm of water and the outer diameter of the impeller is 35 cm. The vanes are curved backwards at an angle of 30 degrees to the wheel tangent at the impeller tip. The thickness of the vanes occupies 10% of the peripheral area. The passage is 50 mm wide and the impeller rotates at a speed of 1500 rpm. If the manometric efficiency is 82%, find the pressure head developed across the impeller in metres of water column. Assume that there is no loss of energy in the impeller and that the flow velocity is constant throughout. **10**

b) State the criteria for selection of a centrifugal pump for a given application. **6**

OR

10. a) Impeller of a centrifugal pump is 185 mm in diameter and width at the outlet is 60 mm. The blades are curved backwards at an angle of 20 degrees. The H-Q characteristic of the pump is given by :

$$H = 45 + 220 \ Q - 1660 \ Q^2$$

The pump delivers water through a 150 mm diameter and 80 m long pipe to a static lift of 32 m. Calculate the head developed, discharge and the manometric efficiency if the pump speed is 3200 rpm. Friction factor for the outlet pipe
material as 0.028 and the frictional head loss in the suction pipe is negligible. **10**

b) Why is multistaging used for a centrifugal pump ? Describe the methods used
for multistaging. **6**

Unit – VI

11. a) An axial compressor has 10 stages with an overall stagnation pressure ratio of 6.192. Isentropic efficiency of each stage is 90%. Ambient air temperature is 25°C and ambient air pressure is 1 bar. Stagnation pressure ratios of all the stages are equal and overall stagnation pressure ratio is the product of stage stagnation pressure ratios. Same is the case for stagnation temperature ratio. The degree of reaction for each stage is 50% at the mean blade height. The first stage of the compressor has a set of Inlet Guide Vanes (IGVs) followed by rotor and stator rings. Exit angle of the IGVs is 20 degrees with respect to the axial direction and the velocity of flow at the rotor inlet is 150 m/s. Rotor hub diameter to tip diameter ratio is 0.5 for the first stage and compressor speed is 15000 rpm. Taking $\gamma = 1.4$ and $C_p = 1.005$ kJ/kgK for air, determine :
   i) Stage stagnation temperature ratio,
   ii) Overall isentropic efficiency,
   iii) Rotor inlet and exit angles and stator inlet angle for first stage,
   iv) Specific work done on air in the first stage,
   v) Rotor blade speed at the mean blade height in the first stage,
   vi) Inner and outer diameters of the first stage rotor annulus.

   Draw neat inlet and outlet velocity triangles at the mean blade height for the first stage rotor showing all the improtant details. **12**

   b) Explain slip and prewhirl in connection to centrifugal compressors. **6**

OR

12. a) A centrifugal compressor runs at 15000 rpm with an overall stagnation pressure ratio of 4. Ambient air conditions are 25°C and 1 bar. Vanes are radial. Slip factor is 0.96 and power input factor (work factor) is 1.04. Flow in the inlet section up to the impeller entry is isentropic and that in the impeller and the diffuser is adiabatic. There is no prewhirl at axial entry to the impeller. Mechanical efficiency is 96% and the electric motor driving the compressor is 98% efficient. The loss of stagnation pressure from impeller exit to diffuser exit is 0.1 bar. Isentropic efficiency of the impeller alone is 90%. Taking $\gamma = 1.4$ and $C_p = 1.005$ kJ/kgK for air, determine :

   i) Electrical energy consumed by the electric motor per kg of air,

   ii) Overall isentropic efficiency of the compressor,

   iii) Impeller tip diameter.

   Draw neat T – s diagram showing only the stagnation temperatures and pressures
   involved in the present problem. **12**

   b) Explain surging and rotating stall with reference to axial compressors. **6**

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T.E. (Mechanical Engineering) (Sem. – II) Examination, 2011
MECHATRONICS
(New) (2008 Course)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. a) How Microbalance Machine works used which is for measurement of weight in Jwellery shop, explain its working with suitable diagram ?   **8**

   b) Classify thermocouples used for measurement of temperature.   **4**

   c) Explain one of the following :   **4**

      1) Bridge Circuit in measurement

      2) Basic Divider Circuits.

                     OR

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

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

   c) Explain different static characteristics parameters used in measurement techniques.   **4**

3. a) Compare an LVDT with a potentiometer as a position sensor. What are advantages and disadvantages of using an LVDT ?   6

   b) A potentiometer with a total range of 350° is supplied with a voltage of 8 Vdc. The voltage at the wiper is 3.7 Vdc. What is the present angle of the pot ?   5

   c) Describe proximity sensor with application.   5

                              OR

4. a) How does a bimetallic temperature sensor work ?   5

   b) A 350° wire-wound potentiometer has 300 turns and a total resistance of 1 kΩ. What is the resolution in ohms ? In degrees ?   6

   c) How variable reluctance sensor works ? Explain with example.   5

5. a) What is meant by Nyquist Frequency ?   4

   b) Carry out block diagram reduction for following system.   8

Reduce the Block Diagrams shown below:

   c) A microprocessor-based control system runs at a clock speed of 1 MHz. The system uses an 8-bit ADC with a 100-μs conversion time. The program loop that processes the analog-to-digital input requires 55 instructions with an average execution time of 4 clocks/instruction. If analog-to-digital conversion is not overlapped with processing, what is the maximum sample rate ? What is the highest frequency that this system can monitor ?   6

                              OR

6. a) Write down the limitations of a sample and hold circuit used for ADC.   6

   b) Write a note on DAC (Digital to Analog Conversion) and how it is done ?   4

c) Carry out block diagram reduction for following system. **8**

SECTION – II

7. a) Explain following terms with respect to control system. **4**
   1) Feed Back and Feed Forward Control System.
   2) Regulator System.

   b) In a certain system, an electric heating element was found to increase the temperature of a piece of metal $10°$ for each ampere of current. The metal expands 0.001 in /deg and pushes on a load sensor which outputs 1 V/0.005 in. of compression. **6**
   a) Find the transfer functions of the three components and draw the block diagram.
   b) Calculate the overall transfer function of this system.

   c) What is the difference between a process control system and a servomechanism ? **6**

   OR

8. a) Explain following terms : **4**
   1) Process Variable.
   2) Process Error.

   b) Give an example of the following : **6**
   a) Feed forward control system.
   b) Feedback control system.
   c) Regulator control system.

   c) Explain control systems used for following (as open-or closed-loop control.) **6**
   a) Controlling the water height in a toilet tank
   b) Actuation of street lights at 6 P.M.
   c) Stopping a clothes dryer when the clothes are dry.

9. a) Explain working of PID control system and why this controller is mostly used in industry. **6**

   b) What problem is solved and what new problem is created with the addition of integral feedback ? **4**

   c) Explain why a proportional control system lifting a weight can never reduce the steady-state error to zero. **6**

                    OR

10. a) Explain how the addition of integral feedback in a proportional control system eliminates steady-state error. **4**

   b) What is the difference between analog and digital control system ? Explain with appropriate example. **6**

   c) A position control system has a gain KP of 2 in oz/deg and works against a constant friction torque of 6 in oz. What is the size of the dead band ? **6**

11. a) Explain application of PLC system for following case studies. **6**
      1) Bottle Filling Machine.
      2) Elevator.

   b) Construct the ladder logic diagrams for (a) the NAND gate and (b) the NOR gate. Also develop a truth table for both logics. **12**

                    OR

12. a) In a certain bank, each of three 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. **12**

   b) List the steps the PLC takes to execute the ladder diagram program. **6**

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T.E. Mechanical (Semester – II) Examination, 2011
REFRIGERATION AND AIR CONDITIONING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* *Answer **3** questions from Section **I** and **3** questions from*
 *Section **II**.*
2) *Answers to the **two** Sections should be written in*
 separate *answer books.*
3) ***Neat*** *diagrams must be drawn **wherever** necessary.*
4) *Black figures to the **right** indicate **full** marks.*
5) ***Use*** *of logarithmic tables slide rule, Mollier charts,*
 *electronic pocket calculator and steam tables is **allowed**.*
6) *Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) What are the advantages of air refrigeration ?   **3**

   b) Write a note on vortex tube refrigeration.   **5**

   c) In a Bell Colemn cycle, air is drawn into cylinder of a compressor at a
      pressure of 1 bar and – 5°C. It is compressed isentropically to 5 bar at
      which it is cooled to 15°C. It is then expanded in the expansion cylinder to
      1 bar and discharged into the refrigerating chamber. The expansion takes
      place according to law $pV^{1.22}$ = constant. Find the work done on the air
      and cop of the plant. Also find the plant capacity in TR for a mass flow
      rate of 20 kg/min.   **8**

                        OR

2. a) What are the disadvantages of air refrigeration ? **3**

   b) Write a note on thermoelectric refrigeration. **5**

   c) Derive an expression for COP of refrigerator and heat pump, working on reversed Carnot cycle. **8**

Unit – II

3. a) Discuss the effect of superheating of refrigerant vapour on COP of VCR cycle. **6**

   b) Compare : VAR and VCR. **4**

   c) In an absorption system, heating, cooling and refrigeration takes place at the temperatures of 150° C, 30° C and – 20° C respectively. Find theoretical COP of the system.

   If the generator temperature is increased to 200°C and evaporator temperature is decreased to – 40°C, find % change in COP. **6**

                    OR

4. a) Discuss the effect of decrease in evaporator pressure on COP of VCR cycle. **6**

   b) Explain selection criteria of refrigerant absorbent mixture. **4**

   c) An ammonia refrigerator works between temperature limits of – 15°C and 30°C. The refrigerant is sub cooled to 20°C before expansion. Assuming refrigerant to be dry saturated at compressor inlet, find COP of the plant. Use p-h diagram. **6**

Unit – III

5. a) Explain : GWP, ODP.   **6**

   b) What is a secondary refrigerant ?   **2**

   c) What are the desirable properties of refrigerant ?   **6**

   d) What is the necessity of multipressure systems ? Name 4 commonly used
      multipressure systems.   **4**

                              OR

6. a) Explain : TEWI.   **4**

   b) What is the necessity of multistage compression in refrigeration ? Explain
      any one method used for cooling the refrigerant vapour between stages of
      multistage compression with the help of a neat sketch.   **8**

   c) Explain cascade refrigeration system with a neat sketch.   **6**

                           SECTION – II

7. a) What do you understand by Effective Temperature ? In what way it is
      connected with comfort air conditioning ? What factors are involved in
      effective temperature ?   **8**

   b) An air-conditioned space is maintained at 27°C DBT and 50 per cent RH.
      The ambient conditions are 40°C DBT and 27°C WBT. The space has a
      sensible heat gain of 14 kW. Air is supplied to the space at 7°C saturated.

      Calculate :

       i) Mass of moist air supplied to the space in kg/hr.

      ii) Latent heat gain of space in kW.

      iii) Cooling load of the air washer in kW if 30 per cent of air supplied to
           the space is fresh, the remainder being recirculated.   **10**

                              OR

8. a) Explain with neat sketch/diagram different psychrometric processes and show then on the hand-drawn psychrometric chart. **8**

   b) Given for a conditioned space :

   Room sensible heat gain = 20 kW

   Room latent heat gain = 5 kW

   Inside design conditions : 25°C, DBT, 50 % RH

   Bypass factor of the cooling coil = 0-1

   The return air from the space is mixed with the outside air before entering the cooling coil in the ratio of 4 : 1 by weight : Determine

    i) Apparatus dew point

   ii) Condition of air leaving cooling coil

   iii) Dehumidified air quantity

   iv) Ventilation air mass and volume flow rates. **10**

 9. a) Write short notes on :

    i) Hermatic compressor

   ii) Thermostatic expansion valve. **8**

   b) What is the difference between winter and summer air conditioning system ? What different equipments are required ? Explain. **8**

                OR

10. a) Explain unitary and central air conditioning system. **8**

    b) Explain different air conditioning system components. **8**

11. a) A circular section main duct of 1.2 m diameter carries air flowing at the velocity of 600 m/min. This duct has three branch ducts receiving equal air volumes, at equal intervals. Each interval duct has a friction loss of 1.2 mm of water and a static pressure of 4 mm of water is required at each branch. Calculate the velocities and diameters of the second and third lengths so as to have static regain just enough to overcome the frictional loss in the succeeding length of main duct upto the next branch. The static regain factor is 0.6. Draw the simple sketch of the above duct system. **10**

   b) What factors are responsible for the spoilage of the food and vegetable products ? **6**

                    OR

12. a) Write a short notes on :

    i) Cold storage

    ii) Basic selection method for a fan in air conditioning system. **8**

   b) What are the objectives of duct designing ? Explain static regain method of duct design giving its advantages and disadvantages. **8**
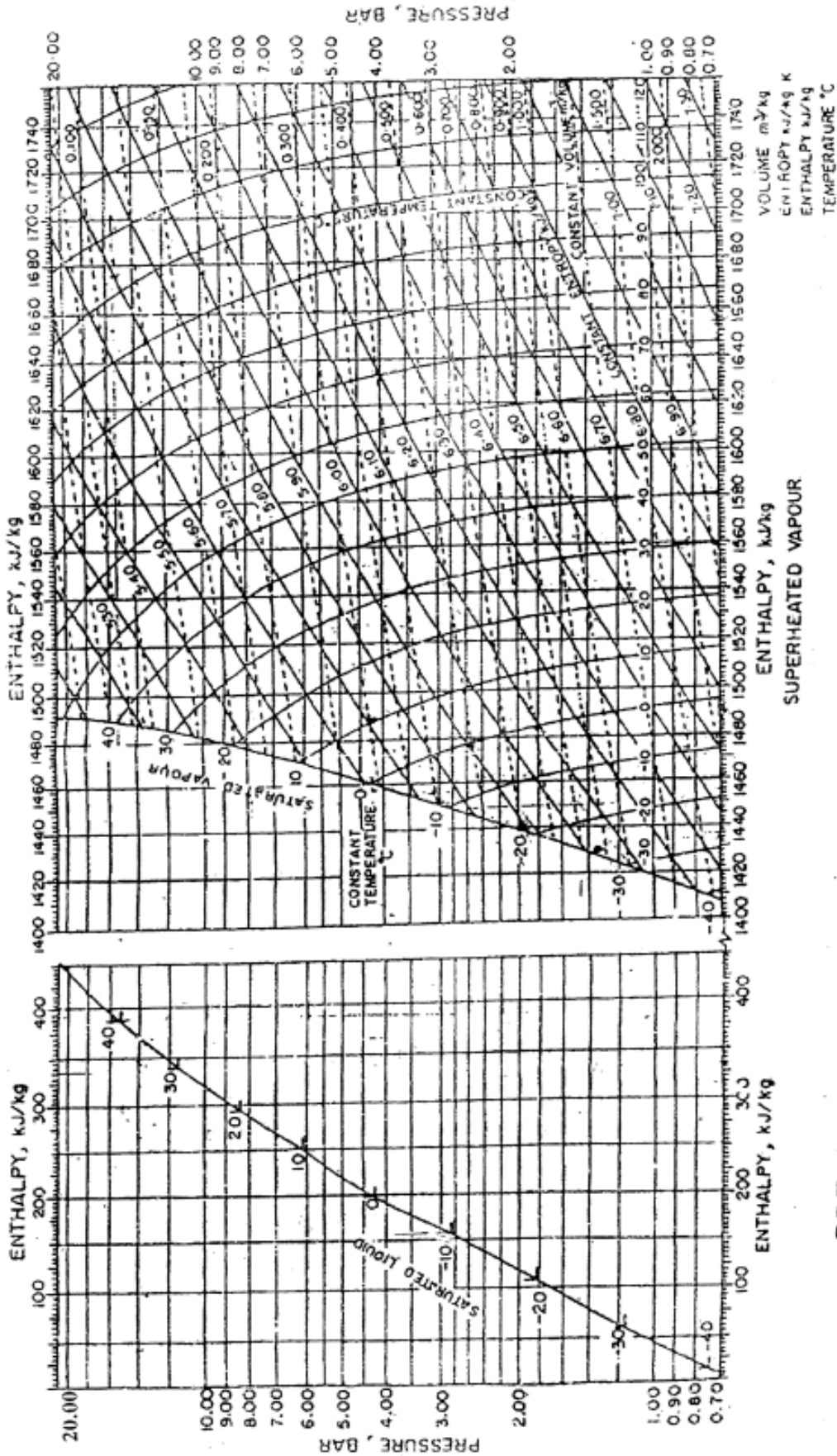
PRESSURE – ENTHALPY DIAGRAM REFRIGERANT, AMMONIA (R 717)

Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
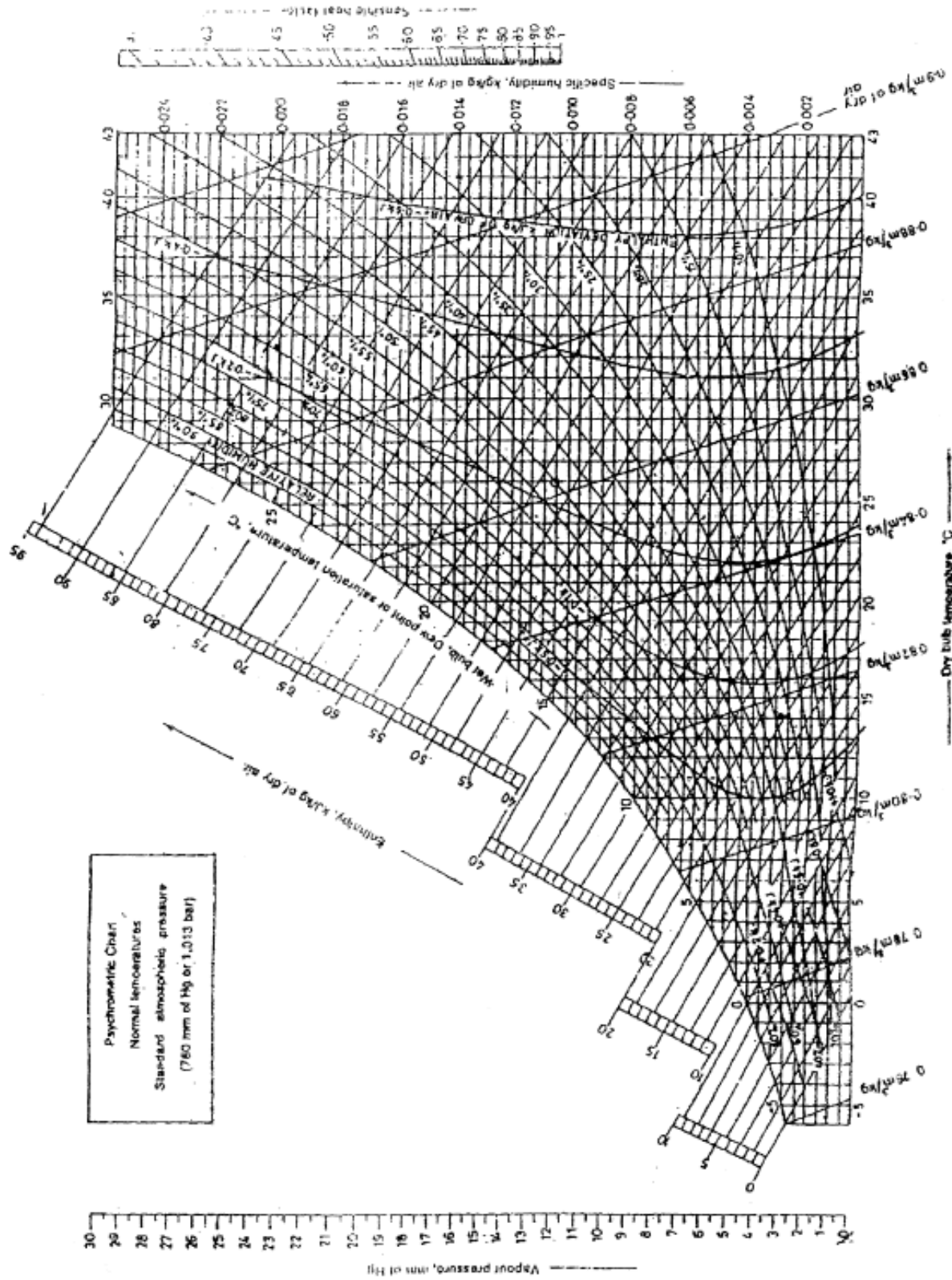
T.E. (Mechanical/Sandwich) (Semester – I) Examination, 2011
(Elective – I) (Self Study)
A) PRODUCTION MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours   Total Marks : 100

Instructions : 1) Answer **any 3** questions from **each** Section.
2) Answer **3** questions from Section **I** and **3** questions from Section **II**.
3) Answers to the **two** Sections should be written in **separate** books.
4) Neat diagrams must be drawn **wherever** necessary.
5) Assume suitable data, if **necessary**.

SECTION – I

1. a) What is scientific management ? Explain principles of scientific management.   **8**

   b) Explain principles of organisation.   **8**

                    OR

   a) Explain any four types of business ownership.   **8**

   b) List the type of organisation structure and explain it.   **8**

2. a) Define industrial engineering. What are the functions of industrial engineering ?   **8**

   b) What is production planning and control ? What are its objectives ?   **8**

                    OR

   a) Explain key principles of material handling.   **8**

   b) What are the types of production system ? Explain any two types.   **8**

3. a) What is motion pictures ? How they are used for analysis ?   **10**

   b) Explain SIMO chart and chronocylo graph.   **8**

                    OR

   a) How to calculate standard time ? Explain MOST.   **10**

   b) What is ergonomics ? Explain its importance with one example.   **8**

SECTION – II

4. a) Compare sampling inspection and 100 percent inspection. **8**

   b) Explain $\overline{X}$ chart and R chart with its steps. **8**

   OR

   a) What is quality audit ? Discuss any six components of quality audit. **8**

   b) What is TQM ? What are elements of TQM ? **8**

5. a) What are quality control tools ? Discuss in details. **8**

   b) What is 5S ? Explain with one example. **8**

   OR

   a) Explain Concurrent engineering and Reverse engineering. **8**

   b) What is concept quality function and deployment house of quality ? **8**

6. a) What is structure of ISO 9000 standards and decision tree for selection of standard ? **10**

   b) What is reliability ? How it is used ? **8**

   OR

   a) Explain concept of design of experiments. **10**

   b) What is hypothesis ? Explain concept of hypothesis testing. **8**

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TE (Mechanical/Sandwich) (Semester – I) Examination, 2011
Elective – I (Self Study)
C] WELDING TECHNOLOGY (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the two Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

UNIT – I

1. a) What is the chemistry involved in combustion of fuel gases with oxygen from welding point of view ?   **8**

   b) List the different fuel gases used in gas welding with its application and explain the procedure to generate the acetylene gas.   **8**

                              OR

2. a) How will you identify the gas flames ? With proper justification give the application of each flame.   **8**

   b) Explain the classification of ferrous filler metals.   **8**

UNIT – II

3. a) On the basis of following points explain the TIG welding with neat sketch
      i) Welding torch
      ii) Electrode and filler metal
      iii) Welding power source
      iv) Inert gas.   **9**

   b) Explain with neat sketch FCAW process and list the advantages and application of it.   **9**

                       OR

P.T.O.

4. a) Explain the role of core wire in coated electrode. What are the ingredients present in the coating ? Also mention the role they play to get sound weld. **9**

   b) Explain the carbon arc welding process. Also briefly give the classification of carbon arc welding. **9**

UNIT – III

5. a) What is the basic principle behind electric resistance welding ? Explain the effect of process controlling parameters on resistance welding. **10**

   b) Distinguish between spot and seam welding. **6**

   OR

6. a) What are the advantages and limitations of resistance welding ? **6**

   b) Write a short note on :
      i) Flash butt welding
      ii) Percussion welding. **10**

SECTION – II

UNIT – IV

7. a) Explain the friction welding process mentioning its advantages, disadvantages and applications. **10**

   b) Distinguish between LBM and EBM. **8**

   OR

8. a) What is the principle behind ultrasonic welding ? Mention its advantages, limitations and application. **8**

   b) Write a short note on : **10**
      i) Thermit welding
      ii) Atomic hydrogen welding

UNIT – V

9. a) Explain with neat sketch the difference between the brazing and braze welding process. **8**

   b) Write a short note on brazing methods. **8**

   OR

10. a) Explain soldering process with advantages, limitations and application. **8**

   b) Explain the concept and procedure of adhesive bonding also sketch and explain the types of adhesive bonded joints. **8**

UNIT – VI

11. a) Calculate the cost of welding 750 cm length single bevel butt joint as shown in fig. using the following data : - Electrode E 6010, ϕ 3.15×350 mm long, deposition rate 952 gm/hr, operating factor 30%, deposition efficiency 76.3%, coated electrode cost Rs. 1.50/gm, power Rs. 3.00/kWh, voltage 25v, current 100A, weight of reinforcement 3.14gm/cm, density of weld metal 7.85 gm/cu.cm, labour and overhead cost Rs. 1000/hr,
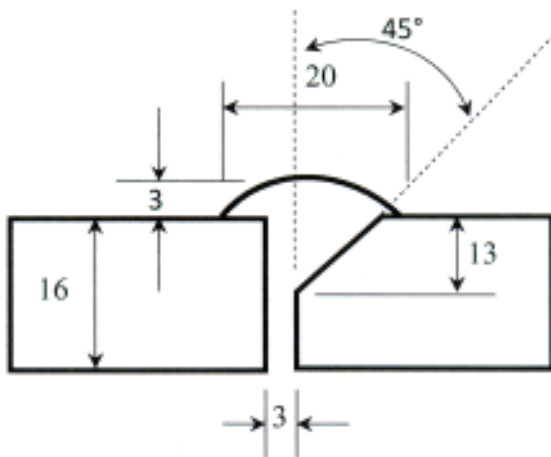
10

   b) What are the defects in weld ? Also mention the causes for this defect. **6**

OR

12. Write a short note on :
   i) Discontinuities of weld
   ii) Weld quality. **16**

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T.E. (Mech – Sandwitch) (Semester – II) Examination, 2011
THEORY OF MACHINE AND MACHINE DESIGN – II (New)
(2008 Pattern)

Time : 4 Hours   Max. Marks : 100

SECTION – I

1. a) Synthesis a four bar mechanism for three successive positions given in the
   table below.   **10**

Position	1	2	3
θ	30	90	180
ϕ	40	115	175

   Consider L_1 = grounded link, L_2 = input link, L_3 = coupler link,
   L_4 = output link, θ = input link angle, ϕ = output link angle. If the
   grounded link of length 100 mm is horizontal and input link is of 20 mm
   length, synthesis the mechanism using precision positions of the input link
   and precision positions of the output link. Ground the pivot of input link
   on left hand side and ground the pivot of output link on right hand side.
   Input and output links are rotating in opposite directions. Comment on
   mechanism obtained.

   b) Explain the following terms related to synthesis of mechanism :   **8**

      i) Function generation

      ii) Body guidance

      iii) Precision position

      iv) Structural error.

                              OR

2. a) Draw the profile of a cam operating a roller follower and with the following data.   **14**

   Minimum radius of cam = 25 mm, Lift = 30 mm

   Roller diameter = 15 mm

   The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration during the decent period.

   b) A function varies from 0 to 8. Find the Chebychev spacing for four precisions by using graphical method.   **4**

3. a) Two spur gear wheels of pitch circle diameter of 100 mm and 350 mm have involute teeth of 5 mm module, and 20° angle of obliquity. The addenda are equal and it is as large as possible while avoiding the interference. If pinion rotates at 100 rpm, find :   **10**

   i) The addendum,

   ii) The contact ratio,

   iii) The sliding velocities

      a) at the beginning of point of contact and

      b) at the end of point of contact.

   b) State and prove the law of gearing.   **6**

                    OR

4. a) Gear wheel A having 14 teeth is rigidly mounted on the driving shaft. It gears with compound wheel B-D. B gears with fixed annular wheel C and D gears with annular wheel E. The compound wheel B-D revolve freely on a pin. The annular wheel E is rigidly mounted on the driven shaft. Module of all the gears is same. The driving and driven shafts and the annular wheels are coaxial. Number of teeth on gear C, E and D are 100, 98, 41. Driving shaft rotates at 1200 rpm and transmits 25 kW power.   **10**

   i) Sketch the arrangement

   ii) Find the speed of driven shaft

   iii) Find the torque transmitted by the driven shaft.

   b) Explain with the help of neat diagram the various forces acting on helical gear.   **6**

5. a) Define the following terms related to gyroscope

     i) Axis of precision

    ii) Gyroscopic couple

    iii) Gyroscopic acceleration.   **6**

  b) A motor cyclist travels round a curved track of 80 m radius at 80 km/hr. **10**

Determine the angle of heel, if

Mass of the motorcycle with rider = 120 kg,

Combined CG from ground = 0.425 m,

Mass of each wheel = 0.8 kg,

Radius of gyration of each wheel = 0.220 m,

Effective wheel diameter = 0.6 m,

The mass of rotating parts is 1.4 kg having a radius of gyration of 0.9 m and it rotates at 3 times the speed of the wheel and in opposite direction.

                        OR

6. a) A band and block brake having 12 blocks, each of which subtends an angle of 16° at the center is applied to a rotating drum of diameter 600 mm. The blocks are 75 mm thick. The drum and flywheel, mounted on same shaft have a mass of 1800 kg and have a combined radius of gyration of 600 mm. The two ends of the band are attached to pins on the opposite sides of the brake fulcrum at a distance of 40 mm and 150 mm from the fulcrum. If the force of 250 N is applied at a distance of 900 mm from the fulcrum, find

     i) The maximum braking torque,

    ii) The angular retardation of the drum

    iii) The time taken by the system to be stationary from the rated speed of 300 rpm.

Take coefficient between the blocks and the drum as 0.3.   **10**

  b) Explain with neat diagram Bewis torsion type dynamometer.   **6**

SECTION – II

7. a) Derive an expression for virtual number of teeth of a helical gear. **6**

   b) A gear drive transmits 22.5 kW power. The velocity ratio is 1:2 and pinion rotates with 200 rpm. The approximate center distance between the shafts is 600 mm. The teeth are 20° stub involute profiles. The static stress for a cast iron gear taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear load. Deformation factor in the Buckingham equation may be taken as 80. The material combination factor for wear is 1.4. **12**

   OR

8. a) Explain different types of gear tooth failure with causes and remedies. **6**

   b) A pair of cast iron bevel gears connects two shafts at right angles. The pitch diameter of pinion and gear are 80 mm and 100 mm respectively. Tooth profile of the gears are of $14\frac{1}{2}°$ composite form. The allowable static stress for both the gear is 55 MPa. If the pinion transmits 2.75 kW at 1100 rpm. Find the module and number of teeth on each gear. Check the design for wear. Take the surface endurances limit as 630 MPa and modulus of elasticity for caste iron 84 kN/mm². **12**

9. a) What are the design consideration in design of friction clutch ? **6**

   b) A ball bearing operates on a work cycle consisting of three parts, a radial load of 3000 N at 720 rpm for 30% of the cycle, a radial load of 7000 N at 1440 r.p.m. for 40% of the cycle and radial load of 5000 N at 900 r.p.m. for remaining cycle. The basic dynamic capacity of the bearing is 30700 N, Calculate :

   i) Rating life of bearing in hrs.

   ii) Average speed of rotation

   iii) Life of bearing with 95% reliability. **10**

   OR

10. a) Derive stribeck equation for static load carrying capacity of roller bearing.   **6**

   b) A dry single plate clutch is to be designed for a vehicle whose engine rated to give 100 kW at 2400 rpm and maximum torque 500 N-m. The outer radius of the plate is 25% more than the inner radius. The intensity of pressure between the plates is not to exceed 0.07 N/mm². The coefficient of friction is 0.3. Eight helical springs are required to provide axial thrust necessary to engage the clutch. If each spring has stiffness equal to 40 N/mm. Determine dimensions of friction plates and initial
   compression in the springs.   **10**

11. a) Write short note on S-N curve.   **6**

   b) A circular bar of 500 mm length is supported freely at its two ends. A central cyclic load is acting on shaft with minimum value of 20 kN and maximum value of 50 kN. Find diameter of bar by taking factor of safety 1.5, size effect of 0.85, surface finish factor 0.9. The material properties of the bar are ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa.   **10**

                    OR

12. a) Explain modified Goodman diagram for fluctuating axial and bending stresses.   **6**

   b) A cantilever beam (Fig. 1) made of cold drawn carbon steel of circular cross section is subjected to a load which varies from - F to 3F. Determine the maximum load that this member can withstand for an indefinite life using factor of safety as 2. The theoretical stress concentration factor is 1.42 and notch sensitivity is 0.9. Consider ultimate stress 550 MPa, yield stress 470 MPa, Endurance limit 275 MPa, size factor 0.85, surface finish factor 0.89.   **10**
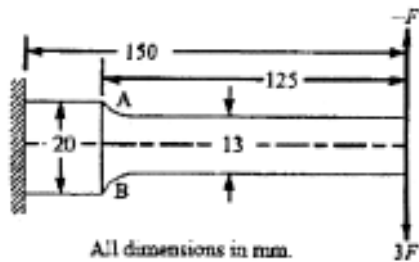
Fig. 1

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T.E. (Mechanical Engineering (Sandwitch)) (Semester – II) Examination, 2011
MECHATRONICS
(2008 Course) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answer to the **each** Section should be written in **separate** books.*
*3) **Draw** suitable neat diagrams, **wherever** necessary*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of electronic pocket calculator is **allowed**.*
*6) **Assume** suitable data, if **required**.*

SECTION – I

1. a) How Microbalance Machine works used which is for measurement of weight in Jewellery shop ? Explain its working with suitable diagram.   **8**

   b) Classify thermocouples used for measurement of temperature.   **4**

   c) Explain **one** of the following :
      1) Bridge circuit in measurement
      2) Basic Divider Circuits.   **4**

                             OR

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

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

   c) Explain different static characteristics parameters used in measurement techniques.   **4**

P.T.O.

3. a) Compare an LVDT with a potentiometer as a position sensor. What are advantages and disadvantages of using an LVDT ?   **6**

   b) A potentiometer with a total range of 350° is supplied with a voltage of 8 Vdc. The voltage at the wiper is 3.7 Vdc. What is the present angle of the pot ?   **5**

   c) Describe proximity sensor with application.   **5**

                   OR

4. a) How does a bimetallic temperature sensor work ?   **5**

   b) A 350° wire-wound potentiometer has 300 turns and a total resistance of 1 k Ω. What is the resolution in ohms ? In degrees ?   **5**

   c) How Variable Reluctance Sensor Works ? Explain with example.   **6**

5. a) What is meant by Nyquist Frequency ?   **4**

   b) Carry out block diagram reduction for following system.   **8**

Reduce the Block Diagrams shown below:

   c) A microprocessor-based control system runs at a clock speed of 1 MHz. The system uses an 8-bit ADC with a 100-μs conversion time. The program loop that processes the analog-to-digital input requires 55 instructions with an average execution time of 4 clocks/instruction. If analog-to-digital conversion is not overlapped with processing, what is the maximum sample rate ? What is the highest frequency that this system can monitor ?   **6**

                   OR

6. a) Write down the limitations of a sample and hold circuit used for ADC.   **6**

   b) Write a note on DAC (Digital to Analog Conversion) and how it is done ?   **4**

c) Carry out block diagram reduction for following system : **8**

SECTION – II

7. a) Explain following terms with respect to control system :
   1) Feed Back and Feed Forward Control System
   2) Regulator System. **4**

   b) In a certain system, an electric heating element was found to increase the temperature of a piece of metal 10° for each ampere of current. The metal expands 0.001 in/deg and pushes on a load sensor which outputs 1 V/0.005 in. of compression.
   a) Find the transfer functions of the three components and draw the block diagram.
   b) Calculate the overall transfer function of this system. **6**

   c) What is the difference between a process control system and a servomechanism ? **6**

   OR

8. a) Explain following terms :
   1) Process Variable
   2) Process Error. **4**

   b) Give an example of the following :
   a) Feed forward control system
   b) Feedback control system
   c) Regulator control system. **6**

   c) Explain control systems used for following (as open-or-closed-loop control)
   a) Controlling the water height in a toilet tank
   b) Actuation of street lights at 6 P.M.
   c) Stopping a clothes dryer when the clothes are dry. **6**

9. a) Explain working of PID control system and why this controller is mostly used in industry. **6**

   b) What problem is solved and what new problem is created with the addition of integral feedback ? **4**

   c) Explain why a proportional control system lifting a weight can never reduce the steady-state error to zero. **6**

   OR

10. a) Explain how the addition of integral feedback in a proportional control system eliminates steady-state error. **4**

    b) What is the difference between analog and digital control system ? Explain with appropriate example. **6**

    c) A position control system has a gain KP of 2 in. oz/deg and works against a constant friction torque of 6 in.oz. What is the size of the dead band ? **6**

11. a) Explain application of PLC system for following case studies :
    1) Bottle Filling Machine
    2) Elevator. **6**

    b) Construct the ladder logic diagrams for a) the NAND gate and b) the NOR gate. Also develop a truth table for both logics. **12**

    OR

12. 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. **12**

    b) List the steps the PLC takes to execute the ladder diagram program. **6**

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T.E. (Mechanical S/W) (Semester – II) Examination, 2011
TRIBOLOGY
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* *Answers to the* ***two*** *Sections should be written in* ***separate***
books.
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) ***Use*** *of logarithmic tables, slide rule, Mollier charts,*
electronic pocket Calculator is ***allowed.***
4) *Assume suitable data if* ***necessary.***

SECTION – I

1. a) Discuss the methods to reduce tribological problems in design stage.   **6**

   b) Explain the importance of recycling of used oil.   **8**

   c) Compare load carrying capacity of hydrodynamic, hydrostatic and rolling
      contact bearings with the help of graph.   **2**

   OR

2. a) Explain the effect of temperature and pressure on viscosity of the lubricant.   **8**

   b) Enumerate the desirable properties of lubricant.   **8**

3. a) Using deformation theory, derive the equation for coefficient of friction
      with usual notations.   **8**

   b) What are different methods for wear debris analysis ? Explain ferrography
      technique in detail.   **8**

   OR

4. a) Derive the equation for volume of abrasive wear with usual notations.   **8**

   b) Explain different methods for measurement of friction with neat diagrams.   **8**

5. a) Derive the equation for pressure distribution of infinitely short journal
      bearings with usual notations. State the assumptions made.   **10**

   b) Explain selection of bearing design variables in case of Hydrodynamic
      Journal Bearings.   **8**

   OR

P.T.O.

6. a) The following data is related to a 360° hydrodynamic journal bearing :

   • Radial load   = 10 kN

   • L/D ratio   = 1

   • Journal radius   = 800 × radial clearance

   • Permissible bearing pressure = 1000 kPa

   • Journal Speed   = 1440 RPM

   • Density of the lubricant   = 860 kg/m^3

   • Specific heat of lubricant = 2.1 kJ/kg°C

   • Minimum oil film thickness = 25 microns

   Calculate :

    i) Diameter of the journal;

   ii) The total flow rate of lubricant in *lpm*;

   iii) The side leakage;

   iv) Power lost in friction;

    v) Average temperature if makeup oil is supplied at 35°C; and

   vi) The absolute viscosity of the lubricant.

   Table 1 : Dimensionless parameters for 360° Hydrodynamic journal bearings

L/D	h_0/C	ε	S	(r/C).f	(Q/r.Cn$_s$L)	Q$_s$/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

   12

   b) Explain different regimes of hydrodynamic lubrication with the help of Stribeck curve. **6**

SECTION – II

7. a) Derive an expression for flow rate and pressure distribution for a hydrostatic step bearing with neat diagram. Show the pressure distribution in the bearing. **8**

   b) Explain different compensating elements in hydrostatic lubrication system. **8**

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

8. a) The following data is related with the hydrostatic step bearing :

   - Shaft Speed   = 100 RPM

   - Supply pressure   = 50 bar

   - Shaft diameter   = 500 mm

   - Recess diameter   = 300 mm

   - Viscosity of the lubricant = 35 MPa-sec

   - Specific gravity of lubricant = 0.86

   - Specific heat of lubricant   = 2kJ/kg°C

   Calculate :
    i) The load carrying capacity of bearing;
   ii) The optimum oil film thickness;
   iii) The flow requirement in *lpm*;
   iv) The total power loss ; and
    v) The temperature rise, assuming the total power loss in bearing is converted into the frictional heat. **10**

   b) Explain different power losses in hydrostatic step bearings. **6**

9. a) Derive the expression for the pressure distribution, load carrying capacity and time of approach for squeeze film lubrication between square plates. **10**

   b) Explain different warning and protective devices in lubrication of plain bearings. **6**

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

10. a) A plate of 25 mm length and infinite width is separated from the plane by an oil film 25 microns thickness and having viscosity of 0.05 N-s/m². If the normal load per unit width of 20 kN/m is applied on the plate, determine :

   i) The time required to reduce the film thickness to 2.5 microns; and

   ii) The maximum pressure. **6**

   b) Explain lubrication systems for gears in detail. **8**

   c) Explain the necessity of lubrication in metal working. **2**

11. a) Derive an expression for pressure distribution in narrow width tapered pad bearings with neat sketch. State the assumptions made. **10**

   b) State the properties of bearing materials which govern the selection of material for sliding contact bearings. **6**

   c) Explain Labyrinth Seals. **2**

                    OR

12. a) The Rayleigh step bearing has following details : **8**

   • Length of the bearing   = 850 mm
   • Width of the bearing   = 250 mm
   • Load on the bearing   = 200 kN
   • Sum of surface roughness on contacting surfaces = 5 microns
   • Minimum oil film thickness = 18 × Sum of surfaces roughness value
   • Sliding velocity = 7.5 m/s

   Calculate :
   i) Dimensions of the step;
   ii) The maximum oil film thickness;
   iii) The viscosity of the lubricating oil; and
   iv) Maximum pressure at the step.

   b) Explain with neat sketches, the solid bushing and lined bushing. **6**

   c) Explain the principle of Elasto-hydrodynamic lubrication. **4**

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T.E. Production (Semester – I) Examination, 2011
METROLOGY AND MECHANICAL MEASUREMENTS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. a) Differentiate between Line standard, End standard and Wavelength standard of metrology. **8**

   b) Describe with neat sketch working principle of Autocollimator and state its applications. **8**

        OR

2. a) Differentiate between : (i) Precision and Accuracy

                              (ii) Systematic and Random errors in measurement. **8**

   b) Describe clearly with neat sketches applications of sine bars and sine centers. Also list out merits and demerits of them. **8**

3. a) Differentiate between mechanical and pneumatic comparator. **8**

   b) Calculate the fundamental deviation and tolerances and hence limits of size for hole and shaft for the following 60H8f7.

   Given data : (i) FD $= -5.5D^{0.41}$. **10**

        OR

4. a) Describe Taylor's principal in design of limit gauges. **6**

   b) Design Go and No-Go gauges for the inspection of shaft and hole assembly designated as $75H_7m_6$ **12**

   Given data : (i) 75 mm lies between diameter steps of 50-80 mm

                 (ii) IT6 = 10 i and IT7 = 16 i

                 (iii) F.D. for shaft 'm' is given by FD = + (IT7 – IT6)

P.T.O.

5. a) What is surface roughness and explain different methods of surface roughness evaluation ?   **8**

   b) Derive expression for pitch value P = 0.866p - d for metric threads in two-wire method. Explain procedure for screw thread effective diameter measurement on FCM.   **8**

   <center>OR</center>

6. a) Explain the principle of measurement by light, wave interference method. Sketch the optical arrangement of NPL gauge interferometer to compute the length of a slip gauge.   **8**

   b) Explain with sketch working principle of Taylor-Hobson Talysurf surface tester with its advantages and disadvantages.   **8**

<center>SECTION – II</center>

7. a) Draw generalized block diagram of measurement system and explain functions of each element in it.   **6**

   b) What is transducer ? Give its classification. Explain resistive transducers with their advantages, disadvantages and applications.   **10**

   <center>OR</center>

8. a) Describe the selection criteria used for transducers for particular application.   **8**

   b) Define 'Transducer'. Explain with sketches capacitive transducer with their advantages, disadvantages and applications.   **8**

9. a) Describe the constriction and working of various types of Bourdon tube gauges with neat diagram.   **10**

   b) Explain working of (I) radiation pyrometer (ii) infrared pyrometers. List their applications, advantages and disadvantages.   **8**

   <center>OR</center>

10. a) Describe with sketch the working of McLeod gauge for the measurement of vacuum. List its advantages and disadvantages. **10**

    b) Explain Rota meter with neat sketch. **8**

11. a) Discuss the torque measurement methods of rotating shaft. **8**

    b) What are load cells ? Explain the working of load cell using strain gauges. **8**

                    OR

12. a) Explain the working of pony brake with its advantages and disadvantages. **8**

    b) What are dynamometers ? How are they classified ? Explain working of any one of them. **8**

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T.E. (Production Engg.) (Semester – I) Examination, 2011
KINEMATICS OF MANUFACTURING MACHINES (2008 Pattern) (New)

Time : 4 Hours   Max. Marks : 100

Instructions : *1) Attempt Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** from Section **I** and Q.**7** or Q.**8**,*
*Q.**9** or Q.**10**, Q.**11** or Q.**12** from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Assume suitable data, **if necessary**.*
*5) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain with neat sketch, the kinematic analysis of Bevel gear generator. **10**

   b) Explain Blotch method of synthesis of a four bar mechanism to obtain the desired

   values of velocities and acceleration for the input link, coupler link and output link. **8**

   OR

2. a) In a four bar mechanism ABCD, the link AD is the fixed link and the dimensions of
   various links are : AB = 50 mm, BC = 100 mm, CD = 150 mm and AD = 180 mm.
   The angular velocity and angular acceleration of the link AB are 20 rad/s and
   10 rad/s^2 respectively. For 45° inclination of input link AB, determine : **10**

   i) Angular displacement of output link CD.

   ii) Angular velocity of output link CD.

   iii) Angular acceleration of output link CD.

   b) What do you understand by coupler curve ? How will you generate coupler curve
   using Fredunsteins equation ? **8**

3. a) Two involute gears in mesh have a module of 6 mm and pressure angle of 20°.
   The larger gear has 45 teeth while the pinion has 28 teeth. If they have a standard
   addendum, find : **8**

   I) The contact ratio,

   II) The angle of action of the pinion and the gear wheel,

   III) The ratio of the sliding velocity: at the beginning of the contact, at the pitch
   point, at the end of the contact.

b) In a reverted epicyclic train (Fig. 1), the arm A carries two wheels B and C and a compound wheel D-E. The wheel B gears with wheel E and the wheel C gears with wheel D. The number of teeth on wheels B, C and D are 75, 30 and 90 respectively. Find the speed and direction of wheel C when wheel B is fixed and arm A makes 100 r.p.m. clockwise. **8**
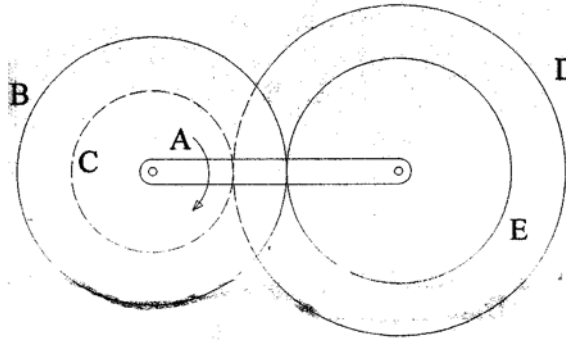
Fig. 1

OR

4. a) An epicyclic train (Fig. 2) is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B, which drives wheel D through an idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 rpm about the axis of A and D. If the wheels B and D have 25 and 40 teeth respectively, find the number of teeth on C and speed and sense of rotation of C. **8**
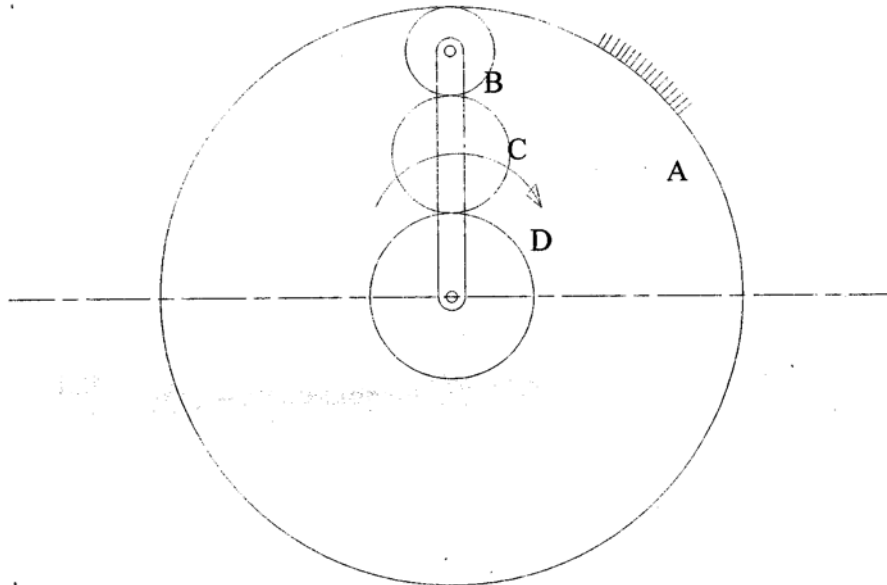
Fig.2

b) A spur pinion of 19 teeth is in mesh with a gear of 45 teeth. The pressure angle is 20° module 5 mm and standard addendum of one module is used. Calculate : **8**

   i) length of path of contact

   ii) length of arc of contact

   iii) contact ratio.

5. a) The intercepted areas between the output torque curve and the mean resistance line of a turning moment diagram for a multi cylinder engine, taken in order from one end are as follows : **8**

$-35, + 410, - 285, + 325, - 335, +260, - 365, + 285, - 260$ mm^2.

The diagram has been drawn to a scale of 1 mm = 70 N-m and 1 mm = 4.5°. The engine speed is 900 r.p.m. and the fluctuation in speed is not to exceed 2% of the mean speed.

Find the mass and cross-section of the flywheel rim having 650 mm mean diameter. The density of the material of the flywheel may be taken as 7200 kg/m^3. The rim is rectangular with the width 2 times the thickness. Neglect effect of arms.

b) Describe in brief the following : **8**

   i) Coefficient of fluctuation of speed.

   ii) Maximum fluctuation of energy.

   iii) Coefficient of fluctuation of energy.

   iv) Energy stored in a flywheel.

OR

6. a) The areas of the turning moment diagram for one revolution of a multi-cylinder engine with reference to the mean turning moment, below and above the line, are $-32, +408, - 267, + 333, - 310, + 226, - 374, + 260$- and $- 244$ mm^2.

The scale for abscissa and ordinate are : 1 mm = 2.4° and 1 mm = 650 N-m respectively. The mean speed is 300 r.p.m. with a percentage speed fluctuation of $\pm 1.5\%$. The density of the material may be taken to be 7200 kg/m^3. Find the cross section for the flywheel rim having 1.76 m mean diameter, assuming that the width is 4 times the thickness. Neglect the effect of the boss and arms. **8**

b) A punching machine carries out 8 holes per minute. Each hole of 30 mm diameter and 25 mm thick plate requires 6 Nm of energy per square mm of the shared area. The punch has a stroke of 100 mm. Find the power of the motor required if the mean speed of the flywheel is 18 m/s. If total fluctuation of speed is not to exceed 2.5% of the mean speed, determine the mass of the flywheel. **8**

SECTION – II

7. a) With a neat sketch define the following terms as applied to cam : **6**

   i) Base circle

   ii) Pitch circle

   iii) Pressure angle.

  b) A cam rotating clockwise at a uniform speed of 1000 r.p.m., is required to give a roller follower the motion defined below :

   I) Follower to move outwards through 50 mm during 120° of cam rotation,

   II) Follower to dwell for next 60° of cam rotation,

   III) Follower to return to its starting position during next 90° of cam rotation,

   IV) Follower to dwell for the rest of the cam rotation.

   The minimum radius of the cam is 50 mm and the diameter of the roller is 10 mm. The line of the stroke of the follower is off-set by 20 mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, draw profile of the cam and find the maximum velocity and acceleration during outstroke and return stroke. **12**

               OR

8. a) Explain with a neat sketch : **6**

   i) Knife edge follower

   ii) Roller follower

   iii) Mushroom follower

  b) Construct the profile of a cam to suit the following specifications :

   Cam shaft diameter = 40 mm; Least radius of cam = 25 mm; Diameter of roller = 25 mm; Angle of lift = 120° ; Angle of fall = 150°; Lift of the follower = 40 mm; Number of pauses are two of equal interval between motions.

   During the lift the motion is S.H.M. During the fall the motion is uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the centre of the cam. **12**

9. a) Explain the terms 'Static Balancing' and 'Dynamic Balancing'. State the necessary conditions to achieve them. **4**

   b) A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angle between the cranks measured anticlockwise are A to B 45⁰, B to C 70⁰ and C to D 120⁰. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve in a radius of 100 mm, find their magnitudes and angular positions. **12**

   OR

10. a) Define swaying couple and derive the expression for maximum and minimum value of swaying couple. **4**

    b) An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles.

    The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m. **12**

11. a) Define the following terms used to Vibratory Motion : **8**

   i) Period and frequency of vibration.

   ii) Free vibrations

   iii) Forced vibrations

   iv) Damping factor.

b) Derive an expression for the natural frequency of free longitudinal vibrations by

   equilibrium method. **8**

                    OR

12. a) Derive an expression for the frequency of free damped vibrations for the conditions

   as follows : **12**
   i) Overdamping
   ii) Underdamping and
   iii) Critical damping.

b) Write a note on Logarithmic Decrement. **4**

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T.E. (Production) (Semester – I) Examination, 2011
MATERIAL FORMING
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

***Instructions** :* *1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

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

*4) Black figures to the **right** indicate **full** marks.*

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

*6) Assume suitable data, **if necessary**.*

SECTION – I
UNIT – I

1. In a tensile test of circular specimen 66.36 mm^2 cross sectional area and 25 mm gauge length the following results were obtained.

Loads (KN)	5	10	15	20	25	30	32.5	33.75	35	36.05	35.2	34
Length (mm)	25.0095	25.019	25.0285	25.035	25.118	25.2475	25.3495	25.4445	25.635	25.7575	26.015	26.067

Calculate :

   i) Engineering stain and engineering stress, true stain and true stress.   **8**

   ii) Determine Young's modulus.   **2**

   iii) Calculate elastic work done and plastic deformation.   **6**

OR

2. a) What are the assumptions in material forming ? What are the different
methods used for the analysis of forming processes ? **8**

b) i) A bar length Lo is uniformly extended until its length L = 2Lo. Compute
engineering and true stain for this extension. **4**

ii) To what final length, L, must a bar of initial length Lo, be compressed
if the strain are to be same (except for sign) as those in above mentioned
part (i). **4**

UNIT – II

3. a) In open die forging, considering *plain strain* condition show that, the
maximum pressure, $P_{max} = \sigma_0 . e^{2\mu L/h}$ **12**

Where,

σ_0 = yield stress

μ = coefficient of friction

2L = total length of rectangular work piece

h = thickness of work piece.

b) Explain briefly the process used for making headed rivets. **6**

OR

4. a) Explain briefly the following with neat sketch. **12**

i) Flash and flash gutter

ii) Tumbling process

iii) Natural draft

iv) Counter lock in forging.

b) Explain briefly the procedure to design 'edging' impression in forging. **6**

UNIT – III

5. Derive an equation for the drawing stress induced during tube drawing operation by using fixed tapered plug. **16**

OR

6. a) Compare the drawing stresses and drawing load using i) Fixed tapered plug ii) floating tapered plug iii) moving cylindrical mandrel; for the data given below :

   Initial internal diameter of tube = 55 mm

   Initial wall thickness of tube = 2 mm

   Final wall thickness of tube = 1.5 mm

   Final internal diameter of tube = 50 mm

   Yield strength of tube material = 350 MPa

   Die angle = 30°

   Plug angle = 20°

   Coefficient of friction between die and tube as well as between tube and plug=0.05. **12**

   b) Explain lubrication process used in wire drawing operation. **4**

SECTION – II

UNIT – IV

7. State true or false with justification :

   i) Friction is essential during rolling process. **8**

   ii) Rolling load can be decreased by increasing roll diameter. **8**

OR

8. a) Determine the deformed radius of curvature of chilled iron rolls of 600 mm diameters, rolling copper strip of 700 mm wide, 70 mm thick given 20% reduction. The Yield stress of copper is 700MPa. (Poisson's ratio = 0.35 and Young's modulus = 2.01 MN/mm^2). **8**

   b) Explain the roll pass sequence for any structural shape of rolling produce with neat sketch. **8**

UNIT – V

9. a) Explain the following :

   i) CCD and shape factor **3**

   ii) Porthole dies **3**

   iii) Hooker's process. **4**

  b) Explain single action press and double action press for tube making. **8**

OR

10. a) Suggest and explain suitable extrusion process type for manufacturing of following components :

   i) Beverage cans **5**

   ii) Aluminum channels of sliding windows. **5**

  b) Explain the various defects occur during extrusion process. State the causes and remedies to overcome these defects. **8**

UNIT – VI

11. a) Explain the effect of following factors on the efficiency of electro-hydraulic system. **12**

   i) Electrode gap width   ii) Stand-off distance

   iii) Charge energy   iv) Hydrostatic head

   v) Initiating wire   vi) Electrode material.

  b) Explain the importance of field shaper and drivers in electro-magnetic forming. **4**

OR

12. Write short note on :

   i) Spinning machine **6**

   ii) Stretch forming **6**

   iii) Types of coils in EMF. **4**

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T.E. (Production) (Semester – I) Examination, 2011
PRODUCTION MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
                       *2) Answers to the **two** Sections should be written in*
                           separate *books.*
                       *3) Neat diagrams must be drawn **wherever** necessary.*
                       4) Use of the logarithmic tables, slides rule, Mollier charts,
                       electronics pockets Calculator and steam tables is
                       allowed.
                       *5) Assume suitable data, if **necessary**.*

SECTION – I
Unit – I

1. a) Define Operation Management and discuss the history of Operations
Management.   **9**

    b) Discuss the scope and objectives of Production Management.   **9**

                   OR

2. a) Explain the types of Production system.   **9**

    b) Explain the framework for Production Management.   **9**

Unit – II

3. a) Explain how other departments in an industry are associated with Production
Planning and Control department.   **8**

    b) Explain with the help of block diagram functions of Production Planning and
Control.   **8**

                   OR

4. a) With the help of figure explain the stages in Product Life Cycle.   **8**

    b) Define Production Planning and Control. State the objectives of Production
Planning and Control.   **8**

Unit – III

5. a) Define Plant Layout. Explain the objectives of good plant layout. **6**

   b) Explain any two types of computerized plant Layout. **10**

   OR

6. a) What is the relationship between good plant Layout and Material Handling system ? **8**

   b) Explain different types of Material handling equipments with its applications. **8**

SECTION – II
Unit – IV

7. a) Define Sales forecasting. How sales forecasting method are classified ? **9**

   b) The demand for a product is given below. The forecast for June was 200 units. Forecast the demand for the month of September taking the value of $\alpha = 0.3$. **9**

Month	June	July	Aug
Demand	150	200	250

   OR

8. a) Explain with the help of figure various demand patterns used in Sales forecasting. **9**

   b) Find the coefficient of correlation between cost of production and the sales price for which data is as : **9**

Period	1	2	3	4	5	6
Cost	100	118	130	142	160	175
Price	125	140	152	164	188	198

Unit – V

9. a) Explain in brief Finite Loading and Critical Ratio scheduling. **8**

   b) There are seven jobs each of which has to go through the machines M1 and M2 in the order of M1M2. Processing time in hours are given as : **8**

Jobs	A	B	C	D	E	F	G
Machine M1	6	24	30	12	20	22	18
Machine M2	16	20	20	13	24	2	6

   Determine a sequence of these jobs that will minimize the total elapsed time. Compute the idle time on machine M2.

OR

10. a) Explain Forward and Backward Scheduling. **8**

    b) The activity details and their predecessors are given below along with their activity times. Construct the network diagram and compute the critical path. **8**

Activity	Predecessors	Activity Time (Weeks)
A	--	4
B	A	3
C	A	2
D	B	5
E	B	3
F	C,D	4
G	E,F	3

Unit – VI

11. a) Explain the basic concept of Computerized Production Management. **8**

    b) List and explain any two advanced manufacturing philosophies. **8**

OR

12. a) Write a short note on Supply Chain Management. **8**

    b) Explain in short Just-in Time (JIT) system. **8**

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T.E. (Production Engineering) (Semester – I) Examination, 2011
CUTTING TOOL ENGINEERING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Attempt* **one** *question of* **each** *Unit from Section –* **I** *and*
Section – **II**.
2) Answer to the questions should be written on **separate**
books.
3) Draw **neat** *diagram* **wherever** *necessary.*
4) Assume suitable data if **required**.

SECTION – I

UNIT – I

1. a) During machining a mild steel work piece with 0-10-7-6-8-90-1 mm ORS
shaped cutting tool, the following observation were made, feed = 0.25 mm /rev,
Depth of cut = 1.5 mm, cutting speed 60 m/min, cutting force = 1100 N,
feed force = 450 N, chip thickness = 0.5 mm. Find chip reduction coefficient,
shear force, Normal force, coefficient of friction, specific energy
in friction.   **10**

   b) Write note on :
      i) Merchant force circle,
      ii) Dynamometer for lathe tool force measurement.   **10**

                                       OR

2. a) A tubing of 60 mm outside diameter is turned on a lathe at a cutting speed
of 25 m/min and feed 0.5 mm/ rev, the rake angle of tool is 20 degree. The
cutting force is 600 N and feed force 200 N, the length of continuous chip
in one revolution is 60 mm-calculate-chip thickness ratio, chip thickness,
shear plane angle, coefficient of friction, velocity of chip along face, power
for cutting.   **10**

   b) Explain the conditions that leads to continuous chip, discontinuous chip
and BUE chip formation.   **5**

   c) Explain in drilling what factors affect the drilling torque and thrust force.   **5**

UNIT – II

3. a) What is the function of flutes in reamer ? With neat sketches explain the importance of
   i) hand of cut
   ii) hand of helix in reamer. **8**

   b) List different types of cutting tool materials used in metal cutting. What are the distinguish features of cutting tool ? Discuss. **7**

   OR

4. a) What is meant by negative rake tool ? Distinguish between solid tool and tipped cutting tool. Explain why cemented carbide tool are provided with negative rake angle in machining high strength and hard materials. **7**

   b) Explain with suitable sketch the different methods for clamping insert on tool holder. **8**

UNIT – III

5. a) Derive the following expression $Tmp = \left(\frac{1}{n}-1\right)k_2$

   Where Tmp = Tool life for maximum production in Min. **8**

   n = Exponent in tool equation, k_2 = tool changing time in Min.

   b) Explain different types of wear and mechanism of a single point cutting tool. **7**

   OR

6. a) Explain heat affected zone (HAZ) in metal cutting. Discuss how to reduce HAZ. **7**

   b) Find out optimum cutting speed and corresponding tool life for minimum cost for machining of mild steel work piece with HSS tool from following data. When the cutting speed was 25 m/min the tool life was 170 minutes and when the speed was increased to 40 m/min, the tool life was dropped to 50 minutes. Operating cost is 25 paise/min. Tool cost/cutting edge/tool failure is Rs. 2 and tool changing time = 1.5 min. **8**

SECTION – II

UNIT – IV

7. a) A hole in a component is to be finished to $22.5^{+\,0.01}$ mm in diameter, the hole size before broaching is $21.5^{+\,0.05}$ mm in diameter. Determine pitch of teeth, length of cutting portion, number of cutting teeth contact at a time and force required to pull broach through work. The work piece having a length 40 mm long. Given Rise/tooth = 0.015 mm, Number of finishing teeth = 3, force to remove / mm² of metal is 4200 N. Also sketch the broach of your design and show dimension on it. **10**

   b) What are form tools ? Classify them and explain the profile correction in form tool. **5**

OR

8. a) Mild steel job are to be reamed to obtain a hole of 20 ± 0.2, calculate the tolerances on the reamer and wear allowance, if the over size cut by the reamer varies from 4 to 10 microns and manufacturing tolerance extends up to 20 microns. Draw a sketch of tolerance zone for above reamer diameter and show the dimension on it. **8**

   b) Calculate the cross section of a single point turning tool made of HSS. Data given are as follows : Allowable stress of HSS=200 Mpa, Young's modulus of HSS = 2×10^5 MPa, main cutting force = 1500 N, permissible deflection of tool tip = 0.04 mm. Also draw geometry of the tool by assuming suitable angle. **7**

UNIT – V

9. a) Explain with figure how many degrees of freedom are restricted by use of a 'V' block and one locating pin on it for locating a round workpiece. **5**

   b) Write a short note on :
      i) Type of bushes,   ii) Indexing Jig. **10**

OR

10. a) Write a note on selection of a clamping device. **5**

b) Fixed cost of fixture is Rs. 3,000 and one run is made/year saving of labour cost/unit Rs. 2, overhead are 45% on labour saved and annual allowance for repair and depreciation is 12% and 45% respectively. Bank rate of interest/annum is 7% and annual rate of taxes is 4% year, setup cost Rs. 400. Find :

   i) Number of pieces produced/year,

   ii) Number of years required for earning on investment. **5**

c) Explain with neat sketch 3-2-1 locating principle. **5**

UNIT – VI

11. Design a jig for drilling Φ 25 mm holes for a component shown in fig. no 1. **20**

               OR

12. Design a milling fixture to mill at face A and B for a component shown in fig. no 1.

Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping and bushing. **20**
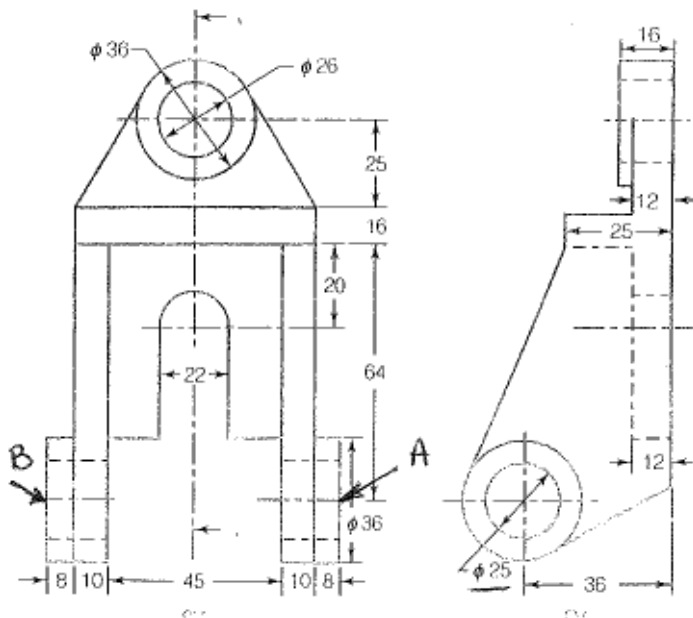
Fig. No. 1

T.E. (Production) (Semester – II) Examination, 2011
MACHINE TOOL ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* *Attempt* **one** *question from* **each** *Unit in Section* **I** *and Section* **II**.
   2) *Answer to the Sections should be written on* **separate** *answer*
      books.
   3) *Figures to the* **right** *indicate* **full** *marks.*
   4) **Assume** *suitable data, if* **necessary**.

SECTION – I

UNIT – I

1. Design and draw cam profile for the component shown in figure below. Also
   work out the following requirements.
   a) Sequence of operation,
   b) Table for cam angle and cycle time,
   c) Cam profile for turret operation.   **20**

Data given :

Operation	Speed	Feed
Turning	25M/min	0.2 mm/rev.
Grooving	12/min	0.1 mm/rev.
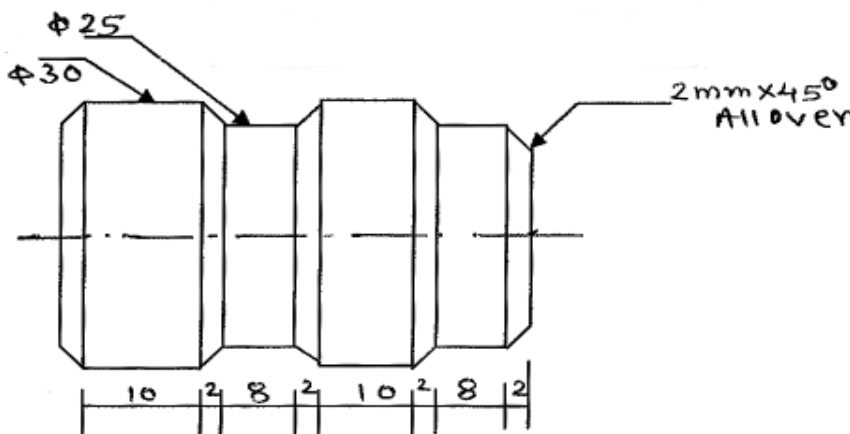
OR   **P.T.O.**

2. a) List the procedure for drawing cams for turret type automat. **6**

   b) Explain parallel action multispindle automat. **6**

   c) What is transfer line machine ? Explain with neat sketch rotary type transfer machine. **8**

UNIT – II

3. a) What are the types of machine tool control system ? Differentiate between CNC and conventional machine. **7**

   b) Describe the factors that affecting the quality and performance of CNC. **8**

   OR

4. a) What are the additional features provided on the following :
      i) Machining centre,
      ii) Turning centre. **8**

   b) Explain how accurate position control is obtained in CNC machine. **7**

UNIT – III

5. a) A recirculating conveyor has a total length 2100 cm. Its speed is 960 cm/min and the spacing of part carriers along its length is 320 cm. Each carrier can hold one part. Automatic machine to load a part is 0.25 min and unload time is the same. The required loading and unloading rates are 2 parts/min.
      i) What is the maximum possible flow rate of parts on the conveyor system ?
      ii) How many parts could be contained on the conveyor system if every carriers were filled to capacity ?
      iii) How much time is required for the conveyor to make one complete loop ? **6**

   b) State the principles of material handling system. **5**

   c) Write a short note on Economic consideration in material handling. **4**

   OR

6. a) Explain how the selection material handling is to be done. **6**

   b) What is AGV ? Explain the its principle of working. **5**

   c) Write a short note on ASRS. **4**

SECTION – II

UNIT – IV

7. a) Explain with neat sketch principle of operation, working and application for USM-process. **8**

   b) Write a short note on :

   i) LBM

   ii) Comparison of conventional with non conventional process. **10**

   OR

8. a) Explain factors affecting on MRR in EBM. **5**

   b) Discuss the effect of standoff distance on the machining accuracy and MRR in AJM. **5**

   c) Draw RC ckt for EDM and explain it. State advantages, limitations and application of EDM process. **8**

UNIT – V

9. a) How control system are classified ? Explain preselective control system used in machine tool. **8**

   b) How vibrations can be minimized by proper installations of a machine tool ? Which material is used for dampers ? **8**

   OR

10. Write a note on :

    i) Coolant type and selection,

    ii) Chip disposal system,

    iii) Maintenance of CNC lathe. **16**

UNIT – VI

11. a) Explain the construction and working of pinion cutter type gear manufacturing machine. Also explain its typical application as compared to hobbing process. **8**

    b) Explain with neat sketch a gear manufacturing by a form milling cutter. **8**

OR

12. a) What are the advantages and disadvantages of hobbing process as compared to other generating process ? **6**

    b) Make a brief comparison of form grinding and profile grinding processes used for finishing of gears. **6**

    c) Write a short note on gear lapping. **4**

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T.E. (Production) (Semester – II) Examination, 2011
TOOL DESIGN
(New) (2008 Course)

Time: 4 Hours   Max. Marks: 100

N.B. : i) *From Section **I** solve, Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6**, and from Section **II** solve Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12**.*
ii) *Neat diagrams must be drawn **wherever** necessary.*
iii) ***Use** of electronic pocket calculator is **allowed**.*
iv) *Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain different types of die set with neat sketch.   **8**

   b) What is stripper ? What are the functions of stripper ? Explain with neat sketch type of stripper used in press work.   **8**

OR

2. Design a blanking die for the component shown in fig.1.
   i) Find the cutting force and die clearance.   **4**
      Given: sheet thickness = 1mm
      Shear strength = 200 Mpa
   ii) Design blanking die.   **3**
   iii) Design and draw punch plate and also explain in short how punch is hold.   **3**
   iv) Draw front view and die plan of press tool with position of stopper, stripper etc. on it.   **6**

Fig: 1
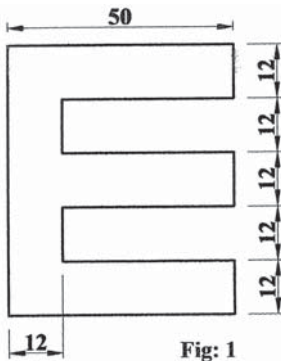
3. a) Calculate the developed length of a bend component shown in fig.2. If thickness of the part is increase to 5mm, what is its developed length ?   **4**

   b) What are the methods of reducing spring back and explain with neat sketch the methods used for the component in fig.2.   **6**

   c) Draw press tool drawing (F.V. and Die Plan) for the same.   **6**

Fig: 2
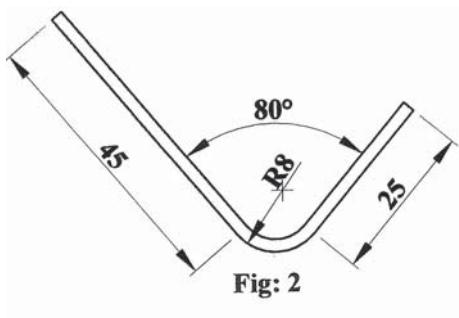
OR

4. Design a drawing die for the work piece shown in fig.3. Calculate :

   i) Percentage reduction.   **1**

   ii) Number of draws required.   **2**

   iii) Blank size.   **3**

   iv) Die and punch design (size) for each draw.   **6**

   v) Drawing and blank holding force for each draw.   **4**

Fig: 3
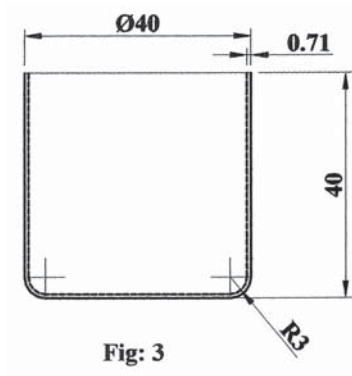
5. Design a progressive die for the component shown in Fig.4.

Given : Stock thickness = 2mm, shear strength of material = 195 MPa.

   i) Draw strip layout and find material utilization. **4**

   ii) Find press tonnage. **3**

   iii) Design die block **3**

   iv) Design and draw pilot and show its mounting **3**

   v) Draw assembly drawing of press tool (Die plan and front view). **5**
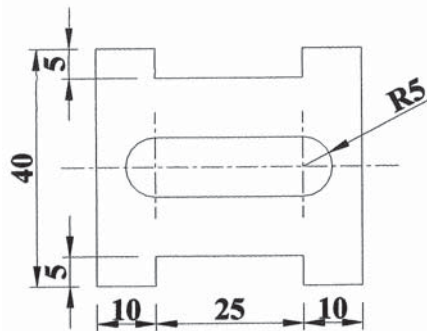
Fig: 4
Material: Al, 2mm thick

OR

6. a) Explain with neat sketch the difference between combination die and compound die. **8**

   b) Explain with neat sketch die terminology in die casting. **10**

SECTION – II

7. Design closed die for forging a component shown in fig.5. **16**
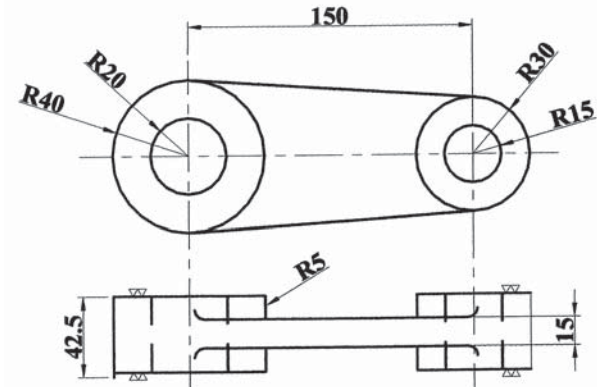
Fig:-5

OR

8. a) What is upsetting ? And what are the components formed by upsetting ? And with any one of the component explain the rules of upsetting. **10**

   b) How stock size is calculated in close die forging ? **6**

9. a) Explain basic terminology in injection moulding. **6**

   b) Write short note on : **10**
      i) Injection mould for thermosetting plastic
      ii) Blow moulding.

                    OR

10. a) What is meant by bolster ? What are their functions ? What are its different types ? Explain with neat sketch. **8**

    b) What is local insert ? And when it will be used ? **4**

    c) Explain the function of sprue bush and register ring with sketch. **4**

11. Design single impression injection mold for the plastic glass shown in figure 6. **18**

Fig. 6:Plastic Glass (*sectional view*)
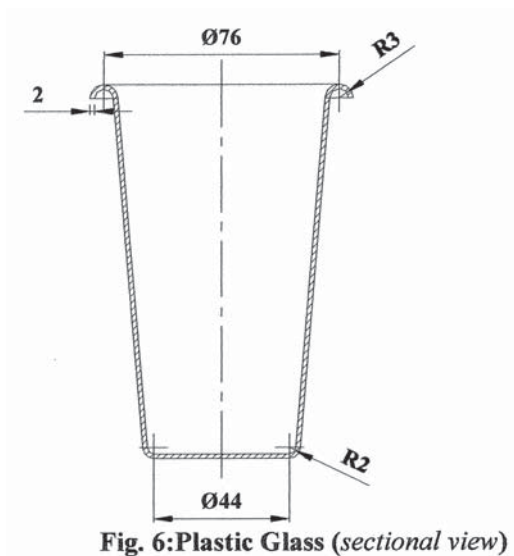
                    OR

12. a) Explain different methods of mould cooling in injection moulding. **8**

    b) What is gate ? What are their functions ? Explain different types of gate with neat sketch. **10**

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T.E. (Production and Industrial Engg.) (Semester – II) Examination, 2011
INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

Unit – I

1. Explain briefly the following techniques of industrial engineering
   (**four** mark **each**) :   **16**

   i) Ergonomics

   ii) Plant layout

   iii) Value analysis

   iv) Inventory control.

                                   OR

2. a) Explain contribution of Gantt and Maynard to the field of industrial
      engineering.   **8**

   b) Bad design of product increases work content. Justify.   **8**

Unit – II

3. a) Explain 'Outline process chart' with suitable illustration.   **8**

   b) Explain the step 'Examine critically' of method study.   **8**

                          OR

4. a) Explain 'Questionnaire technique' of method study.   **8**

   b) Explain 'SIMO Chart' with suitable illustration.   **8**

Unit – III

5. a) Explain the procedure to carry out work sampling study to calculate standard
      time for the job.   **8**

   b) Explain various types of allowances.   **10**

                          OR

6. Write short note on :

   i) Criticism on time study   **6**

   ii) Westing house system of rating   **6**

   iii) MOST.   **6**

SECTION – II

Unit – IV

7. a) Define quality in various ways. Explain dimensions of quality of product
      and quality of service.   **8**

   b) Compare the single sampling, double sampling and multiple sampling plan. **10**
      The following table shows the no. of defectives found in inspection of
      10 lots of 100 items each :

Lot no.	1	2	3	4	5	6	7	8	9	10
No. of defectives	6	3	1	4	3	0	11	5	2	3

   Determine the controlled limits for P chart and state whether the process is
   in control, where the total no. of defectives items is 38.

                          OR

8. a) What is importance of OC curve ? How it is useful in preparing various sampling plans ? **8**

   b) In an automatic bottle filling plant, 500g of liquid was to filled in bags. The permissible variation is $\pm 5g$. To investigate the process capability, 5 bags were taken at random from each batch for 10 successive batches and results are shown in table below. **10**

Batch	1	2	3	4	5	6	7	8	9	10
Mean grams of 5 bags	500	499	500	504	500	500	498	501	503	497
Range	3	4	2	4	3	5	4	2	6	4

Establish control chart limits for X bar and R charts. Calculate the process capability and interpret the meaning of control chart. Take A2 = 0.577, D3 = 0, D4 = 2.115. Will the process be able to meet the specification.

Unit – V

9. a) Give salient features of TQM. Explain Deming's approach for quality. **8**

   b) Define: MTTF, MTBF, FMECA, FTA **8**

   An equipment is subjected to maintenance time constraints of 30 min. What is probability that it will meet the specification if MTTR is 0.262 hours ?

OR

10. a) Explain with suitable example any one Quality Assurance tool in detail. **8**

    b) Discuss system reliability and types of a system. **8**

    A unit has a reliability of 0.99 for a specified mission time. If two identical units are used in parallel redundancy, what overall reliability will be obtained ?

Unit – VI

11. a) Describe the ISO 9000 quality system and briefly discuss five standards of ISO 9000:1994 series. **8**

b) Explain with suitable application a procedure to get ISO 9000 certification in industry. **8**

OR

12. a) Discuss briefly: **8**

a) ISO 14001

b) MBNQA.

b) Using the building where you live, determine the environmental aspects and impacts. Establish hypothetical objectives and targets. **8**

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T.E. (Prod s/w) (Semester – II) Examination, 2011
KINEMATICS DESIGN OF MACHINES (2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Solve Que. No.**1** or Que. No. **2**, Que. No. **3** or Que. No. **4**, Que. No. **5** or Que. No. **6** from Section – **I** and Que. No. **7** or Que. No. **8**, Que. No. **9** or Que. No. **10**, Que. No. **11** or Que. No. **12**. from Section – **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

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

*4) Black figures to the right indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

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

SECTION – I
UNIT – 1

1. a) Explain with neat sketch, the kinematic analysis of bevel gear generator.   **8**

   b) Synthesize a four bar mechanism to generate a function $y = x^{1/3}$ for $1 \le x \le 4$ at three precision points. The crank rotates from an angle $30°$ to $120°$, where as the follower link rotates from an angle $60°$ to $150°$. Assume length of fixed link as 60 mm.   **8**

                    OR

2. a) Explain following kinematic chain representation with figure :   **6**
    i) E-22
    ii) C-13
    iii) K-23

b) Explain following methods of synthesis of mechanism with figure :

   i) Three position synthesis by Chebychev spacing

   ii) Overlay method. **10**

UNIT – 2

3. a) What is cumulative fatigue damage ? How the life of component subjected to different values of fluctuating stresses in cycle is estimated by using 'Miners Equation'. **8**

   b) A cantilever beam of circular cross section, made of cold drawn steel (S_{ut}=550N/mm^2) is fixed at one end and subjected to a completely reverse force of 1000 N at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed end and free end of the cantilever beam is 400 mm. If the desired life of the beam is 40,000 cycles, determine the diameter of the beam. **8**

OR

4. a) Define the following terms :

   i) Endurance Strength

   ii) Fatigue

   iii) Notch Sensitivity. **6**

   b) A mechanical component is subjected to the following bending stress cycle :

   i) $\pm 400 \text{N}/\text{mm}^2$ for 70% of time

   ii) $\pm 500 \text{N}/\text{mm}^2$ for 10% of time

   iii) $\pm 300 \text{N}/\text{mm}^2$ for 20% of time

   The component is made up of plain carbon steel 50C4 (S_{ut}=660N/mm^2). If the endurance limit of the component is 280 N/mm^2, determine its life. **10**

UNIT – 3

5. a) What factor you will consider while selecting a gear material ? **3**

   b) Where you will use the following gears ? (Name any two application)

      i) Spur Gear

      ii) Helical Gear

      iii) Bevel Gear. **3**

   c) A pair of spur gears with 20° full depth involute teeth consists of 21 teeth pinion meshing with 60 teeth internal gear. The pinion shaft is directly coupled to a 10 hp. Electric motor running at 1440 rpm. The gear shaft is transmitting a power to a machine. The application factor is 1.5. The pinion as well as gear are made of plain carbon steel (S_{ut}=720N/mm²). The module and face width of gears are 3 mm and 35 mm respectively. The gears are machined to the specification of grade 8 and heat treated to a surface hardness of 300 BHN. Assuming the dynamic load is accounted by 'Spott's Equation' calculate

      i) the factor of safety against bending failure and

      ii) the factor of safety against pitting failure.

   Use following data :

   1hp = 735.5 W

   For grade 8 16 +1.25 $\left[m + 0.25\sqrt{d}\right]$

   $$Fd = \frac{e.np.zp.b.rp.rg}{2527\sqrt{rp^2 + rg^2}} \cos\phi$$

   Lewis Factor $Y = 0.484 - \dfrac{2.87}{Z}$ Notations have usual meaning. **12**

             OR

6. a) What is 'Formative Spur' gear ? What is the significance of formative number of teeth in the design of helical gear ? **6**

b) A helical pinion having 21 teeth to be made of plain carbon steel 55 C8 (S_{ut}=720N/mm^2) is to mesh with a gear to be made of plain carbon steel 40 C8 (S_{ut}=580N/mm^2). The gear pair is required to transmit 10 kw power from an electric motor running at 1500 rpm. to a machine running at 300 rpm. The starting torque of the motor is 150% of the rated torque. The factor of safety required is 2.0. The face width is 10 times the normal module and tooth system is 20° full depth involute. The helix angle is 25°. The gears are to be machined to meet the specification of grade 7. The gear and pinion are to be hardened to 350 BHN. Design the gear pair by using the dynamic load.

For grade 7,e =11.0+0.9 $\left[mn + 0.25\sqrt{d}\right]$

$$Fd = \frac{e.np.zp.b.rp.rg}{2527\sqrt{rp^2 + rg^2}}.Cos\phi.Cos\Psi$$ **12**

Lewis Factor $Y' = 0.484 - \dfrac{2.87}{Z'}$

Notations have usual meaning

SECTION – II

UNIT – 4

7. a) Differentiate between the static capacity and dynamic capacity of a ball bearing. What is their significance in the selection of bearings ? **5**

b) Explain how the following factors influence the life of bearing

i) Load

ii) Speed

iii) Temperature. **3**

c) A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to a stationary equivalent radial load of 3 kN for 10% of time, 2 kN for 20% of time, 1 kN for 30% of time and no load for remaining cycle. If the total life expected for the bearing is 20×10^6 revolutions at 95% reliability. Calculate the dynamic load rating of the ball bearing when the bearings are selected from the manufacturer's catalogue, which lists 'C' at 90% reliability. **10**

OR

8. a) A single row deep groove ball bearing operates with the following work cycle :

Element No.	Element Time %	Radial Load 'Fr' kN	Thrust Load 'Fa' kN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed in Rpm.
1	40	4.0	1.0	0.56	1.4	inner	1.5	700
2	30	3.0	1.0	0.56	1.6	outer	2.0	1440
3	Remaining	No Load	No Load	-	-	outer	-	700

If the expected life of the bearing is 10,000 hrs with a reliability of 95%, calculate the basic dynamic load rating of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability.
If there are six such bearing in the system, what is the probability that all bearing will survive for 10,000 hours. **10**

b) What are the desirable properties of the sliding contact bearing materials ? Describe different materials used for sliding contact bearing. **8**

UNIT –5

9. a) Derive expression and show that tensile stress in the rim of the flywheel due to the centrifugal force is given by $\sigma_t = \rho R^2 \omega^2 = \rho v^2$.

   (Notations have usual meaning) **8**

   b) Write short note on 'Construction of Flywheel'. **8**

OR

10. A single cylinder, single acting, four stroke oil engine develops 20 kw at 300 rpm. The workdone by the gases during the expansion stroke is 2.3 times the workdone on the gases during the compression and the workdone during the suction and exhaust strokes is negligible .The speed is to be maintained within $\pm 1\%$. Determine the mass moment of inertia of the flywheel. **16**

UNIT – 6

11. a) A batch of 100 deep groove ball bearings have a normally distributed failure time with a mean of 8000 hrs and a standard deviation of 700 hrs. How many bearings are likely to fail within first 8900 hrs ?

The areas below the standard normal distribution curve from zero to z are as follows : **7**

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

b) Explain Johnson's method of optimum design for redundant specifications. **9**

OR

12. a) What is importance of reliability in modern engineering design ? How it is different from the factor of safety ? **8**

b) Explain the difference between the design tolerance and natural tolerance. How the designer should select a tolerance for minimum rejection of component ? **8**

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T.E. (Production S/W) (Semester – II) Examination, 2011
PRODUCTION AND INDUSTRIAL MANAGEMENT – II (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

SECTION – I

UNIT – I

1. a) Explain Money Market and Capital Market.   **6**

   b) Explain the functions of Marketing Management.   **8**

   c) Explain Law of Diminishing Marginal Utility.   **4**

                          OR

2. a) Explain objectives of Material Management.   **8**

   b) What is Market research ?   **6**

   c) What are the different forms of Money ?   **4**

UNIT – II

3. a) Differentiate between special purpose and general purpose machines.   **8**

   b) Discuss time estimate and time standard.   **8**

                          OR

4. a) Explain the process sheet design with suitable example.   **8**

   b) What are the functions of process engineering ?   **8**

UNIT – III

5. a) Explain principle process operations in detail. **8**

   b) Write short note on selective Assembly. **8**

   OR

6. a) What are the advantages of using commercial tooling ? **6**

   b) What is the Purpose and utilization of Tolerance chart ? **8**

   c) Define Tooling. **2**

SECTION – II

UNIT – IV

7. a) What are the advantages and limitations of Statistical Quality Control ? **8**

   b) Explain the types of Acceptance sampling Plans. **8**

   OR

8. a) Write short note on OC Curve. **8**

   b) The following table gives the number of errors observed at final inspection of a certain samples. Prepare a C-chart and comment on the state of control. **8**

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of errors	6	10	8	7	12	9	5	7	3	4
Sample No.	11	12	13	14	15	16	17	18	19	20
No. of errors	8	6	10	10	6	12	3	11	2	1

UNIT – V

9. a) Discuss in detail Total Productive Maintenance (TPM). **12**

   b) What is Quality Circle ? **4**

OR

10. a) Explain Quality Function Deployment (QFD). **8**

    b) Explain JIT. **8**

UNIT – VI

11. a) Explain the terms "Product" and "Service" in context with ISO 9001.
       Standards. **8**

    b) State the elements of Quality System. **8**

    c) Define "TPM". **2**

OR

12. a) Write down the short note on Design of Experiments. **8**

    b) Explain Taguchi Method. **8**

    c) Define : Reliability. **2**

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T.E. (Electrical) (Semester – I) Examination, 2011
POWER ELECTRONICS
(2008 Pattern) (New)

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　　　Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
　　　　　　　*2) Answers to the **two** Sections should be written in **separate** books.*
　　　　　　　*3) **Neat** diagrams must be drawn **wherever** necessary.*
　　　　　　　*4) Black figures to the **right** indicate **full** marks.*
　　　　　　　*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
　　　　　　　*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Draw gate characteristics of SCR. Explain how valve of gate voltage and gate current can be selected.　　　　　　　　　　　　　　　　**8**

　　b) Draw and discuss switching characteristics of SCR.　　　　　　**8**

OR

2. a) Explain UJT pulse firing circuit of SCR.　　　　　　　　　　　**8**

　　b) Explain over current and thermal protection of SCR.　　　　　**8**

3. a) Explain single phase mid point converter with necessary circuit and waveforms.　　**9**

　　b) Explain single phase full converter with necessary circuit and waveforms.
　　　Also state advantages and disadvantages over single phase semi converter.　　**9**

OR

P.T.O.

4. a) Explain the concept of overlap angle and associated voltage drop in single
    phase converter. **9**

   b) Explain three phase semi controlled converter with necessary circuit and
    waveforms. **9**

5. a) Explain four modes of operation of TRIAC. Also state in which quadrant for
    which polarities of terminals it is more sensitive. **8**

   b) Explain two step single phase ac voltage regulator feeding inductive load with
    circuit and w/fs. **8**

                    OR

6. a) Explain three phase single step ac voltage regulator feeding resistive load with
    necessary circuit and waveforms. **8**

   b) Explain VI characteristics and construction of DIAC. **8**

                    SECTION – II

7. a) Explain how choppers are classified. Draw neat circuit and explain working
    of class C chopper feeding a motor load. **6**

   b) A step down chopper has input voltage of 200 V feeding RLE load with
    $R = 2\,\Omega$, $L = 10$ mH and E = 20 V. The time of chopping cycle is 1000 μs
    and on time of chopper is 300 μs. Find
     i) Maximum and minimum value of load current.
     ii) Average load current. **10**

                    OR

8. a) For a dc step down chopper, derive expression for :
     i) Average output voltage and current.
     ii) RMS output voltage
     iii) RMS and average chopper device currents.
     iv) Effective input resistance of chopper.

    Draw circuit diagram and relevant waveforms. **8**

   b) A RLE load is fed from 400 V dc source through a chopper circuit for R = 0,
    L = 0.05 H and duty cycle of 25%. Find chopping frequency to limit maximum
    load current to 10 A. **8**

9. a) Explain working of a 3ϕ inverter with 180° mode of conduction for 3ϕ star connected resistive load. Draw waveforms of control signals and phase e line voltages. **10**

   b) Discuss how output voltage and frequency is controlled in PWM inverters. **8**

OR

10. a) Draw neat circuit diagram for 1ϕ full bridge inverter feeding inductive load. Explain its operation with help of output voltage and current waveforms. Calculate rms output voltage. What is the function of feedback diodes ? **10**

    b) Discuss various PWM techniques used in inverters. How Sinusoidal PWM is used for harmonic elimination ? **8**

11. a) Draw and explain construction of MOSFET and its switching characteristics. **8**

    b) What is Safe Operating Area (SOA) ? Compare MOSFET and BJT SOA. **8**

OR

12. a) State characteristics and advantages of IGBT compared to MOSFET. Explain latch up in IGBT. **8**

    b) What is MCT ? Explain its typical characteristics and applications. **8**

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T.E. Electrical (Semester – I) Examination, 2011
ELECTRICAL INSTALLATION, MAINTENANCE & TESTING
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) Answer **03** questions from Section **I** and **03** questions
from Section – **II**.
2) Answers to the **two** Sections should be written in
separate books.
3) Neat diagrams must be drawn **wherever** necessary.
4) Black **figures** to the **right** indicate **full** marks.
5) Use of logarithmic tables, slide rule, Mollier charts,
electronic pocket calculator and steam tables is
allowed.
6) Assume **suitable** data, if **necessary**.

SECTION – I
Unit – I

1. a) What are different types of feeders and distributors ? Bring out their relative
advantages and disadvantages.   **8**

b) A single phase distributor has a resistance of $0.2\,\Omega$ and reactance of $0.3\,\Omega$. At
far end the voltage V_b is 240 V and the current is 100 A at pf 0.8 lagging .At mid
point 'a' the current is 100 A at 0.6 lagging PF with respect to voltage V_a
at 'a' Find supply voltage and phase angle between V_s and V_b.   **8**

OR

2. a) Apply Kelvin's law to determine the economic cross section for the conductor
of a 3 phase 10 km long 33 kv overhead line. The line supplies a load of 4 MW
at 0.8 pf for 10 hours a day, 2 MW at 0.8 pf for 6 hours a day and 1 MW at
0.8 Pf for 8 hours a day. The line is used for all the 365 days in the year. The
line cost can be taken as Rs. (85000+2000 a) per KM length of line where a is
the area of cross section in mm². The resistance of aluminium of length 1 m
and area 1 mm² is $0.0286\,\Omega$. Energy cost is Rs. 0.80 per kwh.   **8**

b) Compare overhead and underground supply system. State advantages and
disadvantages.   **8**

Unit – II

3. a) Classify and explain various types of substations. **8**

   b) Explain why earthing is required. **8**

                 OR

4. a) Explain in detail functions of the equipments used in substation. **7**

   b) Explain the terms :
      i) Touch potential
      ii) Step potential
      iii) Transfer potential. **9**

Unit – III

5. a) Explain planned and preventive maintenance of transformer. **9**

   b) Explain in detail the process of deterioration of insulation. **9**

                 OR

6. a) Explain dc test for measurement of insulation resistance. **9**

   b) Explain different maintenance strategies. **9**

SECTION – II

Unit – IV

7. a) Explain in detail various failure modes of transformer. **10**

   b) What is dissolved gas analysis ? How it is useful for condition monitoring of transformer ? **8**

                 OR

8. a) Explain contamination process in transformer oil. **5**

   b) Explain the process of filteration of transformer oil with block diagram. **5**

   c) Explain in detail condition monitoring of on load tap changer. **8**

Unit – V

9. a) Explain different failure modes of power cables. **5**

   b) Write a short note on condition monitoring of power cables. **5**

   c) Explain importance of signature analysis in condition monitoring. **6**

OR

10. a) Explain various abnormal conditions and causes of failure of induction motor. **8**

    b) What is thermography ? Explain its use in condition monitoring of electrical equipment. **8**

Unit – VI

11. Explain working, troubleshooting and maintenance of following household appliances (any **two**) : **16**

    i) Water pump

    ii) Mixer

    iii) Washing machine.

OR

12. Explain working, trouble shooting and maintenance of (**any two**) : **16**

    i) Electric Fan

    ii) Microwave oven

    iii) Refrigerator.

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T.E. (Electrical Engineering) (Semester – II) Examination, 2011
ENERGY AUDIT AND MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Discuss some of the long term energy strategies available for the energy security. **8**

   b) What is green house effect ? What are the key green house gases ? Discuss adverse effects of harmful emissions. **8**

                               OR

2. a) Give salient features of Energy Conservation Bill 2001. **8**

   b) Briefly describe the energy reforms taking place in India. **8**

3. a) Define demand side management with suitable examples enlight tools for demand restrain. **8**

   b) State role of energy manager and list duties of energy manager. **8**

                               OR

4. a) How demand side management is used to control agricultural and domestic load ? **8**

   b) Give the structure of energy management cell in a industry. Also explain commitment of top management towards energy conservation. **8**

5. a) Why energy audit is to be carried out ? Explain phases of energy audit. **9**

   b) With reference to energy audit explain following :

   i) energy policy

   ii) action plans

   iii) energy or power flow diagram. **9**

                OR

6. a) Explain with examples, fuel and energy substitution. **5**

   b) Give the format of energy audit report. **5**

   c) Use CUSUM technique and calculate energy savings. The average production can be 4000 MT/month. The specific energy consumption data is given below :

Month	Actual-SEC kWh/MT	Predicted - SEC kWh/MT
Jan.	242	265
Feb.	238	265
Mar.	287	265
Apr.	237	265
May	295	265
June	246	265

   Draw necessary Cusum graph. **8**

SECTION – II

7. a) The exterior areas of a compressor section are illuminated by twenty wall mounted 1000 W tungsten halogen single fitting lamp, luminaries. The lamp is 'ON' 12 hours a day, throughout the year.

   With reference to data given below suggest the suitable retrofit for annual energy saving and simple pay back period. Take electricity cost Rs. 4.00/kWh.

Luminaire	Lumens	Efficacy	Cost/lamp
1000 W Halogen lamp	22,100	22.7	Rs. 5,000
250 W HPSV lamp	24,600	98.4	Rs. 5,500
400 W metal halide lamp	27,000	67.5	Rs. 6,500

10

   b) Explain benefits of TOD tariff and power factor tariff with reference to energy management. **8**

               OR

8. a) A proposed energy conservation project requires capital investment of Rs. 20,000. The cash flow generated by the project for next six years are Rs. 8,000, Rs. 8,000, Rs. 8,000, Rs. 6,000, Rs. 6,000 and Rs. 6,000 respectively. Calculated net present value and state economic viability of the project. **8**

   b) i) What criteria need to be considered while listing down the investment opportunities for any energy conservation projects ?

      ii) Write a note on AB tariff. **10**

9. a) What is cogeneration ? Explain different configurations possible with steam turbine cogeneration system. **8**

   b) Enlist energy conservation opportunities in pumping systems. **8**

               OR

10. a) i) Explain effect of unbalance in supply on motor performance.

   ii) How to access installed load efficacy ratio for an illumination scheme ? **8**

   b) Enlist measures to be adopted for following components of HVAC system by which energy consumption can be reduced.

   i) Compressor   ii) Cooling tower. **8**

11. a) Explain technical means for T & D loss minimization. **8**

   b) Elaborate possible avenues for energy conservation in steel industry. **8**

                OR

12. a) What are the probable areas in which energy can be saved for municipal corporation ? State financially attractive measures by which energy can be saved. **8**

   b) During energy audit of IT industry, audit team have identified short term and long term energy conservation measures. What may be the recommendations of the team in respect of higher total harmonic distortion, lower power factor and use of DG set ? **8**

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T.E. (Electrical) (Semester – II) Examination, 2011
UTILIZATION OF ELECTRICAL ENERGY
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* Answer **any one** question from **each** Unit.
  2) Answer **3** questions from Section **I** and **3** questions from Section **II**.
  3) Answer to the **two** Sections should be written in **separate** books.
  4) **Neat** diagrams must be drawn **wherever** necessary.
  5) Black figures to the **right** indicate **full** marks.
  6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.

SECTION – I

Unit – I

1. a) Differentiate between direct and indirect arc heating. With neat diagram explain construction and working of Ajax Wyatt Furnace. State its advantages and disadvantages. **10**

   b) A piece of insulating material is to be heated by dielectric heating. The size of piece is 10 cm × 10 cm × 3 cm thick. The frequency of supply voltage is 20 MHz and power absorbed is 400 watts. Calculate voltage necessary for heating and current that flows in the material. The material has relative permittivity of 5 and power factor is 0.05. **6**

   OR

2. a) State and explain the causes of failure of heating elements in resistance heating. **8**

   b) Write note on laser beam welding and ultrasonic welding. **8**

P.T.O.

Unit – II

3. a) What is the principle of electrodeposition ? State and explain the factors on which the quality of electro-deposition depends. **8**

   b) What is electroplating and what for is it done ? Describe the various operations involved in electroplating. **8**

                    OR

4. a) With neat diagram explain four main parts of refrigeneration cycle. State their functions. **8**

   b) Draw electrical circuit diagram of window air conditioner and explain it. **8**

Unit – III

5. a) A hall 30 meter long and 12 meter wide is to be illuminated and illumination required is 50 lumens / meter^2. A 300 watt lamp has lumens output 4700. Estimate number of lamps required. Take mounting height as 5 meter. Make the sketch showing the location of lamps. Calculate space height ratio. Take depreciation factor 1.3 and utilization coefficient 0.5. **8**

   b) Define the following terms and state their units :
      i) luminous flux
      ii) solid angle
      iii) illuminance. **6**

   c) A 250 V lamp has a total flux of 3000 lumens and takes a current of 0.8 Ampere. Calculate
      i) lumens per watt and
      ii) MSCP per watt. **4**

                    OR

6. a) Write note on polar curve. Explain how MSCP of light source is to be determined from polar curve. **10**

   b) Write note on flood lighting. Draw sketches showing possible locations of flood lighting. **8**

SECTION – II

Unit – IV

7. a) Discuss various methods of track electrification. **8**

   b) Draw neat diagram and write note on feeding and sectioning arrangement. State the precautions to be taken while providing neutral section. **8**

   OR

8. a) Compare single phase 25 kV AC system with dc system of track electrification. **8**

   b) Write note on pantograph and bow collector. **8**

Unit – V

9. a) Draw and explain various parts of speed time curve between the two stations. Define average speed and schedule speed. **10**

   b) A train is required to run between two stations 2 km apart at an average speed of 40 kmph. The run is to be made according to a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 60 kmph, acceleration to 2 kmphps, cousting retardation to 0.15 kmphps and braking retardation to 3 kmphps, determine the duration of acceleration, cousting and braking. **6**

   OR

10. a) Define the term specific energy consumption. Derive the expression for total energy output in watt hour for trapezoidal speed time curve. **8**

    b) A train has its schedule speed of 30 kmph between the stations 1 km apart. If the acceleration is 1.8 kmphps, braking retardation is 3 kmphps, estimate the maximum speed of the train and hence distance covered by the train during acceleration, retardation and free running period and the time taken for each of these journeys. Draw the speed time curve. Assume train stops for 20 seconds at the station. **8**

Unit – VI

11. a) State and explain the desired characteristics of motors for traction duty. **10**

b) What is transition ? State different methods of transition. Explain bridge transition. **8**

OR

12. a) Explain why is d.c. series motor not suitable for regenerative braking. Explain the modification to be made in the motor to make it suitable for regenerative braking. **10**

b) Due to regeneration braking a 400 ton train has its speed reduced from 80 to 50 kmph in a distance of 1.5 km down a uniform gradient 1 in 1000. Find energy returned to the line. Specific train resistance is 50 Newton per ton and efficiency of equipment is 80%. Allow 10% rotational inertia. **8**

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T.E. Electrical (Semester – II) Examination, 2011
DESIGN OF ELECTRICAL MACHINES (2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions :   *1) Answer **3** questions from Section **I** and **3** questions from*
                              *Section **II**.*
                        *2) Answers to the **two** Sections should be written in **separate***
                              books.
                        *3) **Neat** diagrams must be drawn **wherever** necessary.*
                        *4) Black figures to the **right** indicate **full** marks.*
                        *5) **Use** of logarithmic tables slide rule, Mollier charts,*
                              *electronic pocket calculator and steam tables is **allowed**.*
                        *6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Write a short note on :
      i) Magnetic leakage
      ii) Pulsation losses.   **8**

   b) Calculate the specific iron loss in a specimen of alloy steel for a maximum
      flux density on 3.2 Wb/m^2 and a frequency of 50 Hz, using 0.5 mm thick
      sheets. The resistivity of alloy steel is 0.3×10^{-6} Ω m. The density is
      7.8×10^3 kg/m^3. Hysteresis loss in each cycle is 400 J/m^3.   **4**

   c) Explain in brief the phenomen of Rotating Hysteresis.   **4**

                              OR

2. a) Explain in detail Carter's fringe curves.   **8**

   b) Explain the principal components of armature leakage fluxes.   **8**

3. a) Draw the heating curves and cooling curve.

      Define heating time constant, cooling time constant and discuss the concept
      of final steady temperature rise.   **8**

b) The temperature rise of a transformer is 25°C after one hour and 37.5°C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 40°C in 2.5 hour when disconnected, calculate its cooling time constant. The ambient temperature is 30°C. **8**

OR

4. a) Determine the dimensions of core and yoke for a 200 KVA, 50 Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times the width of core laminations. Assume voltage per turn 14V, maximum flux density 1.1 Wb/m^2, window space factor 0.32, current density $3A/mm^2$, and stacking factor = 0.9. The net iron area is 0.56 d^2 in a cruciform core where d is the diameter of circumscribing circle. Also the width of largest stamping is 0.85 d. **10**

b) Draw neat sketches and explain in brief

i) Cylindrical winding

ii) Helical winding

iii) Crossover winding. **6**

5. a) Obtain the expression for leakage reactance of three phase core type transformer. **8**

b) A 6600 V, 60 Hz single phase transformer has a core of sheet steel. The net iron cross sectional area is 22.6×10^{-3} m^2, the mean length is 2.23 m and there are four lap joints. Each lap joint takes $\dfrac{1}{4}$ times as much reactive mmf as it required per meter of core. If B_m = 1.1 Wb/m^2, Determine

a) the number of turns on the 6600 V winding and

b) the no load current.

Assume an amplitude factor of 1.52 and that for a given flux density, mmf per meter = 232 A/m ; specific loss = 1.76 W/kg. Specific gravity of plates = 7.5 **10**

OR

6. a) Discuss the mechanical forces in transformers and explain how they are taken into consideration while fabricating and how the mechanical bracing is provided. **8**

   b) A 1000 KVA, 6600/440 V, 50 Hz, 3 phase, delta/star, core type, oil immersed natural cooled (ON) transformer. The design data of the transformer is :

   Distance between centres of adjacent limbs = 0.47 m, the outer diameter of high voltage winding = 0.44 m, height of frame = 1.24 m.

   Core loss = 3.7 kW and I^2R loss = 10.5 kW.

   Design a suitable tank for the transformer. The average temperature rise of oil should not exceed 35°C.

   The specific heat dissipation from the tank walls is 6W/m^2 - °C and 6.5 W/m^2 - °C due to radiation and convection respectively. Assume that the convection is improved by 35 % due to convection. **10**

SECTION – II

7. a) Explain various factors which are taken into account for deciding specific electrical a specific magnetic loading of 3-phase induction motor. **10**

   b) Draw a winding diagram for a 4 pole, 24 slot, 3 phase mush connected armature. Show the winding diagram for phase R-only. **8**

                OR

8. a) Define following terms :
   i) Pole pitch   ii) Slot angle
   iii) Coil span   iv) Pitch factor
   v) Distribution factor. **8**

   b) Find the main dimensions of a 16 kW, 3 phase, 400 V, 50 Hz, 2810 rpm squirrel cage induction motor having an efficiency of 0.85 and a full load p.f of 0.86. Assume specific magnetic loading = 0.5 Wb/mm^2. Specific

   electric loading = 25500 $\dfrac{\text{amp. conductor}}{\text{meter}}$. Take the rotor peripheral speed

   as 20 m/sec at synchronous speed. **10**

9. a) Derive the equation for end ring current for the rotor of squirrel cage induction motor. **8**

   b) A 3-phase induction motor has 48 stator slot with 9 conductors per slot and 96 rotor slot with 3 conductors per slot. Find the number of stator and rotor turns. Find the voltage across the rotor slip rings when the rotor is open circuited and as rest. Both stator and rotor are star connected and a voltage of 400 V is applied across the stator terminals. **8**

   OR

10. a) What are different methods of eliminate harmonic torques ? **8**

   b) A 12 Kw, 3 phase, 6 pole, 50 Hz, 220 V, star connected induction motor has 72 stator slot, 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 0.9. The rotor mmf may be assumed as 85 % of stator mmf. Also find the area of each bar and area of each and ring if the current density is 6 A/mm^2. **8**

11. a) Explain leakage fluxes and leakage reactances in the magnetic. Circuit of a 3-phase induction motor. **10**

   b) Explain the methods of improving starting torque of squirel cage induction motor. **6**

   OR

12. a) A 15 kW, 400 V, 50 Hz, 6 pole, 3 phase star connected induction motor has a magnetizing current which is 35 percent of the full load current. Calculate the value of stator turns per phase if the mmf required for flux density at 30° from pole axis 4005 A. **10**

   Assume, winding factor = 0.95

   full load efficiency = 0.95

   and full load power factor = 0.86.

   b) Discuss various losses in case of 3-phase induction motor. **6**

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T.E. (Electrical) (Semester – II) Examination, 2011
CONTROL SYSTEM – I (New)
(2008 Pattern)

Time : 4 Hours   Max. Marks : 100

SECTION – I

1. a) Give comparison between open loop and closed loop systems.   **8**

   b) Find $\dfrac{C(s)}{R(s)}$ for S.F.G. shown in following figure.   **8**
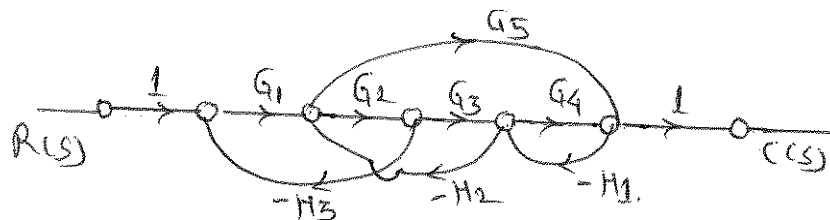
Fig. 1b

OR

2. a) Draw the mechanical network for the system in Fig. 2a, and obtain its F-V analogous circuit.   **10**
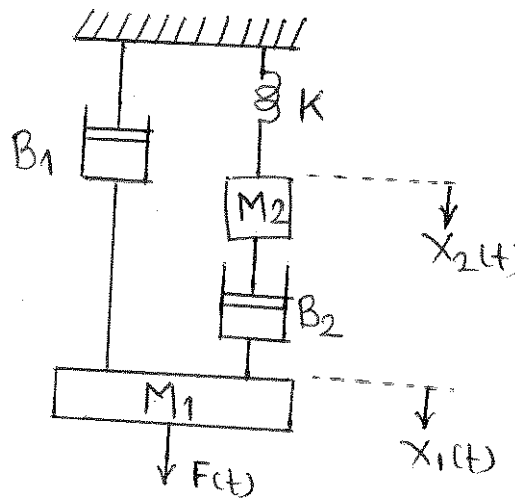
Fig. 2a

b) Find the closed loop T.F. for the block diagram shown in fig. 2b). **6**
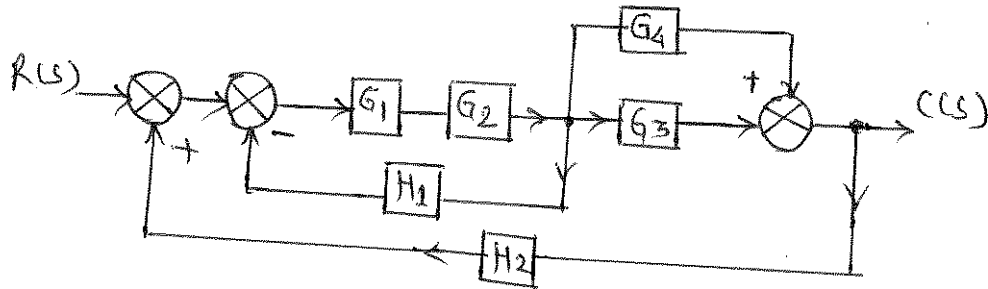
Fig. 2b

3. a) Derive the static error coefficients and steady state error for type 1 and type 2 systems when inputs are : Unit step, Unit ramp and Unit parabolic. **8**

b) For a unity feedback system having $G(s) = \dfrac{10(s+1)}{s^2(s+2)(s+10)}$. Determine : **8**

   i) Type of system

   ii) Error coefficients and

   iii) Steady state error for input as $1 + 4t + \dfrac{t^2}{2}$.

OR

4. a) Explain time response of a second order system when $\xi = 0, 0 < \xi < 1$ and $\xi = 1$. **8**

b) For each of the transfer function given below, find the values of W_n, ξ, W_d and T_p. **8**

   i) $G(s) = \dfrac{16}{s(s+8)}$

   ii) $G(s) = \dfrac{64}{s^2 + 5s + 64}$.

5. a) Explain two special cases which occur in Routh's table. How are these cases handled ? **6**

b) Explain the terms :

   i) Stability of a control system

   ii) Absolute stability

   iii) Marginally stable system. **6**

c) A unity feedback system has **6**

$$G(s) = \frac{K}{s(s+10)\,(s^2+4s+5)}.$$

Determine range of K for closed loop system to be stable.

OR

6. a) Explain with examples effects of adding pole and zero on the root locus. **6**

   b) Sketch the root locus for a system having open loop transfer function, **12**

   $$G(s)H(s) = \frac{K}{s(s+2)\,(s+5)}$$

   Determine the value of K for

   i) Critical damping,
   ii) Marginal stability from the root locus.

SECTION – II

7. a) Construct the bode plot and determine :
   i) W_{gc}
   ii) W_{pc}
   iii) GM
   iv) PM for the open loop unity feedback system whose transfer function is
   $$G(s) = \frac{10}{s(1+0.4s)\,(1+0.1s)}.$$ **12**

   b) Explain frequency response specifications. **6**

OR

8. a) State and explain Nyquist stability criterion. **6**

   b) Explain what is principle of argument. **4**

   c) Draw the Nyquist plot for a given transfer function $G(s) = \frac{(s+2)}{(s+1)(s-1)}.$ **8**

9. a) Determine the state model of electrical network shown in fig. 9 (a). **8**
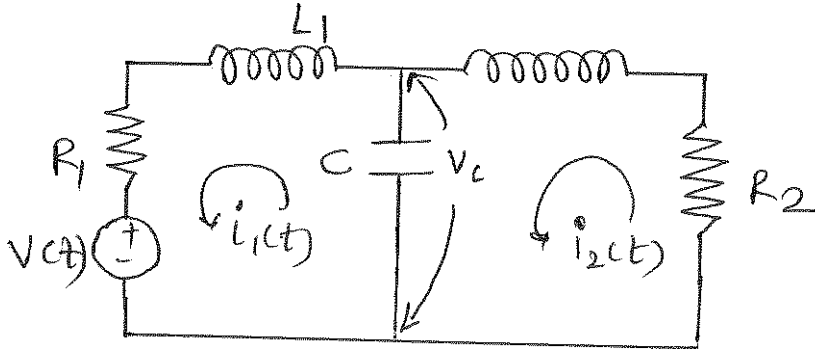
Fig. 9a

b) For a given transfer function of a system obtain the state model by direct decomposition. **8**

$$T(s) = \frac{(s+2)(s+3)}{s(s+1)(s^2+9s+20)}$$

OR

10. a) State the advantages of state variable technique. **4**

b) Define and explain : **6**

   i) State   ii) State variable
   iii) State equation.

c) Determine the state model of the system for the following transfer function. **6**

$$\frac{y(s)}{v(s)} = \frac{8}{s^3 + 3s^2 + 2s + 5}$$

11. Write short note on the following :
   i) A.C. servomotor. **6**
   ii) Armature controlled DC servomotor. **6**
   iii) D.C. tachogenerators. **4**

OR

12. a) Explain what do you understand by a phase lag compensation network ? **8**

b) Describe synchro pair as error detector with circuit diagram. **8**

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T.E. (Electronics) (Semester – I) Examination, 2011
FEEDBACK CONTROL SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours   Total Marks : 100

*Instructions : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the right indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Explain with neat diagram and waveform working principle of synchro error detector.   **6**

   b) Reduce the following block diagram into a single equivalent block using block diagram reduction technique.   **10**

OR
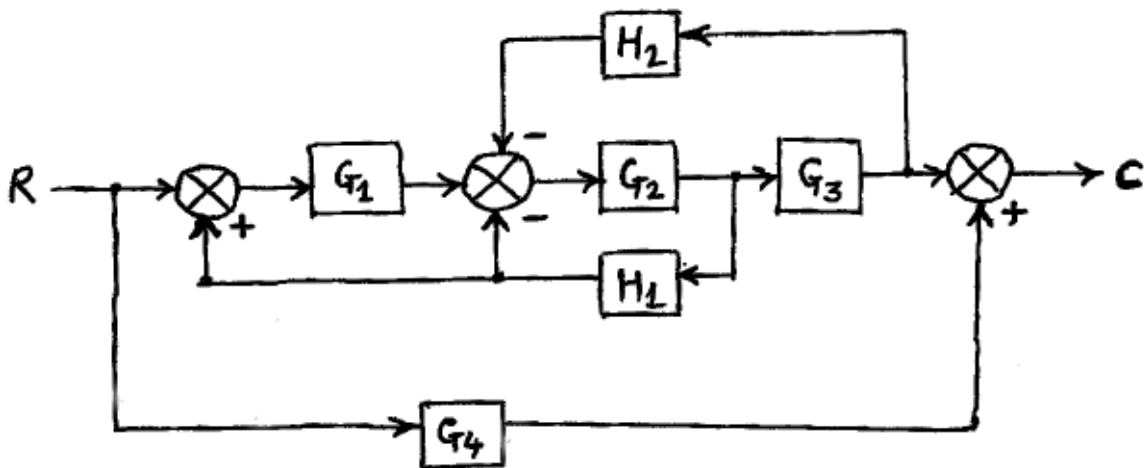
2. a) Many closed loop and open loop control systems may be found in homes. List several examples and describe in detail one example each of open loop and closed loop control system. **6**

b) For the signal flow graph shown in figure determine transfer function. **10**
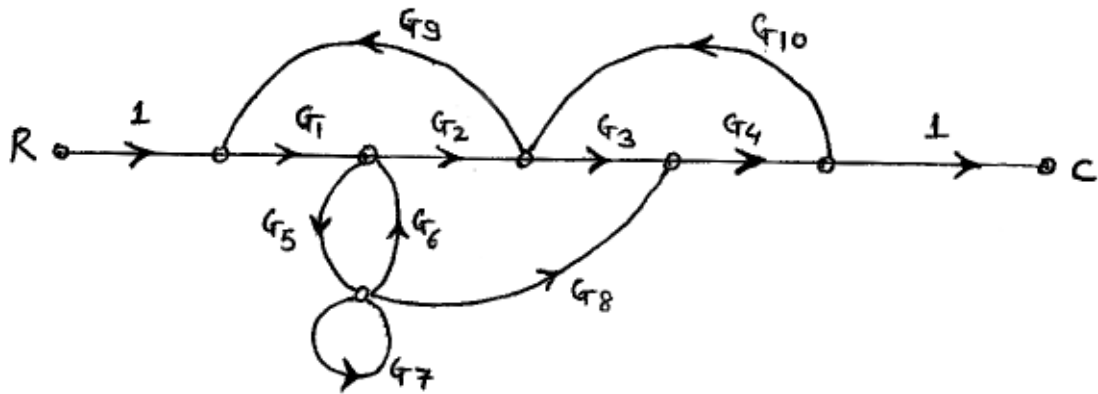
3. a) State Routh's criteria. A unity feedback control system has

$$G(s) = \frac{K}{s(s+10)(s^2 + 4s + 5)}.$$

Find the range of k for the stability of the system using Routh's criteria. **8**

b) The open loop transfer function of a unity feedback system is given by :

$$G(s) = \frac{K}{s(Ts+1)}$$

By what factor should K be multiplied so that the maximum overshoot of unit step response is reduced from 80% to 20%. **8**

OR

4. a) Find Kp, Kv, Ka and steady state error for a system with open loop transfer

   function as : $G(s) H(s) = \dfrac{4(s^2 + 10s + 100)}{s^2(s + 3)(s^2 + 6s + 10)}$

   where the input is : $r(t) = 2 + 2t + t^2$.   **6**

   b) The feedback control system has an open loop transfer function :

   $G(s) = \dfrac{K(s + 1)}{s(s - 1)}$

   Sketch the root locus plot with K as variable parameter and show that the loci

   of complex roots are part of a circle with (– 1, 0) as center and radius $= \sqrt{2}$.   **10**

5. a) Explain the following terms and state their importance :

   i) Phase margin

   ii) Gain margin.   **6**

   b) A unity feedback control system has open loop transfer function as :

   $G(s) = \dfrac{100}{s(1 + 0.1s)(1 + 0.2s)}$

   Sketch bode plot and determine from it :

   i) Gain Crossover frequency

   ii) Phase crossover frequency

   iii) Gain margin

   iv) Phase margin

   v) Closed loop stability of a system.   **12**

   OR

6. a) State Nyquist stability criteria. Explain how gain and phase margin are obtained

   from Nyquist plot. **6**

   b) A unity feedback control system has open loop transfer function as :

   $$G(s) \, H(s) = \frac{s+1}{s^2(s-4)}.$$

   Sketch the Nyquist plot and determine the stability of the closed loop system. **12**

SECTION – II

7. a) Obtain the state model of the system whose transfer function is given by

   $$T(s) = \frac{s^2 + 3s + 3}{s^3 + 2s^2 + 3s + 1}.$$ **8**

   b) The state equations of a linear time invariant system are as given below :

   $$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) \; ; t > 0.$$

   i) Is the system controllable ?

   ii) Compute the state transition matrix. **8**

   OR

8. a) Explain the following terms :

    i) State

    ii) State variables

    iii) State equations

    iv) State transition matrix. **8**

  b) Obtain the time response of system given by :

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -2 & 0 \end{bmatrix} x(t) \quad \text{where} \ x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

    and $y(t) = [1 \ -1] \ x(t)$. **8**

9. a) Draw and explain generic architecture of a Programmable Logic Controller. **6**

  b) Draw the ladder logic symbols for the following elements :

    i) Normally Open Push Button

    ii) Temperature Limit Switch

    iii) Pressure Limit Switch

    iv) Level Limit Switch

    v) Solenoid

    vi) Motor

    vii) Control Relay

    viii) Green Light. **4**

  c) Explain the following terms related to proportional controller :

    i) Controller Equation

    ii) Proportional Gain

    iii) Proportional Band

    iv) Offset Error.

    State how offset error can be eliminated. **8**

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

10. a) Draw a ladder diagram for an elevator system. **10**

  b) State controller equations for the P, P + I, P + D and PID control actions. **4**

  c) Draw a response of a PID controller for :

    i) Unit step input

    ii) Unit ramp input. **4**

11. a) Explain how fuzzy logic control scheme can be applied for temperature control of a process. **8**

b) What are the basic steps involved in the design of a fuzzy controller ? Explain with suitable example. **8**

OR

12. a) Explain with neat diagram the biological and artificial neuron models. **8**

b) Distinguish between feed forward neural network and recurrent neural network. **8**

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T.E. Electronics (Semester – I) Examination, 2011
NETWORK SYNTHESIS AND FILTER DESIGN
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions: *1) Answer **3** questions from Section – **I** and **3** questions from*
*Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate***
books.
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic*
*pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the concept and physical significance of poles and zeros.   **6**

   b) Test the following polynomial is Hurwitz polynomial or not.

   a) $F(S) = s^4 + s^3 + 5s^2 + 3s + 4$

   b) $F(S) = s^4 + s^3 + 2s^2 + 3s + 2$.   **10**

                          OR

2. a) What is elementary synthesis procedure ? Synthesize the following function
   by removal of poles.   **8**

   b) Give the properties of Positive real function and check the given function
   for the p.r.f.

   $$H(s) = \frac{(s+2)}{(s^2 + 3s + 2)}.$$ **8**

3. a) Synthesize first and second Foster forms of LC network for the impedance

   $$Z(S) = \frac{(s^2 + 1^2)(s^2 + 4^2)}{s(s^2 + 2^2)}.$$ **12**

   b) State and explain the properties S of RC Impedance. **6**

   OR

4. a) State properties of the LC driving point impedance function. **6**

   b) Synthesize first and second Cauer forms of RC network for the impedance :

   $$Z(S) = \frac{(s+1)(s+4)}{s(s+2)}.$$ **12**

5. a) Realize the T.F. in terms of constant resistance Lattice network terminated in
      $1\,\Omega$. **8**

   $$\frac{V_2}{V_1} = \frac{s^2 - s + 1}{s^2 + s + 1}$$

   b) Synthesize given voltage ratio as constant resistance bridge T Network

   $$\frac{V_2}{V_1} = \frac{s^2 + 1}{s^2 + 2s + 1}.$$ **8**

   OR

6. a) i) What are the properties of Zero Transmission ?

      ii) Derive the expression for T.F. of bridge T network with constant resistance
          and prove $R_2^2 = Z_1 Z_2$. **10**

   b) Synthesize the following transfer function for a constant resistance lattice with
      $1\,\Omega$ termination

   $$\frac{V_2}{V_1} = \frac{s^2 - 3s + 2}{s^2 + 3s + 2}.$$ **6**

SECTION – II

7. Butterworth response that realizes the specification given in the normalized form. The cut off frequency $f_p = 1Hz$, The stopband frequency $f_s = 2Hz$, The passband attenuation $A_{max} = 3.01db$, The passband attenuation $A_{min} = 25$ db.

 i) Find the order of Butterworth filter.

 ii) Transfer function from the table and synthesize it for a termination of 50Ω.

 iii) Actual values of component if cut off frequency of filter is 3×10^4 rad/sec. **16**

OR

8. A) Chebyshev magnitude function required to meet the following specification : The cut off frequency wp = 1rad/sec, The loss in the passband is 0.5 db, The stopband loss or attenuation $A_{min} = 20$ db.

 i) Find the order of filter.

 ii) Transfer function and synthesize it for a termination in 50Ω. **12**

 B) Compare Butterworth and Chebyshev responses. **4**

9. A) Find the transfer function for the negative feedback biquad topology in terms of feed forward and feedback transfer function assuming ideal op-amp. **8**

 B) Design a second order Butterworth low pass filter having upper cut off frequency is 1.5 KHz. Then using RC-CR transformation realize high pass filter with same frequency. **8**

OR

10. A) Explain frequency scaling and impedance scaling with suitable example. **8**

 B) Explain with suitable example the coefficient matching technique for obtaining element values. **8**

11. 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) Explain the effect of op-amp frequency characteristics on the performance of an active filter in brief. **8**

OR

12. A) The op-amp used in the inverting circuit shown in fig. 12.(A) has an input bias current of 500 nA and an input offset current that can ranges between ± 100 nA. Find the resulting maximum output offset voltage. **6**
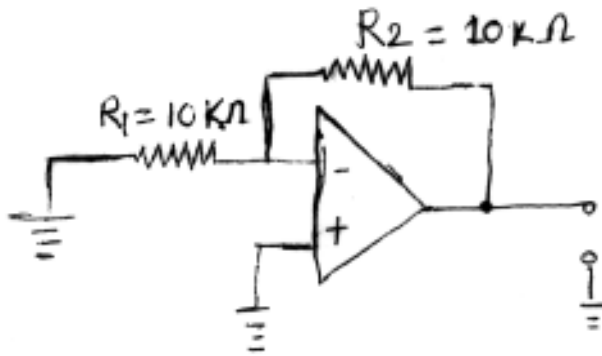
Fig. 12.(A)

B) For the n/w function as shown in fig. 12.(B), find the transfunction function $\dfrac{V_o(s)}{I_{in}(s)}$ and compute the sensitivities of K, wp with respect to the passive elements R, L and C. **6**
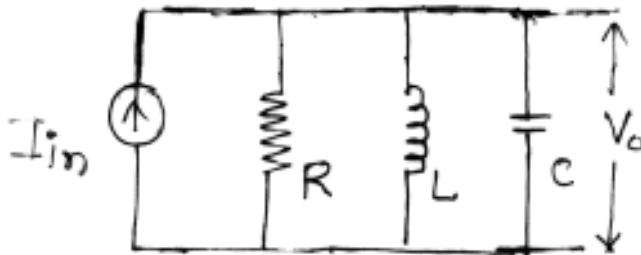
Fig. 12.(B)

C) i) Prove the if $P = X_1^a \ X_2^b \ X_3^C$ then $S_{X_1}^P = a,\ S_{X_2}^P = b,\ S_{X_3}^P = C$.

   ii) Prove that if P can be expressed as ratio of two function P_1 and P_2 then $S_X^P = S_X^{P_1} + S_X^{P_2}$. **6**

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T.E. (Electronics) (Semester – I) Examination, 2011
MICROCONTROLLERS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions *:* 1) *Answer* **3** *questions from Section –* **I** *and* **3** *questions from*
         Section – **II**.
       2) *Answers to the two Sections should be written in* **separate**
         books.
       3) **Neat** *diagrams must be drawn* **wherever** *necessary.*
       4) **Black** *figures to the* **right** *indicate* **full** *marks.*
       5) *Assume* **suitable** *data, if* **necessary**.

SECTION – I

1. a) Interface 8 K EPROM and 8 KRAM to 8 bit microcontroller using suitable 3:8
   decoder such that, following addresses are generated.
   1) EPROM starts from 0000H
   2) RAM starts from 8100H

   Show all control lines and address map.   **8**

   b) Write difference between microcontroller and microprocessor.   **8**

               OR

2. a) Explain in detail special function register (SFR), give its bit address. **8**

   b) Draw functional block diagram of 8051 microcontroller and explain it in detail. **8**

3. a) Explain timer/counter mode of 8051.   **8**

   b) Explain an interrupt structure of 8051.   **8**

               OR

4. a) Explain structure of Internal memory of 8051.   **8**

   b) State and explain different addressing modes of 8051. Illustrate with an example. **8**

5. a) Explain following instruction in detail :
   i) POP
   ii) ACALL
   iii) CJNE
   iv) RETI
   v) JNB SAN
   SAN !..... **10**

   b) Explain the following software development tools (**any two**) : **8**
   i) Assembler   ii) Simulator   iii) Emulator.

   OR

6. a) Write assembly language program of addition of two sixteen bit numbers stored at locations 30 H and 32 H and store result from 40 H. **6**

   b) Write a ALP of 8051 to find a factorial of N number with suitable example. **6**

   c) Write program in assembly language for dividing 16 bit number by 8 bit number with suitable example. **6**

SECTION – II

7. a) Write ALP to generate staircase using 8 bit DAC, also draw interface diagram. **8**

   b) Explain the following buses in detail :
   i) RS-232   ii) RS-485 **8**

   OR

8. a) Interface the digital to analog converter with microcontroller 8051 and write an ALP for generating sine wave. **8**

   b) Draw an interfacing diagram for LCD with 8051 and write an ALP to display "Hi ! TRONICS" on 16×2 LCD starting with first line. **8**

9. a) State features of I^2C bus and explain the following conditions.
   i) Start   ii) Stop   iii) ACK. **8**

   b) Draw an interfacing diagram using I^2C bus with 8051 for EEPROM and RTC. Also comment on interfacing. **8**

   OR

10. a) Draw functional block diagram of PIC 18F microcontroller and explain it. **8**

   b) Explain in detail program memory and data memory of PIC 18F microcontroller. **8**

11. a) Draw and explain generalised DAS in detail. **8**

   b) Design a 8051 based system for temperature measurement, use suitable sensor and signal conditioning. Display the temperature on LCD. Draw the complete block diagram and flow chart. **10**

                    OR

12. Write a short note on :

   i) DC motor control using 8051. **9**

   ii) Temperature measurement using 8051. **9**

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T.E. (Electronics) (Semester – I) Examination, 2011
POWER ELECTRONICS
(2008 Pattern)(New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answer **3** questions from Section – **I** and **3** questions from*
*Section – **II**.*
2) *Answers to the **two** Sections should be written in **separate**
books.*
3) ***Neat** diagrams must be drawn **wherever** necessary.*
4) *Black figures to the **right** indicate **full** marks.*
5) ***Use** of logarithmic tables, slide rule, Mollier charts, electronic
pocket calculator and steam table is **allowed**.*
6) *Assume **suitable** data, if necessary.*

SECTION – I

1. a) Explain source inductance effect on the operation of single phase
converter. Derive the equation of average output current (Idc) and average
load voltage (Vdc). **10**

   b) A single phase full converter is supplied from 230 V, 50 Hz source. The load
consist of R = 10Ω and large inductance so as to render the load current
constant. For a firing angle of 30°, determine (a) average output voltage
(b) average output current, (c) average and rms values of thyristor current and
(d) the power factor. **8**

               OR

2. a) Explain in detail 3ϕ dual converter with input and output voltage waveforms. **10**

   b) What are different methods of triggering circuits for phase controlled rectifiers ?
Explain micro controller based firing circuit for 1 ϕ converter. **8**

3. a) Explain in detail the operation of step up chopper. Derive the expression of
average output voltage. **8**

b) A battery powered electric vehicle uses a dc motor drive, controlled by a dc chopper working at 10 KHz. The battery voltage is 220 V. The minimum turn-on and turn-off time of the chopper switch (an inverter grade SOR) are 2 μsec, respectively. Determine the minimum and maximum dc voltage that the chopper can deliver to the motor. **8**

OR

4. a) Explain with circuit diagram and necessary waveforms of four quadrant chopper. **8**

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

5. a) What is resonant converter ? Explain the need of resonant converter. **4**

b) Define cycloconverter. Compare 3-pulse and 6-pulse cycloconverter. **6**

c) Write a short note on SLR half bridge DC to DC converter. **6**

OR

6. a) Explain single phase bridge type cycloconverter with load voltage and load current waveforms. **8**

b) The input voltage to 1-ϕ bridge cycloconverter is 120 V (rms). The load resistance is $5\,\Omega$ and the load inductance is L = 40 mH. The frequency of the output voltage is 20 Hz. If the converters are operated as semiconverters such that $0 \leq \alpha \leq \pi$ and the delay angle is $\alpha_p = 2\pi/3$. Determine (a) the rms value of output voltage v_0, (b) the rms current of each thyristor I_R and (c) the input power factor P.F. **8**

SECTION – II

7. a) Explain with the help of a neat circuit diagram and necessary waveforms, the operation of a 3-ϕ VSI with each SCR conducting for an angle of 180°. Compare with 120° conduction. **10**

b) Write a short note on voltage control methods in inverter. **8**

OR

8. a) Draw the schematic of a 3-ϕ CSI and describe its operation with current waveforms. **10**

b) Write a short note on PWM inverter. **8**

9. a) What is the need of protection circuit for semiconverter devices ? Explain in detail the snubber circuit for the protection of thyristor. **8**

b) For the circuit shown in fig. (a), **8**

   a) Calculate the maximum values of $\dfrac{di}{dt}$ & $\dfrac{dv}{dt}$ for the SCR.

   b) Find the rms and average current ratings of the SCR for firing angle delays of 90° and 150° and

   c) Suggest a suitable voltage rating of the SCR.
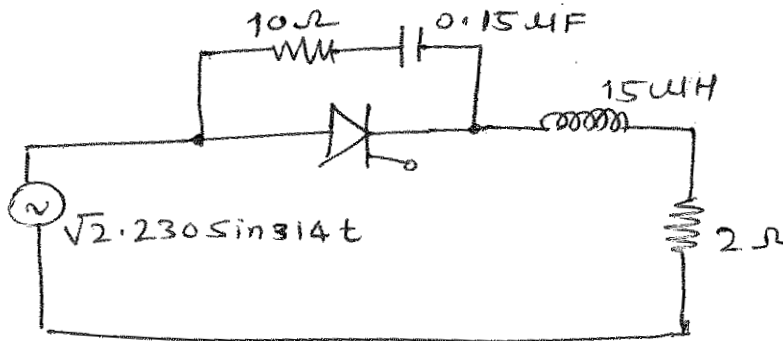
Fig. (a)

OR

10. Write a short notes on **(any two)** : **16**
   a) Electronic Ballast
   b) HVDC transmission line
   c) HF induction heating.

11. a) Compare phase angle control and asymmetric angle control methods. **8**
   b) Explain semiconverter operation of full converter. **8**

OR

12. a) What is necessity of power quality ? Explain with different types of power line disturbances. **8**
   b) What is energy audit ? Explain the required procedure for energy audit. **8**

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T.E. (Electronics) (Semester – II) Examination, 2011
DRIVES AND CONTROL (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section – **I** and **3** questions from Section – **II.***
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume **suitable** data, **if** necessary.*

SECTION – I

1. a) What are dual converters ? Explain with a neat circuit diagram and relevant wave forms the working of 3ϕ dual converter. With circulating current mode of operation. **10**

   b) The speed of separately existed dc motor is controlled by 1ϕ full converter. The field current also controlled by a full converter and the field current is set to the maximum possible value. The a.c. supply voltage is 1ϕ 208V, 50Hz . The armature resistance Ra$=0.50\Omega$, Rf$=345\Omega$, and motor voltage constant is 0.7V/A – rad/sec. If the delay angle of armature converter is 45° and armature current Ia$=55$A. Determine;
      i) Torque developed
      ii) The speed
      iii) Input power factor of supply. Assume the armature and field current to be continuous and ripple free. **8**

                          OR

2. a) Explain field failure and under voltage protections for D.C. motors. **6**

   b) Explain working of 1ϕ full converter for continuous and discontinuous current mode of separately existed d.c. motor drive. **6**

   c) Compare the power factor improvement techniques SAC, EAC, P.W.M. **6**

P.T.O.

3. a) Explain briefly the braking methods of d.c. motor . **8**

   b) Explain open loop control of dc drives with transfer function. **8**

                          OR

4. a) What is reversible drive ? Explain with diagram and waveforms working of 4. quadrant chopper. Explain the application. **10**

   b) Explain the motor performance parameter. **6**

5. a) Which are the speed control methods of induction motor ? Explain the operation any one in detail. **8**

   b) Justify "It is possible to operate the induction motor in both sub synchronous and super synchronous modes using scherbius system". **8**

                          OR

6 a) Explain briefly the braking methods of Induction motor. **8**

   b) A 3φ 4 pole I.M. is operated from 415/50Hz supply. Stator voltage control is employed to vary the speed. The motor is driving a load torque of 100N-M. Find out the following if the motor speed is 100 rad/sec. **8**
      i) Slip
      ii) Air gap power (Pag)
      iii) Slip power (Pslip)
      iv) Mechanical o/p power (Pmech)
      v) Efficiency.

                   SECTION – II

7. a) What are the difference between salient pole motor and switched reluctance motor ? **8**

   b) Explain the operation of Switch Reluctance Motor (SRM). Also list the SRM that have sparked interest in its use as an adjustable drive. **8**

                          OR

8. a) Draw and explain briefly the torque speed characteristics of synchronous reluctance motor at constant voltage and frequency. **8**

   b) Explain the salient pole synchronous motor with vector diagram. **8**

9. a) List the drive requirements for stepper motor. **6**

   b) With the help of a neat circuit diagram and relevant waveforms, explain the operation of unipolar voltage chopper drive for PM and hybrid stepper motor drive. **8**

   c) What is a self control mode of synchronous motor. **4**

OR

10. a) Describe construction and principle of working variable reluctance type stepper motors. **6**

   b) Draw and explain the operation of 3ϕ brushless d.c. motor drive. **6**

   c) Describe construction and principle of working permanent magnet type stepper motors. **6**

11. a) Explain Traction motor driver. **8**

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

   i) Fussy logic based induction motor speed control.

   ii) Fussy logic based wind generation system.

OR

12. a) Write short note on Neuro fussy system. **8**

   b) Explain neural network based PWM controller. **8**

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T.E. (Electronics) (Semester – II) Examination, 2011
SENSORS AND INTERFACES (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* *Answers to the **two** Sections should be written in*
*   **separate** *books.*
2) ***Neat*** *diagrams must be drawn **wherever** necessary.*
3) ***Black*** *figures to the right indicate **full** marks.*
4) ***Use*** *of logarithmic tables slide rule, Mollier charts, electronic*
*   pocket calculator and steam tables is **allowed**.*
5) *Assume **suitable** data, **if** necessary.*

SECTION – I

1. a) Explain with neat diagram working of a electromagnetic flow meter. **8**
   b) Explain various types of optical proximity sensors. **8**

                                OR

2. a) Explain how incremental and absolute rotary encoders are used for the
   measurement of angular velocity or speed of rotation of a shaft. **8**
   b) Compare thermocouple, RTD and semiconductor temperature sensors. **8**

3. a) Explain the use of Wheatstone's Bridge along with instrumentation amplifier as
   a signal conditioning circuit. **10**
   b) Explain with neat diagram I/P and P/I converters. **8**

                                OR

4. a) Explain with circuit diagram voltage to current and current to voltage
   converters. **10**
   b) Write a short note on SMART and intelligent transmitters. **8**

5. a) Describe working of typical flash A/D converter for 4 bit operation. **8**
   b) Draw neat diagram for LCD-PIC microcontroller interface and briefly explain
   how it works. **8**

                                OR

6. a) Draw and explain the interfacing of 4 * 4 matrix keyboard to 8051 microcontroller. **8**

   b) State the different types of ADC and state their specifications. **8**

SECTION – II

7. a) Explain how simultaneous analog and digital communication is achieved with HART Protocol. **8**

   b) Write short notes on 12C Bus. **8**

OR

8. Write short notes on :

   a) Foundation Fieldbus. **8**

   b) RS 232 Standard. **8**

9. a) What is an actuator ? Explain the working of single and double acting cylinders with pneumatic directional control valves. **8**

   b) Explain principle of operation of stepper motor. State important selection criterion. **8**

OR

10. a) Explain the role of relays and solenoid valves with any one application. **8**

    b) What is an actuator ? Explain with neat diagram working of :

    i) Spring diaphragm actuator

    ii) Piston actuator. **8**

11. a) Define scan cycle of a PLC. Explain with neat diagram architecture of a PLC. Give important specifications of a PLC. **10**

    b) Develop a physical ladder diagram for an electric motor with NO START push button, NC STOP push button, thermal overload limit switch opening on high temperature, GREEN light when running and RED light for thermal overload. **8**

OR

12. a) Explain various selection criterion for a PLC. **6**

    b) Compare programmable logic controller with a personal computer. **6**

    c) State different types of input and output devices for PLC. **6**

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T.E. (Electronics) (Semester – II) Examination, 2011
MICROCOMPUTER BASED SYSTEM (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions :   1) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section – **I**.
2) Attempt Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section – **II**.
3) Answers to the **two** Sections should be written in **separate** books.
4) **Neat** diagrams must be drawn **wherever** necessary.
5) Assume **suitable** data, if **necessary**.

SECTION – I

1. a) Explain the concept of memory segmentation. What are the advantages of using memory segmentation ? Show how memory segment overlapping will occur in 8086 processor. **8**

   b) With suitable diagram explain minimum and maximum mode of 8086 processor. **8**

                    OR

2. a) Draw the bit pattern of flag register and explain each flag with suitable example for 8086 processor. **8**

   b) State different addressing modes of 8086 processor and explain any three addressing modes with suitable example. **8**

3. a) Explain following instructions with suitable example.

   1) TEST   2) INT N

   3) SAHF   4) PUSH   **8**

   b) Write an ALP to find sum of numbers in an array of 10 bytes. **8**

                    OR

P.T.O.

4. a) Write an ALP to transfer an array of 10 bytes to another location and store in reverse order. **8**

   b) Draw the interrupt vector table and explain the concept of interrupt vector for 8086 processor. **8**

5. a) Explain the internal architecture of 80386 processor with suitable block diagram. **10**

   b) With the help of suitable figure explain the Translation Look-aside Buffer (TLB) to speed up the paging operation. **8**

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

6. a) Draw the structure of control registers in 80386 processor and explain how paging is controlled by control registers. **10**

   b) Draw and explain programming model of 80386 processor. **8**

<div align="center">SECTION – II</div>

7. a) Draw the ADC interfacing diagram using COM port and explain the functions of each pin. **8**

   b) With suitable block diagram explain the PCI Bus interface to the PC. **8**

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

8. a) Explain with block diagram IBM PC system based mother board. **8**

   b) State and explain the features of USB interface over other interfaces. **8**

9. a) Explain the programming model of ARM Processor with suitable figure. **8**

   b) With the help of block diagram explain three stage pipelined instruction execution. **4**

   c) Write an ALP for ARM 7 to transfer 10 words from source location to destination location. **6**

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

10. a) Explain following Addressing modes for ARM processor with suitable example :

    i) Pre indexed

    ii) Post indexed. **8**

  b) State and explain any four Co-processor instructions. **4**

  c) Explain the condition code field in ARM instructions. **6**

11. Design 8086/8088/ARM7 based closed loop control circuit for DC motor using Pulse Width Modulation (PWM) control.

  i) Draw complete interfacing diagram.

  ii) Flow chart

  iii) Explain important design steps. **16**

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

12. Design 8086/8088/ARM7 based system to sense temperature from L-35 (Temperature Sensor) and display it on 2 digit common anode 7-segment display.

  i) Design signal conditioning circuit.

  ii) Draw the complete interfacing diagram.

  iii) Draw the flowchart. **16**

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T.E. (Electronics) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*
*2) Answers to the **two** Sections should be written in **separate***
books.
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic*
*pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the functions of management listed below :
Planning, Organizing, Staffing, Direction, Co-ordination, Co-operation,
Control.   **9**

   b) Define Quality. Explain the phases in Quality Management.   **9**

                                          OR

2. a) What is system ? Describe various activities to functional subsystems.   **9**

   b) What is the role of Decision Making ? Discuss about system approach to
problem solving.   **9**

3. a) Explain significance of Data Communication. Describe the role and advantages
of satellite communication.   **8**

   b) What are the basic concept of networking ? Compare star, ring, bus topologies.   **8**

                                          OR

4. a) Explain the impact of convergence technology (CT) on consumer electronics,
telecommunication and IT.   **8**

   b) List out the 10 technology shift from analog to digital economy.   **8**

5. a) Explain Business Process Re engineering (BPR). **8**

   b) Describe Information System (IS) design for Internetworked business (Level-1 to 5). **8**

                        OR

6. Write short notes on **(any two)** : **16**

   i) Hospital care system

   ii) Monitoring of quality along the supply chain

   iii) Error model.

                  SECTION – II

7. Explain the errors caused by system environmental factors and the uncertainty implications. **18**

                  OR

8. a) Compare open loop system and close loop system of business IS view. **9**

   b) Explain Information Integrity system. **9**

9. State and explain the concept of system dynamic model. List out various steps in system dynamics method. **16**

                  OR

10. Explain STELLA with reference to following : **16**

    i) Mapping and modeling

    ii) Simulation and analysis

    iii) Communication.

11. Explain concept of usefulness-Usability-Integrity (UUI) Paradigm. **16**

                  OR

12. Write short note on : **16**

    i) Cost benefit analysis   ii) Accuracy and consistency.

                _____

T.E. (Electronics) (Semester – II) Examination, 2011
DISCRETE TIME SIGNAL PROCESSING
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*
*2) Answers to the **two** Sections should be written in **separate***
books.
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts,*
*electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Give the advantages and disadvantages of digital signal processing over analog
   signal processing.   **6**

   b) Write a short note on BIBO stability of LT1 system.   **6**

   c) If a system has input x(n) and unit impulse response h(n) as given below :

   $x(n) = \dfrac{n}{4}$ for $0 \le n \le 8$

   $= 0$ elsewhere
   and
   $h(n) = 1$ for $-3 \le n \le 3$
   $= 0$ elsewhere
   Determine the response of a system.   **6**

                        OR

2. a) A 100 Hz sinusoid is sampled at rates of 240 Hz, 140 Hz, 90 Hz and 35 Hz. In each case, has aliasing occurred; and if so, what is the aliased frequency ? **6**

   b) Obtain direct form I, direct form II structure for system described by

   $y(n) = -0.1\, y\,(n-1) + 0.72\, y\,(n-2) + 0.7\, x(n) - 0.252\, x(n-2)$. **6**

   c) Consider the system shown in figure :
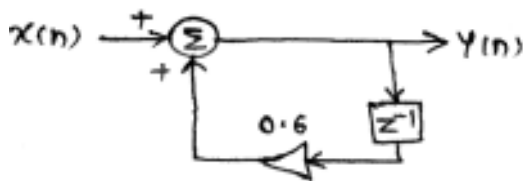
   Find its response if $x(n) = (0.4)^n$, $n \geq 0$ and initial condition is $y\,(-1) = 10$. **6**

3. a) Explain the periodicity property of twidle factor (W_N). **8**

   b) Find circular convolution of two finite duration sequences given below using graphical method.

   $x_1(n) = \{1, -1, -2, 3, -1\}$
   $x_2(n) = \{1, 2, 3\}$. **8**

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

4. a) Compute 4 point DFT of two real sequences :

   $g(n) = \{1, 2, 0, 1\}$
   $h(n) = \{2, 2, 1, 1\}$
   Using a single 4 point DFT. **8**

   b) An 8-point sequence is given by

   $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$. Compute 8 – point DFT by radix – 2 DITFFT. Also sketch magnitude and phase spectrum. **8**

5. a) Compute the response of the system :

   $y(n) = 0.7\, y(n-1) - 0.12y\,(n-2) + x(n-1) + x(n-2)$ to the input $x(n) = nu(n)$. Is the system stable ? **8**

b) A discrete time causal system has a transfer function as

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2z^{-1} - 0.15z^{-2}} .$$

  i) Determine the difference equation of the system.

  ii) Show pole-zero diagram and find magnitude at $w = 0$ & $w = \pi$.

  iii) Find impulse response of the system. **8**

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

6. a) Determine all possible sequences x(n) associated with z-transform

$$x(z) = \frac{5z^{-1}}{(1 - 2z^{-1})(3 - z^{-1})} .$$ **8**

b) Determine one sided z-transform of

$$y(n) + \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) = 0$$

$$y(-1) = y(-2) = 1.$$ **8**

<div align="center">SECTION – II</div>

7. a) Obtain the direct form realization of linear phase FIR system given by

$$H(z) = 1 + \frac{2}{3}z^{-1} + \frac{15}{8}z^{-2} + \frac{2}{3}z^{-3} + z^{-4}.$$ **8**

b) Find the digital network in direct and transposed form for the system described by difference equation.

$$y(n) = x(n) + 0.5\,x(n-1) + 0.4\,x(n-2) - 0.6\,y(n-1) - 0.7\,y(n-2).$$ **8**

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

8. Design digital high pass butterworth filter with cut-off freq. = 30 Hz and sampling freq. = 150 Hz. **16**

9. a) Write a note on sampling rate conversion by rational factor I/D. **8**

   b) Design a two stage decimator for the following specifications :

   Decimation factor : D = 100

   Passband : $0 \le F \le 50$

   Transition band : $50 \le F \le 75$

   Input sampling rate : 10 KHz

   Ripple $\delta_p = 10^{-1}$, $\delta_s = 10^{-3}$. **8**

   OR

10. a) Write a note on multirate narrowband digital filtering. **8**

    b) Write a short note on hi resolution narrowband spectral analysis. **8**

11. a) Explain Von-Neumann architecture with the help of block diagram. **6**

    b) Explain the applications of DSP for DC motor control, AC phase control and proportional controller. **6**

    c) Give differences between microprocessor and DSP. **6**

    OR

12. a) Write a note on VLIW architecture. **6**

    b) Give the different addresssing formats of DSP processor. **6**

    c) Explain important features of TMS320C28XX DSP processor. **6**

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T.E. (E&TC) (Semester – I) Examination, 2011
CONTROL SYSTEMS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. A) What is Open Loop and Closed Loop control system ? Explain with the real time examples.   **8**

   B) Reduce the following block diagram shown in Fig. (1) into a single equivalent block by the Block Reduction Techniques.   **8**

Fig. 1

OR

**T.E. (Electronics and Telecommunication) (Semester – I)
Examination, 2011
DIGITAL COMMUNICATION
(2008 Pattern) (New)**

Time: 3 Hours
Max. Marks: 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain with a neat sketch, the block diagram of digital communication system and discuss the various formatting techniques involved in it. **8**

   b) The signal g(t) = 10 cos (40 π t) cos (400 π t) is sampled at the rate of 500 samples/sec.
   i) Determine the Nyquist rate.
   ii) Calculate the cut off frequency of ideal reconstruction filter.
   iii) Draw the spectrum of resulting sampled signal.
   iv) If g(t) is considered to be a band pass signal, determine the lowest permissible sampling rate. **8**

   OR

2. a) The information in an analog waveform, whose maximum frequency fm = 4000Hz is to be transmitted using a 16-level PAM system. The quantization distortion must not exceed $\pm$ 1% of the peak to peak analog signal.
   a) What is the minimum number of bits per sample that should be used in the transmission system ?
   b) What is the minimum required sampling rate and bit rate of the system.
   c) What is the 16-ary PAM symbol transmission rate ? **8**

   b) Explain how companding improves the signal to noise ratio of PCM system with respect to μ-law ? **8**

3. a) For the sequence 10111001, sketch the waveform using the following data formats :

   i) Unipolar Rz

   ii) Polar NRz

   iii) Alternate Mark Inversion

   iv) Split phase Manchester coding.

   Draw the corresponding spectrum of the above formats and explain. **10**

   b) What are the different types of multiplexers used in digital communication system ? Explain quasi-synchronous multiplexer in detail with a neat sketch. **8**

                          OR

4. a) Consider a sequence 10100001000000010 is applied to the scrambler shown in Figure 1. Determine the output sequence 'O'. Design the corresponding descrambler and verify whether its output matches with the given sequence. **10**

Figure. 1

   b) Derive the expression for signal to noise ratio of integrate and dump receiver. **8**

5. a) Explain in brief the different types of random processes with suitable examples. **8**

   b) Consider the random process X(t) = A cos $2\pi fct$, where the frequency 'fc' is constant and amplitude 'A' is uniformly distributed

   $$f_A(a) = \begin{cases} 1 & 0 \leq a \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

   Determine whether it is strictly stationary or not. **8**

   OR

6. a) Show that if the wide sense stationary process X(t) is passed through LTI system with impulse response h(t), then its output has constant mean square value. **8**

   b) What are the different properties of random process ? A wide sense stationary random process X(t) is applied to the input of LTI system with impulse response h(t) = 3e^{-2t} u(t). Find the mean value of output Y(t) of the system if E[X(t)] = 2. **8**

SECTION – II

7. a) Draw the constellation diagram of 16-ary PSK and 16 QAM. Compare them with respect to their Euclidean distance. What is the physical significance of Euclidean distance ? **10**

   b) What is coherent detection ? Draw the block diagram of BPSK receiver and explain its operation with proper mathematical expressions. **8**

   OR

8. a) Explain the necessity of continuous PSK. State and explain the basic principles of MSK with block schematic and suitable waveforms. **10**

   b) In a digital communication system, the bit rate of NRz data stream is 1 Mbps and carrier frequency of transmission is 100 MHz. Find the symbol rate of transmission and band width requirement of the channel in the following cases. **8**
     i) BPSK
     ii) QPSk
     iii) 16-ary PSK.

9. a) Find the bit error probability for a BPSK system with bit rate of 1Mbps. The received waveforms $S_1(t) = A \cos \omega_0 t$ and $S_2(t) = -A \cos \omega_0 t$ are coherently detected with a matched filter. The value of A is 10 mV. Assume that noise power special density $N_0 = 10^{-11}$ W/Hz and that signal power and energy per bit are normalised relative to 1Ω load. **8**

   b) Derive the expression for the probability of error of a BFSK system. **8**

                    OR

10. a) Derive the expression for the probability of error of a BPSK sysem. **8**

   b) Prove that the error probability of MSK is same as that of QPSK system. **8**

11. a) Design a 4-bit PN sequence generator and verify the properties of maximum length sequence. Assume that initial state is 1000. **8**

   b) Consider a fast hop spread spectrum system with binary FSK, 2 hops/symbol and a PN sequence generator with outputs with a binary message 010010010000. The message is transmitted using following PN sequence {010, 110, 101, 100, 000, 101, 011, 001, 001, 111, 011, 001, 110, 101, 101, 001, 110, 001, 011, 111, 100, 000, 110, 110 }. Plot the output frequency for the input message. **8**

                    OR

12. a) What is the difference between multiplexing and multiple access techniques ? Compare TDMA, FDMA and CDMA. **8**

   b) A transmitter has an output of 2W at a carrier frequency of 2GHz. Assume that Tx and Rx antennas are parabolic dishes each 3ft in diameter. Assume that efficiency of each antenna is 0.55.
      a) Evaluate the gain of each antenna.
      b) Calculate EIRP of the transmitted signal in units of dBW. **8**

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T.E. (Electronics and Telecommunication) (Semester – I) Examination, 2011
DIGITAL COMMUNICATION
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
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   iii) Draw the spectrum of resulting sampled signal.

   iv) If g(t) is considered to be a band pass signal, determine the lowest permissible sampling rate.   **8**

                          OR

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   b) Explain how companding improves the signal to noise ratio of PCM system with respect to μ-law ?   **8**

P.T.O.

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  b) What are the different types of multiplexers used in digital communication system ? Explain quasi-synchronous multiplexer in detail with a neat sketch. **8**

OR

4. a) Consider a sequence 10100001000000010 is applied to the scrambler shown in Figure 1. Determine the output sequence 'O'. Design the corresponding descrambler and verify whether its output matches with the given sequence. **10**
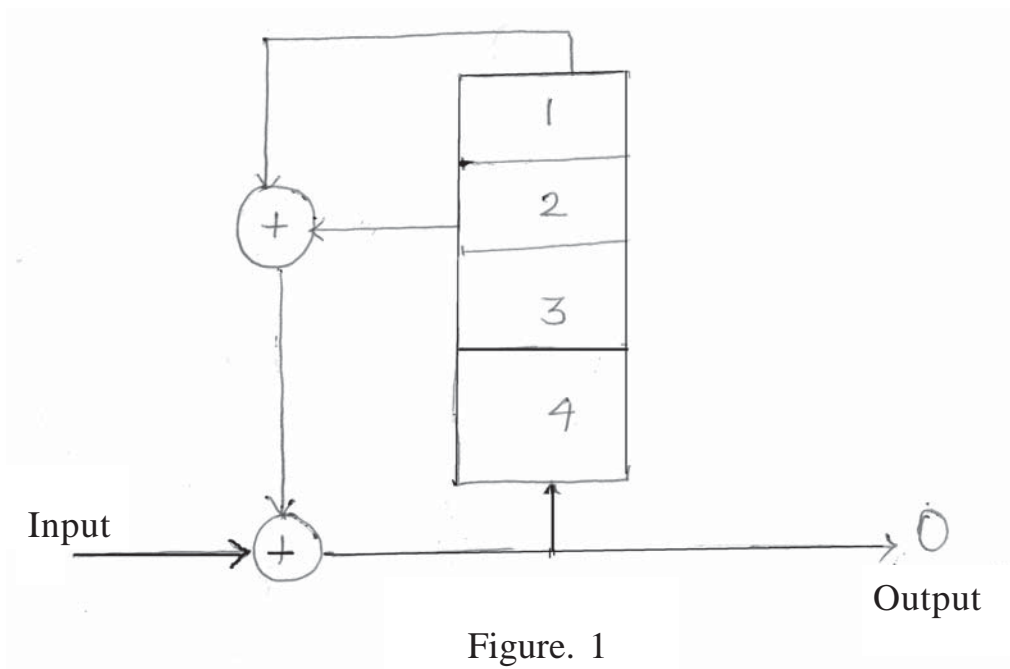

Figure. 1

  b) Derive the expression for signal to noise ratio of integrate and dump receiver. **8**

5. a) Explain in brief the different types of random processes with suitable examples. **8**

   b) Consider the random process $X(t) = A \cos 2\pi f_c t$, where the frequency 'fc' is constant and amplitude 'A' is uniformly distributed

   $$f_A(a) = \begin{cases} 1 & 0 \le a \le 1 \\ 0 & \text{otherwise} \end{cases}$$

   Determine whether it is strictly stationary or not. **8**

   OR

6. a) Show that if the wide sense stationary process $X(t)$ is passed through LTI system with impulse response $h(t)$, then its output has constant mean square value. **8**

   b) What are the different properties of random process ? A wide sense stationary random process $X(t)$ is applied to the input of LTI system with impulse response $h(t) = 3e^{-2t} u(t)$. Find the mean value of output $Y(t)$ of the system if $E[X(t)] = 2$. **8**

SECTION – II

7. a) Draw the constellation diagram of 16-ary PSK and 16 QAM. Compare them with respect to their Euclidean distance. What is the physical significance of Euclidean distance ? **10**

   b) What is coherent detection ? Draw the block diagram of BPSK receiver and explain its operation with proper mathematical expressions. **8**

   OR

8. a) Explain the necessity of continuous PSK. State and explain the basic principles of MSK with block schematic and suitable waveforms. **10**

   b) In a digital communication system, the bit rate of NRz data stream is 1 Mbps and carrier frequency of transmission is 100 MHz. Find the symbol rate of transmission and band width requirement of the channel in the following cases. **8**
      i) BPSK
      ii) QPSk
      iii) 16-ary PSK.

9. a) Find the bit error probability for a BPSK system with bit rate of 1Mbps. The received waveforms $S_1(t) = A \cos \omega_0 t$ and $S_2(t) = -A \cos \omega_0 t$ are coherently detected with a matched filter. The value of A is 10 mV. Assume that noise power special density $N_0 = 10^{-11}$ W/Hz and that signal power and energy per bit are normalised relative to 1Ω load. **8**

   b) Derive the expression for the probability of error of a BFSK system. **8**

                    OR

10. a) Derive the expression for the probability of error of a BPSK sysem. **8**

    b) Prove that the error probability of MSK is same as that of QPSK system. **8**

11. a) Design a 4-bit PN sequence generator and verify the properties of maximum length sequence. Assume that initial state is 1000. **8**

    b) Consider a fast hop spread spectrum system with binary FSK, 2 hops/symbol and a PN sequence generator with outputs with a binary message 010010010000. The message is transmitted using following PN sequence {010, 110, 101, 100, 000, 101, 011, 001, 001, 111, 011, 001, 110, 101, 101, 001, 110, 001, 011, 111, 100, 000, 110, 110 }. Plot the output frequency for the input message. **8**

                    OR

12. a) What is the difference between multiplexing and multiple access techniques ? Compare TDMA, FDMA and CDMA. **8**

    b) A transmitter has an output of 2W at a carrier frequency of 2GHz. Assume that Tx and Rx antennas are parabolic dishes each 3ft in diameter. Assume that efficiency of each antenna is 0.55.
    a) Evaluate the gain of each antenna.
    b) Calculate EIRP of the transmitted signal in units of dBW. **8**

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T.E. (E&TC) (Semester – I) Examination, 2011
MICROCONTROLLERS AND APPLICATIONS
(2008 Pattern)(New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Black** figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, **if** necessary.*

SECTION – I

1. a) Compare CISC and RISC Processors.   **6**

   b) Explain criteria for choosing a microcontroller.   **4**

   c) Discuss the advantages and disadvantages of Harvard and Van-Neumann architecture.   **6**

   OR

2. a) Explain the historical developments in Microprocessors and Micro controllers. **8**

   b) Explain various steps performed by Microcontroller for calculating short jump address while executing instructions.   **4**

   c) Explain the criteria for selecting type and size of memory for specific design. **4**

3. a) Explain PSW register of 8051. Write code for selecting bank 2 of 8051. **8**

   b) Interface 8 KB of RAM and 4 KB of EPROM with 8051. The starting address of ROM is 8000H.   **8**

   OR

4. a) Explain memory organization of 8051. **8**

   b) Explain important features of architecture of 8051. **8**

5. a) Find the contents of register A after execution of following set of instructions. **4**

   MOV A, # 6A H

   MOV R4, # 6E H

   XRA A, R4

   CLC C

   MOV A, # 4D H

   SWAP A

   RRC A

   RRC A

   RRC A

   RRC A

   b) Write Assembly language program to obtain 1's complement of a given number. **4**

   c) Write an ALP to convert packed BCD number 35 into HEX number and store the result in memory locations 50 H and 51 H. **5**

   d) Write a program to transfer a string "PUNE" located at 250 H memory location to memory location 350 H. **5**

                 OR

6. a) Write the following instructions :

     i) DJNZ   ii) AJMP

   iii) RETI   iv) SWAP A

    v) DA **10**

   b) Write a program to add ten bytes in external RAM. Assume starting location of block is 5000 H. Assume sum to be 8 bits. Store the results at memory location 6000 H. **8**

SECTION – II

7. a) Interface 4 * 4 keyboard matrix with 8051. Send ASCII code of each key to Port 0. **8**

   b) Explain RS 232 standard in detail. **8**

   OR

8. a) Interface 16 * 2, 8 bit LCD to 8051 and display message "FIVE STAR" on first line and "UNIVERSITY" on second line. **8**

   b) Explain operation of 12 C protocol with timing diagram for START, STOP and ACKNOWLEDGE. **8**

9. a) What do you mean by prescaling of PIC timer ? What is the of prescaling ? Explain Watch Dog Timer in detail. **8**

   b) Draw and explain status register of PIC controller. **8**

   OR

10. a) Write embedded C program to blink LED connected to port of PIC. **8**

    b) Write embedded C program to implement HEX Counter on port and display the count. **8**

11. a) Design micro controller based Path Follower. **10**

    b) Design a test board of 8051 and explain its memory interface. **8**

   OR

12. a) Design a digital thermometer to display the temperature in Celsius. The range of temperature is from 0 to 100 C. **10**

    b) Design a system to measure a speed of DC motor. Display that speed on seven segment display. **8**

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T.E. (E & TC) (Semester – I) Examination, 2011
DIGITAL SIGNAL PROCESSING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions*
*from Section **II**.*
*2) Answers to the **two** Sections should be written in*
***separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables slide rule, Mollier charts,*
electronic pocket calculator and steam tables is
***allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Consider the analog signal $x_a(t) = 3\cos 2000\pi t + 5\sin 6000\pi t + 10\cos 12,000t$. **6**

   i) What is the Nyquist rate for this signal ?

   ii) If this analog signal is sampled at $F_s = 5000$ samples/sec, what is the discrete-time signal obtained after sampling ?

   iii) What is the analog signal $y_a(t)$ we can reconstruct from the samples if we use ideal interpolation ?

   b) Obtain the direct form-I and direct form-II structures for the following systems : **12**

   i) $y(n) = 0.8y(n – 1) – 0.5y(n – 2) + 2x(n) + x(n – 1) – x(n – 2)$

   ii) $y(n) = – 0.25y(n – 1) + 0.05y(n – 2) + x(n) – 2x(n – 2)$

   iii) $y(n) = 0.5x(n) + 0.25x(n – 1) + x(n – 2) + 0.25x(n – 3) + 0.5x(n – 4)$

   OR

2. a) Find the zero input, zero state and total response for the given difference equation. **8**

   $y(n) + 2y(n – 1) + y(n – 2) = x(n) + x(n – 1)$.

   with initial condition $y(–1) = y(–2) = 1$ and input $x(n) = \left(\dfrac{1}{2}\right)^n u(n)$.

P.T.O.

b) Define Zero input response and Zero state response. For any value of n, derive difference equation y(n) having Zero input response $y_{zi}(n)$ and Zero state response $y_{zs}(n)$. Show that Zero state response $y_{zs}(n)$ can also obtain by convolving input x(n) with impulse response h(n). **10**

3. a) Draw the spectrum of ideal lowpass filter in **6**

    i) Continuous Time Fourier Transform domain $X_a(\Omega)$ (i.e. CTFT)

    ii) Discrete Time Fourier Transform domain $X(\omega)$ (i.e. DTFT)

    iii) N = 8 point Discrete Fourier Transform domain X(K) (i.e. DFT)

b) For a given sequence x(n) = {1, 2, 3, 1} and h(n) = {1, 1, 1} Find **10**
    i) Linear Convolution.
    ii) Linear convolution using Circular Convolution without zero padding.
    iii) Circular Convolution.
    iv) Show that answer in part ii is aliased in time domain.

              OR

4. a) Obtain the relation between DTFS and DFT. Find N = 5 point DFT for x(n) = {1, 0, 1, 0, 1}. **8**

b) Find N = 8 point DFT using Radix-2 FFT DIF algorithm for given sequence. **8**

    x(n) = {1, 1, 1, 1, 0, 0, 0, 0}.

5. a) Determine the Z-Transforms and ROC of the following signal, and also sketch the corresponding Pole-Zero patterns. **8**

    i) $x_1(n) = (a^n + a^{-n})\, u(n)$ a real and ≤ 1

    ii) $x_2(n) = \dfrac{1}{2}\cdot\left(\dfrac{1}{3}\right)^{n-1} u(n-1)$

b) If output of a system is given by

    y(n) = 1.5y(n − 1) + 0.5y (n − 2) + x(n) + 2x(n − 1). **8**

    Find system transfer functions, system impulse response, and frequency response. Is system stable ?

              OR

6. a) Compute the impulse response and unit step response of system given by difference equation. **8**

   $y(n) = 0.7y(n – 1) – 0.12y(n – 2) + x(n – 1) + x(n – 2)$.

   b) The impulse responses of the systems are given by : **8**
   i) $h_1(n) = a^n u(n)$
   ii) $h_2(n) = n.a^n u(n)$

   where $a = 0.2$ $a = 1$ and $a = 2$

   Show that for different value of a whether both the above systems are stable or unstable ?

SECTION – II

7. a) Show that the impulse response of a linear phase FIR filter with positive symmetry for N even can be expressed as **8**

   $$h(n) = 1/N \left[\sum_{k=1}^{N/2-1} 2|H(k)| \cos[2\pi k(n-\alpha)/N] + H(0) \right], \text{ where } \alpha = (N-1)/2$$

   and H(k) are the samples of the frequency response of the filter taken at intervals of kF_s/N.

   b) A requirement exists for a lowpass FIR filter satisfying the following specifications : **10**

   Passband 0-5 KHz.

   Sampling frequency 18 kHz.

   Filter length 9

   Obtain the filter coefficients using the frequency sampling method.

   OR

8. a) Design a digital low pass Butterworth IIR Filter using BLT for following specification

   $f_e = 1KHz$, $f_s = 3KHz$, $F_s = 8KHz$, $R_p = 2dB$ and $A_s = 15$ dB. **8**

   b) Give Justification for following : **6**
   1) IIR filter have more sharpness than FIR filter, why ?
   2) FIR Filter are Linear in Phase and stable, but IIR are not, why ?

   c) Obtain H(z) for second order Normalized LPF using BLT. **4**

9. a) Explain sampling rate Interpolation by integer factor. **6**

   b) What is the principle of Downsampling ? What is the importance of antialiasing filter ? Derive the expression for decimated output signal i.e. y(m). **10**

                        OR

10. a) With aid of block diagram and waveform explain sampling rate conversion by Non-integer factor. **6**

    b) Explain how Multirate sampling can be used efficiently in **10**
       1) Sub-Band coding.
       2) Acquisitions of high quality data.

11. a) What should be the desirable Architectural features, execution speed, type of Arithmetic and wordlength required for selecting a DSP processor. **8**

    b) Draw the functional block diagram of DSP TMS 320C6713 CPU. Explain any five salient features of TMS 320C6713 processor. **8**

                        OR

12. a) Draw the block diagram of a simplified generalized real time digital processing system and explain each block. **8**

    b) Explain in short : **8**
       1) How MAC unit can be efficiently used for convolution ?
       2) How Barrel shifter shifts n-bit in single clock cycle ?

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T.E. (E & TC) (Semester – II) Examination, 2011
SIGNAL CODING AND ESTIMATION THEORY (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answer **any three** questions from **each** section.*
2) *Neat diagrams must be drawn **wherever** necessary.*
3) *Black figures to the right indicate **full** marks.*
4) *Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Consider a DMS 'X' with two symbols x_1 and x_2 with probabilities $P(x_1) = 0.9$ and $P(x_2) = 0.1$. Find the efficiency and the redundancy of this code and its second order extension.   **10**

   b) A channel with three input x_1, x_2 and x_3, three output y_1, y_2 and y_3 with noise matrix as given below.

   $$P[Y \mid X] = \begin{bmatrix} .6 & .2 & .2 \\ .2 & .6 & .2 \\ .2 & .2 & .6 \end{bmatrix}.$$ **8**

   Calculate H (X), H(Y), H(X,Y), H(X|Y), I (XY) where $P(x_1) = \frac{1}{8}, P(x_2) = \frac{1}{8}$ and $P(x_3) = \frac{6}{8}$.

                                    OR

2. a) Define :

   i) Source Coding Theorem

   ii) Channel Coding Theorem

   iii) Information Capacity Theorem

   iv) Kraft's Inequality.   **8**

b) A sequence is encoded using the LZW algorithm and the initial dictionary shown in table

Index	1	2	3	4
Entry	a	ɸ	r	t

The output of the LZW encoder is the following sequence, Decode this sequence.

3	1	4	6	8	4	2	1	2	5	10	6	11	13	6

Encode the decoded sequence using the same initial dictionary. Comment on your answer. **10**

3. a) Show that the Shannon's limit for an AWGN channel is -1.6 db. **8**

b) A channel has a bandwidth of 5KHz and a signal to noise power ratio of 63. Determine the bandwidth needed if the S/N power ratio is reduced to 31. What will be the signal power required if the channel BW is reduced to 3 KHz ? **8**

OR

4. a) Explain DCT in context to JPEG. Compare between DCT and wavelet with respect to image compression. **8**

b) The generator matrix for a (7,4) block code is shown below.

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

   i) Find all code words and its minimum distance.

   ii) Find parity check matrix.

   iii) How many errors it can detect ?

   iv) Is it a linear code ? Justify. **8**

5. a) Generator vectors for a rate $\frac{1}{3}$ convolutional encoder are $g^{(1)} = 110$, $g^{(2)} = 101$, $g^{(3)} = 111$.

   Draw block diagram of encoder, construct encoder matrix and determine code word if input vectors are [1 0 1 1 0 0]. **10**

   b) What are turbo codes and explain the necessity of interleaver in turbo codes ? **6**

                          OR

6. Consider the 8 state, 8 -PSK. TCM scheme as shown below. **16**
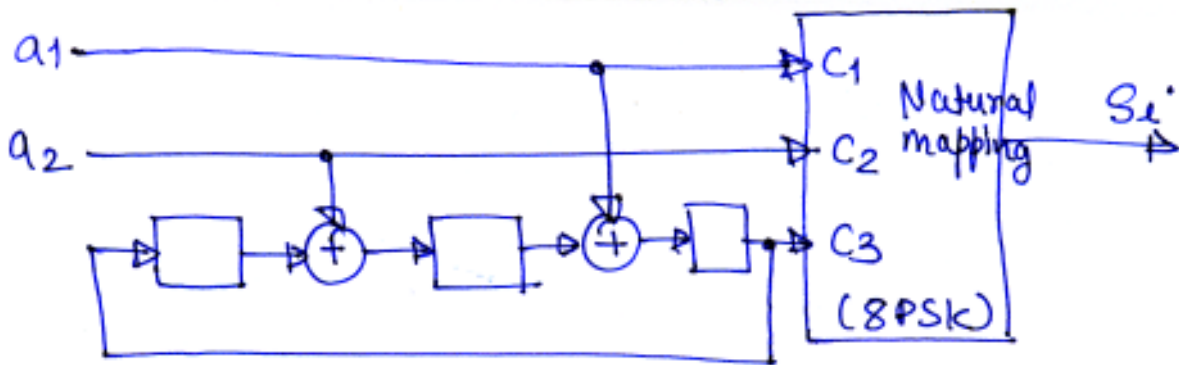
   i) Draw Trellis diagram.

   ii) Find d_{free} and Asymptotic coding gain and comment on it.

                       SECTION – II

7. a) A (15,5) BCH triple error correcting code has the following generator matrix.

   $g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$

   Find the corrected code word if transmitted code word is $x^7 + x^2$. Take the primitive polynomial $x^4 + x + 1$. **12**

   b) Explain the following terms with the help of equations.

      i) Primitive polynomial

      ii) Minimal polynomial

      iii) Generator polynomial. **6**

                          OR

8. a) Design a (15,11) RS code. Find code whose message polynomial is given as (x+1). **8**

   b) What are encryption standards ? Discuss in brief about symmetric and asymmetric cryptography. **8**

   c) Explain the advantages of RS code over BCH code. **2**

9. a) Let $H_1 : Y_k = m+N_k$, K =1, 2,...K
   $H_0 : Y_k = N_k$,   K=1,2.... K

   i) Assuming the constant m is unknown . Obtain the Maximum Liklihood estimation of the mean.

   ii) Suppose now mean is known but the variance is unknown. Obtain the MLE of $\theta = 6^2$. **10**

   b) Write a short note on CRAMER-RAO BOUND. **6**

                 OR

10. a) Explain Kalman filter in context to estimation theory. **8**

    b) Explain least square estimation techniques. **8**

11. a) Write short note on Neyman-Pearson detector. **8**

    b) A ternary communication system transmits one of the three amplitude signal {1,2,3} with equal probabilities. The independent received signal samples under each hypothesis are
    $H_1 : Y_k = 1+ N$ K = 1,2..K
    $H_2 : Y_k = 2+N$ K = 1,2... K
    $H_3 : Y_k = 3+N$ K = 1,2, ... K

    The additive noise N is Gaussian with mean zero and variance σ^2. The costs are C_{ii}=0 and C_{ij} =1 for $i \neq j$. I_j, j = 1, 2, 3 determine the decision regions. **8**

                 OR

12. a) Explain MINMAX criterion in detail. **8**

    b) Give MAP criterion and explain multiple hypothesis for three regions H_0, H_1, H_2. Hence give the criterion to select the hypothesis. **8**

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T.E. (E & TC) (Semester – II) Examination, 2011
SYSTEM PROGRAMMING AND OPERATING SYSTEMS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. a) Define language processor.

   Also explain various language processing tools.   **8**

   b) Enlist the different types of errors that are handled by PASS-I and PASS-II

   of a TWO PASS ASSEMBLER.   **6**

   c) What is a LITERAL ? What is its advantage in assembly language programming ?   **4**

   OR

2. a) Write an algorithm for Second Pass Assembler.   **6**

   b) Explain completely the processing of LTORG, ORIGIN statements by PASS-I

   and PASS-II of a Two Pass Assembler.   **8**

   c) Explain different phases of language processing.   **4**

3. a) What are the differences between Macros and functions ?   **4**

   b) Explain top down parsing in detail. What type of grammar is required by this

   parser ?   **6**

   c) Explain in detail various phases of a compiler.   **6**

   OR

4. a) Draw a neat flowchart for MACRO processor to handle nested macro

   definitions.   **6**

   b) Explain the need for a Lexical Analyser ? With example explain how it works.   **6**

   c) Compare Compiler and Interpreter.   **4**

5. a) What is Loader ? Enlist basic functions of a loader.   **6**

   b) Explain the function of compiler- and-go scheme. What are the advantages

   and disadvantages of the scheme ?   **6**

   c) Write a note on MS-DOS linker.   **4**

   OR

6. a) Explain the design of a absolute loader. **6**

   b) Explain the design of a direct linking loader. Also explain all required data structures. **8**

   c) What is a Linker ? **2**

SECTION – II

7. a) What is an operating system ? What are the basic services and functions of an operating system ? **8**

   b) Explain inter process communication. Explain different IPC problems. **8**

   OR

8. a) Explain process and threads in details. **8**

   b) Explain dead lock. Explain different methods to avoid deadlock. **8**

9. a) Explain the concept of segmentation. **4**

   b) Discuss and compare with example various page replacement policies. **8**

   c) What do you mean by page fault ? How operating system handles this ? **4**

   OR

10. a) Explain the need for paging. **2**

    b) Explain virtual memory management. **6**

    c) What are the advantages and disadvantages of segmentation ? **8**

11. Write short notes on : **18**

    a) File directories.

    b) Power management in file system.

    c) Disk arm scheduling algorithm.

    OR

12. Write short notes on : **18**

    a) File system and implementation.

    b) Graphical user interface.

    c) Clock software.

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T.E. (E &TC) (Semester – II) Examination, 2011
COMPUTER ORGANISATION AND ARCHITECTURE
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. a) Explain the operation of sequential circuit binary multiplier with

    Multiplicand   1101

    Multiplier   1011.   **8**

   b) Using Booth's algorithm multiply

    Multiplicand = – 13

    Multiplier   = + 11   **8**

                            OR

2. a) Explain following addressing modes with example
        1) Indirect mode
        2) Index mode
        3) Relative mode.   **6**

   b) Carry out bit pair recoding of following multipliers

    1 1 0 1 0

    0 1 1 0 1   **4**

   c) Represent (178.1875) in single precision floating point format.   **6**

3. a) Explain with neat block diagram single bus organisation.   **9**

   b) Using input output gating for the registers in single bus organisation explain
      operation of
        1) Fetching a word from memory
        2) Storing a word in memory.   **9**

                            OR

4. a) Draw neat block diagram of three bus organisation of data path inside the processor and hence explain the control sequence for instruction Add R4, R5, R6. **9**

   b) What is microprogrammed control ? Using single bus organisation write control sequence for execution of instruction Add (R3), R1. Write microinstructions for the same. **9**

5. a) Explain how multiple interrupt requests can be handled using
      1) Vectored Interrupt
      2) Using individual interrupt request and acknowledge lines. **6**

   b) Explain use of PCI bus in computer system. Also explain data transfer signals on PCI bus. **10**

                     OR

6. a) Write notes on :
      1) USB
      2) Cache Memory. **16**

                  SECTION – II

7. a) Explain 8086 architecture. **8**

   b) With suitable example explain difference between rotate and shift instructions. **4**

   c) Explain with suitable example how physical address of operand is calculated in 8086. **4**

                     OR

8. a) Explain interrupt vector table of 8086. **8**

   b) Explain string instructions of 8086. **8**

9. a) Explain flag register of 80386. **8**

   b) Explain memory paging mechanism in 80386. **8**

                     OR

10. a) Explain segment descriptor in detail. **8**

    b) Explain the use of various registers in 80386. **8**

11. a) What is the difference between loosely coupled and tightly coupled multiprocessor system ? **6**

b) Compare RISC and CISC. **6**

c) Explain pipelining mechanism of RISC processor. **6**

OR

12. a) List and explain various registers in ARM core. What are different modes of operation in ARM ? **5**

b) Explain superscalar processor architectures. **8**

c) Explain role of Barrel shifter in ARM core data flow model. **5**

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T.E. (Electronics & Telecomm. Engg.) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT
(New) (2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Define "Management theory" and explain the necessity of applying this theory for the various functions of today's organization.   **8**

   b) Define "quality" of a product and explain the importance of quality of a product in a typical buyer's market.   **8**

2. a) What do you mean by a term "quality management" and state the different phases of quality management.   **8**

   b) Compare the terms 'productivity' and 'efficiency' in a competitive environment.   **8**

3. a) What is an "economic framework" and how it affects growth of an organization in future ?   **8**

   b) In your opinion, what are the different challenges faced by an emerging organization due to "globalization" ?   **8**

4. a) Define "convergence technology (CT)" and its role in development of technology industry.   **8**

   b) Take the case of 'telecommunications' industry and explain how it has benefitted from convergence with electronic and software industries.   **8**

5. Write short notes (**any 3**) :   **18**

   i) Supply Chain Management

   ii) Phases in Quality Management

   iii) Management Information System

   iv) Elements of Convergence Technology.

SECTION – II

6. a) Explain with examples significance of data communication in the modern industrial management scenario. **8**

   b) Explain basic elements of a typical communication system and the process of transfer of a message from a source to destination. **8**

7. a) Explain with suitable diagrams, how information and resources are shared and coordinated, considering the following : **8**

    i) Types of computer networks

    ii) Network topologies

    iii) Network strategies.

   b) Explain the meaning and principles of TQM (Total Quality Management). **8**

8. a) Compare system integrity and system security of an information system. **8**

   b) Explain the methodology of problem solving using system dynamics method. **8**

9. a) Explain the reasons of introduction of information integrity errors. **8**

   b) Explain the various control points for "Data Integrity" and how we can data integrity errors using them. **8**

10. Write short notes (**any 3**) : **18**

    i) Rise of supply chain information systems

    ii) Market price mechanism

    iii) Dynamo

    iv) Components of information.

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T.E. (E & TC) (Semester – II) Examination, 2011
WAVE THEORY AND ANTENNAS (New)
(2008 Pattern)

Time : 3 Hours   Total Marks : 100

Instructions *: 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

           *2) Answers to the **two** Sections should be written in **separate** books.*

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

           *4) Black figures to the **right** indicate **full** marks.*

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

           *6) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) What is Poynting vector ? What is its significance ? Derive an expression for Poynting vector P.   **8**

   b) State Maxwell's field equations and explain their significance. Derive the wave equation for lossless dielectric medium.   **8**

           OR

2. a) What is polarisation ? Explain linear, circular and elliptical polarisation.   **8**

   b) A plane electromagnetic wave having frequency of 10 MHz has an average Poynting vector of 1 W/m². The medium is lossless with relative permeability 2 and relative permittivity 3. Find,

     i) Velocity of propagation

     ii) Wave length

     iii) Impedance of the medium

     iv) rms electric field E.   **8**

3. a) Write a note on ionospheric abnormalities. **8**

   b) A television transmitting antenna mounted at a height of 120 m radiates 15 kW of power equally in all directions in azimuth at the frequency of 50 MHz. Calculate :

   i) Maximum line of sight range

   ii) Field strength at receiving antenna mounted at height of 16 m at a distance of 12 km

   iii) The distance at which the field strength reduces to 1 mW/m. **8**

   OR

4. a) Write short note on :

   i) Duct propogation

   ii) Multi-hop propogation. **8**

   b) Explain the following :

   i) MUF

   ii) Skip distance

   iii) D-Layer

   iv) Virtual height. **8**

5. a) Derive vector potential A for an electric current source J. **8**

   b) Calculate the effective length of $\lambda/2$ antenna. Given $R_r = 73\,\Omega$, $A_{e(max)} = 0.13\lambda^2$ and $\eta = 120\,\pi$. **8**

   OR

6. a) Define and explain the following antenna terminologies :

   i) Radiation pattern

   ii) Radiation power density

   iii) Radiation intensity

   iv) Directivity. **8**

   b) An antenna has radiation resistance of $72\,\Omega$, a loss resistance of $8\,\Omega$ and power gain of 12 db. Determine antenna efficiency and its directivity. **8**

SECTION – II

7. a) Derive power density and radiation resistance with respect to infinitesimal dipole. **10**

   b) Derive the equation for input impedance of half wave dipole. **8**

   OR

8. a) Describe the principles of End-fire and broadside arrays. Explain the principle of pattern multiplication with illustrative diagram. **9**

   b) Design a 4 element broadside Dolph-Tchebyscheff array of $\lambda/2$ spacing between elements. The pattern is to be optimum with a side lobe level 19.1 db down the main lobe maximum. **9**

9. a) What are the different antennas used at low frequencies ? Describe any one antenna in detail along with neat labelled diagram. **8**

   b) Explain the important features of a loop antenna. Describe radio direction finding. **8**

   OR

10. Write short note on the following :

    i) V-antenna

    ii) Wave antenna

    iii) Travelling wave antenna

    iv) Tower radiator. **16**

11. a) What are electromagnetic horn antennas ? What are the various types of horns ? What are their practical applications ? Compare these antennas with paraboloidal reflector antennas. **10**

b) A paraboloidal reflector antenna with diameter 20 m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.54. Calculate the antenna gain in decibels. **6**

OR

12. Write short note on the following :

i) Turnstile antennas

ii) Biconical antenna

iii) Microstrip antenna

iv) Yagi-Uda antenna. **16**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
INSTRUMENTATION FOR CHEMICAL ANALYSIS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions :   1) *Answers to the* **two** *Sections should be written in* **separate**
                              books.
                         2) **Neat** *diagrams must be drawn* **wherever** *necessary.*
                         3) *Black figures to the* **right** *indicate* **full** *marks.*
                         4) *Assume suitable data, if* **necessary**.

SECTION – I

1. a) Explain Qualitative analysis and Quantitative analysis. Give examples of different
    analytical methods. What is trace analysis ?   **8**

   b) Write a note on "Role of Instrumentation in chemical analysis".   **8**

                    OR

2. a) Explain principle and Instrumentation used for Electrophoresis.   **8**

   b) Explain principle and Instrumentation used for potentiometry.   **8**

3. a) Write a note on "Deviation of Beer-Lambert's law'.   **8**

   b) Explain with a neat diagram principle and working of Atomic Absorption
    Spectrometer.   **8**

                    OR

4. a) Explain with a neat diagram 'sputtering in hollow cathode lamp'.   **8**

   b) Differentiate :
      1) Single beam instrument and double beam instrument.
      2) Photocolorimeter and UV-VIS spectrophotometer.   **8**

5. a) Explain the principle of Atomic Emission Spectroscopy. With a neat diagram
    explain working of Flame Photometer.   **9**

   b) With a neat diagram, explain working of FTIR spectrometer.   **9**

                    OR

P.T.O.

6. Write notes on : **18**

   a) Plasma Excitation

   b) IR detectors

   c) Beer-Lambert's law.

SECTION – II

7. a) Explain with a neat diagram working of a Gas Chromatograph (GC). Also explain how retention time can be manipulated in GC. **10**

   b) Enlist various types of GC detectors and explain one GC detector in detail. **6**

   OR

8. a) Explain with a block diagram working of Mass Spectrometer. **8**

   b) Enlist various types of Mass Analyzers and explain one Mass Analyzer in detail. **8**

9. a) Explain working of NMR spectrometer. How sensitivity can be increase in NMR spectrometer ? **8**

   b) What is fluorescence. Explain with a neat diagram principle and working of a Spectrofluorimeter. **8**

   OR

10. a) Explain working of CO_2 analyzer. Also explain importance of gas analyzers. **8**

    b) What is Raman effect ? Explain working of Raman Spectrometer. **8**

11. a) Explain Bragg's law and also explain working of X-ray diffractometer. **9**

    b) What is Auger electron ? Explain Auger spectroscopy. **9**

    OR

12. Write notes on : **18**

    a) HPLC detectors

    b) Scintillation counter

    c) Carrier gas in GC.

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
EMBEDDED SYSTEM DESIGN (New)
(2008 Pattern)

Time: 3 Hours   Max. Marks: 100

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

SECTION – I

1. a) Explain the interrupt structure of 8051. What are the vector addresses of all the interrupts ? Explain all the SFRs related to Interrupts. How is the priority of interrupts decided ?   **10**

   b) Explain the use of pins XTAL 1 and XTAL 2 of 8051. What role do they play in generating the timing ? Also show the connections done to these two pins.   **8**

                                   OR

2. a) What is stack memory ? Where is it located in 8051 ? Explain the role of stack memory when executing interrupts.   **10**

   b) Explain the internal memory organization of 8051.   **8**

3. Write a program to transmit 40 bytes from internal data memory of 8051 at address 30H serially at a baud rate of 9600. Assume Fosc = 11.0592 MHz.   **6**

   Also draw the flowchart for the same   **4**

   Explain the calculations done for the specified baud rate.   **2**

   Explain all the SFRs used in the program and their configuration bits.   **4**

                                   OR

4. Write a program to measure pulse width of signal generating from a sensor using 8051. Store the pulse width as number of machine cycles in registers R0 and R1.   **6**

   Also draw the flowchart for the same.   **4**

   If the result is R0 and R1 is E123H, interpret the pulse width for Fosc = 2 MHz and Fosc = 6 MHz.   **2**

   Explain all the SFRs used in the program and their configuration bits.   **4**

5. An 8051 based temperature control system is to be designed with the control action as on -off. The heater is turned on and off with a relay. The sensor used for temperature measurement is Pt 100. The system is user friendly and has a 3×3 keys keyboard. Draw the scheme in detail covering the following points.

    i) Block diagram **4**

    ii) Keyboard interfacing **4**

    iii) ADC interfacing for sensor signal conditioning **4**

    iv) Relay Interfacing for heater on off **2**

    v) Relay on/off indicator **1**

    vi) Power on indicator. **1**

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

6. a) With a neat diagram, explain the interfacing of 3×3 matrix keyboard to 8051. Also draw a flowchart to explain the logic used for detection of key presses. **8**

    b) What is I2C communication ? Explain with neat waveforms the working of I2C communication. **8**

<div align="center">SECTION – II</div>

7. a) Explain Timer 1 operation of ATMega 8535 AVR microcontroller. **8**

    b) What is Brown out Reset ? What is the voltage level for Brown out detection in AVR microcontrollers ? **8**

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

8. a) Enlist the Architectural features of AT Tiny 2313. **8**

    b) The following is the TIMSK register of ATMega 8535 AVR microcontroller. Explain the bits of this I/O register. **8**

7	6	5	4	3	2	1	0
OCIE2	TOIE2	TICIE1	OCIE1A	OCIE1B	TOIE1	OCIE0	TOIE0
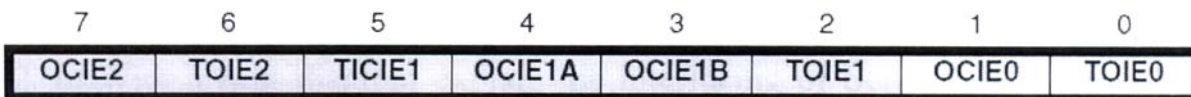
9. a) Explain the different clock sources which can be used with AVR microcontrollers. **8**

    b) Explain the RS232 communication link of AVR microcontrollers. **8**

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

10. a) Explain the following instructions of AVR microcontrollers : **8**
    i) CPSE Rd, Rs
    ii) NEG Rd
    iii) LD Rd, Y+
    iv) SEC.

    b) Explain the AVR hardware design issues with respect to Power Supply. **8**

11. Discuss the Design of Data Acquisition system with RS 232 interface using AVR microcontroller based on the following points.

    a) Block diagram **4**

    b) Description **4**

    c) Selection of ICs for the system **6**

    d) A general algorithm **4**

                    OR

12. a) With a neat schematic, explain the interfacing of stepper motor to AVR microcontroller. **10**

    b) With a neat diagram explain the interfacing of serial ADC to the AVR microcontroller. **8**

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T.E. (Instrumentation & Control) (Semester – I) Examination, 2011
CONTROL SYSTEM COMPONENTS (New)
(2008 Pattern)

Time : 3 Hours   Total Marks : 100

Instructions : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.
2) Answers to the **two** Sections should be written in **separate** books.
3) **Neat** diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.
6) Assume suitable data, if **necessary**.

SECTION – I

1. A) List 4 types of relays and explain with neat sketch the working of reed relay and give its application.   **8**

   B) Give the two applications of the following types of switches :
      i) Selector switch
      ii) Pressure switch
      iii) Proximity switch
      iv) DIP switch
      v) Thermostat.   **10**

                             OR

2. A) Draw the diagram and compare contactor with relay.   **8**

   B) Suggest a suitable switch for the following applications :
      i) Small switch for PCB mounting
      ii) Used for starting and reversing the direction of motor
      iii) Indicating full retraction and full extension of a two way cylinder
      iv) Automatic start and stop of a compressor
      v) Used for switching operation on test instruments.   **10**

3. A) What is meant by an interlock ? Explain by giving examples.   **8**

   B) List 4 types of starters. Draw using standard symbols electrical wiring diagram for direct online starter.   **8**

                             OR

4. A) What is braking of motors ? What are the various methods of braking ? Draw electrical wiring diagram for any one type. **8**

   B) Explain 4 types of motor protection circuits. **8**

5. A) Explain with neat sketch the pneumatic power supply circuit. List min. 6 components of pneumatic power circuit. **8**

   B) Explain ON delay and OFF delay timers with timing diagram. **8**

                    OR

6. A) Explain with neat diagram construction and working of following control valves

     i) 3/2 control valve

     ii) 4/3 control valve. **10**

   B) Draw and explain any two special types of pneumatic cylinders. **6**

                    SECTION – II

7. a) Draw the symbols and explain the function of the following hydraulic components

     i) Relief valve

     ii) Non return flow control valve

     iii) Pressure reducing valve

     iv) 4/3 direction control valve. **8**

   b) An 8 inch bore hydraulic cylinder has a $5\dfrac{3}{8}$ inch diameter piston rod. Develop using standard symbols a hydraulic circuit to develop equal forces while extending and retracting. **10**

                    OR

8. a) Name six general standard specifications used in the selection of hydraulic oil.   **6**

   b) Using standard symbols, draw hydraulic circuits for the following :   **12**
      i) Meter in
      ii) Meter out.

9. a) Explain with a neat sketch the construction and working of synchro. State its application.   **8**

   b) What are different standard ISA sequences for alarm annunciator ?   **8**

                    OR

10. a) Explain the construction and working of HRC fuse. State its advantages and disadvantages.   **8**

    b) State the use of damper. Explain any one type.   **8**

11. a) Explain various methods to make an instrument safe in hazardous area. Explain the concept of any one method.   **8**

    b) State the precautions to be taken for sanitary pipe fittings.   **8**

                    OR

12. a) Explain the following tube fittings
       i) Union
       ii) Tee
       iii) Elbow
       iv) Plug.   **8**

    b) Define hazardous area location and give its classification. Suggest appropriate protection method of each type.   **8**

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T.E. (Instrumentation and Control) (Sem. – I) Examination, 2011
ELECTRONIC INSTRUMENTATION
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions *: i) Solve Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** in Section **I**, Q.**7** or*
*Q.**8**, Q.**9** or Q.**10** and Q.**11** or Q.**12** in Section **II**. Total **six***
*questions to be attempted **minimum**.*
*ii) Start **each** question on a **new** page.*
*iii) Assume **suitable** data **wherever** required.*
*iv) **Neat** labelled diagrams are expected.*

SECTION – I

1. a) Draw and explain the block diagram of basic DMM. State the advantages and disadvantages of DMM.   **8**

   b) Define the following terms :   **4**

   i) Average voltage.

   ii) RMS voltage.

   iii) True RMS voltage.

   iv) Crest factor.

   c) Calculate the disturbance capacitance in a Q meter based on the given data :   **4**

   $f_1 = 2$ MHz $f_2 = 6$ MHz

   $C_1 = 100$ pF $C_2 = 10$ pF.

                              OR

2. a) Explain Auto Ranging and Auto Zeroing in VM.   **10**

   b) Explain series substitution and shunt substitution method to measure the unknown impedance using a Q meter.   **6**

                                                                    P.T.O.

3. a) Draw a neat labeled internal block diagram of 8038. With a suitable diagram explain the working of the sine wave converter in 8038. **8**

   b) With suitable diagrams explain the following : **8**

      i) Direct synthesis type of frequency synthesizer.

      ii) Sampled sine wave type of frequency synthesizer.

                    OR

4. a) Define jitter. Explain various types of jitter with suitable waveforms. **8**

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

      i) Pulse generator.

      ii) PLL type of indirect frequency synthesis.

5. a) Draw and explain the CRT in a CRO. **6**

   b) Differentiate between Analog CRO and Digital CRO. **4**

   c) Explain the roll mode and refresh mode in DSO. **8**

                    OR

6. a) Explain significance of following terms in oscilloscope : **8**

      i) Post deflection accelerator

      ii) Control grid

      iii) Delayed sweep

      iv) Focusing anode.

   b) Differentiate between Dual Beam and Dual Trace oscilloscope. **4**

   c) State the different types of probes. Explain the current probe and the attenuator probe. **6**

SECTION – II

7. a) What is quantization error ? State its types with the help of neat suitable graphs. **6**

   b) Compare the following : **8**

      i) SAR and Dual slope type of ADC.

      ii) Binary weighted and R-2R type of DAC.

    c) An 8 bit DAC has reference voltage V_{ref} = 5 V. What is the output voltage when binary input is B_{in} = 10110001 ? **2**

                OR

8. a) Explain R-2R ladder type of DAC with suitable diagram and example. **6**

    b) Determine conversion time of 16-bit ADC if clock frequency is 1 MHz and reference voltage is 5V for ADC. **2**

    c) Explain SAR type of ADC with suitable diagram and example. **8**

9. a) With a neat labeled diagram and necessary waveforms explain the totalizing mode of Universal counter. **8**

    b) State the different sources of error in digital instruments. Explain any three in detail. **8**

             OR

10. a) Explain the totalizing mode and ratio mode in Universal counter with suitable block diagrams and waveforms. **10**

    b) Explain digital capacitance meter. **6**

11. a) What is a spectrum analyzer ? Explain the heterodyne type of spectrum analyzer with the help of a neat block diagram. **9**

    b) Write short note on : **9**

       i) Virtual Instrumentation Architecture.

       ii) THD analyzer.

            OR

12. a) Write short note on : **15**

       i) Distortion meter.

       ii) Wave analyzer.

       iii) Virtual Instrumentation.

    b) State the difference between wave analyzer and spectrum analyzer. **3**

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T.E. (Instrumentation & Control) (Semester – I) Examination, 2011
INDUSTRIAL MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions*
*from Section – **II**.*
*2) Answers to the **two** Sections should be written in*
***separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
5) Use of logarithmic tables, slide rule, Mollier charts,
electronic pocket calculator and steam tables is
***allowed**.*

SECTION – I

1. a) Define management and explain the role of managers in global business
      environment.   **8**

   b) State and explain Porter's five forces. How they will be helpful in competitive
      business ?   **10**

                                          OR

2. a) Explain Business process Re-engineering.   **8**

   b) Explain the BCG matrix.   **8**

   c) Enlist the different functions of management.   **2**

3. a) Write a note on quality circle.   **8**

   b) What is SPC ? How it can be helpful in process industries ?   **8**

                                          OR

4. a) Explain expansion and diversification as business strategies.   **6**

   b) Explain in brief any five clauses of ISO 9001.   **10**

5. a) Explain the term 'purchasing ' in relation to a manufacturing industry. Give the general purchase procedure.   **10**

   b) Write a short note on store keeping.   **6**

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

6. a) A manufacturing unit uses 20000 units of a specific component. The ordering cost is Rs. 250 per order. The inventory carrying cost is 15% of average annual consumption value. The cost per unit of the component is Rs. 25. Assuming 300 working days in a year, determine

   i) Economic order quantity

   ii) No. of orders/year

   iii) Inventory cycle

   iv) Total inventory cost.   **10**

   b) Write a note on supply chain management.   **6**

<div align="center">SECTION – II</div>

7. a) Define motivation and explain Herzberg's Motivation theory.   **8**

   b) Giving importance, explain appraisal management.   **8**

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

8. a) What is the role of Job Description in manpower planning ? Explain.   **6**

   b) Define manpower planning. Explain its objectives, functions and techniques. **10**

9. a) What is capital ? What are the two types of capital ? Give the different sources of finance.   **8**

   b) Briefly explain CPM and PERT as a tool in project analysis. Differentiate these also.   **10**

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

10. a) A project consist of the following activities with different times.

Activity	Nodes	to	tm	tp
A	1-2	2	5	8
B	2-3	1	1	1
C	3-5	0	6	18
D	5-6	7	7	7
E	1-4	3	3	3
F	4-5	2	8	14

(Where, to = optimistic time, tm = most likely time, tp = pessimistic time)

Draw the network diagram. Calculate estimated time and deviation and variance. Show also the critical path on diagram.   **12**

b) What is CVP graph ? Explain its assumptions and importance.   **6**

11. What is disaster management ? Explain its causes, effects and mitigation mechanisms.   **16**

OR

12. Write notes on following.   **16**

a) Global warming -causes and effects

b) Safety and Environmental norms.

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING FUNDAMENTALS
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions : 1) Answer **3** questions from Section **I** and **3** questions from
                        Section **II**.
                   2) Answers to the **two** Sections should be written in **separate**
                        books.
                   3) **Neat** diagrams must be drawn **wherever** necessary.
                   4) **Use** of logarithmic tables slide rule, Mollier charts, electronic
                        pocket calculator and steam tables is **allowed**.
                   5) Assume suitable data, **if necessary**.

SECTION – I

1. a) Define the following terms :   **8**

    i) Linearity

    ii) Causality

    iii) Time varying and time invariant systems

    iv) Stability

   b) Obtain the linear convolution of the following sequences :   **8**

   x(n) = {1, 2, 1, 2}

   h(n) = {1, 0, 5, 1}

                        OR

2. a) Explain in detail with examples the basic operations performed on the signals.   **8**

   b) Sketch a discrete time signal $x(n) = 4^{-n}$ for $-1 \le n \le 1$ and obtain   **8**

    i) $y_1(n) = 2x(n) + \delta(n)$

    ii) $y_2(n) = x(n)u(2-n)$

3. a) Find the difference equation with the transfer function given as : **8**

$$H(z) = \frac{(1 + z^{-1})^2}{\left(1 - \frac{5}{2} z^{-1}\right)\left(1 + \frac{7}{4} z^{-1}\right)}$$

   b) Find the magnitude response and the impulse response of a system described by the difference equation : **8**

$$y(n) - 0.5y(n - 1) = x(n) - 0.25x(n - 1)$$

OR

4. a) A system has an impulse response **8**

$$h(n) = (0.5)^n u(n) + n(0.2)^n u(n)$$

   Draw the parallel realization of the system.

   b) Obtain direct form – I and form –II filter structure for a transfer function : **8**

$$y(n) = x(n) + \frac{1}{3} x(n - 1) + \frac{3}{4} y(n - 1) - \frac{1}{8} y(n - 2)$$

5. a) Explain the relationship between DTFT and DFT. **4**

   b) Calculate 8 point DFT of : **8**

   x(n)= {1, 1, 2,2}

   c) Determine the IDFT of the following sequence : **6**

   X(k)={4, 1–j, –2, 1+j}

OR

6. a) Find the circular convolution of the following sequences : **8**
   x(n) = {1, 0, 2, 3}
   h(n) = {2, 1}

   b) Determine the response of FIR filter using DFT if : **10**

   $x(n) = \left\{\underset{\uparrow}{2},1\right\}$

   $h(n) = \left\{2,\underset{\uparrow}{2}\right\}$

SECTION – II

7. Explain in detail different stages of decimation to obtain Radix – 2 Decimation in Time FFT algorithm. **16**

OR

8. a) Compute the eight point DFT of a sequence, **10**
   x(n)= {0.5, 0.5, 0.5,0.5,0,0,0,0,0}, using radix 2 decimation in time FFT algorithm.

   b) Explain how the inverse DFT can be obtained by means of FFT algorithm. **6**

9. a) Design the causal linear phase FIR filter for following specifications : **8**

   $$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & |\omega| \le \dfrac{\pi}{4} \\ 0, & \text{otherwise} \end{cases}$$

   Using Blackman window.

   b) Give the advantages and disadvantages of window method. **8**

OR

10. a) Find the magnitude and phase response function of fifth order low pass linear phase FIR filter with cut-off frequency 2 rad/sec using hamming window. **8**

    b) Why FIR filters are called as linear phase filters ? **8**

11. a) Using impulse invariance method design a digital Butter worth filter satisfies the following conditions : **12**

$$0.8 \leq \left|H(e^{j\omega})\right| \leq 1, \ 0 \leq |\omega| \leq 0.2\pi$$

$$\left|H(e^{j\omega})\right| \leq 0.2, \ 0.6\pi \leq |\omega| \leq \pi$$

Take T = 1 sec.

b) Write short note on bilinear transformation method. **6**

OR

12. a) Give the advantages and limitations of digital filters. **6**

b) Find H(z) using impulse invariance method at 5 Hz sampling frequency

from, $H(s) = \dfrac{2}{(s+1)(s+2)}$. **8**

c) Draw the characteristics of Chebyshev type – I and type – II filter. **4**

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
POWER PLANT INSTRUMENTATION
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

*Instructions : 1) Answers to the **two** Sections should be written in **separate***
books.
*2) **Neat** diagram must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume suitable data **if necessary**.*
*5) **All** questions are **compulsory**.*

SECTION – I

1. a) What is drying operation ? What is its need in industry ? Suggest suitable
scheme for control of dryer.   **8**

   b) What is Humidification and Dehumidification ? Explain in detail.   **8**

   OR

2. a) Draw a distillation column; name its parts along with supporting devices.
Explain its working detail.   **10**

   b) Give the detailed classification of compressors. Give its industrial applications.   **6**

3. a) What are the types of cooling towers ? Explain operation of closed cycle
cooling tower with neat sketch.   **8**

   b) Draw a neat diagram for cross flow and counter flow type heat exchanger.
In which case the heat transfer will be more ? Why ? Justify your answer.   **8**

   OR

4. a) Enlist basic elements of simpler refrigeration system. Draw the basic interconnection between them. Also draw the diagram showing conditions of the basic circuit as they appear on a pressure-enthalpy diagram. **12**

   b) Discuss in brief about waste water treatment in plant. **4**

5. a) What is working fluid in power plant ? What are the desirable features of working fluid ? **6**

   b) Draw and explain cogeneration-plant cycle based on a steam turbine as the prime mover (STCP). **12**

                              OR

6. a) Explain the need and procedure for power factor measurement in power plant. **9**

   b) Describe the limitations of the current transformer under short-circuit conditions. Describe the applicability of fiber-optic transducers. **9**

                      SECTION – II

7. a) Draw and explain three-element boiler feed water control system with schematic of electronic control system. **6**

   b) What is FBC ? Explain its principle. **6**

   c) Explain combustion control with neat sketch. **6**

                              OR

8. a) "Water tube boilers are most widely used in modern power plants", justify with suitable reasons. **6**

   b) What are the advantages gained by using economizer in modern power plant ? **6**

   c) What is the function of the superheater in power plant ? How they are classified ? **6**

9. a) Why thermal stress needs to be measured and controlled in turbine ? Explain how it is achieved. **8**

   b) What are functions of instruments used in power plant ? Name some of the mechanical and electrical instruments used power plant. **8**

   OR

10. a) What are the effects of Oxygen contamination of feed water ? How it is controlled ? **6**

    b) What is ionic purity meter ? Describe its working with the help of neat sketch. **6**

    c) Does chromatographic techniques are required in power plant ? If yes justify your answer with proper example. **4**

11. a) Enlist advantages and disadvantages of Diesel Power Plant. **8**

    b) How power can be obtained from solar energy ? Describe its methods in brief. **8**

    OR

12. a) What are primary and secondary energy sources ? Describe with suitable sketches how power can be obtained from wind ? Discuss its merits and demerits. **10**

    b) Write note on thermoelectric generator. **6**

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T.E. (Chemical) (Sem. – I) Examination, 2011
(2008 Pattern) (New)
MASS TRANSFER – I

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answer* **three** *questions from* **I** *and* **three** *questions from Section* **II**.
2) *Answers to the* **two** *Sections should be written in* **separate** *books.*
3) **Neat** *diagrams must be drawn* **wherever** *necessary.*
4) **Black** *figures to the* **right** *indicate* **full** *marks.*
5) **Use** *of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is* **allowed**.
6) *Assume* **suitable** *data, if necessary.*

SECTION – I

1. a) Discuss general principle of mass transfer operation and classify different mass transfer operations.   **6**

   b) A mixture of He and N_2 gas is contained in a pipe at 298° k and 1 atm total pressure which is constant throughout. At one end of the pipe at point 1 the partial pressure PA_1 of He is 0.6 atm and at the other end 20cm, $PA_2 = 0.2$ atm. Calculate the flux of He at steady state if Δ_{AB} of the He-N_2 mixture is 0.687 cm^2/sec.   **10**

OR

2. a) Discuss the general design principles established in the design of any plant involving the diffusional operations ?   **6**

   b) Calculate the amount of diffusion of acetic acid (A) in 2hrs. across a film on non-diffusing water (B) solution, 1mm thick at 17°C, when the concentration on opposite side of the film are 9 and 3 weight% acid respectively. The diffusivity of acetic acid in solution is 0.95×10^{-9} m^2/sec.

   Data : At 17°C, Density of 9% solution = 1012 kg/m^3

   Density of 3% solution = 1003 kg/m^3

   Mol.wt. of acetic acid = 60

   Mol.wt. of water = 18   **10**

3. a) State and explain Fick's law of diffusion. **4**

   b) Differentiate between molecular and eddy diffusion. **4**

   c) A volatile organic compound benzene costing Rs. 45 per kg is stored in a tank 10m diameter and open at top. A stagnant air film 10 mm thick is covering the surface of the compound beyond which the compound is absent. If the atmospheric temp. is 25º C. Vapour pressure of the compound is 150mm Hg and its molor diffusivity is 0.02 m^2/hr. Calculate the loss of benzene in Rs/day. **10**

   OR

4. a) State and explain Maxwell's law of diffusion. **8**

   b) Predict the diffusion coefficient of acetone in water at 25º C and 50º C using the Wilke-chang equation.
   Data : Viscosity of H_2O at 25ºC = 0.8937 Cp
   Viscosity of H_2O at 50ºC = 0.5494 Cp
   Acetone molar volume = 0.0756 m^3/kg mole
   Association factor = 2.26. **10**

5. a) Discuss the factors to be considered for the selection of a suitable solvent for gas absorption process. **6**

   b) A packed tower is designed to recover 98% CO_2 from a gas mixture containing 10% CO_2 and 90% air using water. The equilibrium relation is given as y = 14x, where y is kg Co_2/kg dry air and x is kg CO_2 /kg H_2O. The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if $(HTU)_{OG}$ = 1 m. **10**

   OR

6. a) Explain the absorption factor 'A'. **3**

   b) Write short note on absorption with chemical reaction. **5**

   c) Explain equipment used for absorption along with different types of packings. **8**

SECTION – II

7. a) Define wet bulb temp. and derive an expression relating wet bulb temp. with absolute humidity and psychrometric ratio. **10**

7. b) 30000 m³ of a gas at 289 °K and 101.3 KN/m² saturated with water vapor is compressed to 340 KN/m^2, cooled to 289 °K and condensed water is drained off. Subsequently the pressure is reduced to 170 KN/m^2 and the gas is distributed at this pressure and 289 °K. What is percentage humidity ? The vapor pressure of water at 289 °K is 1.8 KN/m^2. **8**

OR

8. a) An air, water sample has DBT 50° C and WBT 35° C, using humidity chart calculate, i) Absolute humidity, ii) Dew point, iii) Humid heat, iv) Percentage relative humidity, v) Enthalpy of saturated air, vi) Humid volume. The total pressure is 1 atm, average molecular weight of air is 28.84 and vapor pressure of air at 50° C is 0.1234×10⁵ N/m^2. **12**

8. b) What are the various type of cooling towers and equipments used for humidity measurement ? Explain any one in brief. **6**

9. a) Explain the terms a) Flooding and b) Loading. **6**

   b) Compare plate column and packed column. **7**

   c) Define i) Ideal tray, ii) Murphree tray efficiency, iii) Overall tray efficiency. **3**

OR

10. a) Explain construction and working of any two of the following with neat sketch.

   a) Venturi scrubber, b) Mechanically agitated vessel, c) Wetted wall column. **12**

10. b) What are various type of trays used in tray column ? Explain any one in brief. **4**

11. a) Data on drying rate curve of a particular solid is given below. The weight of the dry material is 48 Kg/m^2. Calculate the time required to dry the material form 25% to 8% moisture (dry basis).

    X :   0.30   0.20   0.18   0.15   0.14   0.11   0.07   0.05

    N :   1.22   1.22   1.14   0.90   0.80   0.56   0.22   0.05

    where x is $\dfrac{Kg\ water}{Kg\ dry\ solid}$ and $N-\dfrac{Kg}{m^2.hr.}$.   **12**

11. b) What are factors affecting rate of drying ?   **4**

OR

12. a) Explain drying rate curve with neat sketch.   **8**

12. b) A wet solid is to be dried from 35% to 10% moisture (wet basis) under constant drying conditions in fire hours. If the equilibrium moisture content is 4% and critical moisture content is 14%. How long it will take to dry solids to 6% moisture under the same conditions ?   **8**

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T.E. (Chemical) (Semester – I) Examination, 2011
INDUSTRIAL ORGANIZATION AND MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

Instructions : *1)* *Answer* **three** *questions from Section –* **I** *and* **three**
  questions from Section – **II**.
  2) *Answers to the two Sections should be written in*
  separate *books.*
  3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
  4) *Assume* ***suitable*** *data,* ***if*** *necessary.*

SECTION – I

1. a) Define Management and state the importance and characteristics of Management. **10**

   b) State various forms of business. Explain co-operative organization in detail. **8**

         OR

2. a) Explain the concept of Management by Objectives (MBO). **8**

   b) Explain with a neat sketch line and staff organization along with advantages
      and limitations. **10**

3. a) Explain the importance of training of personnel in Chemical Industry. Explain
      the various methods of training. **8**

   b) What is motivation ? How it is important for industry prospective ? **8**

         OR

4. a) What is meant by manpower planning ? What are the objectives and benefits
      of manpower planning ? **8**

   b) Explain Industrial fatigue along with its causes. **8**

5. a) Explain the functions of the Store Keeper. **6**

   b) Write short notes on : **8**
      1) LIFO   2) FIFO

   c) Define Tender and state its types. **2**

         OR

P.T.O.

6. a) Enlist the Objectives and functions of Purchase department. **8**

   b) Write Short notes on : **8**
      1) VED Analysis   2) MNG Analysis.

SECTION – II

7. a) Select a product of your choice and explain how will you market the product from Local to Global. **10**

   b) Define advertising and explain the functions and benefits of advertising department in an Industry. **8**

OR

8. a) Explain "Advertising as a promotional Tool". **6**

   b) Define pricing and enlist various factors affecting price fixation. **8**

   c) Explain the importance of sales forecasting. **4**

9. a) Explain in detail the elements and methodology for Total Quality Management. **10**

   b) What is Antidumping Duty ? Explain. **6**

OR

10. a) State and Explain patents and procedure of registration of a patent in India. **10**

    b) Write a note on ISO. **6**

11. a) Write short notes on : **6**
       1) FERA and   2) FENA

    b) State and Explain the need and advantages of work measurement. **10**

OR

12. Write short notes on : (**Any Three**) **16**
    1) Flow Diagrams and String Diagrams
    2) Work Measurement
    3) MRTP Act
    4) Therblings.

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T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL PROCESS TECHNOLOGY
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Describe the manufacturing of soda ash with reaction details and engineering problems involved in it. **12**

   b) Draw schematic representations of any four unit operations and give their applications. **6**

         OR

2. a) Describe production of elemental aluminium. **8**

   b) Discuss different methods for different salts recovery from sea water. **10**

3. a) Describe production of ammonia with engineering problems involved in it. **8**

   b) With a neat figure, describe the finnish process for sulphur. **8**

         OR

4. a) Describe manufacture of phosphoric acid by weak acid process. **8**

   b) Discuss DCDA process for sulphuric acid production. **8**

5. a) Describe the production of absolute alcohol by fermentation. **8**

   b) Explain how starch is produced from maize. **8**

         OR

6. a) Discuss production method of sucrose from sugarcane with engineering problems. **8**

   b) Write a note on pollution aspects in paper-pulp industry. **8**

P.T.O.

SECTION – II

7. a) Explain coking of coal and the types of coke oven. **10**

   b) Discuss how oil is extracted from natural raw materials. **8**

OR

8. a) Explain how cleaning action taken place when soap or detergents are used and discuss production of soap. **10**

   b) Describe production of penicillin. **8**

9. a) Write a note on refinery operations. Explain alkylation in detail. **8**

   b) Draw neat flow diagram and explain pyrolysis. **8**

OR

10. a) Discuss production of water gas and producer gas. **8**

    b) Draw neat flow diagram and discuss in brief

    1) Polymerization　　　　　　　　2) Hydrogenation. **8**

11. a) Explain manufacturing of vinylchloride via EDC. (ethylene dichloride) **8**

    b) Discuss production of phenol by cumene oxidation . **8**

OR

12. Draw neat flow diagram (**any 4**) : **16**

    a) Production of acetone

    b) Steam cracking of hydrocarbons

    c) Methanol production

    d) Production of phthalic anhydride

    e) Styrene production

    f) Production of Formaldehyde.

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T.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL REACTION ENGINEERING – I
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) **Assume** suitable data, if necessary.*

SECTION – I

1. a) Explain elementary and non-elementary reaction in detail.   **6**

   b) A reactant, called the substrate, is converted to product by the action of an enzyme, a high molecular weight (MW>10,000) protein like substance. An enzyme is highly specific, catalyzing one particular reaction or one group of reaction. Thus, $A \xrightarrow{\text{enzyme}} R$

   Many of these reaction exhibit the following behaviour.

   1) A rate proportional to the concentration of enzyme introduced into the mixture $[E_0]$

   2) At low reactant concentration, the rate is proportional to the reactant concentration $[A]$.

   3) At high reactant concentration the rate levels off and becomes independent of reactant concentration.   **12**

                    OR

2. a) A certain reaction has a rate given by

   $-r_A = 0.005 \, C_A^2$, Mol/(Cm^3. min)

   If the concentration is expressed in mol/lit and time in hours, what would be the value and unit of rate constant ?   **4**

b) Explain the kinetic model for non-elementary reaction. **6**

c) Experimental analysis shows that the homogeneous decomposition of ozone proceeds with a rate

$$-r_{O_3} = K[O_3]^2 [O_2]^{-1}$$

   i) Suggest a two step mechanism to explain this rate.
   ii) What is the overall order of reaction ? **8**

3. a) Show that, $C_A = C_{A_O} (1 - x_A)$. **4**

   b) Derive the design equation for variable volume batch reactor. **6**

   c) After 8 minute in a batch reactor, reactant ($C_{A_O} = 1$ mol/lit) is 80% converted, after 18 min, conversion is 90%. Find a rate equation to represent this reaction. **6**

                    OR

4. a) For the elementary reaction in series,

$$A \xrightarrow{k_1} R \xrightarrow{k_2} S, \ k_1 = k_2 \text{ at } t = 0$$

   Find the maximum concentration of R and when it is reached ? **10**

   b) Find first order rate constant for disappearance of A in the gas reaction, $A \rightarrow 1.6 \, R$. If the volume of reaction mixture starting with pure A increases by 50% in 4 minutes, the total pressure within the system stays at 1.2 atm and the temperature is 25°C. **6**

5. a) Explain holding time and space time for flow reactors. **4**

   b) Pure gaseous reactant A ($C_{A_O} = 100$ Millimole/lit.) is fed at a steady rate into a MFR (V = 0.1 lit) where it demerizes (2A → R) for different gas feed rates the following data are obtained.

v_o, lit/h	–	30	9.0	3.6	1.5
C_{A_F}, millimole/lit.	–	85.7	66.7	50	33.4

   Find a rate equation for this reaction. **12**

                    OR

6. a) In train of CSTR, of equal volume, an irreversible constant density first order reaction is carried out show that if number of CSTR is very large, the total volume of all reactors in series tends to that of PFR for some extent of conversion and show that,

$$\tau_{N, \text{ reactors}} = \frac{N}{K} [(Co/_C)^{1/N} - t]$$

$$\tau_p = \frac{1}{K} \ln (Co/_C) \qquad \qquad \mathbf{8}$$

b) Derive the design equation of recycle of PFR. **8**

SECTION – II

7. Explain quantitative treatment of mixed flow reactor for a first order reaction in series. **18**

OR

8. a) Explain instantaneous fraction yield and overall fractional yield. **4**

b) Give the qualitative discussion about product distribution in parallel reaction. **14**

9. a) Explain the effect of temperature on the reaction by collision theory. **6**

b) A 500 K the rate of a bimolecular reaction is ten times the rate at 400 K. Find the activation energy for this reaction.

 i) from Arrhenius law

 ii) from collision theory

 iii) What is the percentage difference in rate of reaction at 600 K predicted by these two methods. **10**

OR

10. a) Discuss optimum temperature progression (OTP) needed for optimum reactor performance. **4**

b) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. **6**

c) Exothermic reversible reaction $A \rightleftharpoons R$ carried out between 0°C to 100°C.

$$\Delta G^{\circ}_{298} = -14130 \text{ J / mole}$$

$$\Delta H^{\circ}_{298} = -75300 \text{ J/mole}$$

$$C_{P_A} = C_{P_R} = \text{constant.}$$

Calculate equilibrium conversion X_{A_e} at 75°C temperature. **6**

11. Write note on :

   i) Tank in series model, and

   ii) Disporsion model. **16**

                OR

12. a) From a pulse input a vessel the following output signal is obtained.

Time, minutes –	1	3	5	7	9	11	13	15
Concentration –	0	0	10	10	10	10	0	0

Using the variance matching procedure, determine the number of tanks to use. **8**

b) Explain E, F and C curve and find the relationship between them. **8**

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T.E. (Chemical) (Semester – II) Examination, 2011
TRANSPORT PHENOMENA
(2008 Course) (New)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate**
books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic
pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive the velocity profile and momentum profile for a Newtonian fluid
through a circular pipe inclined at angle β. Find the ratio of maximum
velocity to average velocity. **12**

   b) Compute the mean molecular velocity $\bar{u}$ cm sec^{-1} and the mean free path
λ cm in O_2 at 1 atm. and 273.2°K. Assume d = 3.0 $\overset{\circ}{A}$. What is the ratio of
mean free path to molecular diameter in this situation ? **6**

OR

2. a) What is Lennard Jones potential and what does it represents ? **4**

   b) What is the science of reheology ? **4**

   c) The following data are available on the viscosity of mixtures of hydrogen
and Freon-12 (dichloromethane) at 25°C and 1 atm.

x_1 mole fraction	$\mu \times 10^6$ g cm^{-1} Sec^{-1}
0.00	124.0
0.25	128.1
0.50	131.9
0.75	135.1
1.00	88.4

Compute and compare the values of three intermediate compositions, using
observed viscosities for pure components. **10**

P.T.O.

3. a) Determine $\mu^{(t)}/\mu$ at $S = R/2$ for water flowing at a steady rate in a long smooth round tube under following conditions.

   R = tube radius = 3 in

   $\tau_0 =$ wall shear stress $= 2.36 \times 10^{-5}$ lb$_f$. in^{-2}

   $\int =$ density $= 62.4$ lb$_m$ft^{-3}

   $\nu =$ Kinematic viscosity $= 1.1 \times 10^5$ ft^2 sec^{-1} **8**

   b) Define instantaneous pressure, time smoothed pressure and pressure fluctuations. **8**

   OR

4. a) Explain Buckinghams PI theorem. **4**

   b) Discuss friction factors for packed columns. **6**

   c) Explain friction factor and friction losses in pipe fittings, sudden expansion and contraction. **6**

5. a) Explain Chapman-Enskog theory for monoatomic gas at low density. **8**

   b) An electric current of 200 Amp. is passed through stainless steel wire having radius r = 1.26 mm and length L = 91 cm. The wire has resistance of $0.126\,\Omega$. The outer surface temperature. T_w is held at 422.1°K. The average thermal conductivity is K = 22.5 W/mk. Calculate the centreline temperature. **8**

   OR

6. a) Give the physical significance of Brinkman number and explain when will the temperature become maximum. **10**

   b) A 60W bulb is buried in soil (K=0.84w/m.K) and burnt untill a steady state is reached. Find the temperature 0.3 m away from it. **6**

SECTION – II

7. a) Heat is flowing through an annular walls of inside radius r_i and outside radius V_0. Thermal conductivity varies linearly from K_0 at T_0 to K_1 at T_1. Develop an expression for heat flow through wall at $r = r_0$. **12**

   b) Explain Deisslers empirical formula for the region near the wall. **6**

OR

8. a) Derive the expression for temperature distribution for the nuclear heat source stored at the centre in a spherical shell. Where will the temperature be maximum ? **10**

   b) What are semiempirical expressions for turbulent energy flux and what are their applications ? **8**

9. a) Estimate D_{AB} for a mixture of 80 mole percent methane and 20 mole percent ethane at 2000 Psia and 104°F (136 atm, 313°K) The experimental value of (ρD_{AB} at 293°K is 0.163 atm cm^2 sec^{-1}). **8**
   Data :
   Methane – $T_c = 190.7K$ $P_C = 45.8$ atm.
   Ethane – $T_c = 305.4K$ $P_C = 48.2$ atm

   b) Explain diffusion through stagnant gas film. **8**

OR

10. a) A large tank filled with a mixture of CH_4 and air is connected with second tank filled with a different composition of CH_4 and air. Both tanks are at 100 kN/m^2 and 0°C. The concentration between the tanks is a tube of ID. 2mm and length 1500 mm. Calculate the steady state rate of transport of CH_4 through the tube when the concentration of CH_4 is 90% (mole) in one tank and 50% (mole) in other. Assume that the transport is by molecular diffusion. **8**

    b) Discuss the procedure for setting up and solving mass flow problems in detail. **8**

11. a) Compare Ficks law of diffusion with Newtons law of viscosity and Fouriers law of thermal conductivity, state the analogous relation. **8**

    b) Explain diffusion in laminar falling film. **8**

OR

12. a) Discuss transfer coefficents at high mass transfer rates for penetration theory. **8**

    b) What is the difference between macroscopic and microscopic balance ? Explain with suitable example. **8**

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T.E. Chemical (Semester – II) Examination, 2011
MASS TRANSFER – II
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

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

*4) Black figures to the **right** indicate **full** marks.*

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

*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain TXY and PXY diagram.   **8**

   b) A mixture containing 70 mole % benzene and 30 mole % tolune is to be vaporized at 760 mm Hg pressure untill 1/3 moles of original liquid mixture are in vapor phase. Calculate the composite composition of the distillate and the residue when the separation takes place under equilibrium distillation. The average relative volatility of benzene with respect to tolune may be taken as 2.5.   **8**

OR

2. a) State and explain principle and operation of simple distillation.   **6**

   b) What is relative volatility ?   **2**

   c) What is Azeotropic system ? Explain Azeotropic distillation.   **8**

3. a) Explain q-line for different feed conditions.   **8**

   b) A feed containing 45 mole % of component A and rest water is to be continuously distilled to get a over head product as 95 % A and bottom product as 96 mole % water. Feed contains 30 mole % vapour. The relative volatility of the system is constant and is equal to 2.6.

   Calculate :
   i) Minimum number of plates at total reflux
   ii) Minimum reflux ratio
   iii) Number of theoretical stages if a reflux ratio of 2.5 times the minimum is used.   **10**

OR

4. a) What is Reflux Ratio ? Explain types of refluxes. **8**

b) A continuous fractionating column is to be designed to separate 13600 kg/hr of mixture of 40% benzene and 60% tolune in to an overhead product containing 97% benzene and bottom product containing 98% tolune (all wt%). A reflux ratio of 3.5 is to be used. Calculate the moles of overhead product and bottom product per hr. Determine the number of ideal plates and the

position of the feed plate if the feed is liquid at its boiling point. **10**

Mole fraction of Benzene in liquid	1.0	0.78	0.58	0.41	0.26	0.19	0.13
Mole fraction of Benzene in vapour	1.0	0.90	0.78	0.63	0.46	0.39	0.26

5. a) Describe the principle and operation of continuous counter-current multistage liquid-liquid extraction for immiscible system. **10**

b) What are the advantages of extraction over distillation ? **4**

c) What is selectivity ? **2**

OR

6. 200 kg of aqueous acetic acid solution containing 25% acetic acid is to be extracted with 150 kg of isopropyl ether solvent at 20°C. Two batch extractions are to be done with fresh and pure solvent. Estimate the quantities and compositions of the extract and raffinate products.

Water layer	A	98.1	95.5	84.4	71.1	59.8	37.1
	B	1.2	1.6	2.3	3.4	4.4	16.5
	C	0.69	2.89	13.3	25.5	36.7	46.4
Ether layer	A	0.5	0.8	1.9	3.9	6.9	15.1
	B	99.3	98.4	93.3	84.7	71.5	48.7
	C	0.18	0.79	4.82	11.4	21.6	36.2

A – Water, B – Ether, C – Acetic Acid. **16**

SECTION – II

7. a) Derive an expression for finding number of stages required in case of multistage counter current leaching. **12**

   b) Discuss in brief, factors affecting the rate of leaching. **4**

                        OR

8. Caustic soda is being made by treatment of slaked lime, $Ca(OH)_2$ with a solution of sodium carbonate. The resulting slurry consists of particles of calcium carbonate $CaCO_3$ suspended in a 10% solution of sodium hydroxide NaOH 0.125 kg suspended solid/kg solution. This is settled, the clear sodium hydroxide solution with drawn and replaced by an equal weight of water and the mixture thoroughly agitated. After repetition of this procedure (a total of two fresh water washes). What fraction of the original NaOH in the slurry remains unrecovered and therefore lost in the sludge ? The settling characteristics of the slurry, determined under conditions representing the practice to be followed in the process, show absorption of the solute on the solid. **16**

x = wt fraction NaOH in clear solution	0.090	0.070	0.0473	0.033	0.0208	0.01187	0.0071	0.0045
N = kg $CaCO_3$/kg solution in settled sludge	0.495	0.525	0.568	0.600	0.620	0.650	0.659	0.666
y* = wt fraction NaOH in solutionof the settled sludge	0.0917	0.0762	0.0608	0.0452	0.0295	0.0204	0.01435	0.01015

9. Air is being dried by passing it over silica gel in a particular operation 6 cm^3 of moist air (measured at 25°C and 1 atm abs. pressure) with an initial moisture content equivalent to 22 mm Hg partial pressure is passed over certain weight of silica gel (with an initial residual moisture content of 5 gms of moisture per 100 gms of dry gel) until the gel has attained 15 gms of moisture per 100 gms of dry gel. The resulting air is passed over new silica gel of equal quantity as used in the first operation. Calculate :

   a) The least moisture content of air that can be obtained and

   b) The final moisture content of silica gel. **16**

Equilibrium data :

gm moisture 100 gm dry gel	0	5	10	15	20	25	30	35	40
P.P. of H_2O in mm Hg	0	2.14	4.74	7.13	9.05	10.0	12.69	14.3	16.7

OR

10. a) State and explain types of adsorption. **6**

    b) Write principles of ion exchange process. **6**

    c) Explain the nature of adsorbents. **4**

11. a) Describe the methods of super saturation. **6**

    b) Explain with neat sketch of Hollow fibre membrane for gas permeation. **6**

    c) Calculate the yield of $MgSO_4\ 7H_2O$ crystals when 1000 kg saturated solution of $MgSO_4$ at 353 K (80°C) is cooled to 303 K (30°C) assuming 10% of the water is lost by evaporation during cooling.

    Data : Solubility of $MgSO_4$ at 353 K = 64.2 kg/100 kg water solubility of $MgSO_4$ at 303 K = 40.8 kg/100 kg water.

    At.wt. : Mg = 24, S = 32, H = 1 and O = 16. **6**

    OR

12. a) Explain Ultra filtration along with application. **6**

    b) State and explain working principles of Swenson Walker Crystalliser. **6**

    c) Write material and enthalpy balance of crystallization operation. **6**

_____

T.E. (Chemical) (Semester – II) Examination, 2011
PROCESS INSTRUMENTATION AND CONTROL
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. a) Explain functional elements of instruments in detail.   **8**

   b) Explain need and scope of process instrumentation.   **8**

                                         OR

2. a) Give the classification of instruments.   **8**

   b) Explain the difference between accuracy and precision in an instrument.   **8**

3. a) Define pressure and give classification of pressure measuring instruments.   **8**

   b) Explain with diagram, construction and working, bellows.   **8**

                                         OR

4. a) Define temperature and give classification of temperature measuring instruments. **8**

   b) Explain with diagram, construction and working, filled-system thermometer.   **8**

5. a) Explain classification of flow measuring instruments.   **9**

   b) Explain with diagram, construction and working, orifice meter.   **9**

                                         OR

6. a) Explain classification of level measuring instruments. **9**

   b) Explain with diagram, construction and working of buoyancy method. **9**

SECTION – II

7. Describe with diagram the following techniques of composition analysis. **16**

   a) IR absorption spectroscopy

   b) Ultraviolet absorption spectroscopy.

OR

8. Write note on (**any two**) : **16**

   a) HPLC

   b) Refractometry

   c) Ph meter.

9. a) Describe the heat exchanger automatic control system with block diagram. **8**

   b) Derive the dynamic response equation of first order system for step changes. **8**

OR

10. a) Explain with diagram first order and second order system. **8**

    b) State the differences between servo and regulatory operation. **8**

11. a) An air to open valve on the inflow controls level in a tank. When the process is at the set point the valve opening is 50% ? **9**

    An increase in outflow results in the valve opening increasing to a new steady state value of 70%. What is the resulting offset if the controller PB is :

    I) 50%   II) 25%

    b) Explain with diagram distributed control system. **9**

OR

12. a) State the differences between feedback and feed forward control. **9**

    b) Explain with diagram centralized digital control computerized system. **9**

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T.E. (Petroleum) (Semester – I) Examination, 2011
NUMERICAL METHODS AND GEO-STATISTICS
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions *: 1) i) In Section **I**, attempt Q.No. **1** or Q.No. **2**, Q.No.**3** or*
*Q.No.**4**, Q.No.**5** or Q.No.**6** and*

*ii) In Section II, attempt Q.No. **7** or Q.No.**8**, Q.No. **9** or*
*Q.No. **10**, Q.No. **11** or Q.No. **12**.*

*2) Answer to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **whenever** necessary.*

*4) **Black** figures to the **right** indicate **full** marks.*

*5) **Use** of electronic non-programmable pocket calculator is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Show that the function u = cosh x cos y is harmonic and find f(z) = u + iv
   where u = cosh x cos y in terms of z.   **6**

   b) Evaluate $\oint_c \dfrac{\sin^2 z}{\left(z - \pi/6\right)^3}$ dz where C is |z| = 1.   **5**

   c) Find the map of the straight line y = x under the transformation $w = \dfrac{z-1}{z+1}$.   **6**

                    OR

2. a) If f(z) = u+iv is analytic function, find f(z) if u + v = e⁻ˣ(cos y – sin y). **6**

   b) Find the bilinear transformation which maps the points z = 0, –1, i onto w = i, 0, ∞ . **5**

   c) Evaluate $\oint_c \dfrac{dz}{z^2 - 1}$ where C is the circle $x^2 + y^2 = 4$. **6**

3. a) Calculate the mean and standard deviation for the following table, given the age distribution of 542 members. **9**

Age in Years	20–30	30–40	40–50	50–60	60–70	70–80	80–90
No. of members	3	61	132	153	140	51	2

   b) Find the coefficient of correlation and regression lines to the following data.

x	5	7	8	10	11	13	16
y	33	30	28	20	18	16	9

   8

OR

4. a) Calculate the first four moments of the following distribution about mean and hence find β_1 and β_2 and comment. **9**

x:	0	1	2	3	4	5	6	7	8
f:	1	8	28	56	70	56	28	8	1

b) Find the co-efficient of correlation for the following table : **8**

x:	10	14	18	22	26	30
y:	18	12	24	6	30	36

5. a) The probability that a book will be favourably reviewed by three independent critics are $\frac{5}{7}, \frac{4}{7}$ and $\frac{3}{7}$ respectively. What is the probability that out of the three reviews a majority will be favourable ? **5**

b) If a random variable x follows binomial distribution with mean 5 and $P(X = 1) = 10P(X = 0)$. Find $P(X \geq 1)$. **5**

c) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week. $\left(\chi^2_{5\%0.05} = 11.09 \right)$. **6**

Day	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
No. of accidents	14	18	12	11	15	14

OR

6. a) If 20% of the bolts produced by a machine are defective, determine the probability that out of 4 bolts chosen at random (i) one bolt is defective (ii) At most two bolts will be defective. **6**

b) Wire less sets are manufactured with 25 soldered joints each. On an average,

1 joint in 500 is defective. How many sets can be expected to be free from

defective joints in a consignment of 10000 sets ? [use Poisson distribution].   **5**

c) A variable X follows a normal distribution with mean 12 and standard

deviation 4. Find $(X \geq 20)$ Area $= 0.4772$ when $z = 2$.   **5**

SECTION – II

7. a) Establish the following (with usual notations)

   i) $E = \left(\dfrac{\delta}{2} + \sqrt{1 + \dfrac{\delta^2}{4}} \right)^2$

   ii) $\dfrac{1}{\nabla} y_n - \dfrac{1}{\Delta} y_0 = y_0 + y_1 + y_2 + \ldots + y_n$

   iii) $hD = \log E = 2 \sinh^{-1} \left(\dfrac{\delta}{2} \right)$ **9**

   b) Use Simpson's $\dfrac{1}{3}^{\text{rd}}$ rule to find the area of the circle $x^2 + y^2 = 1$

   (taking h = 0.1). Also find the volume of the sphere of radius 1.   **8**

                    OR

8. a) For the following tabulated data :

x	1	2	3	4	5
y	3.47	6.92	11.25	16.75	22.94

Find y at x = 4.5 and $\dfrac{dy}{dx}$ at x = 1.5

using Newton's difference formulae. **8**

b) Evaluate $\displaystyle\int_0^{\pi} \dfrac{\sin^2\theta}{5+4\cos\theta}\,d\theta$

by Simpson's $\dfrac{3}{8}^{th}$ rule, taking $h = \dfrac{\pi}{6}$

Write the algorithm for Simpson's $\dfrac{3}{8}^{th}$ rule. **9**

9. a) Use method of Regula-Falsi to find a root of the equation $e^x - 4x = 0$ correct to three decimal places. Root lies in the interval (0, 1). Write the algorithm for the above method. **9**

b) Use method of least squares to fit a parabola of the form $y = ax^2 + bx + c$, to the following data

x	0	1	2	3	4	5	6
y	4	9	18	31	48	69	94

8

OR

10. a) Solve the following system of equations by Gauss-Seidel iterative method.

$10 x_1 + x_2 + x_3 = 12$

$2 x_1 + 10 x_2 + x_3 = 13$

$2 x_1 + 2 x_2 + 10 x_3 = 14$ **8**

b) Use Runge-Kutta method to solve the equation $\dfrac{dy}{dx} = \sqrt{x + y}$ with x = 0,

y = 1, h = 0.2 to find y at x = 0.4. **9**

11. a) Solve the Laplace equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid

shown in the figure. [h = k = 1]

8
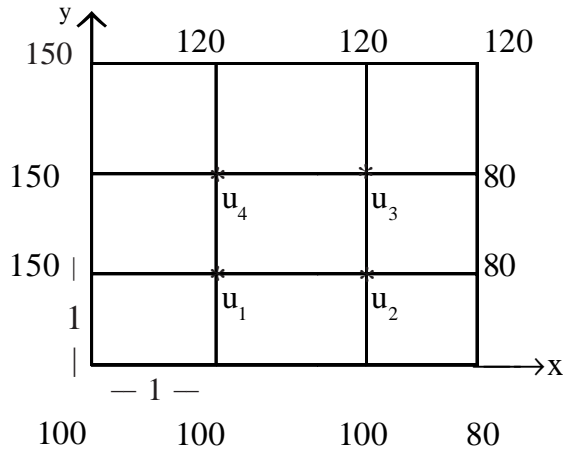
b) Solve the following LPP by Simplex method

Maximize z = $3x_1 + 6x_2 + 2x_3$
Subject to $\quad 3x_1 + 4x_2 + x_3 \leq 2$
$\qquad\qquad x_1 + 3x_2 + 2x_3 \leq 1$
and $\quad x_1, x_2, x_3 \geq 0$ **8**

OR

12. a) Solve the equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 2xy$ [h = k = 2] at the pivotal points of the

grid shown in the figure.

8
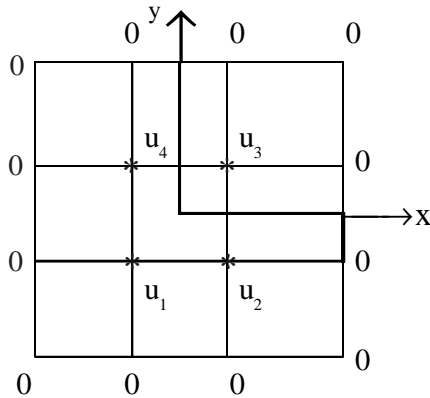
b) Solve the following LP problem by Simplex method.

Minimize z = $x_1 - 3x_2 + 2x_3$

Subject to $\quad 3x_1 - x_2 + 3x_3 \leq 7$

$\qquad -2x_1 + 4x_2 \leq 12$

$\qquad -4x_1 + 3x_2 + 8x_3 \leq 10$

and $\quad x_1, x_2, x_3 \geq 0$

8

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T.E. (Petroleum Engineering) (Semester – I) Examination, 2011
PETROLEUM GEOLOGY – I
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answers to the questions of **both** the Sections should be written*
                        ***separate** answer books.*
                   *2) Draw neat diagrams **wherever** necessary.*
                   *3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. A) Explain the term rock cycle with the help of a neat-labelled diagram. **6**

   B) How are sedimentary rocks recognized from igneous and metamorphic rocks ? **9**

                        OR

2. A) Write in brief on observations carried out in sedimentary rocks. **9**

   B) Describe mode of occurrence of igneous rocks. **6**

3. A) What are convergent and divergent plate boundaries ? **9**

   B) Explain the relationship between grain size and velocity of water in relation to erosion, transportation and deposition of sediments. **6**

                        OR

4. A) Draw the triangular classification of mass movement and describe different terms used. **6**

   B) How internal structure of earth is interpreted using velocity of seismic waves ? **9**

5. A) What are flexure and buckle folds ? Draw and explain structures associated with these folds. **10**

   B) How is presence of normal and reserves faults recognized in wells ? **10**

                        OR

6. A) Draw a representative composite failure envelope on a Mohr diagram along with sketches of fracture geometries that form during failure. **5**

B) Explain clay and shale smears with suitable diagrams. **10**

C) Describe the role of temperature, pressure and water in the deformation of rocks with increasing depth. **5**

SECTION – II

7. A) Following figure shows a cumulative weight percent plotted for sediments deposited in different sedimentary environments. **10**
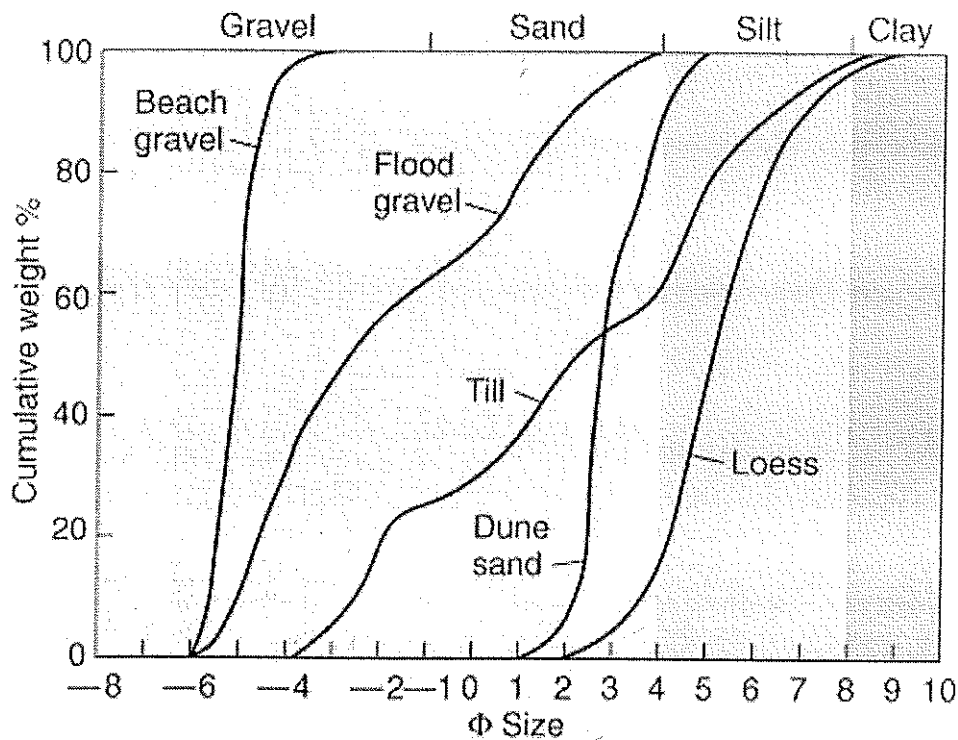
Classify and discuss maturity and sorting of sediments deposited in different sedimentary environments.

B) Draw and explain how geological history is reconstructed in the case of an angular unconformity. **5**

OR

8. A) What is a difference between grain supported and matrix supported framework in clastic sedimentary rocks ? **5**

   B) Discuss the Dunham's Scheme of classification of carbonate rocks. **10**

9. Write notes on **any three** of the following : **15**
   a) Marine depth zones and distribution of organisms.
   b) Trace fossils as an indicator of environment of deposition.
   c) Diagenesis.
   d) Dolomite and dolomitization.
   e) Normal Sedimentation and reverse sedimentation.
   f) Major components of carbonate rock.

10. A) Write "Geological Time Scale" in a tabular form with important events in each era. **8**

   B) Following sedimentary sequence is encountered in a well during wildcat drilling. A break in sedimentation exists between two successive units.

   Limestone deposited in the upper shoreface

   Sand deposited on the coastal plain

   Marine clay typical of offshore

   Limestone deposited in the lower shoreface
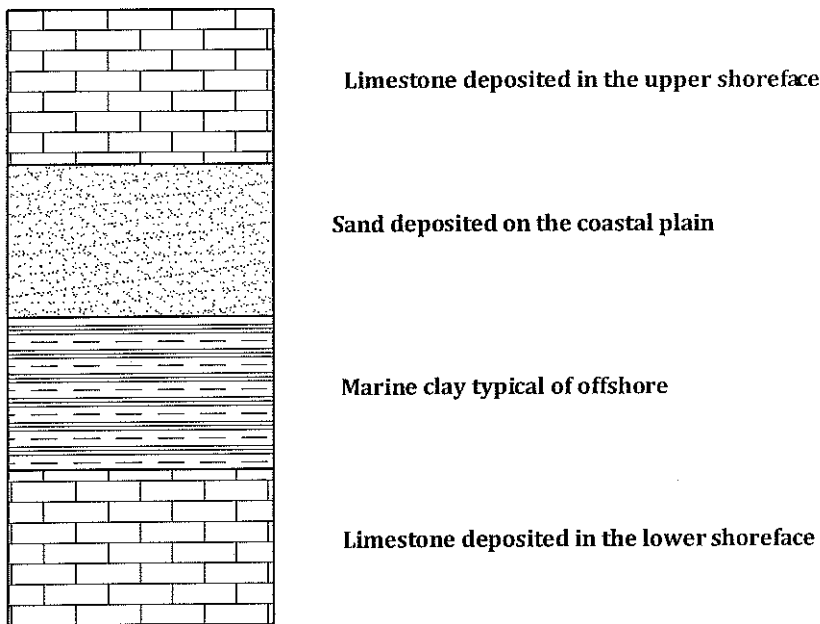
Fig. Q.10. B

   Reconstruct chronology of events based on emergence and submergence of coast. Provide brief explanation in support of your reconstruction. What is progradation and retrogradation ? **12**

OR

11. A) What is geological correlation ? **6**

B) What is genetic increment of strata ? Draw a cross section showing relationship between environment, facies and increment of sedimentation. **9**

C) How bedforms are generated as a result of grain size and velocity of depositional agent ? **5**

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T.E. (Petroleum) (Semester – I) Examination, 2011
HYDROCARBON PROPERTIES AND THERMODYNAMICS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What is a reversible process ? Give its characteristics.   **4**

   b) Give the limitations of the first law of thermodynamics and hence give the necessity of the second law.   **6**

   c) Water at 368 K is pumped from a storage tank at the rate of 25 m³/h. The motor for the pump supplies work at the rate of 2 hp. The water passes through a heat exchanger, where it gives up heat at the rate of 42000 kJ/min and is delivered to a second storage tank at an elevation of 20 m above the first tank. What is the temperature of water delivered to the second tank ? Assume that the enthalpy of water is zero at 273 K and the specific heat of ware is constant at 4.2 kJ/kg K.   **8**

           OR

2. a) Distinguish between state function and path function.   **4**

   b) Write a note on the Clausius inequality.   **6**

c) In a particular chemical plant, air at 800°C and 1 bar leaves a unit at a rate of 10 mol/s. An engineer plans to use the hot air as a source and the ambient atmosphere at 25°C as a sink to operate a heat engine and there by obtain some work and then supply the air at 200°C for use in the other unit. Assuming the air to be an ideal gas with $\gamma = 1.4$, calculate the entropies of the source and the sink and hence find the maximum power delivered by the engine.   **8**

3. a) Discuss the PVT behavior of pure fluids with phase diagrams.   **8**

   b) Assuming that ammonia obeys the Van Der Waals equation of state calculate the molar volumes of ammonia vapor at 1.95 MPa and 321.55 K. The Van Der Waals constants 'a' and 'b' for ammonia are 422.546×10^{-3} Pa(m³/mol)² and 37×10^{-6} m³/mol, respectively.   **8**

                         OR

4. a) Calculate the pressure developed by 1 kmol of gaseous ammonia contained in a vessel of 0.6 m³ capacity at constant temperature of 473 K by the following methods (i) Using the ideal gas equation (ii) Using the Van Der Waals equation (iii) Using the Redlich Kwong equation, given that the critical pressure and critical temperature are 112.8 bar and 405.5 K.   **8**

   b) What are compressibility charts ? Give their significance.   **4**

   c) State the Virial equation and give the significance of the Virial coefficients.   **4**

5. a) What do you understand by the number of degrees of freedom ? How is it determined using the phase rule for non-reacting systems ?   **8**

   b) If the pressure inside a pressure cooker is 200 kPa, what is the boiling point of water inside it ? The normal boiling point of water is 373 K and the latent heat of vaporization of water is 2257 kJ/kg at 373 K.   **4**

   c) Will it be possible to prepare 0.1 m³ of alcohol-water solution by mixing 0.03 m³ alcohol with 0.07 m³ pure water ? If not possible, what volume should have been mixed in order to prepare a mixture of the same strength and of the required volume ? Density of ethanol and water are 789 and 997 kg/m³ respectively. The partial molar volumes of ethanol and water at the desired composition are 53.6×10^{-6} m³/mol and 18×10^{-6} m³/mol respectively.   **4**

                         OR

6. a) Calculate the fugacity of CO at 50 bar and 400 bar, if the following data are applicable at 273 K. **8**

P, bar	25	50	100	200	400	800	1000
Z	0.9890	0.9792	0.9741	1.0196	1.2482	1.8057	2.0819

b) Write a note on the Joule Thomson Expansion. Give the significance if inversion curves. **8**

SECTION – II

7. a) Write a note on the boiling point diagram. Explain how it is helpful to understand the phase behavior of substances. **8**

b) A mixture contains 45% (mol) methanol (A), 30% (mol) ethanol (B) and the rest n- propanol (C). Liquid solution may be assumed to be ideal and perfect gas law is valid for the vapour phase. Calculate the following at a total pressure of 101.3 kPa.

i) The bubble point and vapour composition

ii) The dew point and liquid composition.

The vapor pressures of pure liquids are given below :

Temp, K	333	343	353	363
P_A, kPa	81.97	133.29	186.61	266.58
P_B, kPa	49.32	73.31	106.63	166.61
P_C, kPa	39.32	62.65	93.30	133.29

10

OR

8. a) What are azeotropes ? With proper phase diagrams distinguish between maximum and minimum azeotropes. What is the effect of pressure on azeotropic composition ? **8**

b) Assuming Raoult's law to be valid for the system of benzene (1) ethyl benzene (2) and the vapour pressures are given by the Antoine equations.

In P_1^S = 13.8858 – 2788.51/(T – 52.41)

In P_2^S = 14.0045 – 3279.47/(T – 60)

where P is in kPa and T is in K. Construct the T-x-y diagram. **10**

9. a) Derive the Young-Laplace equation for curved surfaces.   **8**

   b) Write a note on the Knudsen diffusivity.   **8**

                          OR

10. a) Write a note on the Kelvin's equation for lowering of vapour pressure. Give its
       limitation.   **8**

    b) Explain Darcy's law for permeability.   **4**

    c) Explain the terms 'Imbibition' and 'Drainage' with respect to saturation changes
       in porous media.   **4**

11. a) Explain the concept of wax precipitation. Give the effect of pressure on wax
       precipitation.   **8**

    b) With the help of a phase diagram, explain the formation of gas hydrates.   **8**

                          OR

12. a) Explain the precipitation of asphaltenes from bulk crude.   **8**

    b) With the help of neat sketches and examples, explain the solid liquid equilibrium
       diagram.   **8**

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T.E. (Petroleum) (Semester – I) Examination, 2011
PETROLEUM PRODUCTION OPERATIONS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) *Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or **4**, Q. **5** or **6** from*
*Section – **I** and Q. No. **7** or **8**, Q. No. **9** or **10**, Q. **11** or **12** from*
*Section – **II**.*
2) *Answers to the **two** Sections should be written in **separate** books.*
3) ***Neat** diagrams must be drawn **wherever** necessary.*
4) *Black figures to the **right** indicate **full** marks.*
5) ***Use** of logarithmic tables, slide rule, Mollier charts, calculator is **allowed**.*
6) *Assume suitable data, if **necessary**.*

SECTION – I

1. a) Draw the neat schematic sketch of a typical christmas tree and well head
equipment. Indicate various components.   **10**

   b) Draw the neat schematic sketch of a surface choke and write its functions.   **8**

                                  OR

2. a) List nine important components of a christmas tree and well head equipment and
write their functions in two/three lines.   **9**

   b) Write the advantages of e-line, slick line operations.   **4**

   c) Write the general steps involved in well completion procedure.   **5**

3. a) Draw the schematic sketch and name the equipment used to,   **8**
      i) establish communication between tubing and annulus.
     ii) control internal erosion of production tubing.

   b) What is SSV and SSSV ? Write its functions and draw the schematic sketch of a
typical SSSV.   **8**

                                  OR

4. a) Explain production tubing and its functions. Draw the schematic sketches of
tubing buckling, ballooning, tensile failure and write reasons for it.   **12**

   b) What is packer ? What are the functions of it ?   **4**

5. A well is completed with 6000 ft., of 2.875 inch tubing. The bottom hole static pressure is 2,000 psi and the P.I. is 0.25 bbl/day/psi. Additionally, the GLR is 300 cubic feet/bbl. Assuming tubing head pressure of 100 psi, at what rate will the well flow ? Use the given depth pressure gradient flow curves. (Refer the Gilbert Chart : Figures on page 4 to 7). **16**

OR

6. a) Explain pressure loss inside a production tubing as a function of production rate at various gas/liquid ratios. **6**

b) It was desired that a well having a P.I. of 0.5 bbl/(day) (psi) and a SBHP of 2050 psi will flow at a rate of 400 bbl/day. Well is completed with 2.875 inch tubing at 4000 ft. The GLR is 0.3 mcf/bbl. Will the well flow as per expectation ?
(Refer the Gillbert Chart : Figures on page 4 to 7). **5**

c) What is the THP of a well completed with 8000 ft., of 2.875 inch tubing, that is flowing at 600 bbl/day and a G.L.R. of 0.3 mcf/bbl, if the pressure at the bottom of tubing is 2000 psi ? (Refer the Gillbert Chart : Figures on page 4 to 7). **5**

SECTION – II

7. a) Write the general objectives of well completion and its types. Explain the role of well integrity in well completion. **9**

b) Draw the neat schematic sketch of a typical sub-surface completion of a producing wellbore. Indicate production casing, two tubing's, packers, use of screen and gravels to control sand production. Show three productive formations in it. **9**

OR

8. a) Explain perforation efficiency in brief. **4**

b) Write the functions of following : **14**
   i) well completion fluid
   ii) packer fluid
   iii) well swabbing
   iv) well circulation
   v) well activation
   vi) well perforation
   vii) Nitrogen gas in well services.

9. a) Construct typical graphs in following cases.

   i) IPR below bubble point and above bubble point, depletion drive

   ii) IPR before and after improvement of formation damage

   iii) GOR, PI and pressure trends against time for depletion drive. Indicate all the relevant features on it. **10**

  b) Use the equation of state and derive the formula of gas formation volume factor. Also estimate the value of gas formation volume factor for 0.818 gravity dry gas in a reservoir with temperature 220°F and reservoir pressure of 2200 psig. Assume gas compressibility factor, $Z = 0.855$. **6**

        OR

10. a) Write with exact explanation well productivity-advantages of horizontal well technology. **8**

  b) For a test at bubble point pressure the following data is available. **8**

    Calculate : Maximum flow rate using Vogel's IPR,

    Oil flow rate at bottom hole pressure flowing pressure = 600 psia.

    And Generate Vogel's IPR.

    Data given : Reservoir pressure = 2500 psi.

    Bubble point pressure = 2500 psi. Flowing bottom hole pressure is, 1100 psi at test flow rate = 530 bbls/day.

11. a) Classify different workover operations according to formation related problems and mechanical problems of a well. **4**

  b) Draw the schematic sketch and explain Gas 'Cusping' and water 'coning' phenomena. What are the reasons of it ? How to stop it ? Explain. **12**

        OR

12. a) Write in brief, short notes on **any two** of the following : **10**

    i) liquid loading of gas wells

    ii) well stimulation

    iii) effect of skin factor on well performance

    iv) PVT properties.

   b) When to go for Artificial lift technology ? Why ? Explain. **6**

Fig. – Q. 5 & Q. 6

Fig. – Q. 5 & Q. 6

Gradient Pressure in PSI

2.875-INCH, 100 B/D

Q/L RATIO IN MCF PER BBL

DEPTH SCALE IN THOUSANDS OF FEET. (B) GRADIENTS

DEPTH SCALE IN THOUSANDS OF FEET. (A) GRADIENTS

Approximate Depth-Pressure Gradients for 2.875 – in. Tubing / 100BPD
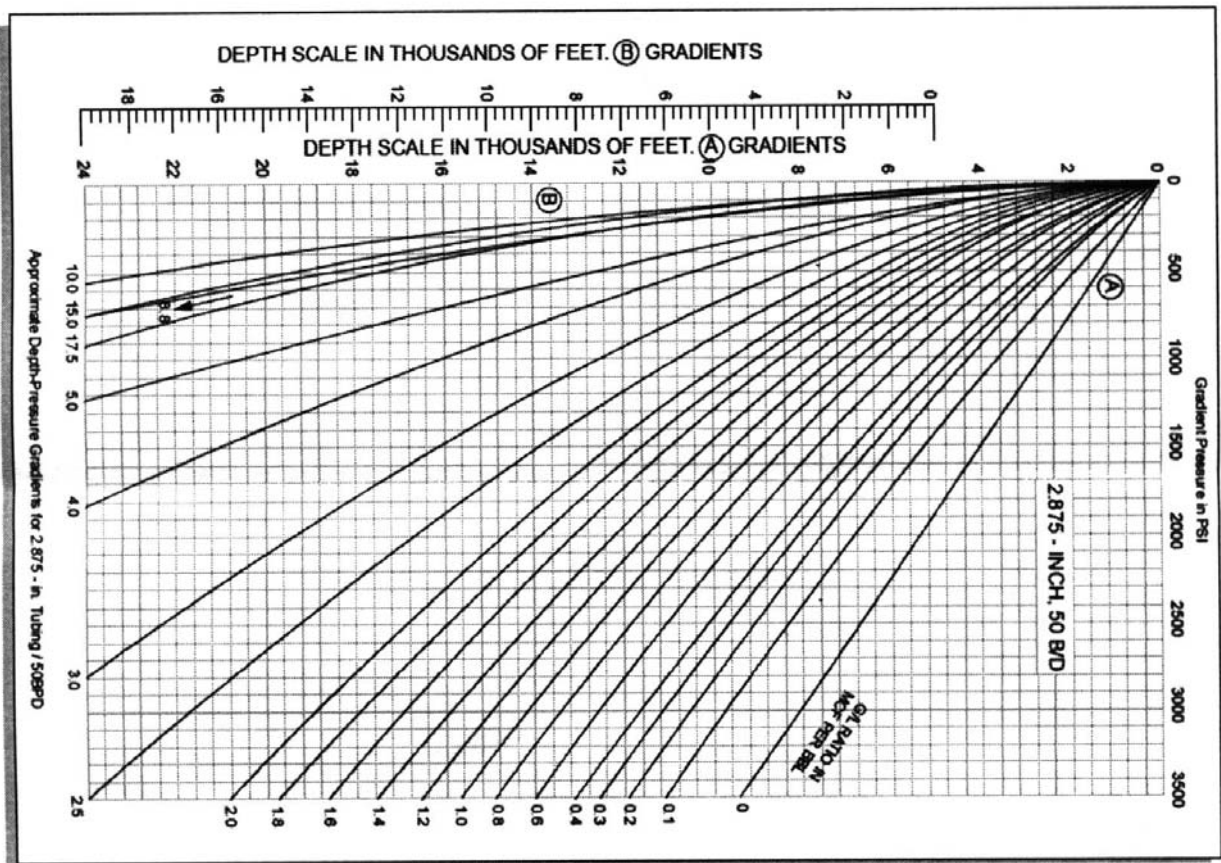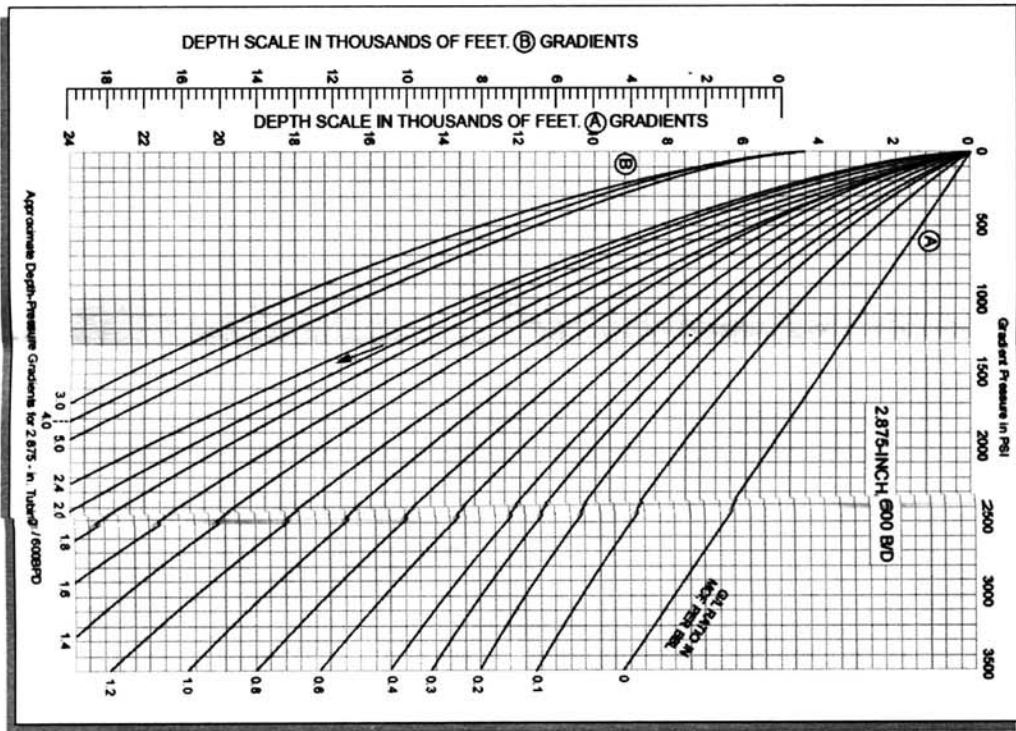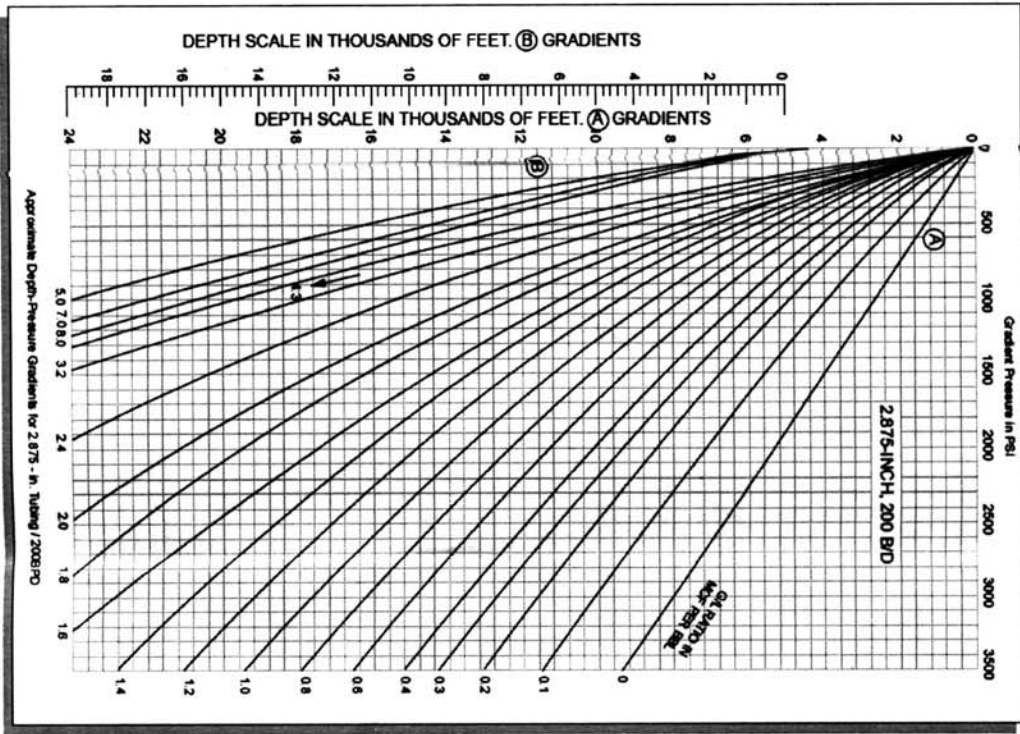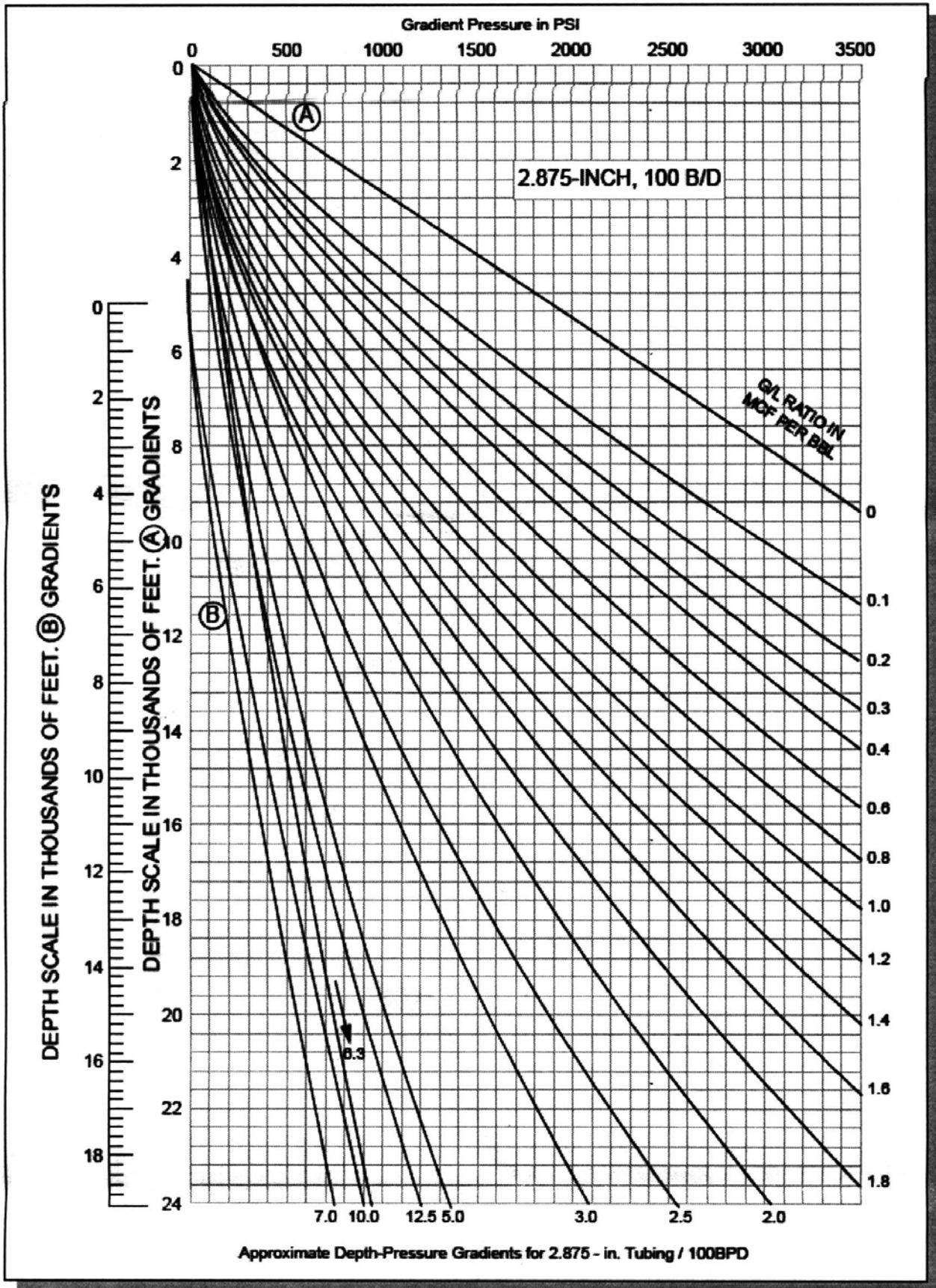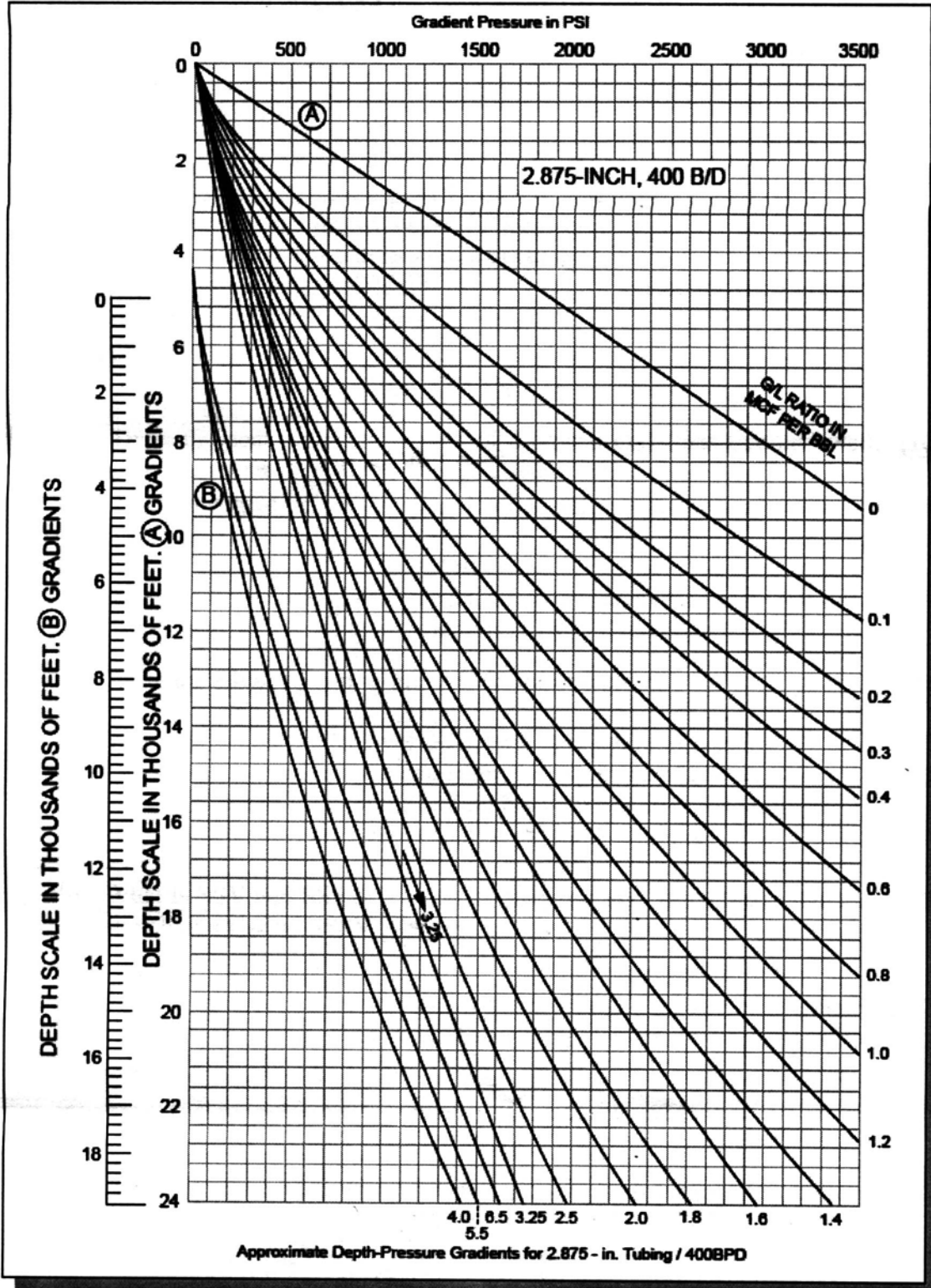
Fig. – Q. 5 & Q. 6

Fig. – Q. 5 & Q. 6

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T.E. (Petroleum) (Semester – II) Examination, 2011
PETROLEUM PRODUCTION ENGINEERING – I
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions :   *i) Answer Q.No.* ***1*** *or Q.No.* ***2****, Q.No.* ***3*** *or Q.No.* ***4****,*
Q.No. ***5*** *or Q.No.* ***6****, from Section –* ***I*** *and Q.No.* ***7*** *or*
Q.No. ***8****, Q.No.* ***9*** *or Q.No.* ***10****, Q.No.* ***11*** *or Q.No.* ***12***
from Section – ***II****.*
ii) Answers to the ***two*** *Sections should be written in*
separate *books.*
iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
iv) ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*
v) ***Use*** *of logarithmic tables, Slide rule, Mollier charts,*
electronic pocket calculator and steam tables is
allowed*.*
vi) Assume ***suitable*** *data,* ***if*** *necessary.*

SECTION – I

1. a) Compare various types of artificial lift techniques and their merits, demerits
over each other.   **14**

   b) Draw the schematic sketch of a 'Jet pump'.   **4**

OR

2. a) Draw the schematic sketch of Intermittent gas lift system and its working in
brief.   **9**

   b) Draw the schematic sketch of casing pressure operated gas lift valve and
explain its working in brief.   **9**

3. a) Use the following data and decide depth for point of gas injection. Also
prove that, for a continuous flow injection.   **10**
   $P_{wh} + Gfa.L + Gfb(D-L) = Pwf.$
   Depth = 8700 ft. Expected rate = 980 bbls/day. Tubing size = $2\frac{3}{8}$ inch.

P.T.O.

P_{wh} = 150 psig, SBHP = 2900 psig. P.I. = 2.8, solution GOR = 275, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 980 psig, °API = 40, S/C Temp. = 122 °F B.H. Temp. = 222 °F. 275 psi /1000 ft = flowing gradient of FBHP. 22.5 psi / 1000 ft = casing pressure gradient. Substract 100 psi from point of balance.

b) Calculate the total injection gas necessary if, optimum GLR = 600 SCF / STB, Formation GLR = 250 SCF / STB while desired oil production (100% oil) is 980 bbls/day.   **6**

OR

4. Explain in detail plunger assisted intermittent gas lift system.   **16**

5. a) Draw and explain the flow regimes such as bubble flow, slug flow, annular flow and mist flow.   **6**

   b) Explain working of sucker rod pumping system with a neat sketch.   **10**

OR

6. a) Explain and derive the equation to calculate ideal counterbalance effect.   **10**

   b) Draw typical dynagraph curves and indicate various operational problems of SRP system on it.   **6**

SECTION – II

7. a) Draw the typical pump performance curve for a submersible pump used in ESP. Explain various parameters and their reading on it.   **8**

   b) Draw the neat schematic sketch of subsurface assembly of ESP and indicate all the components in it. Explain the function of every component in brief.   **10**

OR

8. Draw the neat schematic sketch of a surface and sub-surface set up of ESP system. Also calculate, TDH and total HP, if pump with 0.37 HP/stag is available and each stage gives a head of 25 feet. Following data is available.

It was desired to produce fluid of Sp. Gravity 1.04 (No gas) at the rate of 1250 bbls/day from 5350 ft deep well. The static liquid level = 2100 ft. Casing = 5½ inch O. D. Tubing = $2\frac{3}{8}$ inch O.D T = 154 °F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3100 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 31.5 ft/1000 ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 40 ft., with friction = 30 ft / 1000 ft.   **18**

9. Draw the schematic sketch of a Petroleum Production system, indicate various features of it and explain nodal analysis in detail.   **16**

OR

10. Following data is available, indicating bottom hole flowing pressure Vs gas flow rate production and pressure drop in 2.441 inch tubing against the said flow rate and well conditions. Workout the operating points to know the perforation sizing, flow capacity and pressure loss across the sandface.   **16**

Q_{sc} Mscfd	Pwfs. Psia	ΔP psi (d = 2.441)
25,000	5690	470
20,000	5540	1470
15,000	5450	2200
10,000	5350	3060
5,000	5200	3710

Given data : (Relevant)

T_s = 110 °F, γ_g = 0.83, $\in$ = 0.0006 inch, H = 12,300 ft, T_R = 263 °F μ_g= 0.012 Cp, r_e = 1140 ft, r_w = 0.50 ft., S = 0, h = 20 ft., Perforation diameter = 0.7 inch., z = 0.97, Gravel permeability = 54 darcys., Screen O.D. = 3.06 inch., Hole diameter = 12.25 inch, 4 and 12 perforations per foot are to be checked.

11. a) Describe in brief matrix acidization job. **10**

   b) Write and explain chemical reactions for matrix acidization of Sandstone in brief. **6**

OR

12. a) Explain skin factor and its relevance for a damaged and improved well. **4**

   b) Explain the hydraulic fracturing job. Draw a typical surface read-out graph of this job and indicate all the features on it. **12**

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T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
NATURAL GAS ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answers to the **two** Sections must be written in*
*   **separate** answer books.*
*2) Answer **three** questions from **each** Section.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Neat** diagrams should be drawn **wherever** necessary.*
*5) **Use** of a non-programmable calculator is **allowed**.*
*6) Assume suitable data if necessary and **clearly** state it.*
7) Graph of z factor attached.

SECTION – I

1. Given the gas mixture whose composition is shown below :

Component	Mole Fraction, yi	Critical Temp, Tci (deg R)	Critical Pressure, Pci (psia)
C1	0.7	343.3	666.4
C2	0.12	549.9	706.5
C3	0.06	666.1	616
n-C4	0.12	765.6	550.6

Calculate the density of this gas mixture at 1000 psi and 150 degree F, treating it as

a – Ideal gas

b – Real gas

What is the error in % between the calculated densities above ?   **16**

2. a) Discuss the different pressure tappings used for gas measurement.   **6**

   b) Determine the gas flow rate through an orifice meter of the following conditions.
                                                                                         10

      a) Hw = 40 in. of water

      b) Pf = 143 psig (measured upstream)

      c) Tf = 84 deg F

      d) Psc = 14.4 psia

      e) Tsc = 60 deg F

      f) D = 4.026 in.

      g) Do = 1.50 in.

      h) γg = 0.68

      i) Y = 0.9971

      j) Z = 0.98

      k) Fb = 460.79

3. a) Explain in detail, the various types of flow regimes that affect the Inflow
      Performance Curve.   **6**

   b) Given Data :
      a) Pr = 5200 psia
      b) Re = 2300 ft
      c) H = 30 ft
      d) k = 15 mol
      e) Rw = 0.45 ft
      f) γg = 0.68
      g) Tr = 200 deg F
      h) S = 0
      i) Pwf = 0, 1000, 2000, 3000, 4000, 5000 psia

   c) Calculate the inflow performance curve relationship using pressure squared
      approach.   **10**

4. Write short notes on the following :   **18**

    a) Phase diagram of a gas reservoir

    b) Tubing intake curve

    c) Flowing and Static BHP

SECTION – II

5. Draw a process flow digram and explain the removal of H_2O in a gas stream.   **16**

6. a) Give a detailed description of the two basic types of compressors, their sub-types, with their advantages and disadvantages.   **10**

    b) For gases, what are the three types of compression cycles possible ? Explain in detail.   **6**

7. Using the following data, calculate the flow capacity of the pipeline, using the Weymouth, Panhandle A and Panhandle B equations. Which is the best ? Why ?   **16**

    i) P1 = 800 psia

    ii) P2 = 600 psia

    iii) d = 25.375 in.

    iv) L = 100 miles

    v) γg = 0.67

    vi) T avg = 505 deg R

    vii) Z avg = 0.846

8. Write short notes :   **18**

    a) Impurities in NG stream

    b) Parts of a compressor

    c) Series Pipeline

Table 1

1. Function of pressure ratio for gas flow through restrictions

$$F = \left\{ \left[\left(\frac{P_2}{P_1} \right)^{2/k} - \left(\frac{P_2}{P_1} \right)^{(k+1)/k} \right] \right\}^{1/2}$$

2. Flow rate at which erosion occurs

$$(q_{sc})_e = 1.86 \times 10^5 \ A \left(\frac{p}{zT\gamma g} \right)^{0.5}$$

3. In field units, the pressure drop for a single phase gas is given by :

$$-\frac{dp}{dL} = 5.057 \times 10^{-17}. \frac{f\gamma_g q_{sc}^2 zT}{d^5}. \frac{1}{p} + 0.01875 \frac{\gamma_g}{zT} \sin\theta.p$$

4. Standing-Katz z-factor chart given below

5. $Vo = 133,316 \ \gamma o/Mo$

6. $\gamma o = 141.5/(131.5 + API)$

7. Charles' Law $= V1/V2 = T1/T2$

8. $Mo = 42.43 \ \gamma o/(1.008 - \gamma o)$

9. $\gamma g = Rg \ \gamma sep + 4603 \ \gamma o/(Rg + Vo)$

10. $C' = F_b F_{tb} F_{pb} F_g F_{tf} F_r F_{pv} F_m Y$

11. Ideal gas Law $= PV = nRT$

12. $q_{sc} = C'(h_w p_f)^{1/2}$

13. Weymouth Equation

$$f = \frac{0.014}{d^{1/3}} \quad q_{sc} = 8.4038 \times 10^8 \sqrt{\frac{\left(p_1^2 - p_2^2\right)d^{16/3}}{y_g z T L}}$$

14. Panhandle A Equation

$$f = \frac{0.085}{N_{Re}^{0.147}} \text{ and } q_{sc} = 1.3919 \times 10^9 \left(\frac{p_1^2 - p_2^2}{zTL}\right)^{0.5394} \left(\frac{1}{\gamma g}\right)^{0.4604} d^{2.6182}$$

$$N_{Re} = 1667 \frac{q_{sc}\gamma_g}{\mu_g d}.$$

15. Panhandle B Equation

$$f = \frac{0.015}{N_{Re}^{0.0392}} \quad q_{sc} = 1.1912 \times 10^9 \left(\frac{p_1^2 - p_2^2}{zTL}\right)^{0.510} \left(\frac{1}{\gamma g}\right)^{0.49} d^{2.53}.$$

16. Pseudo-steady state radial flow of gas in a reservoir

$$q = \frac{kh[m(\bar{p}) - m(p_{wf})]}{1424T\left[ln\left(\frac{0.472r_e}{r_w}\right) + s + Dq\right]} \quad q = \frac{kh\left(\bar{p}^2 - p^2_{wf}\right)}{1424\,\bar{\mu}\,\bar{z}\,T\left[ln\left(\frac{0.472r_e}{r_w}\right) + s + Dq\right]}$$

17. Radial flow of compressible gases, in field units

$$Q_g = \frac{kh[m(P_e) - m(p_w)]}{1422T\left(ln\frac{r_e}{r_w}\right)} \quad Q_g = \frac{kh\left[p_r^2 - p_w^2\right]}{1422T(\mu_g z)_{avg}\left(\left[ln\frac{r_e}{r_w}\right]\right)}.$$

18. Pseudo Steady State flow of gas in the reservoir

$$q_{sc} = \frac{kh[m(p_r) - m(p_{wf})]}{1422T\left[ln\dfrac{r_e}{r_w} - \dfrac{3}{4} + s + DQ_g\right]} \qquad Q_g = \frac{703 \times 10^{-6}\, kh\,\left[p_r^2 - p_w^2\right]}{T(\mu_g z)_{avg}\left(\left[ln\dfrac{r_e}{r_w} - \dfrac{3}{4} + S\right]\right)}\;.$$

19. For a separator design, the gas capacity at standard conditions is given by :

$$q = \frac{2.40(D)^2(K)(p)}{z(T + 460)}\left[\frac{pL - p_g}{p_g}\right]^{0.5}\;.$$

20. Nikuradse equation for rough wall pipe calculations

$$\frac{1}{\sqrt{f}} = 1.74 - 2\log\left(\frac{2e}{D}\right)\;.$$

21. Colebrook and While equation for Reynold's number calculations

$$\frac{1}{\sqrt{f}} = 1.74 - 2\log\left(\frac{2e}{D} + \frac{18.7}{N_{Re}\sqrt{f}}\right)\;.$$

22. Boyle's Law P1V1 = P2V2.
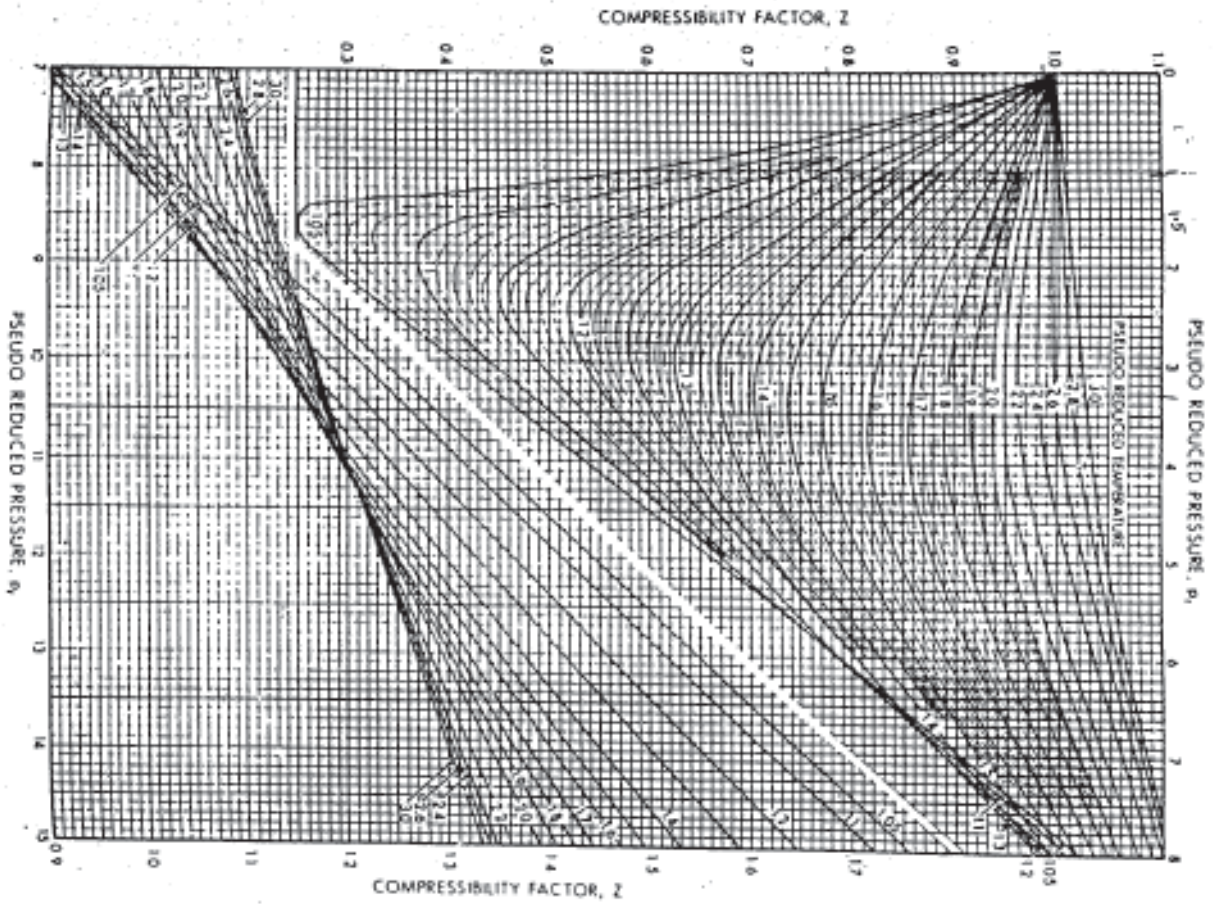
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T.E. (Petro Chemical) (Semester – I) Examination, 2011
NUMERICAL AND STATISTICAL METHODS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) In Section **I**, attempt Q.No. **1** or Q.No. **2**, Q.No. **3** or Q.No. **4**, Q.No. **5** or Q.No. **6**. In Section **II**, attempt Q.No. **7** or Q.No. **8**, Q.No. **9** or Q.No. **10**, Q.No. **11** or Q. No. **12**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Use of non-programmable electronic pocket calculator is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain : **6**

   i) Optimum solution

   ii) Slack variables

   Find all basic feasible solutions to the system of equations :

   $x_1 + 2x_2 + x_3 = 4$

   $2x_1 + x_2 + 5x_3 = 5$

   b) Solve the following LPP problem using simplex method : **10**

   Maximize $z = 10x_1 + x_2 + 2x_3$

   Subject to constraints :

   $x_1 + x_2 - 2x_3 \leq 10$

   $4x_1 + x_2 + x_3 \leq 20$

   $x_1, x_2, x_3 \geq 0$

   OR

2. a) Write the dual of the following LPP : **6**

   Maximize $z = 2x_1 + 3x_2 + x_3$

   Subject to constraints :

   $4x_1 + 3x_2 + x_3 = 6$

   $x_1 + 2x_2 + 5x_3 = 4$

   $x_1, x_2, x_3 \geq 0$

   b) Apply the principle of duality to solve following LPP : **10**

   Maximize $z = 3x_1 - 2x_2$

   Subject to constraints

   $x_1 + x_2 \leq 5$

   $x_1 \leq 4$

   $1 \leq x_2 \leq 6$

   $x_1, x_2 \geq 0$

3. a) A company has three plants X, Y, Z and three warehouses A, B, C. Number of units available at the plants are 2, 3, 5 respectively. Demands at A, B, C are 4, 1, 5 units respectively. The unit costs of transportation are as follows : **10**

	A	B	C
X	7	3	4
Y	2	1	3
Z	3	4	5

   Find the optimum solution to the above transportation problem, using Vogel's approximation method.

b) A department has five employees and five jobs are to be performed. The time each man will take to perform each job is given in the effectiveness matrix below. How the jobs be allocated, one per employee, so as to minimize the total man hours ? **6**

Employee

	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	5	11	9	7	12
E	7	9	10	4	12

OR

4. a) Find the optimum solution for the following transportation problem, using Vogel's approximation method. **10**

	A	B	C	D	E	availability
I	4	1	3	4	4	60
II	2	3	2	2	3	35
III	3	5	2	4	4	40
Demand	22	45	20	18	30	

b) Solve the following assignment problem. **6**

	I	II	III	IV	V
A	6	5	8	11	16
B	1	13	16	1	10
C	16	11	8	8	8
D	9	14	12	10	16
E	10	13	11	8	16

5. a) Obtain correlation coefficient between population density (per square miles) and death rate (per thousand persons) from data related to 5 cities.   **7**

Population density	200	500	400	700	300
Death Rate	12	18	16	21	10

   b) In sampling a large number of parts manufactured by a machine, the probability of a part being defective is 0.1 in a sample of 20. Out of 1000 such samples, how many would be expected to contain at least three defective parts.   **5**

   c) The accidents per shift in a factory are given by the table :   **6**

Accidents x per shift	0	1	2	3	4	5
Frequency y	142	158	67	27	5	1

   Fit a Poisson Distribution to the above table and calculate theoretical frequencies.

                    OR

6. a) Obtain regression lines for the following data.   **7**

x	6	2	10	4	8
y	9	11	5	8	7

   b) If the amount of cosmic radiations to which a person is exposed while flying across a specific continent is a normal random variable with mean 4.35 units and standard deviation 0.59 units. Find the probabilities that the amount of exposure during such a flight is between 4.00 and 5.00 units.

   Given Z = 0.59 , 1.10

   Area = 0.2224 , 0.3643   **5**

c) A set of five similar coins is tossed 210 times and the result is given below. Test the hypothesis that the data follow a binomial distribution. **6**

Given $\chi^2_{5\,:\,0.05} = 11.070$

No. of heads	0	1	2	3	4	5
Frequency	2	5	20	60	100	31

SECTION –II

7. a) With usual notations establish the following . **9**

   i) $\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)(1+\Delta)^{\frac{1}{2}} = 2 + \Delta$

   ii) $E = C^{hD}$

   iii) $E^{\frac{1}{2}} = \mu + \dfrac{1}{2}\delta$

   b) Evaluate $\displaystyle\int_{2}^{6} \log_{10} x \, dx$ by using Simpson's $\frac{1}{3}$ rule, taking n = 6. **8**

OR

8. a) Find $\dfrac{dy}{dx}$ given **8**

x	0	1	2	3	4
y(x)	1	1	15	40	85

Hence find $\dfrac{dy}{dx}$ at x = 0.5.

b) A function y = f(x) is given by following table. Find f(0.2) by suitable formula. And also find f(5.8) by suitable formula. **9**

x	0	1	2	3	4	5	6
y = f(x)	176	185	194	203	212	220	229

9. a) Find the real root of the equation $x^4 - x - 9 = 0$ by Newton-Raphson method correct to three places of decimal. **8**

   b) Solve the following systems of equations, by Guass elimination method. **8**

   $$x_1 + 2x_2 - 2x_3 + 8x_4 = 37$$
   $$5x_1 + 4x_2 + 7x_3 - 2x_4 = 4$$
   $$6x_1 - 12x_2 - 8x_3 + 3x_4 = 49$$
   $$3x_1 - 7x_2 - 9x_3 - 5x_4 = -11$$

   OR

10. a) Solve the following system equation by Guass-Seidal method. **8**

   $$30x - 2y + 3z = 75$$

   $$x + 17y - 2z = 48$$

   $$2x + 2y + 18z = 30$$

   b) Fit a second degree parabola to the following data using the method of least squares by taking the equation. **8**

x	10	12	15	23	20
y	14	17	23	25	21

   as $y = ax^2 + bx + c$.

11. a) Solve $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$, correct to two decimal places, at nodal points of square

   grid using the boundary values indicated. **9**
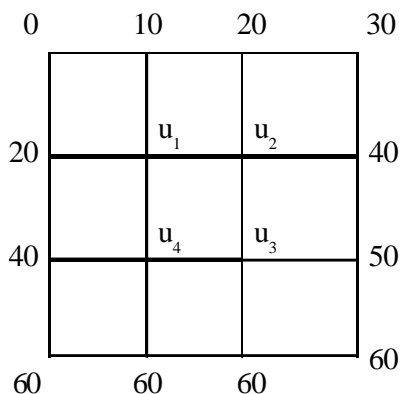
b) Apply Runge-Kutta method to find an approximate value of y when x = 0.2 given that **8**

$$\frac{dy}{dx} = x + y, y = 1 \text{ when } x = 0 \text{ and } h = 0.1.$$

OR

12. a) Using modified Euler's method find the value of y at x = 0.2 with h = 0.1

where $\frac{dy}{dx} = 1 - y$, with y(0) = 0. **8**

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

square mesh with sides x = 0, y = 0, x = 3, y = 3 with u = 0 on the boundary and mesh length 1 unit, correct to one place of decimal. **9**

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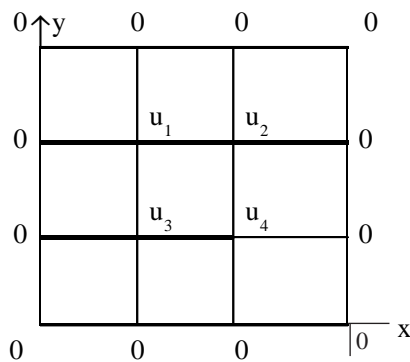
T.E. (Petrochemical) (Semester – I) Examination, 2011
APPLIED HYDROCARBON THERMODYNAMICS
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions : *1) Answer **3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

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

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

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Discuss briefly regarding the scope and limitations of thermodynamics in process design.   **4**

   b) Derive an expression for the first law of thermodynamics for flow process.   **6**

   c) Hydrocarbon oil is cooled from 425 K to 340 K at a rate of 5000 kg/h in a parallel flow heat exchanger. Cooling water at a rate of 10000 kg/h at 295 K is available. The mean specific heats of the oil and water are 2.5 kJ/kg K and 4.2 kJ/kg K respectively.   **8**

   i) Determine the total change in entropy. Is the process reversible ?

   ii) If a reversible Carnot engine is to be operated receiving the heat from the oil and rejecting the heat to the surroundings at 295 K, how much work would be available ?

OR

2. a) State and explain the Carnot principle. **6**

   b) An insulated rigid container contains air at 5 bar and 375 K. The volume of the container is $1m^3$. Air may be assumed to behave as an ideal gas. The specific heat C_v of air is 20.785 kJ/kmol K. The temperature of air is increased by rotating paddle wheel. Calculate the work done to raise the temperature of air to 425 K. **6**

   c) Write a short note on the concept of exergy. **6**

3. a) State and explain any four equations of state for real gases. **8**

   b) Using the Virial equation, calculate the molar volume and compressibility factor of isopropanol vapour at 473 K and 10 bar. The Virial coefficients are :

   $B = -3.88 \times 10^{-4} \ m^3/mol$; $C = -2.6 \times 10^{-8} \ m^6/mol^2$. **8**

   OR

4. a) Explain PVT behavior of pure substances with PV and PT diagrams. **8**

   b) An ideal gas undergoes the following reversible processes : **8**

   i) From an initial state of 343 K and 1 bar, it is compressed adiabatically to 423 K

   ii) It is cooled to 343 K at constant pressure.

   iii) Finally, it is expanded to its original state isothermally.

   Calculate the change in internal energy, change in enthalpy, work done and heat given or absorbed for each step as well as the entire cycle. Assume $C_v = (3/2)R$.

5. a) What are Maxwell's equations ? Give their significance. Derive any one of the Maxwell's equations from first principles.   **8**

   b) The variation of vapour pressure of benzene with temperature is given in the table below.   **8**

T, K	280.6	288.4	299.1	315.2	333.6	353.1
P, bar $\times 10^2$	5.33	8.00	13.30	26.70	53.33	100

   Estimate the latent heat of vaporization of benzene and its vapour pressure at 393 K.

                              OR

6. a) Calculate the fugacity of liquid water at 30°C and 10 bar. Use the steam tables if necessary. State the assumptions made.   **6**

   b) Write short notes on :   **10**

      i) Joule Thomson Expansion

      ii) Thermodynamic Property diagrams

      iii) Chemical Potential.

                      SECTION – II

7. A hydrocarbon mixture contains 35% (mol) propane, 30% (mol) n-butane and 35% (mol) n-pentane at 1447.14 kPa. Assume the solution to be ideal. Calculate the temperature and composition of the liquid and vapor in equilibrium when 55% (mol) of the initial mixture is vaporized. (The K_i values may be obtained from the K-charts provided in the appendix on the last page).   **16**

                              OR

8. A hydrocarbon mixture contains 35%(mol) propane, 30% (mol) n-butane and 35% (mol) n-pentane at 1447.14 kPa. Assume the solution to be ideal. Calculate

   i) The bubble point and the composition of vapor.

   ii) The dew point and the composition of liquid **16**

(The K_i values may be obtained from the K-charts provided on the last page)

9. The azeotrope of the ethanol-benzene system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4 K at 101.3 kPa. At this temperature the vapor pressure of benzene is 68.9 kPa and the vapor pressure of ethanol is 67.4 kPa. What are the activity coefficients in a solution containing 10% alcohol ? **18**

OR

10. Ethyl alcohol and hexane form an azeotrope at 33.2% (mol) ethyl alcohol. It boils at 331.9 K at 101.3 kPa. At 331.9 K, the vapor pressures are 44.25 kPa for ethanol and 72.24 kPa for hexane. Determine **18**

   i) The van Laar constants

   ii) The activity coefficients for 20% ethanol – 80% hexane solution.

11. Methanol is produced by the following reaction : **16**

$$CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$$
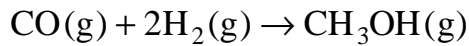
The standard heat of formation of $CO(g)$ and $CH_3OH(g)$ at 298 K are -110500 J/mol and - 200700 J/mol respectively. The standard energies of formation are - 137200 J/mol and - 162000 J/mol respectively.

i) Calculate the standard free energy change and determine whether the reaction is feasible at 298 K.

ii) Determine the equilibrium constant at 400 K assuming that the heat of reaction is constant.

OR

12. The standard free energy change for the reaction **16**

$$C_4H_8(g) \rightarrow C_4H_6(g) + H_2(g) \text{ is given by the relation}$$
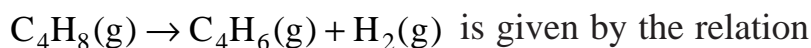
$$\Delta G_T^0 = 1.03665 \times 10^5 - 20.9759 \, T \ln T + 12.9372T$$

Where ΔG_T^0 is in J/mol and T is in K.

Calculate the equilibrium conversion for the operation at 5 bar and 900 K if the feed consists of 50% (mol) butane and 50% inerts.

Appendix – K Charts
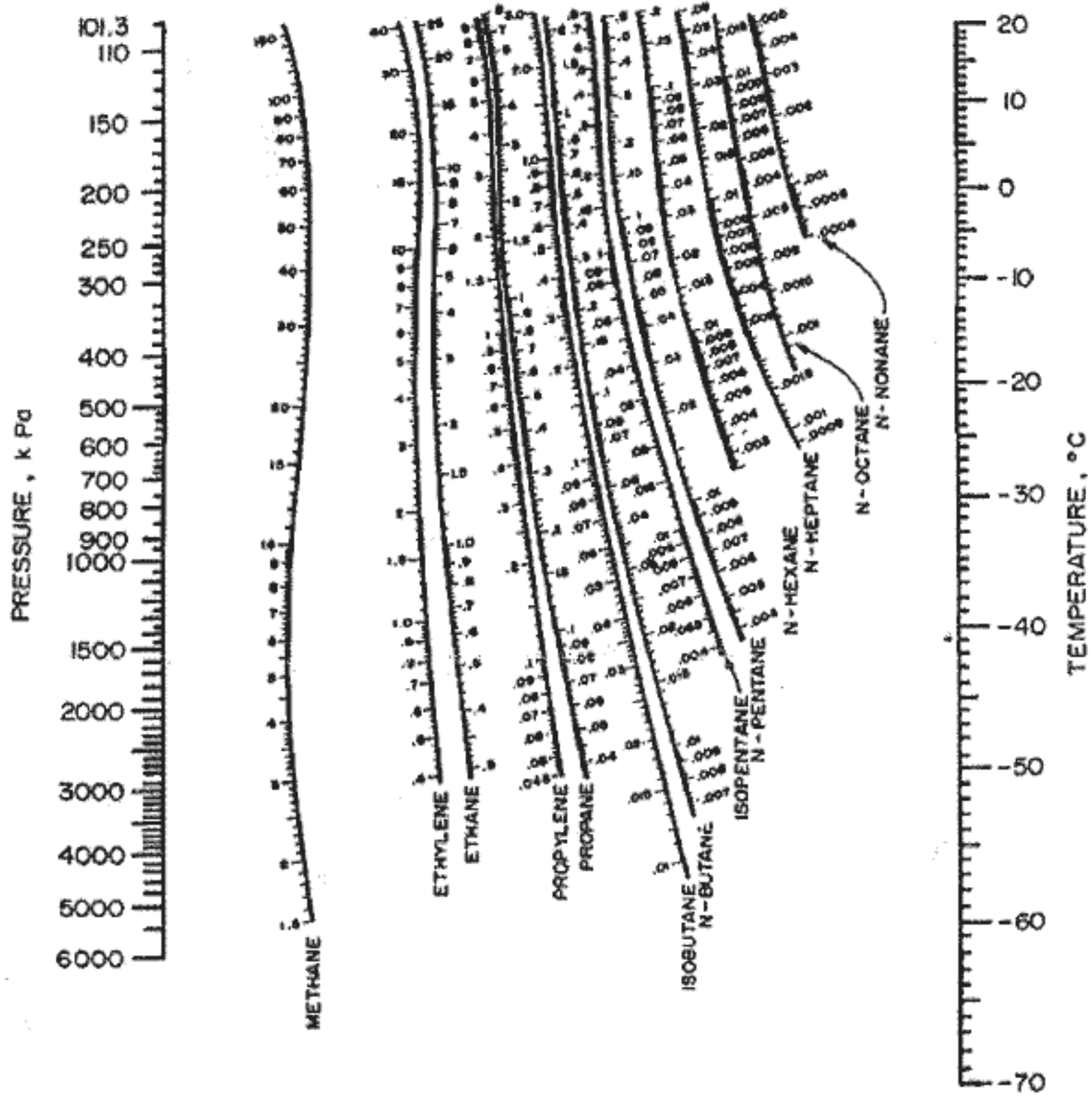
K (or DePriester) Chart (low T range) in SI Units
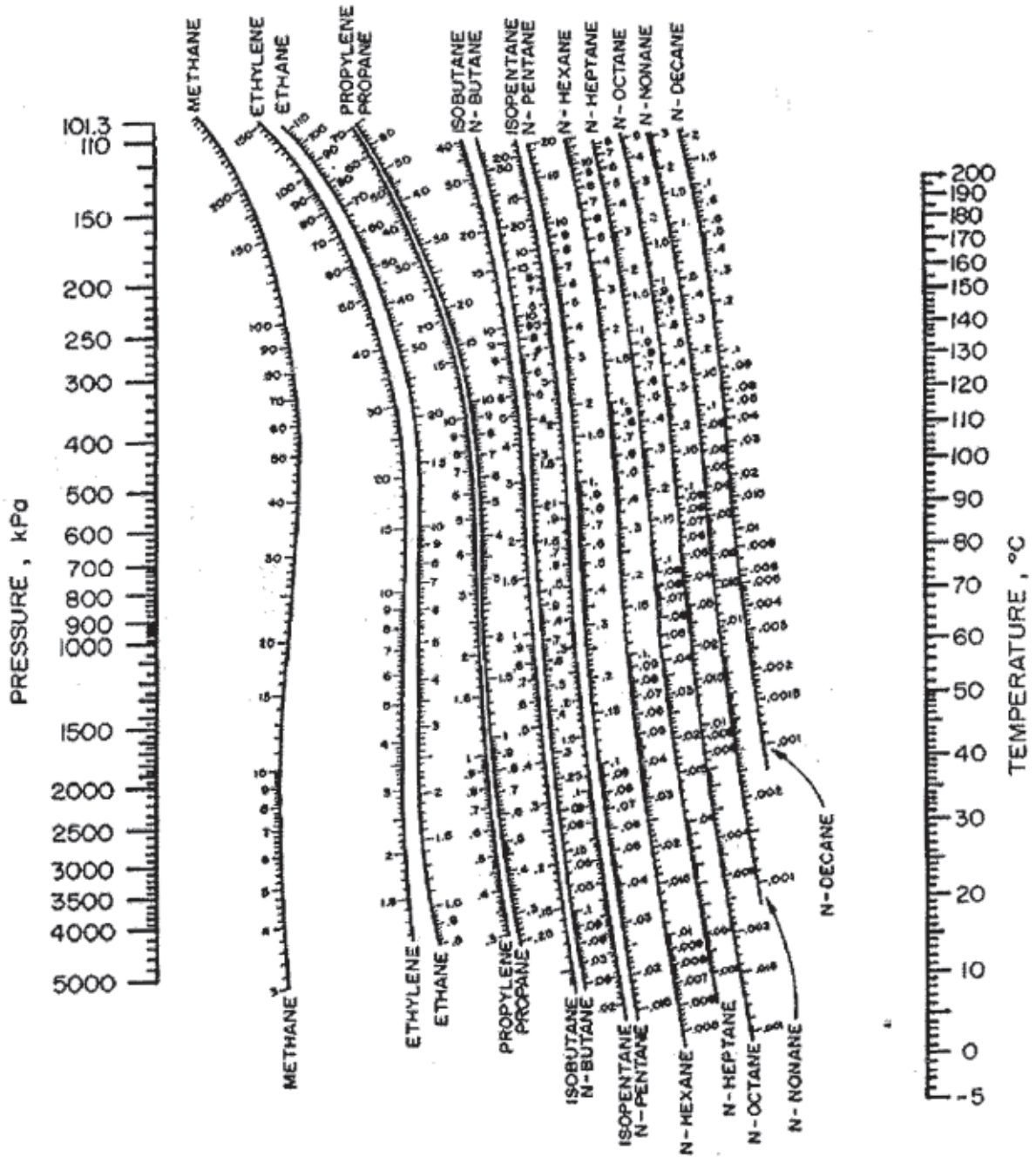
K (or DePriester) Chart (high T range) in SI Units

T.E. (Petrochemical) (Semester – I) Examination, 2011
MASS TRANSFER – I (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. Answer the following questions in brief (**any four**) :   **16**

   a) Classify mass transfer operations by giving suitable example(s).

   b) What equation would you use to estimate the diffusivity of O_2 in liquid water at 25° C ? Which of the necessary constants do you know (can you calculate) ? What are their values ? You do not need to solve the equation.

   c) Explain molecular and eddy diffusion by giving suitable examples.

   d) Describe in brief method to estimate the diffusivity of a volatile solvent into air.

   e) State and explain Fick's law of diffusion.

   f) What is the Sherwood number ? How is it analogous to the Nusselt number ?

            OR

2. a) Derive from fundamentals the expression for steady state diffusion of gas X through another non-diffusing gas Y. Show graphical representation of the final expression. **8**

   b) A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates, the level drops slowly. At a given time t, this level in the tube is Z from the top. Derive an expression to calculate the value of diffusivity of liquid vapour in the gas. Write down the assumptions made in this derivation, if any. **8**

3. a) Calculate the amount of diffusion of acetic acid (A) in 2 hours across a film on non-diffusing water (B) solution 1 mm thick at 17° C when the concentration on opposite side of the film are 9 and 3 weight % acid respectively. The diffusivity of acetic acid in solution is 0.95×10^{-9} m^2/sec.
   Data : At 17° C,
      Density of 9% solution = 1012 kg/m^3,
      Density of 3% solution = 1003 kg/m^3. **9**

   b) Calculate the amount of oxygen (A) diffused in one hour under steady state conditions through a non-diffusing gas mixture of methane (B) and hydrogen (C) in the volume ratio of 2 : 1. The diffusivities one estimated to be :

   $$D_{O_2} - H_2 = 6.99 \times 10^{-5} \, m^2 / s$$

   $$D_{O_2} - CH_4 = 1.86 \times 10^{-5} \, m^2 / sec$$

   The total pressure is 1×10^5 N/m^2 and temperature is 0° C. The partial pressure of oxygen at two planes 2 mm apart one respectively 13000 and 6500 N/m^2.

   Data : R = 8314 Nm/(k mole) (K). **9**

   OR

4. a) H_2 gas flows through a tube of neoprene rubber having ID = 30 mm and OD = 55 mm. The pressure and temperature of the gas are 3 std. atm. pressure and 298 K respectively. If the solubility of hydrogen in rubber is

$$S = 55 \times 10^{-3} \ \frac{m^3 \, (NTP)}{m^3 .rubber.atm.}$$ and diffusivity of H_2 through rubber

$D_{AB} = 1.8 \times 10^{-10}$ m²/sec. Calculate rate of H_2 loss per unit length of tube due to diffusion. **8**

b) By what % would the rate of absorption be increased or decreased by increasing the total pressure from 100 – 200 kN/m² in the following cases :

a) The absorption of NH_3 from a mixture of NH_3 and air containing 15 % NH_3 by volume using pure water as a solvent. Assume that other resistance to mass transfer lies within the gas phase.

b) The same condition as (a) but the absorbing solution exerts a partial vapour pressure of NH_3 of 10 kN/m².

The diffusivity can be assumed to be inversely proportional to absolute temperature. **10**

5. a) Two large storage tanks containing natural gas mixtures, each maintained at a pressure of 10 atmosphere and 298 K. They are connected by a pipeline 25.4 mm in diameter and 1.5 m. In one tank, it contains mainly H_2S separate from the natural gas : 90% H_2S and 10% CH_4 by volume. The second tank contains clean natural gas : 100% CH_4. Accidentally, the valve is left open by an operator. At the initial tank conditions,

$D_{H_2S-CH_4} = 2.02 \times 10^{-6}$ m² /s. Assume the mixtures behave like ideal gases.

Find.

a) What is the steady rate of transfer (pseudo-steady state initially) of methane, $\overline{N}_{CH_4}$, between the two tanks ?

b) What is the mass velocity of Methane with respect to a stationary coordinate ?

c) What is the molar velocity of Methane with respect to Hydrogen Sulfide ?

d) What are the mass concentrations in the two tanks. **8**

b) Develop the material balance equations for counter current mass transfer process by giving the graphical representations of the final equation. **8**

OR

6. In the absorption of component A from an air stream into an aqueous stream, the bulk composition of the two adjacent streams were analyzed to be $P_{A, G}$ equals 0.1 atm and $C_{A, L}$ equals 0.004 kg mole/cm^3. The Henry's constant for this system is 16.5 atm. m^3/kg mole. The overall gas-side mass transfer coefficient K_G was 7.45×10^{-6} kg mole/m^2.s.atm.

If 59 % of the total resistance to mass transfer is in the gas film, determine the following :

a) the gas-side mass transfer coefficient

b) the liquid-side mass transfer coefficient,

c) the concentration on the liquid side of the interface,

d) the mass flux of A. **16**

SECTION – II

7. a) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6 \left(\frac{d^3 \rho^2 g \beta \beta \Delta}{\mu^2} \right)^{1/4} \left(\frac{c_p \mu}{k} \right)^{1/3} \text{ for } Gr^{1/4} \, Pr^{1/3} < 200$$

Where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145° C and 1 atm.

Explain the analogy between Nu = Sh, Sc = Pr, Gr = Gr_{AB}.

Data :

$P^{vap}_{naphthalene}$ = 0.2 atm, D_{AB} = 5.8×10^{-6} m^2/s, d = 9×10^{-2} m

$\rho_{air} = 0.85 \, kg / m^3, \mu_{air} = 2.5 \times 10^{-5} \, kg / m.s$. **9**

b) A stream of air at 100-kPa pressure and 300 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.2 m with a velocity of 15 m/sec. The other data are given below :

Mass diffusivity of naphthalene Vapour in air $= 6 \times 10^{-6}$ m^2/sec

Kinematic viscosity of air $= 1.5 \times 10^{-5}$ m2.sc

Concentration of naphthalene at the air-solid naphthalene interface $= 1 \times 10 - 5$ k mole/m^3.

Calculate :

 i) The overage mass transfer coefficient over the flat plate.

ii) The rate of loss of naphthalene from the surface per unit width.

Note : For heat transfer over a flat plate, convective heat transfer coefficient for laminar flow can be calculated by the equation.

$Nu = 0.664 \, Re^{1/2} \, Pr^{1/3}$

You may use analogy between mass and heat transfer. **9**

OR

8. a) Calculate the maximum rate of absorption of O_2 in a fermenter from air bubbles at 1 atm having diameter of 100 μm at 37° C into water having a zero concentration of dissolved oxygen. The solubility of O_2 from an air in water at 37° C is equal to 2.26×10^{-4} kg mole O_2/m^3.

Data :

Diffusivity of O_2 in $H_2O = 3.34 \times 10^{-9}$ m^2/s

Viscosity of water $= 6.947 \times 10^{-4}$ kg/ms

Density of Water $= 994$ kg/m^3

Density of air particle $= 1.13$ kg/m^3

Assume that agitation is used to produce air bubbles. Determine,
a) Connective mass transfer coefficient
b) Mass transfer rate. **8**

b) H_2O containing dissolved air is to be deoxygenated by contact with N_2 in an agitated vessel 1 m in diameter. The H_2O will enter counter currently at bottom of the vessel and flow through an overflow pipe set in air side of vessel at an appropriate height. Neglecting gas density, estimate, and mass transfer coefficient on liquid side if termperature is 298 K. **10**

Use the following equations to solve this problem :

$$Sh_L = 2.0 + 0.31\ Ra^{1/3}$$

Where, $Sh_L = \dfrac{F_L\,dp}{C.\,D_L}$

and Ra = Rayleigh Number and is given by :

$$Ra = \dfrac{dp^3\,(\rho_L - \rho_o)\,g}{D_L \mu_L}$$

Where,

D_P = Average bubble diameter in m

ρ_L = Density of liquid in kg/m^3

ρ_g = Density of gas in kg/m^3

D_L = Diffusivity of N_2 in water in m^2/sec

μ_L = Viscosity in kg/m.sec

The value of dp may be calculated by :

$$dp = 2.88 \times 10^{-3}\ \phi_G^{-4}$$

Where ϕ_G = Gas hold up and is given by relation :

$$\phi_G = \dfrac{7.067 \times 10^{-3}}{V_t 0.833}$$

Where, V_t = Terminal settling velocity of bubble.

Data at 298 K : $V_t = 0.25$ m/s

$D_L = 1.9 \times 10^{-9}$ m^2/s

$\mu_L = 8.9 \times 10^{-4}$ kg/m.s

$\rho_L = 1000$ kg/m^3.

9. a) It is desired to dry a certain type of fibre board in sheets 0.131 meter by 0.162 meter by 0.071 meter from 58% to 5% moisture (wet basis) content. Initially from laboratory test data with this fibre board, the rate of drying at constant rate period was found to be 8.9 kg/m^2 hour. The critical moisture content was 24.9% and the equilibrium moisture content was 1%. The fibre board is to be dried from one side only and has a bone-dry density of 210 kg/m^3. Determine the time required for drying. The falling rate may be assumed linear. **8**

b) Discuss in brief various types of industrial dryers and explain working principles of any one of dryer with neat sketch. **8**

OR

10. 1400 kg (bone dry) of granular solid is to be dried under constant drying conditions from moisture content of 0.2 kg/kg of dry solid to a final moisture content of 0.02 kg/kg dry solid. The material has an effective area of 0.0615 m^2/kg. Under the same conditions the following rates were previously known. Calculate the time required for drying. **16**

Data :

Moisture content, X, kg/kg dry solid	Rate, N, kg/hr m^2
0.30	1.71
0.20	1.71
0.14	1.71
0.096	1.46
0.056	1.29
0.046	0.88
0.026	0.54
0.016	0.37

11. Write short notes on (**any four**) : **16**

   i) Two Resistance Concept in Interphase Mass Transfer.

   ii) Stage and Stage efficiency.

   iii) Concept of Equilibrium in Interphase mass transfer.

   iv) Types of packings and their characteristics.

   v) Comparison of Packed towers and Tray towers.

   vi) Types of moisture contents in solid.

             OR

12. a) Discuss in brief the significance and application of psychometric charts in simultaneous heat/mass operations. **6**

   b) Write a brief note on : "Types of Cooling Towers". **6**

   c) Define any four humidity terms you know. **4**

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T.E. (Petrochemical Engineering) (Semester – I) Examination, 2011
PETROCHEMICAL PROCESSES – I
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) Answer **three** questions for **each** Section.
  2) Answers to the **two** Sections should be written in **separate books**.
  3) Neat diagrams must be drawn **wherever** necessary.
  4) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) Describe the process for continuous nitration for conversion of benzene to nitrobenzene with fortified spent acid. **12**

   b) Write a note on Biazzi nitrator. **6**

OR

1. a) Describe with flowsheet the process for conversion of EDC to VCM by cracking. **12**

   b) Write a note on photochlorination of cyclohexane. **6**

2. a) Describe with flowsheet the continuous process for preparation of ethyl acetate. **10**

   b) Write a note on Bechamp reduction. **6**

OR

2. a) Describe the process of continuous ammonolysis for conversion of chlorobenzene to aniline. **10**

   b) Write a note on aminating agents. **6**

3. a) Describe with flowsheet the process for conversion of acetaldehyde to acetic acid. **10**

   b) Mention types of oxidative processes with examples. **6**

OR

3. a) Describe with flowsheet the process for conversion of benzene to ethyl benzene. **10**

   b) Write a note on agents used for alkylation. **6**

SECTION – II

4. a) Describe with flowsheet the high pressure process for conversion of ethylene to
   polyethylene. **12**

   b) Write a note on agents used for hydrolysis. **6**

   OR

4. a) Describe with flowsheet the process of catalytic vapour phase reduction for
   conversion of nitrobenzene to aniline. **12**

   b) Write a note on catalysts used for hydrogenation. **6**

5. a) Describe with flowsheet the process for conversion of methanol to formaldehyde. **10**

   b) Differentiate between : **6**

   1) FC alkylation and acylation

   2) Ammonolysis and amination by reduction.

   OR

5. a) Describe with flowsheet the process for conversion of ethyl benzene to styrene. **10**

   b) Write a note on agents used for oxidation. **6**

6. a) Describe with flowsheet the fermentation process for production of ethanol. **10**

   b) Explain the procedures used for working up of sulfonation. **6**

   OR

6. a) Describe with flowsheet the low pressure ziegler process for conversion of ethylene
   to polyethylene. **10**

   b) Compare sulfur trioxide and sulfuric acid as agents for sulfonation. **3**

   c) Write a note on process of desulfonation. **3**

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T.E. (Petrochemical) (Semester – I) Examination, 2011
INSTRUMENTATION AND INSTRUMENTAL ANALYSIS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*5) Assume suitable data, **if** necessary.*

SECTION – I

1. a) List the various temperature scales and compare them on the basis of ice point, steam point and absolute zero point.   **4**

   b) What are the various static characteristics ? Explain each of them.   **8**

   c) A thermocouple gives no emf at 0° C and 0.645 mV at 100° C. If the relationship between emf and temperature was assumed to be linear, then   **6**
      i) What would be the temperature when the emf is 0.173 mV ?
      ii) What is the error that would occur if the actual temperature when this emf was produced is 30° C, assuming linear relationship ?
                 OR

2. a) What do you mean by a first order system ? Derive the step response of a mercury thermometer considered as a first order system.   **10**

   b) A thermometer with time constant 7 seconds and showing a steady state temperature of 27° C is suddenly immersed in an oil bath at 160° C. Find   **8**
      i) The time required for 90 % response.
      ii) The time required for a temperature reading of 100° C.
      iii) The temperature reading on the thermometer after 7 seconds.

P.T.O.

3. a) Explain in detail the principle, construction and working of RTD (Resistance Temperature Detector). **8**

   b) Describe the electrical capacitance method of level measurement. **8**

   OR

4. a) Give the principle construction and working of a diaphragm pressure gauge. **8**

   b) Compare temperature measurement by RTD and thermistor. **8**

5. a) Describe with a neat diagram the principle, construction and working of a turbine flow meter. **8**

   b) A 30 cm × 15 cm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of throat and entrance section of venturimeter is 30 cm. The differential U tube manometer shows a gauge deflection of 25 cm. Assume $C_d = 0.98$. Calculate the flow rate and pressure difference. **8**

   OR

6. a) What are valve characteristics ? Give the graphical representation of different types of valve characteristics. **8**

   b) Define : (i) Turndown ratio, (ii) Rangeability (iii) Cavitation (iv) Valve flow coefficient, C_v. **8**

SECTION – II

7. a) What do you mean by crude assay data ? Explain the standard tests used for the analysis cloud point and pour point of a petroleum product. **8**

   b) On a column 122 cm long, operated at 160° C, the following retention times in minutes were obtained : air peak : 0.8, heptane : 1.22, octane : 1.43. The bandwidth for heptane was 0.14 and for octane was 0.2. What are the relative retentions and resolutions for these bands ? **4**

   c) Give the principles of different spectroscopic techniques used in petroleum analysis. **4**

   OR

8. a) Explain the need for chemical analysis in petroleum industry. **8**

   b) Give the principles of each of the following analytical techniques : **8**
   i) Calorimetry
   ii) Crystallography.

9. a) Explain with a neat diagram, the instrumentation for gas chromatography. **9**

   b) Explain with a neat diagram, the principle, construction and working of a magnetic deflection or sector mass analyser. **9**

                    OR

10. a) Explain the construction and working of a non-dispersive type of IR spectrometer. **9**

    b) Give the construction and working of HPLC. **9**

11. a) Explain the terms : **8**
    i) Resolution
    ii) Partition coefficient and partition ratio
    iii) Effective number of plates and HETP
    iv) Relative retention or selectivity factor.

    b) Give the different constituents of lubricating oil and the additives used in it. **8**

                    OR

12. a) Enlist the various fluid density measurement methods. Describe any one of them. **8**

    b) Describe in detail the principle and working of Abbe's refractometer. **8**

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T.E. (Petrochemical) (Semester – II) Examination, 2011
TRANSPORT PHENOMENA (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Attempt 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) Figures to the **right** indicate **full** marks.*
*   3) **Use** of electronic calculators is **allowed**.*
*   4) Draw **neat** sketch **wherever** necessary.*

SECTION – I

1. a) Explain the role of transport phenomena principles in separation unit
   operations.   **8**

   b) Write a note on momentum diffusivity, thermal diffusivity and molecular
      diffusivity.   **8**

OR

2. a) The mixture of He and N_2 gas is contained in a pipe at 298 K and 1 atm
      total pressure which is constant through out. At one end of the pipe at
      point 1 the partial pressure of He is 0.60 atm and at the other end 0.2 m is
      0.2 atm. Calculate the flux of He at steady state if diffusion coefficient of
      the He-N_2 mixture is $0.687 * 10^{-4} \, m^2$/sec.   **8**

   b) Explain the common features in all three modes of heat, mass and
      momentum transport.   **8**

3. a) Explain the classification of Partial differential equations with respect to
      transport phenomena.   **8**

   b) Derive three dimensional equation of continuity.   **8**

OR

P.T.O.

4. a) Derive the Navier Stokes Equation. **8**

   b) Give the applications of Navier Stokes equation with suitable examples. **8**

5. a) Explain the role of turbulence in heat and mass transfer applications. **6**

   b) Explain with neat figures the velocity profiles of laminar and turbulent flow through pipe. **6**

   c) Write a short note on Prandtl's mixing length theory. **6**

                    OR

6. a) Explain the hydrodynamic development of a turbulent flow through Pipe. **9**

   b) Give the significance of boundary layer theory in heat and mass transfer. **9**

SECTION – II

7. a) Explain different types of impeller designs used for industrial mixing and agitation applications. **9**

   b) Write a short note on power consumption calculations in agitated vessels. **9**

                    OR

8. a) Write a short note on Agitator scale up. **9**

   b) Write a short note on mixing times of miscible liquids. **9**

9. a) Give the solution scheme to unsteady state heat diffusion in one direction equation. **8**

   b) Discuss various dimensionless numbers used in heat transfer. **8**

                    OR

10. a) Determine the temperature distribution in a conducting rod of length 20 cm with following values : conductivity k = 0.25 cal/s.cm. °C, at t = 0 temperature of the rod is zero and the boundary conditions are at length x = 0 Temperature T = 200°C and at x = 20 the Temperature is 50°C. The Cp of the rod is 0.22 cal/g. °C and density is 2.5 g/cm^3. Use the explicit finite difference method. **10**

    b) Derive steady state heat conduction equation in one direction in a solid. **6**

11. a) Derive steady state mass diffusion equation in one direction. Express the three dimensional form of above equation. **8**

    b) Give Dimensionless numbers in mass transfer with expressions. **8**

OR

12. a) What do you understand by stability and convergence of the above solutions ? **10**

    b) Write a short note on prediction of mass transfer coefficients from experimental data. **6**

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T.E. (Petrochemical) (Semester – II) Examination, 2011
REACTION ENGINEERING – I (2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Attempt **any three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **two***
   separate answerbooks.
*3) Figures to the **right** indicate **full** marks.*
*4) Assume **suitable** data **wherever** necessary.*
*5) **Use** of steam tables and electronic calculator is **allowed**.*

SECTION – I

1. a) Derive performance equation of Plug Flow Reactor starting from first
   principles.   **6**

   b) Liquid phase reaction $A \rightarrow 2R$ is carried out in a 1000 Lit batch reactor of
   which only 75% volume is occupied by the reaction mixture. Order of
   reaction with respect to A is given as 1.5. Laboratory studies report 60%
   conversion in four hours when reaction was started with 2.5 Molar
   concentration of A. What will be the kg weight produced of R in 3 hours
   batch time in 3000 L reactor if the reaction started with 5.5 Molar
   concentration of A ? (Mol Wt of R is 150).   **10**

2. a) Derive performance equation of CSTR starting from first principles.   **4**

   b) Second order gas phase reaction $A \rightarrow 1.5R$ is carried out in a 1500 Lit
   tubular reactor which is fully occupied by the reaction mixture. Laboratory
   studies in a constant volume batch reactor report 70% conversion in three
   minutes when reaction was started with 2.5 Mol/L concentration of A. What
   will be the kg/hr weight produced of R if space time in 2000 L reactor is 1.5
   minutes and if the reactor inlet concentration of A is 4.5 Mol/L ? (Mol Wt
   of R is 150)

                                                                                                    12

3. a) State how constant pressure data for a gas reaction in isothermal batch reactor can be treated to yield appropriate kinetic information. **4**

   b) State how constant volume data for a gas reaction in isothermal batch reactor can be treated to yield appropriate kinetic information. **4**

   c) Differentiate between integral and differential analysis. Discuss, in particular, the merits and demerits of each. **8**

4. a) Provide the graphical interpretation of the performance equations of any two ideal reactors. **6**

   b) A mixed flow reactor (4 cubic meter) processes an aqueous feed containing reactant A (Concentration 150 mmol/liter). The reaction is reversible with forward rate constant and equilibrium constant as 0.09 per min and 0.85 respectively. If the conversion is to be 90% of the maximum possible conversion, what should be the volumetric flow rate of the feed ? **12**

SECTION – II

5. a) The off gas from a boiling water nuclear power reactor contains a whole variety of radioactive waste. One of the most troublesome has half life of 8 days. This off gas flows continuously through a large holdup tank in which its mean residence time is 45 days, and where we can assume that the contents are well mixed. Find the fraction of activity removed in the tank. **8**

   b) Explain how reaction kinetics determines the optimum choice of sequencing of available contacting equipment. **8**

6. a) Write a note on autocatalytic reaction. **4**

   b) For the homogeneous auto-catalytic reaction $A + R \rightarrow R + R$, rate is first order w.r.t. both A and R. With a feed concentration of A and R as 0.90 mol/L and 0.10 mol/L we want about 50% conversion of reactant A. What flow reactor or combination of flow reactors is best in that it gives the smallest total volume of reactors needed ? (Just determine the type of reactor system that is best and the type of flow that should be used.) **12**

7. a) Explain in detail the multiple steady states of adiabatic CSTR. What is the relevance of this multiplicity in design and operation of CSTR ? **10**

   b) For two consecutive first order reactions taking place in PFR, derive the optimum space time for maximization of the intermediate product. **8**

8. a) In a parallel reaction sequence, desired product R is formed by the reaction from A along with an undesired product S. The two reactions follow different kinetics. Reaction giving R has order m while that giving S has order n.(m ≠ n). Discuss the factors influencing choice of contacting pattern so that selectivity of R is maximum. **8**

   b) Discuss F, C and E curves in the context of ideal flow reactors. **8**

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T.E. (Petrochemical) (Semester – II) Examination, 2011
PETROCHEMICAL PROCESSES – II (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *: 1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*5) Assume **suitable** data, if necessary.*

SECTION – I

1. a) Give a brief overview of the alternative feedstock sector.   **8**

   b) What do you mean by ASTM distillation ? Describe it in brief and give its significance.   **8**

                                 OR

2. a) What are the various physical and biological methods that help in the formation of petroleum ?   **8**

   b) Write a note on the various types of octane numbers.   **8**

3. a) Discuss the hydrofluoric acid process for alkylation.   **8**

   b) Explain the electrostatic process for desalting of crude.   **6**

   c) Discuss the advantages and limitations of the ebullated bed reactor process ? **4**

                                 OR

4. a) Write a note on the atmospheric topping unit (ATU) of a refinery.   **8**

   b) Discuss the importance of blending in a refinery. Give the various methods of blending .   **6**

   c) What are dewaxing aids ? Give their importance.   **4**

5. a) Write a note on the catalysts used in the catalytic cracking process. Give the advantages of using zeolite catalysts. **8**

   b) Discuss the once through Claus process for the sulphur recovery from refinery gases. **8**

   OR

6. a) Explain the GOFining hydrocracking process. **8**

   b) What is the need for delayed coking ? Discuss the various methods of coke removal from the coke drum. **8**

SECTION – II

7. a) What is catalytic reforming ? Give its significance. What are the typical feedstocks to the reformer ? **9**

   b) Write a note on xylene isomerization. **9**

   OR

8. a) Discuss the method of recovery of hydrogen by adsorption. **6**

   b) What is steam cracking ? Give its significance. **6**

   c) Write a note on the various reforming catalysts. **6**

9. a) Describe the Borstar process for polyethylene. **8**

   b) Describe the Union Carbide process for the manufacture of polypropylene. **8**

   OR

10. a) Describe the method of manufacture of melamine formaldehyde resin. **8**

    b) What are polymers ? Classify them. Explain the various types of polymerization reactions. **8**

11. a) Discuss the various routes for the manufacture of caprolactum. **8**

    b) Describe the production of adipic acid with schematic diagram. **8**

    OR

12. a) Describe the manufacturing process for polyester from dimethyl terephthalate (DMT). **8**

    b) Describe the AMCO process for the manufacture of terepthalic acid. **8**

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T.E. (Polymer Engineering) (Semester – I) Examination, 2011
POLYMER CHEMISTRY – I (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) **All** questions are **compulsory**.
          2) Answer to the **two** Sections should be written in **separate** books.
          3) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) Define monomer. Give five examples each for addition and condensation
      monomers with different functionality.   **8**

   b) Describe GPC method in detail for the determination of MWD.   **9**

                          OR

2. a) What is polydispersity ? Why do synthetic polymers lead to polydispersity ?
      What do you understand by broad MWD ?   **8**

   b) Give the principle of membrane osmometry. Draw the well labelled diagram
      for static and dynamic membrane osmometers.   **9**

3. a) Write a note on redox initiators and peroxide initiators. Give suitable examples
      for each one.   **8**

   b) Give one example each for anionic and cationic initiators and their working
      mechanism.   **9**

                          OR

4. a) Define CMC. Give a pictorial presentation of emulsion polymerization at its
      various stages. Explain the location of initiator.   **8**

   b) Give the kinetics of free radical polymerization.   **9**

5. a) Write a note on polyaddition reaction with suitable examples. **8**

   b) Discuss the kinetics of condensation polymerization.   **8**

                          OR

6. a) What do you understand by stoichiometry ? Explain with suitable assumptions. Explain its significance. **8**

   b) Explain with suitable diagram interfacial polymerization technique. **8**

SECTION – II

7. a) Define copolymerization. Give various types of copolymers. Explain one method of synthesis of copolymer. **8**

   b) Write a note on monomer reactivity ratio. **9**

                        OR

8. a) Give commercial applications of copolymerization of any two polymers. **8**

   b) Write a note on copolymerization equation. **9**

9. a) Explain and differentiate acidolysis, aminolysis and hydrolysis. **8**

   b) Compare incineration and biodegradation. Give advantages and disadvantages of the same. **9**

                        OR

10. a) Give the polymer modification reactions for any three specific functional groups. **8**

    b) Discuss thermal degradation at length. **9**

11. a) Give various examples for structural isomerism in polymers. **8**

    b) Write a note on metallocene catalyst. **8**

                        OR

12. a) Explain how the properties of polymers are affected due to stereoregularity. **8**

    b) Discuss and draw ditacticity in polymers. **8**

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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER MATERIALS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions: *1)* *Answer **3** questions from Section **I** and **3** questions from*
*Section **II**.*

2) *Answers to the **two** Sections should be written in **separate***
books.

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

4) *Black figures to the **righ**t indicate **full** marks.*

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

6) *Assume suitable data, **if necessary**.*

SECTION – I

1. 1) What is the difference between commodity, engineering and high performance
   polymers w.r.t to properties ? Give two examples of each type.   **6**

   2) State 3 copolymers of ethylene and give 2 properties of each of the
   copolymer.   **6**

   3) Write a short note on chlorinated Polyethylene.   **3**

   4) Discuss in brief compounding of Polypropylene.   **3**

                        OR

2. 1) How is polyvinyl alcohol prepared ? Differentiate between hot and cold grade of Polyvinyl alcohol. **6**

   2) Explain the points to be borne in mind while processing polyethylene. **6**

   3) Polyvinylacetate exhibits cold flow. Explain. **3**

   4) Polypropylene is used in medical applications. Explain. **3**

3. 1) How is a PVC paste prepared ? On the basis of the composition distinguish between plastisols, rigisols and organosols. **6**

   2) Discuss processing of PTFE. **4**

   3) Explain the process for manufacture of Expanded Polystyrene Foam. **4**

   4) Write the structure of the following polymers **2**

      a) Polyvinylacetate

      b) Polyvinylidene dichloride

      c) Polytetrafluoroethylene

      d) Polyvinylidene fluoride.

                    OR

4. 1) Discuss the need for addition, mechanism of functioning and two examples of the following additives : **6**

      a) Antioxidants

      b) Plasticisers.

2) State the polymer used in the following applications giving reasons :　　**4**

   a) Non-Stick Cookware

   b) Electric Cappings

   c) Disposable coffee cups

   d) Domestic mixer bodies.

3) Why does Polystyrene require modification ? State the modified forms of Polystyrene giving 2 properties and 2 applications of each type of modified form.　　**6**

5. 1) Explain the batch process for manufacture of PMMA sheets stating the need for preparation of the prepolymer, method of prepolymer preparation and the process of manufacture of the sheets.　　**6**

   2) How is polycarbonate prepared ? Give 2 of its outstanding properties and 2 applications based on those properties.　　**6**

   3) Why does cellulose need to be converted to cellulose acetate ? How is it done ?　　**4**

                    OR

6. 1) Discuss compounding of Cellulose acetate and give 2 applications of Cellulose acetate.　　**6**

   2) List the various grades of Polycarbonate.　　**4**

   3) How is acrylic cement and artificial dentures of PMMA prepared ?　　**6**

SECTION – II

7. 1) What is the difference between adhesion and cohesion in an adhesive joint ?   **3**

   2) Write a few names of different types of additives used in the formulation of paint.   **3**

   3) Describe influence of porosity and polarity of adhesive on adhesion strength with examples of Polyethylene, Polystyrene and Cellulose acetate as substrate.   **3**

   4) Write a short note on importance of Morphology of Substrate on Mechanical adhesion.   **3**

   5) What are the three types of intermolecular forces work in favour of Theories of Adsorption ?   **3**

   6) What is influence of layer of metal oxide on metal for adhesion and what the common methods are used for surface treatment of metals for bonding ?   **3**

   OR

8. 1) What are the different theories that explain the mechanism of adhesion ?   **3**

   2) Briefly explain the types of adhesive systems based on product categories/ origin.   **3**

   3) What are advantages and disadvantages of fillers used in adhesive system ?   **3**

4) What is the sheen of paint and what are the classifications available

   based on sheen ? **3**

5) Write a note on pigments used in paints. **3**

6) Explain the function of Anti-skinning agent and dispersing agent in the

   manufacturing of paints. **3**

9. Answer **any four**.

   1) What are the requirements for a material to exhibit rubber-like properties ? **4**

   2) Explain the process of vulcanization through a sketch of Rheograph

      indicating the process of transition during vulcanization. **4**

   3) What is the difference between a Raw rubber and a Vulcanisate ? What is

      the importance of Vulcanisation for industrial application of rubber ? **4**

   4) What are the important characteristics of carbon blacks that influence

      most in the reinforcement of rubber ? **4**

   5) What is PHR in rubber formulation ? What are the most common activator

      and co-activator are used in rubber compounding and what is the range of

      PHR conventionally used for activator and co-activator in a sulphur cure

      rubber formulation ? **4**

                    OR

10. Answer **any four**.

   1) What is scorch time ts2 in the process of Vulcanisation and explain its importance in terms of processing of rubber ? **4**

   2) Explain the role of peptizer in mastication and role of accelerator in vulcanization with one example each. **4**

   3) Give an example of filler that requires coupling agent for reinforcement and explain the role of the coupling agent. **4**

   4) Write the full form of HAF and FEF and explain one advantage each over other in regard to selection of Carbon Black. **4**

   5) Give a brief outline of Latex rubber technology. **4**

11. Answer **any four**.

   1) What is the glass transition temperature of Unvulcanized Natural rubber ? What are the properties that change at glass transition temperature of Natural rubber ? **4**

   2) Describe CV, SEV and EV system emphasizing the type of sulphide linkage formed during the vulcanisation through sulphur curing. **4**

   3) Give a brief outline for production of Ribbed Smoke sheets. **4**

   4) What are the properties of Natural Rubber that governs the specification of Standard Malaysian Rubber ? **4**

   5) Name one series each for Hot and Cold SBR rubber and outline the advantage of cold SBR over Hot SBR. **4**

                    OR

12. Answer **any four**.

   1) What is major defect in SBR stocks in tire built and how this defect is taken

      care in tire building operation ? Mention two different uses of SBR

      without blending with Natural rubber.   **4**

   2) What are the monomers used for manufacturing Butyl rubber ? Give a few
      examples of important properties of Butyl rubber that are utilized for making
      components.   **4**

   3) What are the advantages of Theromopastic Elastomers over conventional
      rubber and write a few area of uses of Thermoplastic Elastomers ?   **4**

   4) Write the chemical structure of Nitrile Rubber. Explain what types of process
      oils are used for formulating Nitrile rubber and why ?   **4**

   5) Write a short note on Compounding and Curing of Neoprene rubber.   **4**

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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER STRUCTURE PROPERTY RELATIONSHIP
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.
2) Answers to the **two** Sections should be written in **separate** books.
3) **Neat** diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) **Use** of logarithmic tables slide rule, Mollier charts, electronics pocket calculator and steam tables is **allowed**.
6) Your answers will be valued as a **whole**.
7) Assume suitable data, **if necessary**.

SECTION – I

1. a) Write general features of chemical composition and their effect on polymer properties. **3**

   b) Which polymer will give formation of char ? Why ladder polymers are most stable to heat and will they give char formation ? **3**

   c) Which bonds lead to moisture absorption in case of Nylons. Explain effect of moisture absorption on Nylons. **3**

   d) Refering to polyvinyl alcohol and polyvinyl acctate, discuss the effect of side groups on polymer properties. **3**

   e) Explain the effect of presence of H atom in any polymer structure and also types of bonds it forms. **6**

                              OR

2. a) Explain degradation mechanism of PVC. **3**

   b) Draw the structure of poly n butyl acrylate and poly tertiary butyl acrylate, compare their properties based on structure and effect of structure on Tg. explain which one is succeptible to hydrolysis and write hydrolysis reaction. **5**

   c) Explain below mentioned polymeric additives with examples : **10**
      1) Plasticizer   2) Stabilizer
      3) Blowing agent   4) Flame Retarders
      5) Crosslinking Agents

3. a) With suitable examples of thermoplastic polymer, explain the effect of its structure and molecular weight on mechanical, chemical, thermal, optical and electrical properties.   **10**

   b) What is meaning of NMWD and BMWD ? How can they be found out ? In case of blow molding which of the two will give better results and why ?   **6**

                      OR

4. a) Explain effect of plasticizer on :   **4**
      1) Crystalline polymers   2) Melting point and Tg
      3) Tensile strength.

   b) Describe appropriate process for the manufacturing of polyacrylonitrile fibers. Which type of MWD is preferred ?   **3**

   c) Comment on the choices of different molecular weight grades while processing by injection molding and extrusion technique.   **3**

   d) Where do we use evaporation process ? What is role of good and bad solvent in a paint formulation ?   **4**

   e) If 50 mm/min and 100 mm/min speeds are used during tensile testing of polyethylene sample, which will give high tensile strength and why.   **2**

5. a) What do you understand by equilibrium and dynamic flexibility of polymer chains ?   **3**

   b) What is 1st and 2nd order phase transition ?   **3**

   c) With examples give the effect of structure on freedom of rotation.   **10**

                      OR

6. a) In PS what all modification can be made to make it len brittle.   **3**

   b) Comment on the effect of chemical groups on the adhesive properties of polymer. Explain with suitable examples.   **6**

   c) Explain fringed micelle model. Also explain lamella and effect of temperature on growth of spherulite.   **7**

SECTION – II

7. a) Explain how shrink films are obtained.　　　　**2**

   b) Explain the effect of orientation on thermal conductivity and thermal expansion.　　　　**3**

   c) Why amorphous state polymers shrink less than their crystalline grade after processing ?　　　　**3**

   d) Why Nylon 6, 10 has less modulus than Nylon 66 but is still expensive ?　　**3**

   e) Explain what is meant by amorphous state and crystalline state. Give eg. of any one polymer and explain the reasons for their properties it pocesses due to their morphology.　　　　**7**

OR

8. a) Mention all possible factors that can be played with if one needs to modify a given polymer.　　　　**5**

   b) Give any two processing methods and the role of % crystallinity for getting a product using that method.　　　　**4**

   c) Explain influence of % crystallinity on any 4 properties.　　　　**4**

   d) What is the similarity between orientation and crystallisation process ? Explain different states in which orientation can be done. Explain effect of orientation on any 3 properties.　　　　**5**

9. a) Write a short note on LDF and ionic bonds.　　　　**8**

   b) What is the significance of solubility parameters and how it is determined for liquids and polymers ? Also explain CED.　　　　**8**

OR

10. a) Explain how polarity affect coefficient of friction.　　　　**3**

    b) Why cellculose needs to undergo transesterification reaction ?　　　　**3**

    c) What are the different types of intermolecular forces present in any polymer ? Explain all in short.　　　　**10**

11. a) Explain why testing results are obtained with small sized samples and how these results are useful. **6**

b) Explain why starting raw material and the end product obtained from it lands up having different properties in one and two dimentional products. **6**

c) Explain how foams are obtained and which properties are influenced after foam is obtained is closed cell and open cell form. **4**

OR

12. a) Explain how temporary hetrogenity in polymers later gets converted into a permanent continous solid, phase after processing. Explain with any one eg. **6**

b) Write a short note on semicompatible blends and further explain how to make them more compatible. Also explain why blends are prepared. **6**

c) Write a short note on composites. **4**

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T.E. (Polymer Engg.) (Semester – II) Examination, 2011
MATHEMATICAL METHODS FOR POLYMER ENGINEERING
(New) (2008 Pattern)

Time : 3 Hours   Max. Marks : 100

N.B. : *1)* *In Section **I** : Attempt Qn. **1** or Qn. **2**, Qn. **3** or Qn. **4**,*
            *Qn. **5** or Qn. **6**. In Section **II** : Attempt Qn. **7** or Qn. **8**, Qn. **9***
            *or Qn. **10**, Qn. **11** or Qn. **12**.*
      2) *Answers to the two Sections should be written in **separate***
            books.
      3) *Neat diagrams must be drawn **wherever** necessary.*
      4) *Black figures to the **right** indicate **full** marks.*
      5) *Use of electronic pocket calculator is **allowed**.*
      6) *Assume suitable data, if **necessary**.*

SECTION – I

1. a) Prove the following :

    i) $E\nabla = \nabla E = \Delta$

    ii) $\Delta - \nabla = \delta^2$.   **4**

  b) Using Newton's forward difference interpolation formula, find f(8) from the data.   **6**

x	5	10	15	20
f(x)	50	70	100	145

  c) Using Trapezoidal rule, evaluate $\int_{2}^{7} \dfrac{1}{x} \, dx$ dividing into 5 subintervals.   **6**

       OR

2. a) Find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at x = 0 from the following data. **6**

x	0	1	2	3	4
y	1	3	15	43	93

b) Using Simpson's one-third rule, evaluate $\displaystyle\int_0^2 \dfrac{dx}{1+x^3}$ taking n = 4. **5**

c) Using Lagrange's interpolation evaluate f(10) from the following table. **5**

x	5	6	9	11
y	12	13	14	16

3. a) Using Regula-Falsi method find the root of the equation $xe^x – 3 = 0$, correct to 3 decimal places. **6**

b) Solve the system of equations by Guass-Seidel method (Four iterations only).

25 x + 6y – z = 82

6x + 15y + 5z = 75

x + 4y + 40z = 66. **5**

c) Find a straight line that best fits the following data, using method of least square. **6**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

OR

4. a) By using Newton-Raphson's method find the root of $x^4 - x - 10 = 0$ which is near to $x = 2$, correct to three places of decimal. **6**

   b) Use Jacobis iterative method to solve

   $25x = 22 - 6y + 8z$

   $15y = 75 - 6x - 5z$

   $40z = 66 - x - y$

   upto 4 iterations. **5**

   c) Use least-square method to fit a curve of the form $y = ae^{bx}$ to the data. **6**

x	1	2	3	4	5	6
y	7.209	5.265	3.846	2.809	2.052	1.499

5. a) Use modified Euler's method to solve $\dfrac{dy}{dx} = x - y^2$, $y(0) = 1$ to calculate $y(0.4)$ taking $h = 0.2$. **8**

   b) Solve $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown. **9**
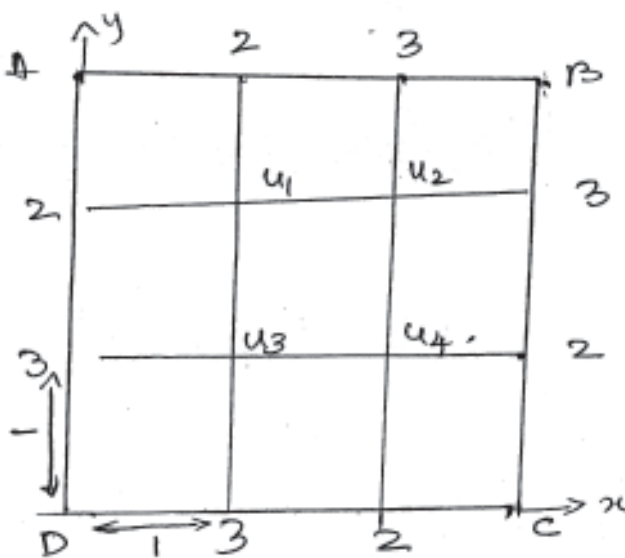
OR

6. a) Compute y(0.1) and y(0.2) by Runge-Kutta method of 4ᵗʰ order for the differential equation

$$\frac{dy}{dx} = xy + y^2 \quad y(0) = 1.$$

8

b) Solve the Poisson equation $\frac{\partial^2 y}{\partial x^2} + \frac{\partial^2 x}{\partial y^2} = -4(x^2 + y^2)$ over the square mesh

with sides x = 0, y = 0, x = 3 and y = 3 with u = 0 on the boundary and mesh length 1 unit, correct to 2 decimal place.

9
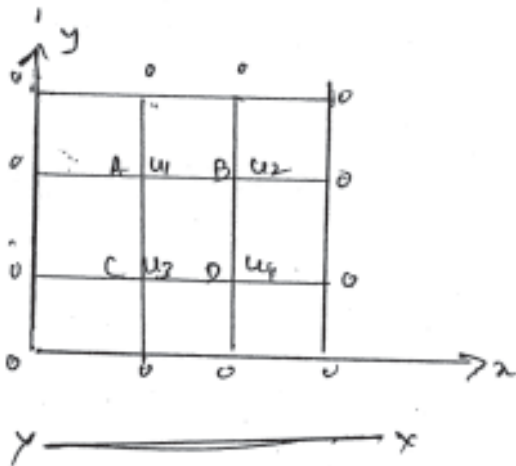
SECTION – II

7. a) Solve the following LPP by using simplex technique

Maximize $z = 3x_1 + 5x_2 + 4x_3$

Subject to $2x_1 + 3x_2 \le 8$

$$2x_2 + 5x_3 \le 10$$

$$3x_1 + 2x_2 + 4x_3 \le 15$$

and $x_1, x_2, x_3 \ge 0.$

10

b) Write the dual of the following LP problem.

Minimize $z = 3x_1 - 2x_2 + 4x_3$

Subject to the constraints

$3x_1 + 5x_2 + 4x_3 \geq 7$, $6x_1 + x_2 + 3x_3 \geq 4$, $7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 3$, $4x_1 + 7x_2 - 2x_3 \geq 2$ and $x_1, x_2, x_3 \geq 0$. **6**

OR

8. a) Solve the following LP problem by using simplex method. **10**

Maximize $z = 6x_1 + 3x_2 + 2x_3$

Subject to $2x_1 + 2x_2 + 3x_3 \leq 300$

$2x_1 + 2x_2 + x_3 \leq 120$

and $x_1, x_2, x_3 \geq 0$

b) Write the dual of the following LP problem. **6**

Maximize $Z = 1600\, x_1 + 1500\, x_2$

Subject to $5x_1 + 4x_2 \leq 500$

$15x_1 + 16x_2 \leq 1800$

and $x_1, x_2 \geq 0$

9. a) For the following distribution, find :
   i) First four moments about the mean and
   ii) β_1 and β_2. **6**

x	2	2.5	3	3.5	4	4.5	5
f	5	38	65	92	70	40	10

b) Compute the coefficient of correlation for the following data,

$n = 100, \bar{x} = 62, \bar{y} = 53, \sigma_x = 10, \sigma_y = 12, \sum(x - \bar{x})(y - \bar{y}) = 8000.$ **5**

c) Number of road accidents on a high way during a month follows Poisson distribution with mean 5. Find the probability that in a certain month, number of accidents on the highway will be
   i) Less than 3
   ii) Between 3 and 5
   iii) More than 3. **6**

OR

10. a) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution.

$[z_1 = 1.48, A_1 = 0.43, z_2 = 1.23, A_2 = 0.39].$ **6**

b) Obtain regression lines for the following data. **6**

x	6	2	10	4	8
f	9	11	5	8	7

c) On an average a box containing 10 articles is likely to have 2 defectives. If are consider a consigment of 100 boxes, how many of them are expected to have three or less defectives ? **5**

11. a) Show that every tensor can be expressed as the sum of two tensors, one of which is symmetric and the other skew symmetric. **5**

b) Determine the metric tensor in :
   i) Cylindrical and
   ii) Spherical polar coordinates. **6**

c) A covariant tensor has components x^2y, y^2z, zx in rectangular cartesian coordinates. Find its covariant components in spherical coordinates. **6**

OR

12. a) If A^{pq}_{rst} is a tensor, choose p = t and show that A^{pq}_{rsp}, where the summation convention is employed, is a tensor. What is its rank ? **5**

   b) A covariant tensor has components xy, xyz, x^2z in cartesian coordinates. Find its covariant components in cylindrical coordinate system. **6**

   c) Prove that

   i) $\dfrac{\partial g_{pq}}{\partial x^m} = [pm,q] + [qm,p]$

   ii) $[pq, r] = g_{rs} \begin{Bmatrix} s \\ pq \end{Bmatrix}$. **6**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER CHEMISTRY – II (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) *Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
3) *Figures to the* ***right*** *indicates* ***full*** *marks.*

SECTION – I

1. a) Write in detail preparation and properties of urea based polymers.   **9**
   b) Explain in detail how silicone polymers can be utilized for special application considering their properties.   **8**

OR

2. a) Write a note on melamine based polymers.   **9**
   b) Compare various types of phenolic resin w.r.t. their synthesis, properties and applications.   **8**

3. a) Give the synthesis and properties of vinyl ester resins.   **9**
   b) Enlist various applications of saturated polyester resin.   **8**

OR

4. a) Explain curing mechanism in unsaturated polyester resins.   **9**
   b) Give the typical formulation of alkyd resin.   **8**

5. a) Give the curing mechanism for epoxy resin. Explain why epoxies are good adhesive materials ?   **8**
   b) Write a note on various isocyanates and hydroxyls used in the manufacture of polyurethanes.   **8**

OR

6. a) Write a note on various raw materials used in epoxy resin manufacture.   **8**
   b) Give the PU formulation and explain the role of individual ingredient in its property.   **8**

SECTION – II

7. a) How will you synthesize polyamides ? Enlist various ingredients. **9**

   b) Explain the properties and applications of polyacetals. **8**

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

8. a) Differentiate polyamides and polyimides on the basis of properties and applications. **8**

   b) Give the basic reactions involved in the synthesis of polyamides, imides and polyacetals. **9**

9. a) Give the properties and applications of PPO. **9**

   b) Write a note on synthesis and applications of PPS. **8**

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

10. a) Give the synthesis of polysulphones. **9**

   b) Differentiate PEK and PEEK on the basis of structure, properties and applications. **8**

11. a) Write a note on LCPs. **8**

   b) Write a note on nanotechnology in composites. **8**

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

12. a) Explain the concept of controlled release drug delivery system. **8**

   b) What do you understand by biomedical applications of polymers ? **8**

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T.E. (Polymer) (Semester – II) Examination, 2011
POLYMER PROCESSING OPERATIONS – I
(New) (2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* **All** *questions are* **compulsory**.
　　　　　　　　2) Answers to the **2** *Sections to be written in* **separate**
　　　　　　　　　answer books.
　　　　　　　　3) Figures to **right** *indicate* **full** *marks.*
　　　　　　　　4) Assume suitable data, **if necessary**.

SECTION – I

1. a) Write a note on vented extruders.   **8**

   b) Explain the term throttle ratio.   **5**

   c) Write a note on material of construction used for extruder screws and barrels.   **5**

OR

2. a) Write a note on ground barrel systems.   **8**

   b) Explain the dispersed solids melting model with respect to single screw
      extruders.   **5**

   c) With a neat sketch, explain the terminology related to extruder screw and
      barrel.   **5**

3. a) Explain with a neat figure, caterpillar haul off system.   **6**

   b) Explain the complete line for slot film casting with a neat sketch. Also explain
      the construction of the die with a neat figure.   **10**

OR

4. a) Explain the external calibration system used for pipes with a neat sketch.   **6**

   b) With a neat sketch, explain the construction of a die used for extrusion of
      thick sheets.   **10**

P.T.O.

5. a) Explain the corrective actions and process setting in case of following injection molding problems.

    i) Sink marks

    ii) Blister marks. **8**

  b) Write in short about fill phase and pack phase in injection molding. **8**

OR

6. a) Write a short note on close loop and open loop injection molding machines. **8**

  b) Explain pressure based switch over technique and typical applications or situations where it is applicable. **8**

SECTION – II

7. a) Write a short note on liquid reservoir molding. **8**

  b) Explain the concept of mold breathing used in thermosetting injection molding and give merits and demerits of breathing sequences. **8**

OR

8. a) Write a short note on injection molding of DMC. **8**

  b) Explain with a neat sketch, any one type of torpedo used in two color pattern making injection molding machine and explain how patterns are obtained. **8**

9. a) Explain with a neat sketch, the in line arrangement used to make deeply embossed sheets. **8**

  b) Explain with a neat sketch, the in line arrangement used to manufacture twisted rods. **8**

OR

10. a) Write a note on downstream equipment used in extrusion of foamed products. **8**

  b) Write a note on process used to manufacture corrugated core sandwich panels. **8**

11. a) Explain the effect of cure time temperature relationship in case of thermosetting material on compression molding and transfer molding. **6**

   b) Discuss the use of preforms in thermoset molding. **6**

   c) Draw a bar chart of transfer molding process, explaining the different operations and their effect on final molding characteristics. **6**

   OR

12. a) Explain the difference in integral and separate pot type transfer molding. **6**

   b) Write a short note on effect of bulk factor, particle size, shape and size distribution with reference to compression molding. **6**

   c) Explain the defects encountered during compression molding and suggest remedies. **6**

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T.E. Polymer (Semester – II) Examination, 2011
POLYMER RHEOLOGY
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions
from Section – **II**.*
*2) Answer to the **two** Sections should be written in
separate books.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables slide rule, Mollier charts,
electronic pocket claculator and steam tables is
allowed.*
*5) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Explain what is rheology and its influence during processing. Explain with any
2 processing techniques and the influence it has on viscosity, and also the
vice versa.   **8**

   b) Explain different types of fluids in chart form with their egs.   **10**

                            OR

2. a) Explain the significance of vectors and tensors. Also justify why vectors cannot
be used to explain rheology and instead tensor can be used.   **6**

   b) Give 2 egs to show effect of normal stress.   **4**

   c) Derive continuity equation.   **8**

3. a) Explain what are the 2 elements used to explain mechanical models. What is
the significance of each element. Also derive Maxwell or Voigt model.   **10**

   b) Explain following terms :   **6**

      1) Doi Edward Theory

      2) WLF equation.

                            OR

4. a) Explain Boltzmann principle of superposition in detail. **10**

   b) Explain following terms :

      1) Stress relaxation

      2) Creep compliance. **6**

5. a) Give the effect of pressure and temperature on viscosity. **6**

   b) Explain what is MWD and give its effect on viscosity with any one eg. **6**

   c) Explain effect of plasticiser on viscosity. Also explain when they act as antiplasticiser. **4**

                    OR

6. a) Explain effect of copolymerisation and effect of fillers on viscosity. **6**

   b) Explain the effect of shear rate on viscosity. **4**

   c) Explain what is zero shear viscosity. **3**

   d) Explain role of blends and its relationship towards viscosity. **3**

                SECTION – II

7. a) Derive an expression for shear rate at walls for flow of a non-Newtonian fluid through an annular cross section. **10**

   b) Derive an expression for pressure drop due to extensional flow through conicylindrical shaped die. **8**

                    OR

8. a) Explain the Hank's criterion for turbulent flow through circular section for a non-Newtonian fluids. **8**

   b) Derive an expression for swelling ratio due to tensile stresses in a short capillary. **10**

9. a) A cone and plate viscometer has a cone radius of 12 cm and angle of cone 2°. For a Newtonian liquid, viscosity is 0.1 Pa-s and for a non-newtonian liquid obeying power law equation as $\tau = 48\dot{r}^{0.8}$, where τ is in N/m² and $\dot{r}$ in sec⁻¹. Calculate the torque experienced by the plate in both the cases if the cone rotates at angular velocity of 60 rad /min. **8**

   b) Discuss the constructional features and working of a capillary rheometer. Explain Robinowitsch correction. **8**

                    OR

10. a) A concentric cylinder viscometer is used to estimate rheological behaviour of LDPE melt at 150°C. The inner diameter of the outer cylinder, do = 30 cm and outer diameter of inner cylinder di -= 28. 4 mm and height of inner cylinder h = 50 mm. The inner cylinder is rotated with different speeds and torque is measured at the outer cylinder. Determine the rheological nature of the melt and develop the power law equation for the system. The speed and torque data is given as :

Speed of rotation (Ω) rpm	5	15	30	50	100	300	500
Torque, NM	1.22	1.83	2.34	2.81	3.61	5.36	6.44

   8

   b) Derive an expression for apparent viscosity for Brookfield viscometer. **8**

11. a) Obtain an expression for mean effective pressure across the cavity for centre gated disc assuming non-isothermal situation. **8**

    b) Derive an expression for compaction force for a circular compression molded disc with radius R and thickness N. **8**

    OR

12. a) A polymer follows power law of the form $\tau = 1,60,000\ \dot{r}^{0.4}$, where τ = shear stress In N/m^2 and $\dot{r}$ is shear rate in sec^{-1}. If the man flow rate is 18 g/s through a circular runner of diameter 10 mm and length 60 mm, calculate the pressure drop through the runner. Melt density is 0.78 g/cc. **8**

    b) Derive an expression for flow length of a power law fluid when it is injected at constant pressure into a rectangular channel assuming the flow is isothermal. **8**

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T.E. (Computer Engineering) (Semester – I) Examination, 2011
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

Instructions *: i) Answers to the **two** Sections must be written in **separate** books.*
*ii) Neat diagrams must be drawn **whenever** necessary.*
*iii) **Assume** suitable data if **necessary**.*
*iv) Solve Section **I** : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
*v) Solve Section **II** : Q.7 or Q.8, Q.9 or 10, Q.11 or Q.12.*

SECTION – I

1. a) Explain component and overall structure of DBMS.   **10**

   b) Explain in detail the different levels of abstraction.   **4**

   c) Discuss the entity integrity and referential integrity constraints.   **4**

                         OR

2. a) How following problems are handled with DBMS

     i) Data isolation

     ii) Data redundancy and inconsistency

     iii) Data integrity ?   **6**

   b) Explain significant difference between File Processing and DBMS.   **6**

   c) Explain the different constraints on specialization/generalization with suitable
      example.   **4**

   d) What is meant by mapping cardinality ?   **2**

3. a) What are different types of joins in SQL ? Explain with suitable example.   **6**

   b) Write short note on Dynamic SQL.   **6**

c) Consider following database :

   Student (Roll_no, Name, Address)

   Subject (Sub_code, Sub_name)

   Marks (Roll_no, Sub_code, marks)

   Write following queries in SQL :

   i) Find average marks of each student, along with the name of student.

   ii) Find how many students have failed in the subject "DBMS".   **4**

                    OR

4. a) What is cursor ? Explain explicit cursor and reference cursor in PL/SQL with
      suitable example.   **6**

   b) What is stored procedure and function ?   **4**

   c) Consider the relational database

      dept (dept_no, dname, loc, mgrcode)

      emp (emp_no, ename, designation)

      project (proj_no, proj_name, status)

      dept. and emp. are related as 1 to many.

      Project and emp are related as 1 to many.

      Write queries for the following :

      i) Give the names of employees who are working on 'Blood Bank' project.

      ii) Give the name of managers from 'MARKETING' department.

      iii) Give all the employees working under status 'INCOMPLETE' projects.   **6**

5. a) What is decomposition ? Suppose that we decompose the schema R = (A, B, C, D, E) into (A, B, C) and (A, D, E). Show that this decomposition is lossless decomposition if the following set F of functional dependencies hold.

   A → BC, CD → E, B → D, E → A. **8**

   b) For the relation schema R = (A, B, C, D, E). Compute the closure F^+ and canonical cover F_c of following set F of functional dependencies.

   A → BC, CD → E, B → D, E → A. **8**

OR

6. a) Describe the concept of transitive dependency and explain how this concept is used to define 3 NF. **8**

   b) Specify Amstrong's axioms. Use Amstrong's axioms to prove the soundness of pseudo transitivity rule. **8**

SECTION – II

7. a) What is ordered indices ? Explain the types of ordered indices with suitable example. **10**

   b) State the important of query optimization. **4**

   c) How cost of query is measured ? **4**

OR

8. a) Construct a B^+ tree for the following set of key values :

   (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume order of tree is 4. **9**

   b) What are the steps involved in query processing ? Explain in brief. **9**

9. a) Explain two phase locking protocol. How does it insure serializabiltiy ? **8**

   b) Explain shado paging recovery scheme and log based recovery scheme. **8**

                    OR

10. a) When do deadlock happens ? How to prevent them and how to recover if deadlock takes place ? **8**

    b) Explain the concept of transaction. Describe ACID properties for transaction. **8**

11. a) Write a short note on **any two** : **12**

      i) Data ware house

     ii) Pointer swizzling techniques

    iii) Centralized and Distributed Database Systems.

    b) Explain how objects are stored in relational databases. **4**

                    OR

12. a) What is the difference between persistent and transient objects ? How persistence handle in typical object oriented database system ? **8**

    b) Explain two-tier and three-tier architecture. **4**

    c) Explain steps for data mining. **4**

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T.E. (Computer) (Semester – I) Examination, 2011
DATA COMMUNICATIONS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *i) Answers to the **two** Sections should be written in **separate** books.*
*ii) Neat diagrams must be drawn **whenever** necessary.*
*iii) Figures to the **right** indicate **full** marks.*
*iv) **Assume** suitable data if necessary.*

SECTION – 1

1. a) Explain in detail digital communication system.   **8**

   b) Explain difference in Bit rate and baud rate.   **4**

   c) Write short note on modem.   **6**

                          OR

2. a) Explain the standard modulation techniques (ASK, FSK PSK).   **8**

   b) Explain in detail synchronous and asynchronous communication.   **6**

   c) Compare Analog and digital modulation.   **4**

3. a) Explain in detail what is delta modulation. Draw diagram for delta modulator and demodulator. What are its advantages over PCM ?   **8**

   b) Explain with diagram operation of DPCM transmitter.   **8**

                          OR

4. a) Explain sampling theorem.   **8**

   b) Explain crosstalk pulse digital modulation techniques.   **8**

5. a) Calculate maximum bit rate of channel having.   **8**

   i) S/N ratio is 0 dB and bandwidth 1200 Hz

   ii) S/N ratio is 20 dB and bandwidth 1200 Hz

   iii) S/N ratio is 20 dB and bandwidth is 2400 Hz

   iv) S/N ratio is 0 dB and bandwidth is 2400 Hz

b) Write all code words of (5, 1) linear block code if generator matrix is given as G = [1 1 1 1 1] If received code word is 1 0 1 1 0, what will be the transmitted code ? **8**

OR

6. a) Consider a data stream that is to be transmitted on a voice grade telephone channel with a bandwidth of 3 KHz. Find the channel capacity if the signal to noise ratio is of 10 db. If 100 Kbps data stream is to be transmitted on the channel is it possible to have error free transmission. Justify your answer. If not suggest system modification. **8**

b) The probabilities of five symbols of a discrete memory less source are 0.35, 0.25, 0.2, 0.15, 0.05. Encode them using Huffman encoding algorithm and find the entropy of above source. **8**

SECTION – 2

7. Write short notes on **any three** : **18**
   i) SONET frame structure
   ii) Cellular telephony
   iii) Blue tooth
   iv) Video on demand
   v) PSTN.

OR

8. a) Explain in detail seven layer ISO-OSI reference model for computer network. **10**

b) Explain the following with respect to ATM. **8**
   i) Constant Bit Rate
   ii) Variable Bit Rate
   iii) Available Bit Rate
   iv) Unspecified Bit Rate.

9. a) Explain different switching techniques. **6**

b) Describe the network components (Connectors, Hubs, Switches, Repeaters, and Bridges) **6**

c) Describe different network topologies (Star, Mesh, Ring, and Bus). **4**

OR

10. a) List and explain wireless transmission media. **8**

b) Explain the sliding window protocol and Go-back-n protocol with neat diagram. **8**

11. a) In an unslotted ALOHA system the packet arrival times form a Poisson process having a rate of 103 packets/sec. If the bit rate is 10 Mbps and there are 1000 bits/packet,

Find :
i) The normalized throughput of the system and
ii) The number of bits per packet that will maximize the throughput. **8**

b) Explain the following frequency hop spread spectrum systems with the help of relevant diagram.
i) Slow frequency hopping
ii) Fast frequency hopping. **8**

OR

12. a) A PN sequence is generated using a feedback shift register of length m = 4 the chip rate is 107 chips per second. Find the following parameter :
i) PN sequence length
ii) Chip duration of the PN sequence
iii) PN sequence period. **8**

b) Explain pure ALOHA and slotted ALOHA in detail. Also draw tradeoff between throughput and normalized delay for pure ALOHA and slotted ALOHA. **8**

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T.E. (Computer) (Semester – I) Examination, 2011
DATA COMMUNICATIONS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions : *i) Answers to the **two** Sections should be written in **separate** books.*
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T.E. (Computer Engineering) (Semester – I) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2008 Pattern) (New)

Time: 3 Hours   Max. Marks: 100

Instructions : *1) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I**. Attempt Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q.**11** or Q.**12**.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

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

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Calculate linear convolution using graphical method for the given discrete time signals.

   $x(n) = u(n) - u\ u(n - 4)$

   $h(n) = 2\delta(n) + \delta(n - 2) - 3\delta(n - 3)$.   **8**

   b) Define impulse response of a system. How stability and causality can be described in terms of impulse response ? Test it for the system having following equation.
   $y(n) = x(n) + 3x(n - 4)$.   **8**

                    OR

2. a) The following two inputs are sampled with the sampling frequency of 40Hz. Find the corresponding discrete time signals and comment on the result.   **8**

   $x_1(t) = \cos 20\pi t$
   $x_2(t) = \cos 100\pi t$

   b) Define following discrete time systems with example.   **8**
    i) Linear   ii) Causal
   iii) Stable   iv) Time Invariant.

                                                                          P.T.O.

3. a) Explain circular shifting of sequences. Prove that the multiplication of two DFTs of two sequences is equivalent to circular convolution of two sequences in time domain. **8**

   b) State and prove following properties of Fourier transform **8**

      i) Time Reversal

      ii) Time shifting

                   OR

4. a) Compare F.T. and D.F.T.

      Find the DFT of the sequence

      $x(n) = 0.5^n u(n)$ $0 \le n \le 3$. **8**

   b) Write a note on overlap-save and overlap-add algorithms. **8**

5. a) Derive first stage of Radix-2 DIT (Decimation In time)FFT algorithm. Draw signal flow graph for $N = 8$. **10**

   b) Obtain z transform of signal $x(n) = -a^n u(-n-1)$. Specify ROC and find out another sequence having the same zT. Comment on the result. **8**

                   OR

6. a) How N point DFT can be obtained using Goertzel algorithm as a response of the system ? Apply it to obtain 4 point DFT for $x(n) = \{\underset{\uparrow}{1}, 1\}$ **10**

   b) Using power series method for determining Inverse z transform (IzT) of

      $$x(z) = \frac{1}{1 - 1.5\, z^{-1} + 0.5 z^{-2}}$$

      for

      i) ROC $|z| > 1$

      ii) ROC $|z| < 0.5$. **8**

SECTION – II

7. a) State and prove time delay property of unilateral z-transform. **8**

   b) Find h(n) for a causal system $y(n) - y(n-5) = x(n) + x(n-1)$

   Determine the response of the system for inputs $x(n) = 2^{-n} u(n)$. **8**

OR

8. a) How to test the causality and stability of the system using H(z). Explain with the example. **8**

   b) Find and draw magnitude, phase response of the system function **8**

   $$H(z) = \frac{z+1}{z(z-1)}$$

9. a) Justify : Ideal filters are practically not realizable. **6**

   b) What are the advantages of bilinear transformation method to design IIR filter ? Design a second order DT butterworth filter with cut-off frequency of 1 kHz and sampling frequency of 10^4 samples /sec by using bilinear transformation method. **12**

OR

10. a) Convert an analog filter with system function H(s) into digital IIR filter using impulse-invariance method. **6**

   $$H(s) = \frac{10}{s^2 + 7s + 10}$$

   b) Write a short note on :
   i) Butterworth filter approximation.
   ii) Linear phase in FIR filter. **12**

11. a) Obtain the system function H(z) fors h(n) = {4, 2, –2, –3} and draw a direct form FIR filter structure. **8**

   b) Explain the significance of the following :
   i) Barrel shifter
   ii) MAC
   iii) ALU
   iv) Program sequence. **8**

   OR

12. a) Compare DSP processor with general purpose processor. **8**

   b) Draw cascade realization of $H(z) = 1 + \frac{3}{2} z^{-1} + \frac{3}{2} z^{-2} - z^3$. **8**

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T.E. (Computer Engineering) (Semester – I) Examination, 2011
THEORY OF COMPUTATION
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

1. a) Let R = {(1, 2), (2, 3), (1, 4), (4, 2), (3, 4)} Find R$^+$, R*.   **4**

   b) The transition table of a NFA 'M' is given below. construct a DFA equivalent
      to M. δ is   **8**

	0	1	2
q_0	q_1, q_4	q_4	q_2, q_3
q_1	-	q_4	-
q_2	-	-	q_2, q_3
q_3	-	q_4	-
q_4	-	-	-

   c) Construct a Moore Machine equivalent to the Mealy Machine M given below.
      δ is   6

	a = 0		a = 1	
q_1	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

                              OR

2. a) Show by principle of mathematical induction that $n^4 - 4n^2$ is divisible by 3 for all $n \geq 0$. **6**

   b) Design a Mealy Machine to find out 2's complement of a given binary number. **6**

   c) Convert the given NFA–$\wedge$ to an NFA. **6**
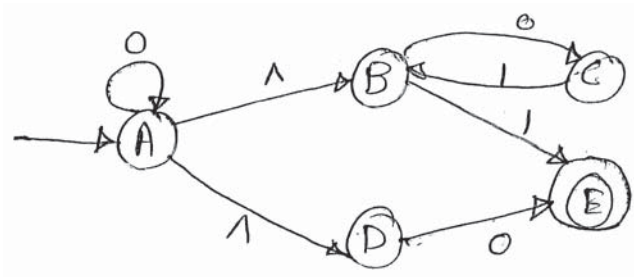
3. a) Using Pumping Lemma, prove that L is not regular : **6**

   $$L = \left\{0^n \mid n \text{ is prime}\right\} = \left\{0^2, 0^3, 0^5, 0^7, 0^{11}, ...\right\}$$

   b) Construct a DFA with reduced states equivalent to the regular expression $10 + (0+11)0*1$. **10**

                    OR

4. a) Consider the following transition diagram and convert it to its equivalent regular expression using Arden's theorem. **6**
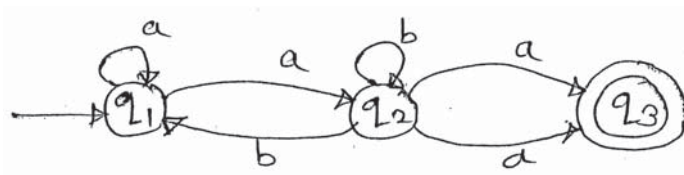
   b) Prove the following :
      $(1+00*1) + (1+00*1)(0+10*1)* (0+10*1) = 0*1(0+10*1)*.$ **4**

   c) Find the regular expressions representing the following sets : **6**

      i) The set of all strings over {a, b} with three consecutive b's.

      ii) The set of all strings over {0,1} beginning with 00.

      iii) The set of all strings over {0,1} ending with 00 and beginning with 1.

5. a) Prove that CFL's are closed under union, concatenation and kleene closure. **8**

   b) Consider the following productions : **8**

   $S \rightarrow aB \mid bA$

   $A \rightarrow aS \mid bAA \mid a$

   $B \rightarrow bS \mid aBB \mid b$

   For the string aaabbabbba find :

     i) Leftmost derivation

     ii) Rightmost derivation

     iii) Parse Tree.

                 OR

6. a) Reduce the following grammar to Greibach Normal form. **8**

   $S \rightarrow SS$, $S \rightarrow 0S1 \mid 01$

   b) Write short note on Chomsky Hierarchy. **8**

7. a) Construct a PDA accepting the language $L = \{a^n b^m a^n \mid n, m \geq 1\}$ by null

   store. **8**

   b) Convert the above PDA in Q. 7(a) to the CFG. **10**

                 OR

8. a) Construct a PDA to accept the language of palindromes with the Marker

   $L = \{x C x^r \mid x \in \{a, b\}^*\}$ **8**

   b) Construct a PDA equivalent to the following CFG. **10**

   $S \rightarrow OBB$

   $B \rightarrow OS \mid IS \mid O$

   Test whether 010^4 is in N(A).

9. a) Design a turing machine over $\{1, b\}$ which can compute concatenation function over $\Sigma = \{1\}$. If a pair of words (w_1, w_2) is the input the output has to be $w_1 w_2$. **8**

   b) Define a post machine. Compare FA, PDA and TM. **8**

                    OR

10. a) Design a turing machine M to recognize the language $\{1^n\, 2^n\, 3^n \mid n \geq 1\}$. **8**

    b) Write a short note on : **8**

       i) Universal Turing Machine

       ii) Halting problem of Turing Machine.

11. a) Prove that, A language $L \subseteq \Sigma^*$ is recursively enumerable (ie. can be accepted by some TM) iff L can be enumerated by some TM. **8**

    b) If L_1 and L_2 are recursively enumerable languages over Σ then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursively enumerable. **8**

                    OR

12. a) Let G be a CFG and 'r' be a regular expression. Show that the problem **8**

       i) $L(G) = L(r)$ ii) $L(r) \in L(G)$

       are undecidable.

    b) Write a short note on post correspondence problem. **8**

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T.E. (Computer Engineering) (Semester – II) Examination, 2011
FINANCIAL AND MANAGEMENT INFORMATION SYSTEMS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

Instructions :   *1) Answer **any 3** questions from **each** Section.*
                              *2) Answers to the **two** Sections should be written in*
                                 ***separate** answer books.*
                              *3) **Neat** diagrams must be drawn **wherever** necessary.*
                              *4) Black figures to the **right** indicate **full** marks.*
                              *5) Assume **suitable** data, if **necessary**.*

SECTION – I

Unit – I

1. a) Define Management. What are different levels of Management ? Explain
      in detail.   **8**

   b) What are social responsibilities of a manager ? Explain different functions
      of manager in brief.   **8**

                      OR

2. a) What are functions of management ? Explain each function in detail.   **8**

   b) Explain followings :   **8**

       i) Multinational Corporations.

      ii) Quality and Total Quality Management.

      iii) Human Resource Management.

      iv) Concept of International business management.

P.T.O.

Unit – II

3. a) Elaborate the scope of financial management in a business organization. **8**

   b) Explain followings : **8**
      i) Balance sheet and Trial balance.
      ii) Fixed assets and current assets.

                OR

4. a) Explain process of Merger and Acquisition. What are advantages of merger
      and acquisition ? **8**

   b) Explain fundamental principle of finance. Explain in brief, different types
      of financial statements. **8**

Unit – III

5. a) What is DSS (Decision Support System) ? Discuss applications of DSS in
      business operations. **8**

   b) Explain followings (**any two**) : **10**
      i) Knowledge Management System.
      ii) Management Information System.
      iii) Business processing reengineering.

                OR

6. a) What is the concept of Management Information System ? What are the
      components of Management Information Systems ? **8**

   b) Explain following (**any two**) : **10**
      i) Decision Support System (DSS).
      ii) Knowledge Management System.
      iii) Role of Management Information System in DSS.

SECTION – II

Unit – IV

7. a) Explain e-commerce. Explain the different business models used in e-commerce. **8**

   b) Describe in detail, the followings : **8**
      i) Content Management System (CMS).
      ii) Security threats to e-business.

                      OR

8. a) What is an enterprise portal ? How it is significant to web-enabled business management ? **8**

   b) Describe in detail, the followings : **8**
      i) Enterprise Content Management (ECM).
      ii) E-commerce.

Unit – V

9. a) Discuss the architecture of ERP systems. Is ERP an asset ? Why ? Explain in brief. **8**

   b) Explain in brief, the followings : **8**
      i) Enterprise Management System.
      ii) Supply Chain Management System.
      iii) Customer Relationship Management System.
      iv) Outsourcing.

                      OR

10. a) Explain the different cultural, political and economical challenges involved in global IT management. **8**

    b) What is supply chain management system and customer relationship management system ? How these systems help business to improve ? **8**

Unit – VI

11. a) Explain the importance of IT Acts to stop the cyber crime in e-business. What are the provisions in IT Act ?   **8**

    b) Explain patents, copyright, and trademarks in detail. How the Intellectual Property Rights (IPR) helps to protect the information ? Explain in brief. **10**

                                OR

12. a) Explain cyber crime and cyber laws in brief. What are the advantages of cyber laws ?   **8**

    b) Write notes on **any two** :   **10**
        i) Intellectual Property Rights (IPR).
        ii) Provisions in IT Act 2000.
        iii) Right to Information Act (RTI).

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T.E. (Comp. Engineering) (Semester – II) Examination, 2011
SYSTEMS PROGRAMMING AND OPERATING SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions *:* 1) *Answer **any 3** questions from **each** Section.*
                   2) *Answers to the **two** Sections should be written in **separate** books.*
                   3) ***Neat** diagrams must be drawn **wherever** necessary.*
                   4) *Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) What are different language processing activities ?   **4**

   b) Draw the flow chart for pass one of a two pass assembler.   **8**

   c) Explain with suitable example the use of intermediate code in two pass assemble.   **4**

                             OR

2. a) What are the differences between positional and keyword parameters ?   **4**

   b) Enlist the steps involved in handling macro definition inside the macro of one pass macro processor.   **6**

   c) Which data structures required in the design of 2 pass macro processor give their formats ?   **6**

3. a) What is a loader ? What are its basic functions ?   **4**

   b) "Direct linking loader is a general re-locatable loader". Justify.   **8**

   c) Compare compile and go loader and absolute loader.   **4**

                             OR

4. a) Give the complete design of direct linking loader.   **12**

   b) What is an object module ? What information does the object module contain ? **4**

P.T.O.

5. a) What is the need of DLL ?　　　　　　　　　　　　　　　　　　　　　**4**

   b) Explain the dynamic linking with and without imports.　　　　　　**8**

   c) What is the use of callback function in DLL ?　　　　　　　　　　　**6**

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

6. a) What are the advantages of multiprogramming ?　　　　　　　　　　**4**

   b) What are the benefits of system calla ?　　　　　　　　　　　　　　**4**

   c) Explain different process scheduling algorithms in multiprocessor systems.　**10**

<div align="center">SECTION – II</div>

7. a) Define the following terms :
      1) Real time OS
      2) Privileged instruction
      3) Batch OS
      4) Semaphore　　　　　　　　　　　　　　　　　　　　　　　　　**8**

   b) Describe the difference between short term, medium term and long term schedulers.　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**8**

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

8. a) What are the draw backs of monitors ?　　　　　　　　　　　　　　**4**

   b) List the differences between user level and kernel level threads.　　**6**

   c) Give solution to bounded-buffer producer consumer using Binary semaphores.　**6**

9. a) What are the weaknesses of Bankers algorithm ?　　　　　　　　　**4**

   b) What are the solutions to recover the system from deadlock ? Explain.　**8**

   c) What are the advantages of preventing the dead lock ?　　　　　　**6**

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

10. a) Explain the first fit, best fit and next fit algorithms with example.　**12**

    b) Explain the difference between logical and physical address.　　　**6**

11. a) What is an I/O buffer ? What is its use ?　　　　　　　　　　　　**6**

    b) Explain the characteristics of FIFO, SSTF and C-SCAN.　　　　**10**

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

12. a) With the help of diagram explain the methods used for record blocking.　**8**

    b) Explain the various free space management techniques.　　　　　　**8**

<div align="center">—————</div>
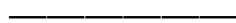
T.E. (Information Technology) (Semester – I) Examination, 2011
OPERATING SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer to the* **two** *Sections should be written in* **separate** *answer books.*
2) Figures to the **right** *indicate* **full** *marks.*
3) Neat diagrams must be drawn **wherever** *necessary.*
4) **Assume** *suitable data* **wherever** *necessary.*

SECTION – I

1. a) Explain various architectures of Operating System with diagram.   **8**

   b) Write a shell program to check if given string is palindrome or not.   **4**

   c) What is a system call ? Explain its significance.   **4**

                                    OR

2. a) Describe in short various functions performed by Operating System.   **8**

   b) Write a short note on :   **8**
      a) Real Time Operating System
      b) AWK programming.

3. a) Explain following scheduling algorithms.   **9**
      1) FCFS
      2) SJF
      3) RR

   b) Explain the following functions with reference to c   **9**

      pthread_create( )

      pthread_join( )

      fork( ).

                                    OR

4. a) Explain a generic way of scheduling the processes which will cater to
      requirements of scheduling criteria provided by user   **9**

   b) Explain with diagram the scheduling method used in Unix.   **9**

5. a) Explain the following functions (along with parameters passed) with reference to semaphore programming in c. **8**

   Semget( )

   sem_post( )

   sem_init( )

   b) Explain how resource allocation graph determines a deadlock. Also discuss an integrated deadlock strategy. **8**

                    OR

6. a) What is a Monitor ? Write a monitor solution for dining philosophers' problem. **8**

   b) What is the significance of classical problems in operating system ? Give example related to at least two classical problem. **8**

SECTION – II

7. a) How memory partitioning is done with buddy system. **8**

   b) Compare paging with segmentation w.r.t the amount of memory required by the address translation structures in order to convert virtual addresses to physical address. **4**

   c) Free memory holes of sizes 15K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K are to be allocated. How processes are placed in first fit, best fit, worst fit. Calculate internal as well as external fragmentation. **6**

                    OR

8. a) Explain the memory management in Linux operating system ? **8**

   b) A process contains following virtual pages on disk and is assigned a fixed allocation of four page frames in main memory. Show the successive pages residing in the four frames using FIFO, LRU, Optimal. **8**

      1, 0, 2, 2, 1, 7, 6, 7, 0, 1, 2, 0, 3, 0, 4, 5, 1, 5, 2

   c) What is thrashing ? **2**

9. a) What are the different buffering ways in I/O buffering ? **8**

   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 C-Scan, Scan, Look, C-look calculate average seek length and show the tracing of request. **8**

   OR

10. a) Explain Unix file system. **8**

    b) Explain free space management. **8**

11. a) What is the difference between passive and active security threats ? **6**

    b) In what way user authentication can be done. **6**

    c) What is asymmetric encryption algorithm ? **4**

    OR

12. a) Explain the following : **8**
       i) Trojan Horse
       ii) Trap Door
       iii) Logic bomb
       iv) Stack and buffer overflow.

    b) What is Morris internet worm ? **8**

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T.E. (IT) (Semester – I) Examination, 2011
SOFTWARE ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

Instructions :
1) Answer **3** questions from Section **I** and **3** questions from Section **II**.
2) Answers to the **two** Sections should be written in **separate** books.
3) Neat diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) Assume suitable data, if necessary.

SECTION – I

1. a) Explain software engineering as a layered technology. **8**

   b) Explain extreme programming with an example. **6**

   c) Consider a system where the stakeholders have a general idea of what the system should do but are unsure of specific software requirements. Write a process pattern for the same. **4**

        OR

2. a) Explain concurrent development model with an example. **6**

   b) Which software process model should be used for the following projects ? Justify your answer. **6**
      i) Office automation system
      ii) A flight control system $\bar{c}$ extremely high reliability.
      iii) An online book store.

   c) Are the unified process and UML related ? Explain. **6**

3. a) Explain the requirements elicitation phase in detial in requirements engg. **8**

   b) Consider the automation of a warehouse which includes : **8**
      i) Accepting and processing orders
      ii) Shipping orders
      iii) Accounting
      iv) Inventory mgmt.

   Develop an use case diagram for the system.

        OR

P.T.O.

4. a) The analysis model repts. a snapshot of the system. Justify. **8**

   b) For the system in Q. 3 b) Identify the analysis classes and draw the class diagram with relevant relationships between classes. **8**

5. 1) Explain the following design concepts : **8**
      i) Modularity
      ii) Information hiding
      iii) Refinement
      iv) Refactoring.

   2) With examples explain data design elements and architectural design elements. **8**

                    OR

6. 1) In detial list the various diagrams that make up the design model of any system. **8**

   2) Explain the various components of an activity diagram and draw one for any activity of an ATM system. **8**

<div align="center">SECTION – II</div>

7. 1) Compare and contrast integration testing for conventional and object oriented software. **8**

   2) Explain loop testing for different types of loops. **8**

                    OR

8. 1) For the given code, draw the flow graph, identify all the independent program paths from the flow graph and calculate the cyclomatic complexity from the flow graph. **10**

   arr-sum (arr, size, sum)

   ```
   {      sum = 0 ;
        i = 1;
      while (i< = size)
         {   If (arr [i] > 0) sum = sum + arr [i];
             i = i + 1;
         }
   }
   ```

   2) Explain orthogonal array testing as a type of black box testing. **6**

9. 1) Explain the W^{5}HH principle. **6**

2) List and explain how web application project metrics help in measuring quality of web applications. **6**

3) For a library management system, calculate the estimated value of function point. **6**

OR

10. 1) Explain with examples the terms measure, measurement, metric and indicator w.r.t. project metrics. **6**

2) Explain the types of metrics used to ensure quality of a system, application or product. **6**

3) Write a note on use-case based estimation. **6**

11. 1) Explain the different types of risks involved in any software system. **6**

2) With a neat diagram explain a task network for concept development. **6**

3) Write a note on version control. **4**

OR

12. 1) Write a note on RMMM plan. **4**

2) Explain the SCM process in detail. **6**

3) Explain the various steps involved in change control process. **6**

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T.E. (Information Technology) (Semester – II) Examination, 2011
SYSTEM SOFTWARE PROGRAMMING
(2008 Pattern) (New)

Time : 3 Hours   Total Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
         *2) Answers to the **two** Sections should be written in **separate** books.*
         *3) **Neat** diagrams must be drawn **wherever** necessary.*
         *4) Black figures to the **right** indicate **full** marks.*
         *5) **Use** of electronic pocket calculator **allowed**.*
         *6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain with example, the difference between literal and symbol. How are they treated by assembler ?   **6**

   b) What feature of assembly makes it mandatory to design a two pass assembler ?

      Explain with example.   **6**

   c) Enlist the different types of errors that are handled by Pass I and Pass II of two pass assembler.   **6**

              OR

2. 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.

      START 100
   A DC 01
      MOVER AREG, A
      ADD AREG, '=3'
      MULT AREG, '=10'
      BC GT, L
      LTORG
   L ADD AREG, '=4'
      ADD BREG, B
   B DS 1
      END   **8**

b) i) Explain the term back-patching. **2**

ii) Can single pass assembler resolve forward reference. Justify your answer with appropriate example and data structure needed. **8**

3. a) Explain following terms with macro :

i) Expansion time variables

ii) Conditional assembly

iii) Keyword and positional parameters. **10**

b) Can macro processing be incorporated in an assembler. Justify your answer. **6**

OR

4. For the following assembly language code, show the contents of macro name table, macro definition table. Finally write down the code after macro expansion.

```
        MACRO
        EVAL &X, &Y, &Z
        AIF (&Y EQ &Z). ONLY
        LOAD &X
        SUB &Y
        ADD &Z
        AGO .OVER
.ONLY   LOAD & Z
.OVER   MEND
        MACRO
        MAJOR &W1, &W2, &W3, &W4, &W5, &W6
        EVAL &W1, &W2, &W3
        STORE &W6
        EVAL &W4, &W5, &W6
        MEND
        START
        MAJOR A, B, C, D, E, F
        END
```
16

5. a) Explain the role of Lexical Analyser in compiler design. List the types of errors
      reported during lexical analysis phase of compiler.   **6**

   b) Construct a left most derivation for the string "ibtibtaea" using the grammar

   S → i CtS

   S → iCtSeS

   S → a

   C → b

   Draw the parse tree also.   **4**

   c) Explain the problems/difficulties that are faced during Top Down Parsing.   **6**

                                   OR

6. a) Explain working of Recursive Descent Parser with an example.   **8**

   b) Write short notes on :
      i) Cross compiler
      ii) Boot strap compiler.   **8**

SECTION – II

7. a) Give postfix, tripple and quadruple form of $A = (-C + D)/(-P * (-Q + R))$.   **6**

   b) Explain following machine independent code optimization techniques.
      i) Common subexpression elimination
      ii) Loop Invariants
      iii) Constant folding.   **12**

                                   OR

8. a) Explain the importance of intermediate code generation in compiler.   **4**

   b) Explain the term activation record and explain its use in storage allocation.   **8**

   c) Explain any one technique of machine dependent code optimization.   **6**

9. a) Draw the flow chart for Pass II of direct linking loader. **12**

   b) List four basic functions of loader. **4**

                    OR

10. a) Compare following :

     i) Dynamic loading Vs dynamic linking

     ii) Image builder Vs linkage editor

     iii) Compile and go loader Vs absolute loader. **6**

   b) Mention four basic functions of the loader and explain how these functions
      are performed by absolute loader. **10**

11. a) Explain following language processing tools.

     i) LEX

     ii) YACC. **6**

   b) Explain significance of Debug monitor. **4**

   c) With the help of diagram, explain user interface and its use in software
      application. **6**

                    OR

12. a) List various types of editors. Explain line editor and give its merits and demerits. **8**

   b) Write short note on "Testing and tools for program testing". **8**

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T.E. (Information Technology) (Semester – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : 1) Answers to the **two** Sections should be written in **separate** sheet.
2) Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.
3) Neat diagram must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) Assume suitable data, **if necessary**.

SECTION – I

1. a) What is understood by term 'Management Information System' ? Discuss various activities performed by Management Information System in an organization.   **9**

   b) What is planning ? Explain how Management Information System is used for Business Planning.   **9**

                                                  OR

2. a) What are the characteristics of an Information System ? Discuss the organization, management and technology dimensions of Information System.   **9**

   b) Define the term 'manager'. With suitable examples explain the functions of manager of an IT industry.   **9**

3. a) What is the role of information in decision making ? Discuss with the help of suitable examples stages of decision making described by Simon.   **8**

   b) Explain following analytical modeling activities that help in using decision Support System.   **8**
      i) What-if analysis
      ii) Sensitivity analysis.

                                                  OR

4. a) Explain following analytical modeling activities that help in using Decision Support System. **8**
   i) Goal-seeking analysis
   ii) Optimization analysis.

   b) Describe how the concept of Artificial Intelligence and Data Mining is used in decision making process. **8**

5. a) What is e-commerce ? Explain C2C, C2G, G2G types of e-commerce system. **8**

   b) List the components of the Supply Chain Management and explain them briefly. **8**

                              OR

6. a) Explain following key components of an e-commerce process architecture. **8**
   i) Access control and security
   ii) Profiling and personalizing
   iii) Search management
   iv) Content management

   b) What is CRM ? Briefly describe acquisition and enhance phases of CRM. Give suitable example. **8**

SECTION – II

7. a) Nil-Jyothi Electronics Ltd. appoints certain daily labors. They are in type of skilled, semiskilled and unskilled worker. The wages per day is given to the worker and it generally paid by cash. The company has decided standard rate for each type of worker. The rate are as under : **8**
   i) Skilled : Rs. 250 per day.
   ii) Unskilled : Rs. 100 per day.
   iii) Semi-skilled : Rs. 200 per day.

   The attendance is maintained by HR dept. Based on the attendance, Accounts dept makes the payment of each worker at the end of the month. Addition to the daily working Hrs. (8 hrs), if the workers has done extra duty then additional payment will be made on the basis of per hour – i.e. 8% for skilled, 6% for semiskilled and 10% for unskilled workers respectively. You are required to do the following :
   a) Design an input screen for maintaining daily attendance of the workers.
   b) Generate salary slip format of all workers in the form of report.
   c) Report generation of additional payments at the end of particular month.

   b) Write brief note on application of Management Information System in hotel business. **8**

                              OR

8. a) M/s. Khushaldas Govinddas is a wholesale trading firm engaged in business for over 30 years. It has over 50 vendors, about 1050 retailers deals in 103 items. The firm has now decided to move into the IT era and need to computerize its operations. You, as a Systems Analyst, are required to give file design, give two output report formats and suggest two exceptional report formats. **8**

b) Write brief notes on : **8**
   i) Enterprise application Integration
   ii) Transaction Processing systems.

9. a) Briefly explain phases of ERP implementation. **8**

b) Why is Document Management Service Important ? How does outsourcing of Document Management Service help in business ? **8**

OR

10. a) BPO Service Industry is doing exceptionally well in India. Why ? What are the advantages of BPO services ? **8**

b) What is Medical Transcription Service ? Why Outsource Medical Transcription Service to India ? **8**

11. a) What is 'Copyright' protection ? Explain its relevance in computer applications. **9**

b) Write the importance of security in Information Technology/Information System and explain the various measures which could be initiated to minimize, if not eliminate altogether, the threats to system security. **9**

OR

12. a) What is the ethical responsibility of business professionals ? **6**

b) Write short notes on **any two** of the following : **12**
   a) Disaster management
   b) Patents
   c) Software piracy
   d) Cultural challenges of Information Technology.

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T.E. Information Technology (Semester – II) Examination, 2011
PROGRAMMING PARADIGMS
(2008 Pattern) (New)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. A) State and explain the importance of learning programming languages.   **10**

   B) State and explain different language paradigms.   **8**

                OR

2. A) What are the attributes of a Good programming language ?   **10**

   B) Define programming environment.   **2**

   C) Explain the concept of data types. Describe specifications of data types.   **6**

3. A) Explain any two problems occurring while evaluating any expression.   **8**

   B) Explain with example the content of Code segment and Activation record at run time.   **8**

                OR

4. A) Explain the concept of backtracking related to Prolog.   **8**

   B) State any 8 elements which require storage at run-time.   **8**

5. A) Explain design principles of object-oriented programming.   **8**

   B) What are the issues required for implementing object-oriented programming ? (any 4).   **8**

                OR

6. A) Explain Applet life cycle.   **10**

   B) State and explain steps required to execute Applet.   **6**

SECTION – II

7. A) What are the drawbacks of Prolog ? **8**

   B) Which type of storage management is used in LISP ? Explain any one with example. **10**

   OR

8. A) How recursion is implemented in Prolog ? Explain it with example. **8**

   B) Discuss Garbage collection and Dangling references using an example in LISP. **10**

9. A) Explain different categories for classification of computer architecture. **8**

   B) Explain concept of Mapping ? Explain different types of Mapping. **8**

   OR

10. A) State the different Synchronization mechanisms of Parallel programming language. Explain any two. **8**

    B) Explain Data parallelism versus Control parallelism. **4**

    C) Explain any two Granularity Levels. **4**

11. A) Sketch the picture of computation for $X = B^2 - 4*A*C$ relative to data flow and control flow methods. **8**

    B) Describe design principles of Database Programming. **8**

    OR

12. A) Explain design principles of Network System. **8**

    B) Describe windows programming. Explain the contents standard EXE project with Visual Basic. **6**

    C) Explain the concept of links in HTML document. **2**

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T.E. (Information Technology) (Semester – II) Examination, 2011
HUMAN COMPUTER INTERACTION AND USABILITY (New)
(2008 Pattern)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer question **1** or **2**, **3** or **4**, and **5** or **6** from*
*Section– **I** and Question **7** or **8**, **9** or **10** and **11** or **12***
*from Section – **II**.*
*2) Answers to the **two** Sections should be written in*
***separate** answer sheet.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
5) Assume suitable data, if necessary.

SECTION – I

1. a) Explain following terms related to the human short-term memory.   **8**
    i) Digit Span
    ii) Chunking
    iii) Recency effect
    iv) Closure

   b) Write brief notes on keyboards, keyboard layouts, keys and function keys.   **8**

                    OR

2. a) What is the difference between recognition and recall in relation to human
      memory ? Explain with example.   **8**

   b) Discuss general principles and goals of user interface design.   **8**

3. a) Describe how HCI affect use of Hospital Management system with respect to :   **10**
    i) the aim of the program (what it is used for)
    ii) describe its interface (picture of the screen)
    iii) describe its interaction (how it is used)

                                                                        P.T.O.

b) Express your opinion- "A design should be User-Centric".   **8**

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

4. a) Describe briefly four different interaction styles used to accommodate the dialog between user and computer. What are the factors you would need to take into account when designing a screen layout for a database application ?   **10**

b) What is WIMP ? Explain how to use its elements to design user interface.   **8**

5. a) Compare and contrast expert reviews with usability testing.   **8**

b) How surveys help in better designing ?   **8**

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

6. a) Evaluate Microsoft Word interface using the "Eight golden rules of interface design".   **8**

b) List and explain the steps of usability testing. What are some of the limitations of such testing ?   **8**

<div align="center">SECTION – II</div>

7. a) What is DECIDE ? Explain in detail DECIDE framework.   **10**

b) Compare the print page design and web page design.   **8**

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

8. a) Discuss the following in respect of designing a web site.   **10**

    a) Browsing

    b) Search facilities.

b) Explain in brief Hutch-World Case Study evaluation framework.   **8**

9. a) What is Cognitive Model ? Discuss with example. **8**

   b) What is Linguistic Model ? Give the BNF notation for a telephone book entry. **8**

                    OR

10. a) Hierarchical Task Analysis (HTA) is used to describe the interactions between a user and a software system. Draw and explain HTA to borrow a book from library. **8**

    b) What is Dialog ? Explain different diagrammatic dialog design notations. **8**

11. a) Explain how following CSCW systems are useful for co-operative working. **8**
       i) Meeting Rooms.
       ii) Shared Drawing Surfaces.

    b) Differentiate Augmented Reality versus Virtual Reality. **8**

                    OR

12. Write a short note on : **16**
    i) Information and data visualization
    ii) Ubiquitous Computing.

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