

Total No. of Questions—12]

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[4657]-105

S.E. (Biotechnology) (Second Semester) EXAMINATION, 2014

BIOCHEMISTRY—II

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—** (i) Solve 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) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Assume suitable data, if necessary.
- (v) Answers to the two Sections should be written in separate answer-books.

SECTION I

1. Define allosteric protein. Explain the allosteric property of hemoglobin. Also illustrate the physiological significance of the co-operative binding of oxygen by hemoglobin ? [18]

P.T.O.

Or

2. Explain in detail about the structure and bonds involved in stabilizing alpha helix and beta pleated sheet. [18]
3. Describe in detail about (8 marks each) : [16]
- (a) Multienzyme complex
 - (b) Regulatory enzyme.

Or

4. Enlist the various steps involved in purification of protein. Give the brief account of each step. [16]
5. Answer the following (8 marks each) : [16]
- (1) Define and differentiate between competitive and non-competitive inhibition.
 - (2) Significance of inhibition studies.

Or

6. Describe the role of the following co-enzymes in any *one* enzyme catalyzed reaction (8 marks each) : [16]
- (1) TDP
 - (2) Biotin.

SECTION II

7. Draw a schematic for (9 marks each) : [18]

- (1) Hierarchical organization of endocrine regulation under the control of hypothalamus.
- (2) Amplification cascade in the stimulation of glycogenolysis by epinephrine in the liver cell to yield blood glucose.

Or

8. Describe in detail about (9 marks each) : [18]

- (1) Growth hormone
- (2) Serpentine receptor.

9. Draw a neat sketch of bacterial flagellar rotation and explain about how does proton flow drives bacterial flagellar rotation. [16]

Or

10. Write short notes on (8 marks each) : [16]

- (1) Na/K pump
- (2) Role of calcium in muscle contraction.

11. Write short notes on (8 marks each) : [16]

(1) Biochemical parameters used for diagnosis of liver disease.

(2) Enzyme tests used for monitoring heart disease.

Or

12. Define the terms and detail the symptoms of Dementia, Osteomalacia, Kwashiorkor and Rickets. [16]

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[4657]-106

S.E. (Biotechnology) (Second Sem.) EXAMINATION, 2014

Cell Biology and Tissue Culture

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answer 3 questions from each Section.

(ii) Answer to the two sections should be written in separate answer-books.

(iii) Figures to the right indicate full marks.

(iv) Neat diagrams must be drawn whenever necessary.

SECTION I

1. With the help of neat labelled diagram explain the structure and function of any *three* cell organelles ? [18]

Or

2. Describe how eukaryotic cells are different from prokaryotic cells. Add a note on different components of cytoskeleton. [18]

P.T.O.

3. Answer the following (8 marks each) : [16]

(i) Transport of molecules across the cell membrane.

(ii) Receptor mediated endocytosis.

Or

4. Explain the fluid mosaic model of cell membrane. Add a note on cell membrane proteins. [16]

5. Discuss the following (8 marks each) : [16]

(a) Cell signaling by G-protein coupled cell surface receptors.

(b) Different types of cell signaling molecules.

Or

6. What is Extracellular Matrix ? Explain its different components in detail. [16]

SECTION II

7. Answer the following (9 marks each) : [18]

(a) Difference between Mitosis and Meiosis;

(b) Cell cycle checks points.

Or

8. With the help of a neat labelled diagram describe the different phases of cell cycle ? Add a note on Apoptosis ? [18]

9. Discuss the following (8 marks each) : [16]

(a) Transmission of nerve impulse through synapse;

(b) Fluid connective tissue.

Or

10. With the help of neat labelled diagram explain different types of epithelial tissue. Add a note on gap junction. [16]

11. Answer the following in detail (8 marks each) : [16]

(a) Characterization of animal cell culture;

(b) Transgenic plants and their applications.

Or

12. Write short notes on (4 marks each) : [16]

(a) Cryopreservation;

(b) Passaging of cells;

(c) Adherent cell culture;

(d) Plant growth hormones.

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[4657]-114

S.E. (Polymer/Petroleum/Petrochem.) (Second Semester)

EXAMINATION, 2014

ENGINEERING CHEMISTRY—II

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

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

SECTION I

1. (a) Explain the reaction of glucose with the following reagents : [6]
- (i) Periodic acid
 - (ii) Bromine water
 - (iii) Nitric acid.
- (b) Discuss physical and chemical properties of amino acids. [6]
- (c) Give classification of carbohydrates. [4]

P.T.O.

Or

- 2.** (a) Draw Haworth's projection formula for : [6]
- (i) Maltose
 - (ii) Sucrose
 - (iii) Cellulose.
- (b) Explain secondary structure of protein. [6]
- (c) Explain *four* factors affecting enzyme activity. [4]

- 3.** (a) Explain the following conversions : [6]
- Carboxylic acid \rightarrow Acid chloride \rightarrow Amide
- (b) Discuss synthesis of alkanes starting from : [6]
- (i) Alkyl halide
 - (ii) Ketone
 - (iii) Primary alcohol.
- (c) Explain synthesis of ester by transesterification method. [4]

Or

- 4.** (a) Give *two* oxidative methods for synthesis of carboxylic acids. [6]
- (b) Explain synthesis of aldehyde from alkenes and that of acetals. [6]
- (c) Give method for synthesis of primary and secondary alcohols. [4]

5. (a) Define : [6]

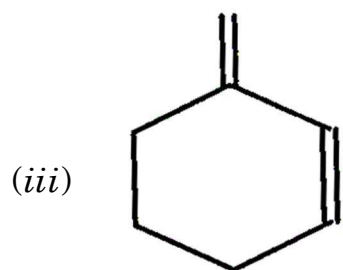
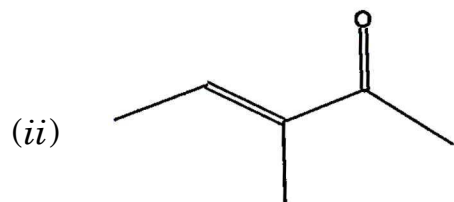
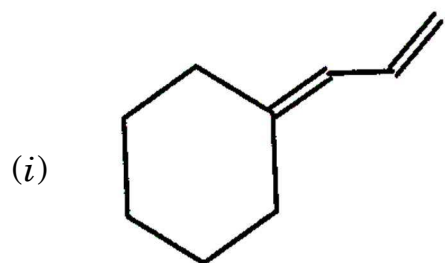
(i) Chromophore

(ii) Bathochromic shift

(iii) Chemical shift

(iv) Hypsochromic shift.

(b) Find λ_{\max} for the following compounds, using Woodward-Fieser rule : [6]



(c) Discuss applications of NMR spectroscopy with suitable examples. [6]

Or

6. (a) By I.R. spectroscopy, how will you determine presence of Ketone, aldehyde and carboxylic acid ? [6]
- (b) Molecular formula of an organic compound is C_4H_6 . It shows ν_{\max} at 1620, 900 and 910 cm^{-1} . Suggest probable structure. [6]
- (c) State and explain Beer-Lambert's law. [6]

SECTION II

7. (a) Draw molecular orbital diagram for the nitrogen molecule. Explain triple bonding in it. [6]
- (b) What are quantum numbers ? Give their significance. Find quantum numbers of last electron of copper atom (At wt. of Cu is 63). [6]
- (c) Explain bonding in CO_2 on the basis of VBT theory. [4]

Or

8. (a) Explain Hund's rule and Aufbau principle. [6]
- (b) Define hybridization. Explain type of hybridization and geometry of methane molecule. [6]
- (c) Give drawbacks of VBT. [4]

9. (a) What is meant by transition elements ? Give electronic configuration of elements of 1st transition series. [6]
- (b) With the help of proper example : [6]
- (i) Co-ordination number
- (ii) Ligand
- (iii) Complex ion.
- (c) Find EAN, O.S. and C.N. of metal ion in the following (any two) : [5]
- (i) $[\text{Mn}(\text{CN})_6]^{4-}$
- (ii) $\text{K}_4[\text{Fe}(\text{CN})_6]$
- (iii) $[\text{Co}(\text{NH}_3)]^{3+}$.

Or

10. (a) On the basis of VBT, explain tetrahedral structure $[\text{NiCl}_4]^{2-}$. [6]
- (b) What is CFSE ? Calculate it for $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{H}_2\text{O})]^{3+}$. Which is more stable ? [6]
- (c) Explain structure and magnetic nature of $[\text{MnCl}_4]^{2-}$. [5]
11. (a) Give principle of atomic absorption spectroscopy. [6]
- (b) Explain two principles of chromatography. [6]
- (c) Write a short note on column chromatography. [5]

Or

- 12.** (a) What is thermogravimetric analysis ? Explain role of thermobalance in this analysis. [6]
- (b) Explain how metal ions can be identified by paper chromatography. [6]
- (c) Give applications of gas chromatography. [5]

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[4657]-115

S.E. (Petroleum, Petrochemical & Polymer)

(Second Semester) EXAMINATION, 2014

PARTICULATE TECHNOLOGY

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answers to the two Sections should be written in separate answer-books.

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

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Use of calculator is allowed.

(vi) Assume suitable data, if necessary.

SECTION I

1. (a) What do you understand by single particle ? Explain the concept in brief. [8]

(b) Explain in detail general characteristics of particulate solids in bulk. [8]

P.T.O.

Or

2. (a) Discuss agglomeration of solids. [8]
- (b) Describe with a neat sketch various screen analysis methods. [8]
3. (a) A material is crushed in Blake Jaw crusher and the average particle size is reduced from 5 cm to 1.3 cm with consumption of 37 Watts-hr/ton. Calculate the energy required to crush the same material with average particle size from 8 cm to 3 cm by using Rittinger's and Kick's laws. Assume mechanical efficiency remains constant. [6]
- (b) Explain with neat sketch the construction and working of smooth roll crusher. [6]
- (c) State and explain various size reduction laws by giving mathematical expressions. [6]

Or

4. (a) A certain set of crushing rolls has rolls of 150 cm in diameter by 50 cm width of face. They are set so that the crushing surfaces are 1.24 cm apart at the narrowest point. The manufacturer recommends 100 rpm as the roll speed. They are crushed a rock having a specific gravity of 2.35 and the angle of nip is 30° . [8]
- (i) What are the permissible sizes of the feed and maximum actual capacity in metric tons per hour if the actual capacity is 12% of the theoretical ?

(ii) After long use, the tires on the rolls of mill have become roughened so that the angle of nip is $32^{\circ} 30'$. What will now be the maximum permissible size of feed and the capacity of rolls ?

(b) Describe in detail fluid energy mill. [6]

(c) What are the *four* basic operating principles on which size reduction machine work. [4]

5. (a) A slurry containing 5 kg of water/kg of solids is to be thickened to a sludge containing 1.5 kg of water/kg of solids in a continuous operation. Laboratory tests using *five* different concentrations of the slurry yielded the following data : [8]

Concentration (kg water/kg solids)	Rate (mm/s)
5.0	0.2
4.2	0.12
3.7	0.094
3.1	0.070
2.5	0.050

Calculate the minimum area of a thickener required to effect the separation of a flow of 1.33 kg/s of solids.

- (b) Explain in detail concept of flocculation. [8]

Or

6. (a) Explain with a neat sketch construction and working of continuous thickener. [8]
- (b) Write a short note on Kynch's theory of sedimentation. [8]

SECTION II

7. (a) List out the various applications of fluidization and explain any *two* in detail. [8]
- (b) Discuss principle and working of centrifugal fluidized bed. [8]

Or

8. (a) A tube of 0.05 m^2 cross-sectional area is packed with spherical particles up to a height of 0.25 m. The porosity of the bed is 0.35. It is desired to fluidize the particles with water (density = 1000 kg/m^3 , viscosity = 10^{-3}). Calculate the minimum velocity of fluidization using Ergun's equation. [8]

Data : diameter of particles = 0.01 m, density of solid particles = 2600 kg/m^3

- (b) Discuss in detail fluidized bed catalytic cracking. [8]

9. (a) A plate and frame press gave a total of 10 m^3 of filtrate in 2000 seconds and 15 m^3 of filtrate in 4200 seconds when the filtration was stopped. Estimate the washing time if 5 m^3 of wash water is used. The resistance of cloth may be neglected and a constant pressure is used throughout. [8]
- (b) Derive the relation for constant rate and constant pressure filtration for the flow of filtrate through cloth and cake resistance combined. [10]

Or

10. (a) Discuss with neat sketch construction and working of rotary drum filter. [8]
- (b) Explain in brief : [10]
- (i) The tube press filter
- (ii) Pressure leaf filter.

11. (a) Explain in detail principle, construction and working of electrostatic separator. [8]

- (b) Estimate the terminal settling velocity for 150 to 230 mesh particles of a limestone whose density is 2800 kg/m^3 falling in water at 30°C . [8]

Data : 150 mesh = 0.104 mm, 230 mesh = 0.063 mm, viscosity = 0.801 C_p , density of water = 995.7 kg/m^3 .

Or

12. (a) Explain in detail Froth flotation process. [8]

- (b) Write short notes on :

(i) Capacity and effectiveness of screen

(ii) Cyclone separator. [8]

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[4657]-124

S.E. (Prod./Industrial) (First Semester) EXAMINATION, 2014

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) 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.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Figures to the right indicate full marks.

SECTION I

1. (a) Define the following terms : [8]

(i) Space lattice

(ii) Unit cell

(iii) APF

(iv) Slip system.

P.T.O.

(b) What is the dislocation ? Compare the edge and screw dislocations. [4]

(c) The resolved shear stress of a single crystal is given by $T = Q\tau \cos A \cos B$, where A is the angle between normal to slip plane and tensile axis and B is the angle between slip direction and tensile axis. Calculate the C.R.S.S. Given that $A = 60^\circ$, probable values of B are 30° , 45° and 84° . Slip starts when $Q\tau$ is 23 kg/mm^2 . [4]

Or

2. (a) Draw the following planes and directions : [8]

(101), (222), [111], [011]

(b) Why is copper more ductile than iron ? [2]

(c) Describe various imperfections in crystals. [6]

3. (a) State the advantages, disadvantages and applications of Rockwell hardness test. [6]

(b) What is fatigue of metals ? Explain the method of testing the metals for fatigue. [6]

(c) State the advantages, disadvantages and applications of Ultrasonic test. [4]

Or

4. (a) Write short notes on the following (any *two*) : [6]
- (i) Erichson cupping test
 - (ii) Durometer
 - (iii) Shear and bend test
 - (iv) Poldi test.
- (b) Draw self-explanatory sketches of the following (any *three*) : [6]
- (i) S-N curves for ferrous and non-ferrous metals
 - (ii) Izod and Charpy specimens
 - (iii) Intercrystalline and intracrystalline fractures
 - (iv) Dye penetrant test.
- (c) What is creep ? Draw a typical creep curve and explain the various stages of curve. [4]
5. (a) What is the phase dig. ? State the purposes of making study of the phase dig. [8]
- (b) Explain in brief the method to plot the equilibrium dig. [6]
- (c) State the Hume Rothery rules of solid solubility. [4]

Or

- 6.** (a) Define the following (any *three*) : [6]
- (i) Solid solution
 - (ii) Intermediate phases
 - (iii) Gibbs' phase rule
 - (iv) Lever rule.
- (b) Explain the process of solidification occurs in the pure metal melts. [6]
- (c) Draw the cooling curves for the following : [6]
- (i) Binary eutectic alloy
 - (ii) Binary solid solution alloy.

SECTION II

- 7.** (a) Coarse grained materials show lower strength than fine grained one, why ? [2]
- (b) Compare Age hardening and Dispersion hardening. [6]
- (c) What is the working principle of a Thermocouple ? State various types of the thermocouples with their specific applications. [8]

Or

8. Write short notes on the following (any *four*) : [16]

(i) Calibration of a thermocouple

(ii) Composite materials

(iii) Martensitic transformation

(iv) Contact pyrometer

(v) Total radiation pyrometer.

9. (a) The characteristics of metal powders are dependent on the method of powder production. Discuss. [8]

(b) Discuss in detail the specific surface and apparent density of metal powders. What is their importance in the P/M field ? [8]

Or

10. (a) Which are the different die design principles to be followed in P/M manufacturing to produce a quality product ? [8]

(b) What is the effect of improper mixing of the powders on quality of P/M product ? [4]

(c) What is the role played by lubricant in compaction ? [4]

- 11.** (a) Draw self-explanatory sketches of the following (any *three*) : [9]
- (i) Pitting corrosion
 - (ii) Galvanic corrosion
 - (iii) Hydrogen evolution mechanism
 - (iv) Oxygen absorption mechanism.
- (b) What is Anodising ? State advantages, disadvantages and applications of this method. [9]

Or

- 12.** (a) Explain CVD process. Are there any advantages of this process over PVD ? [8]
- (b) Write short notes on (any *two*) : [10]
- (i) Ion implantation
 - (ii) Anodic protection
 - (iii) Electroplating.

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[4657]-125

S.E. (Production and Industrial) (Second Semester)

EXAMINATION, 2014

DESIGN OF MACHINE ELEMENT

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answer any *three* questions from each Section.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) 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

UNIT 1

1. (a) Explain the different factors to be considered in designing a machine component. [8]

(b) Explain in brief various theories of failures. [8]

P.T.O.

Or

2. (a) Explain stress concentration and the methods to reduce stress concentration. [6]
- (b) A machine member 50 mm diameter and 250 mm long, supported at one end as a cantilever as shown in Fig. 1. Calculate factor of safety considering combined axial, bending and torsion load using

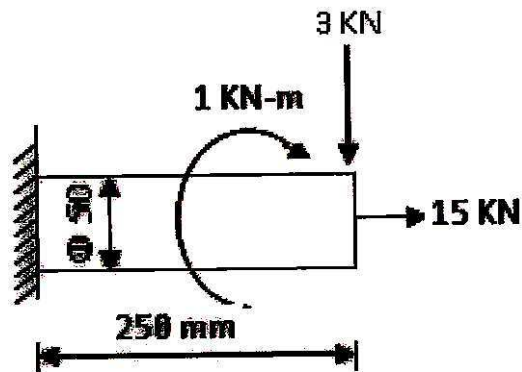


Fig. 1

- (i) Maximum normal stress theory
- (ii) Maximum shear stress theory
- (iii) Distortion energy theory.

Assume tensile yield strength of 175 N/mm². [10]

UNIT 2

3. A shaft is supported on two bearings which are 1 m apart as shown in Fig. 2. Two pulleys A and B are keyed to the shaft. The diameter of both the pulleys is 500 mm with 180° overlap. The two belt directions which are perpendicular to each other. The maximum belt tension in any belt is 2500 N. The ratio of belt tension is 2.2. The shaft is made of steel with ultimate tensile strength of 800 N/mm^2 and tensile yield strength of 500 N/mm^2 . The shock factors in bending and torsion are 1.5 and 1 respectively. Design a solid shaft as per A.S.M.E. code. [18]

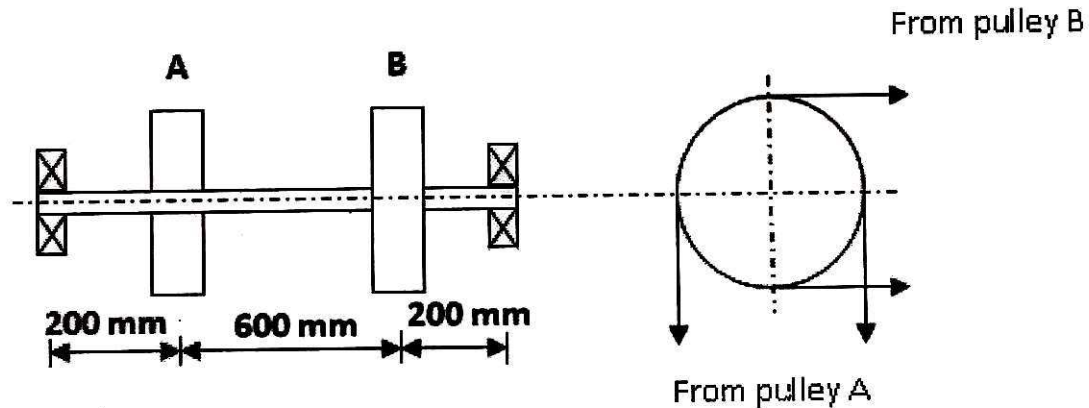


Fig. 2

Or

4. (a) Explain various types of keys with neat sketch. [9]
(b) Explain protected type and unprotected type flange coupling. [9]

UNIT 3

5. (a) What are advantages of welded joints over bolted joints ? [4]
- (b) What are objectives of weld inspection ? State any *one* method. [4]
- (c) A rectangular cross-section bar is welded to a support by means of fillet weld as shown in Fig. 3.

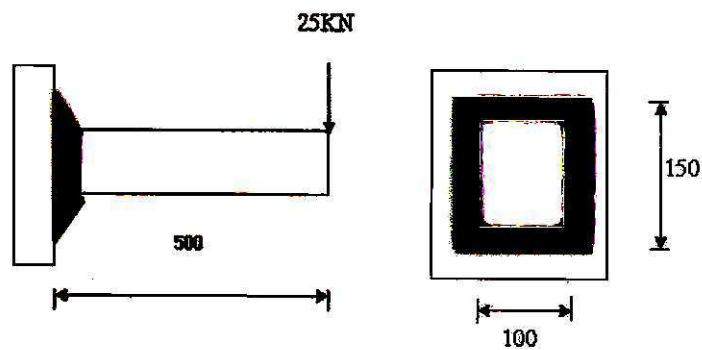


Fig. 3

Determine size of the welds, if the permissible shear stress in the weld is limited to 75 MPa. [8]

Or

6. (a) Explain with sketch strength of parallel and transverse fillet weld. [8]

- (b) A welded joint as shown in Fig. 4, is subjected to an eccentric load of 2 kN. Find the size of weld, if the maximum shear stress in the weld is 25 MPa. [8]

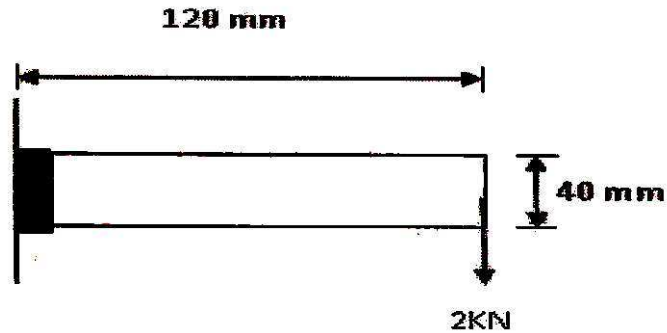


Fig. 4

SECTION II

UNIT 4

7. (a) How does the helix angle influence on the efficiency of square threaded screw ? [4]
- (b) What do you understand by overhauling of screw ? [4]
- (c) The lead screw of a lathe has ACME threads of 64 mm outside diameter and 10 mm pitch. It supplies drive to a tool carriage which needs an axial force of 2500 N. A collar bearing with

inner and outer radius as 40 mm and 80 mm respectively is provided. The coefficient of friction for the screw threads is 0.12 and for the collar it is 0.10. Find the torque required to drive the screw and the efficiency of the screw. Assume uniform wear theory. [10]

Or

8. The screw of a shaft straightener exerts a load of 30 kN. The screw is square threaded of outside diameter 75 mm and 6 mm pitch. Determine :

- (i) Force required at the rim of a 300 mm diameter hand wheel, assuming the coefficient of friction for the threads as 0.12,
- (ii) Maximum compressive stress in the screw, bearing pressure and on the threads and maximum shear stress in threads, and
- (iii) Efficiency of the straightener. [18]

UNIT 5

9. (a) Explain the following terms of the spring : [8]

- (i) Free length
- (ii) Solid length

- (iii) Spring rate
- (iv) Active and inactive coils
- (v) Spring index
- (vi) Stress factor.

- (b) Design a compression helical spring to carry a load of 500 N with a deflection of 25 mm. The spring index may be taken as 8. Assume the following values for the spring material :

Permissible shear stress = 350 MPa

Modulus of rigidity = 84 kN/mm²

Wahl's factor = $(4C-1)/(4C-4) + 0.615/C$, where C = Spring Index. [8]

Or

10. (a) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity is 84 kN/mm². [10]

- (b) Explain the term surge in spring. How can it be eliminated ? [6]

UNIT 6

11. (a) Explain basic form elements. Also explain how these basic shapes are incorporated in products with any *two* suitable examples. [8]

(b) Explain various types of displays with neat sketches. [8]

Or

12. (a) Explain basic principles of design for assembly. [8]

(b) Explain various types of controls with neat sketches. [8]

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[4657]-16

S.E. (Mechanical/Automobile) (I Sem.) EXAMINATION, 2014

MANUFACTURING PROCESSES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Neat diagrams must be drawn wherever necessary.
 - (ii) Figures to the right indicate full marks.
 - (iii) Assume suitable data, if necessary.
 - (iv) Answers to the two Sections should be written in separate answer-books.

SECTION I

1. (a) Discuss various types of patterns with suitable sketches. [8]
- (b) Describe the pattern making allowances. What is the use of contraction rule ? [8]

Or

2. (a) Describe investment casting process with neat sketch. Also state its advantages, limitations and applications. [8]
- (b) Explain hot chamber die casting with suitable sketch. [8]

P.T.O.

3. (a) Explain hot and cold working process. [4]
(b) Explain working principle of forward and backward extrusion process. [4]
(c) Explain rolling operation and various types of rolling mills. [8]

Or

4. (a) Explain : [8]
(i) Metal Spinning
(ii) Tube Drawing.
(b) Sketch and explain the working of universal rolling mill and planetary rolling mill. [8]
5. (a) Describe the process Submerge Arc Welding stating its advantages and limitations. [8]
(b) Differentiate between : [8]
(i) TIG welding and MIG welding
(ii) Soldering and Brazing.

Or

6. (a) Explain principle of resistance welding and its application. [6]
(b) Describe various types of adhesive and their applications. [6]
(c) Differentiate between spot and seam welding. [4]

SECTION II

7. (a) What are the various types of rake angle and its effect on orthogonal cutting operation ? [6]
- (b) List out the various operations performed on lathe machine. Explain any *one* with neat sketch. [8]
- (c) Write down purpose of the following lathe parts : [4]
- (i) Half nut
- (ii) Tail-stock.

Or

8. (a) Define and state the importance of the speed, feed and depth of cut in cutting operation. [9]
- (b) Calculate the machine time required to reduce 60 mm diameter shaft to 50 mm diameter for a length of 1500 mm with depth of cut of 2 mm for rough cut and 1 mm for finish cut.
- Given : [9]
- (i) Cutting speed — 30 m/min
- (ii) Feed — 0.5 mm/rev
- (iii) Approach length — 5 mm
- (iv) Over run length — 5 mm
- (v) No. of Passes — 3 (2 rough cut plus 1 finish cut).

9. (a) Differentiate between up-milling and down-milling. [6]
(b) It is required to divide the periphery of a job into 28 equal divisions. Find the indexing arrangement. [4]
(c) List out the various operations carried out on milling machine. Explain any *two* with neat sketch. [8]

Or

10. (a) Explain with sketch the geometry of plain milling cutter. [8]
(b) Explain the working of universal dividing head. [10]
11. (a) The following letters are printed on a grinding wheel “W-C-80-T-9-S-O”. Explain the meaning of each letter mentioned in the above specification of grinding wheel. [6]
(b) Explain the factors in the selection of grinding wheel. [6]
(c) Differentiate between Honing and Lapping. [4]

Or

12. Write short notes on : [16]
(1) Superfinishing
(2) Buffing and Polishing
(3) Tool and cutter grinder
(4) Cylindrical grinder.

Total No. of Questions—12]

[Total No. of Printed Pages—4+1

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[4657]-17

S.E. (Mechanical/Automobile) (II Sem.) EXAMINATION, 2014

INTERNAL COMBUSTION ENGINES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Answers to the two Sections should be written in separate answer-books.
 - (ii) Neat diagrams must be drawn wherever necessary.
 - (iii) Figures to the right indicate full marks.
 - (iv) Use of calculator is allowed.
 - (v) Assume suitable data, if necessary.

SECTION I

- 1.**
- (a) Explain briefly and classify IC engine. [4+4]
 - (b) Draw and explain valve timing diagram for 4-stroke petrol engine. [4+4]

Or

- 2.**
- (a) Derive an expression for Air Standard efficiency of the Otto cycle. [8]
 - (b) Explain the phenomenon of Dissociation and show its effects on Otto cycle. [4+4]

P.T.O.

3. (a) Explain the phenomenon of pre-ignition. How does it lead to detonation ? [4+4]
- (b) A simple jet carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at 1 bar and 300 K. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.8 of that of the choke, calculate orifice diameter assuming $C_{df} = 0.60$ and $\gamma = 1.4$. [8]

Or

4. (a) Describe stages of combustion in SI engine with the help of P- θ diagram. [4+4]
- (b) Explain with neat sketch the different types of combustion chambers in SI engine. [4+4]
5. (a) Differentiate knocking phenomenon between petrol and diesel combustion chambers. [8]
- (b) Write a note on turbocharger. [4+4]
- (c) Enlist different types of injection nozzles. [2]

Or

6. (a) Explain briefly different variables which affect delay period in C.I. combustion process. [8]

- (b) Draw neat sketch of automatic injector and explain its working. [4+4]
- (c) Define Cetane number. [2]

SECTION II

7. (a) Draw neat sketch of battery ignition system and explain it briefly. [4+4]
- (b) Explain thermostatic cooling with a neat sketch. [4+4]

Or

8. (a) Explain with neat sketch dry sump lubrication system. [4+4]
- (b) Describe with schematic diagram the working of starting system. [4+4]

9. (a) During trial on single cylinder 4-S oil engine, the following results were obtained : [8]

Cylinder diameter = 20 cm

Stroke = 2*D

Mean effective pressure = 6 bar

Torque = 407 N-m

Speed = 250 r.p.m.

Oil consumption = 4 kg/hr

Calorific value of fuel = 43 MJ/kg

Cooling water flow rate = 4.5 kg/min

Air used per kg of fuel = 30 kg

Rise in cooling water temperature = 45°C

Temperature of exhaust gases = 420°C

Room temperature = 20°C

Mean specific heat of exhaust gas = 1 kJ/kgK

Specific heat of water = 4.187 kJ/kgK

Draw heat balance sheet for the test in kJ/hr.

- (b) Explain Willan's line method. Give out its limits. [4+4]

Or

10. (a) An eight cylinder, four stroke engine of 0.09 m bore and 0.08 stroke with a compression ratio of 7 is tested at 4500 r.p.m. on a dynamometer which has 0.54 m arm. During 10 min test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having calorific value of 44000 kJ/kg. Air 27 C and 1 bar was supplied to the carburetor at the rate of 6 kg/min. Take $R = 287 \text{ J/kgK}$. Find :
- (i) The brake power delivered
 - (ii) The brake mean effective pressure
 - (iii) The brake specific fuel consumption
 - (iv) The brake thermal efficiency. [8]
- (b) Discuss Morse test. State its advantages and limitations. [4+2+2]

11. (a) What are the sources of HC formation in petrol engine ? Explain various factors which affect the HC formation. [4+4]
- (b) Explain briefly petroleum refining process. [4+4]
- (c) Enlist factors affecting formation of Nox. [2]

Or

12. Write notes on (any *three*) : [3×6]
- (i) Catalytic converter
- (ii) Exhaust gas recirculation
- (iii) Hybrid vehicle
- (iv) Petrol engine emissions.

Total No. of Questions—12]

[Total No. of Printed Pages—4+1

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[4657]-22

S.E. (Mech./SW) (II Sem.) EXAMINATION, 2014

THERMAL ENGINEERING—II

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Answer *three* questions from Section I and *three* questions from Section II.
 - (ii) Answers to the two Sections should be written in separate answer-books.
 - (iii) Neat diagrams must be drawn wherever necessary.
 - (iv) 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

UNIT I

- 1. (a) Define the following terms : [6]**
- (i) Refrigeration
 - (ii) Ton of Refrigeration
 - (iii) Coefficient of Performance.

P.T.O.

- (b) A Carnot refrigerator requires 1.3 kW per ton of refrigeration to maintain a region at low temperature of -38°C . Determine :
- (i) C.O.P. of Carnot refrigerator
 - (ii) Higher temperature of the cycle
 - (iii) The heat delivered and C.O.P. when this device is used as heat pump. [10]

Or

2. (a) What is sub-cooling and superheating ? Explain with the help of diagram. [6]
- (b) A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is -15°C . The capacity is to be 12 tons. Neglect all losses. Determine :
- (i) Co-efficient of performance
 - (ii) Heat rejected from the system per hour
 - (iii) Power required. [10]

UNIT II

3. (a) Define the following terms : [8]
- (i) Degree of saturation
 - (ii) Specific humidity
 - (iii) Dry bulb temperature
 - (iv) Dew point depression.

- (b) The air supplied to a room of a building in winter is to be at 17°C and have a relative humidity of 60%. If the barometric pressure is 1.01325 bar, find :
- (i) The specific humidity
- (ii) The dew point under these conditions. [8]

Or

4. (a) Explain sensible heating and sensible cooling on psychrometric chart. [8]
- (b) Discuss the working of industrial air-conditioning system. [8]

UNIT III

5. (a) Explain any *one* expansion devices used in refrigeration and air-conditioning system with neat sketch. [6]
- (b) Explain the common refrigeration controls. [6]
- (c) Explain the static regain method in detail. [6]

Or

6. (a) Explain the equal friction method for ducts. [6]
- (b) Describe any *two* types of condensing devices used in refrigeration system. [6]
- (c) Write in brief about testing and maintenance of refrigeration system. [6]

SECTION II

UNIT IV

7. (a) Explain with neat sketch Valve timing diagram. [8]
- (b) A gasoline engine works on Otto cycle. It consumes 8 litres of gasoline per hour and develops power at the rate of 25 kW. The specific gravity of gasoline is 0.8 and its calorific value is 44000 kJ/kg. Find the indicated thermal efficiency of the engine. [8]

Or

8. (a) Discuss any *one* method to find indicated power. [8]
- (b) A single cylinder engine operating at 2000 rpm develops a torque of 8 N-m. The indicated power of the engine is 2.0 kW. Find loss due to friction as the percentage of brake power. [8]

UNIT V

9. (a) Explain stages of combustion in C.I. engine. [8]
- (b) Explain the phenomenon of detonation. [8]

Or

10. (a) Explain how induction swirl is created. What are requirements of injector with this type of swirl ? [8]

- (b) Explain the phenomenon of pre-ignition ? How pre-ignition leads to detonation and vice versa ? [8]

UNIT VI

11. (a) Limitations of supercharging in S.I. and C.I. engines. [6]
(b) Explain with neat sketch catalytic converter. [6]
(c) What are the harmful effects of engine emission ? [6]

Or

12. (a) What is turbocharging ? How is it achieved ? What are its advantages ? [6]
(b) What are the latest emission norms ? [6]
(c) What are the sources of emission from CI engine ? [6]

Total No. of Questions—12]

[Total No. of Printed Pages—4

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[4657]-23

S.E. (Mech. S/W) (II Sem.) EXAMINATION, 2014

MANUFACTURING ENGINEERING

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Answer *three* questions from Section I and *three* questions from Section II.
 - (ii) Answers to the two Sections should be written in separate answer-books.
 - (iii) Neat diagrams must be drawn wherever necessary.
 - (iv) Figures to the right indicate full marks.
 - (v) Assume suitable data, if necessary.

SECTION I

- 1. (a) Discuss different types of casting defects with their remedies. [6]
- (b) Distinguish between hot working and cold working process. [5]
- (c) Write a note on wire drawing process. [5]

Or

- 2. (a) What are the allowances to be provided on pattern ? [5]
- (b) Distinguish between direct extrusion and indirect extrusion. [5]
- (c) Describe the shell moulding process. [6]

P.T.O.

3. (a) Compare with neat sketches forward and backward welding techniques. [6]
- (b) Describe various types of adhesives and their applications. [6]
- (c) Write a note on submerged arc welding. [6]

Or

4. (a) Describe with the help of suitable working setup the principle of GTAW. [6]
- (b) Write a short note on flames used for gas welding process. [6]
- (c) What is resistance welding ? Explain the types of resistance welding and their applications. [6]
5. (a) Give classification of Milling Machine. Describe with neat sketch construction and working of Column and Knee type universal Milling Machine. [8]
- (b) List the taper turning methods on lathe and describe taper turning attachment with neat sketch. [8]

Or

6. (a) Give classification of boring machines. Explain horizontal boring machine with neat sketch. [8]
- (b) How is grinding wheel designated ? Also show the classification of each designation. [8]

SECTION II

7. (a) Explain with neat sketch cutting tool geometry for single point cutting tool. Specify various angles associated to it. [8]
(b) Explain types of chips formed during machining. [4]
(c) Discuss various gear finishing operations. [4]

Or

8. (a) Explain with neat sketch gear manufactured by process of hobbing. [8]
(b) Describe in brief the following : [8]
(i) Thread Rolling
(ii) Thread Grinding.
9. (a) Describe with neat sketch CNC lathe machine and show axes on it. [8]
(b) Differentiate between NC and CNC machine. [4]
(c) Explain programming codes used in NC machines. [4]

Or

10. (a) What is Ultrasonic machining ? Explain with sketch principle and working of USM. [8]
(b) Describe with neat sketch non-conventional method Electro-chemical Machining (ECM). [8]

11. (a) What is six point location principle used in jig and fixture ? Explain it with the help of suitable sketch. [6]
- (b) What are various dies used in sheet metal working ? [6]
- (c) Sketch various quick acting clamps used in jig and fixtures. [6]

Or

12. Write short notes on the following (any *three*) : [18]
- (i) Strip layout
- (ii) Types of drill bushes
- (iii) Two-way clamp
- (iv) Difference between blanking die and piercing die
- (v) Various sheet metal cutting operations.

Total No. of Questions—12]

[Total No. of Printed Pages—8

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[4657]-36

S.E. (Electrical) (Second Semester) EXAMINATION, 2014

POWER SYSTEM—I

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (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 answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) 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) Define the following factors associated with the generating stations : [6]

(i) Demand Factor

P.T.O.

(ii) Diversity Factor

(iii) Load Factor.

(b) Write a short note on H.T. and L.T. customer. [4]

(c) The load on the power plant on a typical day is : [6]

Time (Hour)	Load (MW)
12—6 am	10
6—10 am	30
10 am—6 pm	60
6—10 pm	90
10 pm—12 am	20

Plot the daily load curve and load duration curve. Also find the energy supplied by the plant in 24 hours.

Or

2. (a) What are the economical advantages of interconnected operation of power generating stations ? [6]

(b) Write a short note on time of day tariff. [4]

(c) A generating station supplies different customer groups : [6]

(i) Industrial consumer : 700 MW load

(ii) Commercial consumer : 300 MW load

(iii) Domestic consumer : 500 MW load.

The maximum demand on the station is 1000 MW and number of kWh generated per year is 60×10^5 . Determine :

(i) Diversity factor

(ii) Average load

(iii) Annual load factor.

3. (a) Write a note on control room equipments in a generating station. [8]

(b) A string of suspension insulators consists of four units. The capacitance between each link pin and earth is 1/10th of the self-capacitance of a unit. The voltage between the line conductor and earth is 132 kV. Find the voltage distribution across each unit and string efficiency. [8]

Or

4. (a) What are the major electrical equipments used in a power plant ? List them all. [7]
- (b) Discuss the necessity of excitation system used for alternators. Explain *one* of the types of excitation system used for alternators in brief. [9]
5. (a) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are unsymmetrically spaced but transposed. [6]
- (b) What is the effect of using bundled conductors on line inductance ? [6]
- (c) Write a note on Skin effect. [6]

Or

6. (a) Derive an expression for internal and external flux linkage of a conductor carrying current I amp and thereafter derive the expression for inductance of a single-phase line. [10]

- (b) A three-phase 50 Hz single circuit bundled conductor overhead transmission line with two sub-conductors per phase has horizontal spacing with 6.1 m between the center lines of the adjacent phases. The distance between the sub-conductors of each phase is 30.5 cm and each sub-conductor has a diameter of 2.54 cm. Find the inductance per phase per km of the line. [8]

SECTION II

7. (a) Derive the expression for the capacitance per phase of a three-phase overhead transmission line with symmetrical spacing of conductors, taking into account the effect of earth. Assume complete transposition. Comment on the effect of earth on the capacitance of the transmission line. [10]
- (b) A single-phase 10 km line is 6 m above the ground. The diameter of each conductor is 2 cm and is separated 4 m horizontally. Find : [8]
- (i) Capacitance between the conductors with the effect of ground.

- (ii) Capacitance between phase and neutral taking the presence of ground into account.
- (iii) Capacitance between the conductors neglecting the presence of ground.
- (iv) Charging current when the line is charged at 33 kV, 50 Hz.

Or

8. (a) Explain the 'Method of Images' in determining the effect of earth on the capacitance calculation for overhead transmission lines. [6]
- (b) Derive the equation for capacitance per km of a single-phase overhead transmission line having distance 'D' between the conductors and radius of each conductor 'r'. [6]
- (c) A 220 kV, 50 Hz, 100 km long three-phase transmission line has its conductors at the corners of a triangle with sides 6 m, 6 m and 10 m. The conductor radius is 1.5 cm. Find the capacitance per phase per km and charging current per phase. [8]

9. (a) Determine the generalized circuit constants of medium transmission line. Also prove that the transmission line behaves like a symmetrical network and reciprocal network. [8]

(b) A single circuit, 50 Hz, three-phase, 250 km long transmission line has :

(i) $r = 0.3 \text{ } \Omega/\text{km}$,

(ii) $L = 2.1 \text{ mH/km}$ and

(iii) $C = 0.014 \text{ } \mu\text{F/km}$.

Find A, B, C and D constants of the line using long line consideration. [8]

Or

10. (a) Give classification of transmission line. Explain the effect of load power factor on regulation and efficiency. [8]

(b) Derive the expression for parameters of equivalent “ π ” circuit in terms of line parameters for a long transmission line. [8]

11. (a) What is meant by sag in an overhead line ? Derive the expression for sag when supports are at equal level. [8]
- (b) What are the types of cable faults ? Explain any *one* method of location of faults in underground cable. [8]

Or

12. (a) Derive an expression for capacitance of a single core cable. [8]
- (b) A transmission line has a span of 120 m between level supports. The conductor has cross-sectional area of 3 cm^2 . The tension in the conductor is 2000 kg. The specific gravity of the conductor material is 9.9 gm/cm^3 . If the wind pressure is 1.5 kg/m length of conductor, calculate the sag. What is the vertical sag ? [8]

Total No. of Questions—12]

[Total No. of Printed Pages—4+2

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[4657]-37

S.E. (Electrical) (II Sem.) EXAMINATION, 2014

ELECTRICAL MACHINES—I

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Answer *three* questions from Section I and *three* questions from Section II.
 - (ii) Answers to the two Sections should be written in separate answer-books.
 - (iii) Neat diagrams must be drawn wherever necessary.
 - (iv) 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) Draw and explain exact equivalent circuit diagram of a loaded transformer. [8]
- (b) A single-phase core type transformer has 400 primary turns. The net cross-sectional area of the core is 60 cm^2 and its

P.T.O.

magnetic length is 0.8 m. The primary voltage is 500 V, 50 Hz. What is the maximum flux density in the core ? Assuming a relative permeability of 2000 at this flux density, calculate magnetizing current. [8]

Or

2. (a) Draw and explain No load and Impedance Test. [8]

(b) The efficiency of a 400 kVA, single-phase transformer is 98.77% when delivering full load at 0.8 p.f. lagging and 99.13% at half full load at unity p.f.

Calculate :

(i) Iron loss

(ii) Full load copper loss

(iii) Maximum efficiency at p.f. = 0.8 lagging. [8]

3. (a) Explain parallel operation of single-phase transformer and state the conditions for satisfactory parallel operation. [8]

(b) Two 1-phase transformers A and B rated at 250 kVA each are operated in parallel on both sides. Impedances for A and B are $(1 + j6) \Omega$ and $(1.2 + j4.8) \Omega$ respectively. Find the load shared by each when the total load is 500 kVA at 0.8 p.f. lagging. [8]

Or

4. (a) Draw and explain V-V connection and state its application. [8]
(b) Draw and explain T-T connection with suitable phasor diagram. [8]
5. (a) Draw and explain different types of d.c. motors and write down its KCL and KVL equation. [9]
(b) A 4-pole series motor has 944 wave connected armature conductors. At a certain load, the flux per pole is 34.6 mWb and the total mechanical torque developed is 209 N-m. Calculate the line current taken by the motor and the speed at which it will run. The applied voltage is 500 V and total motor resistance is 3 ohm. [9]

Or

6. (a) Define armature reaction. What are its effects and how it can be minimized ? [9]
(b) A 220 V shunt motor takes a total current of 80 A and runs at 800 rpm. Shunt field resistance and armature resistance are 50 ohm and 0.1 ohm respectively. If iron and friction losses amount to 1600 W, find :
(i) Copper losses
(ii) Armature torque
(iii) Shaft torque
(iv) Efficiency. [9]

SECTION II

7. (a) What are the causes of bad commutations ? Explain the remedial measure such as use of interpoles. [8]
- (b) A series motor, when running at a certain speed on a given load takes 60 A at 500 V. If load torque varies as a cube of speed, calculate resistance required to reduce speed upto 75%. Assume unsaturated field and negligible resistance. [8]

Or

8. (a) With neat sketch, explain the 3-point starter used for D.C. motors. What are its limitations ? [8]
- (b) A 220 V d.c. shunt motor, when running at 1000 r.p.m. draws an armature current of 40 A at full load. Its armature resistance is 0.5 Ω . Calculate the resistance required in series with armature to reduce the speed to 750 r.p.m. under full load torque. If the load torque is halved, what will be the new speed with added resistance is maintained in the circuit. [8]
9. (a) Explain, how the rotating magnetic field is produced when 3-phase supply is fed to symmetrical 3-phase winding of

induction motor. Also prove that the resultant field is of constant magnitude and rotates at synchronous speed by phasor diagrams. [8]

- (b) A 3-phase, 400 V, 50 Hz induction motor runs at 960 r.p.m. at full load. Calculate :
- (i) Speed of rotating stator field
 - (ii) Rotor speed
 - (iii) Slip
 - (iv) Frequency of rotor current
 - (v) Frequency of rotor current at standstill. [8]

Or

10. (a) Sketch, family of curves of torque-slip characteristics of 3-phase inductor motor and comment on its ckts at :
- (i) No load
 - (ii) Full load
 - (iii) Starting
 - (iv) Variable rotor resistance. [8]
- (b) A 3-phase, 500 V, 4-pole, 50 Hz induction motor has starting torque of 200% and maximum torque of 300% of full load torque. Calculate speed at :
- (i) Full load
 - (ii) Maximum torque. [8]

11. (a) With suitable circuit diagram, explain the no load test and blocked rotor test on 3-phase induction motor required for plotting circle diagram. Also, sketch the circle diagram and explain all the performance indices of 3-phase induction motor. [12]
- (b) State the various methods of speed control of 3-phase induction motor. Explain v/f method with neat block diagram. [6]

Or

12. What is the necessity of starter for 3-phase induction motor ? With neat connection diagram explain the following starters :
- (i) D.O.L.
- (ii) Star-Delta
- (iii) Auto-transformer. [18]

Total No. of Questions—12]

[Total No. of Printed Pages—4+1

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[4657]-46

S.E. (Electronics/E&TC) (Second Semester) EXAMINATION, 2014

INTEGRATED CIRCUITS & APPLICATIONS

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

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

SECTION I

1. (a) Derive the expression for A_d , R_i and R_o for dual input balanced output difference amplifier using r -parameters. Draw the small signal model for the same. [10]

P.T.O.

- (b) With the neat diagram explain the necessity and working of the following : [8]
- (i) Level Shifter
- (ii) Current Mirror.

Or

2. (a) State the values for all ideal parameters of op-amp. Explain virtual ground concept related to op-amp. [8]
- (b) (i) Compare ideal and practical op-amp. [10]
- (ii) Explain op-amp output stage.
3. (a) What is the need of frequency compensation ? State and explain different methods of frequency compensation. [8]
- (b) What is Flicker noise ? Define its power density. [4]
- (c) Explain the method of op-amp powering. [4]

Or

4. (a) State the reason for limiting the value of slew rate. An op-amp has slew rate of $13 \text{ v}/\mu\text{s}$. Find the rise time for an output voltage of 8 V amplitude resulting from rectangular pulse input if the op-amp is slew rate limited. [8]
- (b) Write a note on effect of feedback on the closed loop stability of op-amp. [8]

5. (a) Explain voltage to current converter with grounded load using op-amp. [8]
- (b) Design a practical integrator circuit with a d.c. gain of 10 to integrate a square wave of 10 kHz. [8]

Or

6. (a) Draw a circuit diagram and explain op-amp as a : [8]
- (i) Unity gain amplifier
- (ii) Subtractor.
- (b) Draw a neat diagram of inverting summing amplifier with three inputs and obtain the expression for output voltage. [8]

SECTION II

7. (a) Design the inverting Schmitt trigger for :

$$V_{UT} = 4V, V_{LT} = -2V.$$

Assume supply voltage = $\pm 12V$. [8]

- (b) Draw and explain 3 op-amp instrumentation amplifier. Derive the expression for its output. [8]

Or

- 8.** (a) Explain the various power supply performance parameters. [8]
- (b) Explain the necessity of precision rectifier. With neat circuit diagram explain the operation of full wave precision rectifier. [8]
- 9.** (a) Explain the block diagram of IC 9400 for voltage to frequency conversion. [8]
- (b) State the specifications of DAC. Also explain the applications of DAC. [8]

Or

- 10.** (a) List the various methods of A/D conversion, compare them and explain which one is the fastest. [8]
- (b) Calculate the output voltage and conversion resolution of 8 bit R-2R ladder DAC for the input data of 110111101 with reference voltage of 10 V. [8]

11. (a) Draw and explain the block diagram of PLL system in the locked condition. Derive the expression for voltage change in response to an input frequency change as FM and FSK demodulation. [10]
- (b) Design a second order band pass filter with $f_0 = 1$ kHz and BW = 200 Hz. [8]

Or

12. (a) State the advantages of active filter. With the help of circuit diagram explain the operation of first order low pass filter. [8]
- (b) Write short notes on : [10]
- (i) Frequency synthesizer using PLL
- (ii) Phase comparator using PLL.

Total No. of Questions—12]

[Total No. of Printed Pages—7

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[4657]-47

S.E. (E & TC/Electronics) (Second Semester) Examination, 2014

ELECTROMAGNETICS

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :-** (i) Attempt 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) Answer *three* questions from Section I and *three* questions from Section II.
- (iii) Answers to the two Sections should be written in separate answer-book.
- (iv) Neat diagrams must be drawn wherever necessary.
- (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) Derive an expression for electric field intensity at a point $P(x, y, z)$ due to an infinite sheet of charge placed in X-Y plane of uniform charge density ρ_s C/m^2 . [9]

P.T.O.

- (b) A straight non-conductive wire is placed along Z-axis and passes through a point A(3, -3, 0) m. The wire carries a uniform line charge having a density of $0.4 \mu \text{ C/m}$. Find the electric field intensity \bar{E} at (-3, 0, 5) m. [9]

Or

2. (a) State Gauss Law. Using Gauss law find electric field intensity at any point P(x, y, z) due to an infinite line charge of density $\rho_l \text{ C/m}$ along Z-axis. [9]

- (b) The flux density within a cylindrical volume bounded by $\rho = 2 \text{ m}$, $Z = 0$ and $Z = 5 \text{ m}$ is given by $\bar{D} = 30 e^{-\rho} \bar{a}_\rho - 2z\bar{a}_z \text{ C/m}^2$. What is the total outward flux crossing the surface of the cylinder ? [9]

3. (a) Find the expression for energy density in Electrostatic fields. [8]

- (b) A charge distribution with spherical symmetry has density

$$\rho_V = \begin{cases} \rho_0, & 0 \leq r \leq R \\ 0, & r > R \end{cases}$$

find V everywhere and the energy stored in the region $r < R$. [8]

Or

4. (a) Derive Poisson's equation $\nabla^2 V = -\frac{\rho_v}{\epsilon}$ from Gauss law. Explain its physical significance. [8]

- (b) Find the capacitance of each of the capacitors shown in the Fig. 1 below.

Take $\epsilon_{r1} = 4$, $\epsilon_{r2} = 6$, $d = 5$ mm.

Surface area $S = 30$ cm². [8]

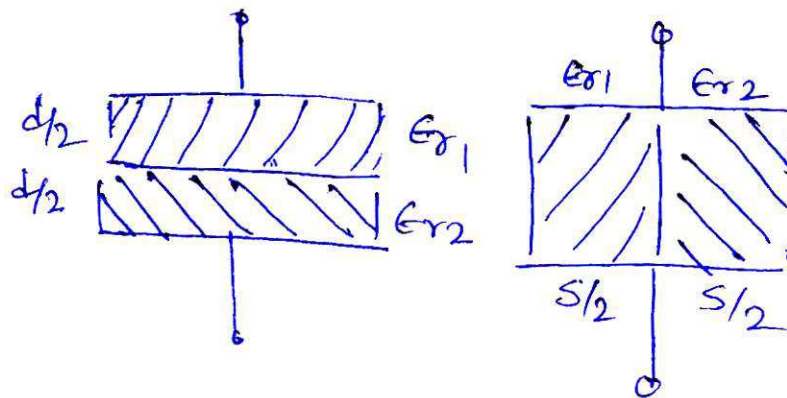


Fig. 1

5. (a) Derive an expression for \vec{H} everywhere, for an infinite long co-axial cable. [8]

- (b) Using concept of curl, obtain the point form of Ampere's circuital law $\nabla \times \vec{H} = \vec{J}$. [8]

Or

6. (a) Derive Biot-Savart's law and Ampere's law using the concept of magnetic vector potential. [8]
- (b) A current distribution gives rise to a vector magnetic potential $\bar{A} = x^2y \bar{a}_x + y^2x \bar{a}_y - 4xyz \bar{a}_z$ Wb/m, find :
- (i) \bar{B} at a point P(-1, 2, 5)
- (ii) The flux through a surface defined by
- $$Z = 1, 0 \leq x \leq 1, -1 \leq y \leq 4. \quad [8]$$

SECTION II

7. (a) The electric field intensity at a point on the surface of a conductor is given by $\bar{E} = 0.2 \bar{a}_x - 0.3 \bar{a}_y - 0.2 \bar{a}_z$ (V/m). Find the surface charge density at that point. [4]
- (b) Region $y < 0$, consists of a perfect conductor while region $y > 0$ is a dielectric medium having $\epsilon_{r1} = 2$. If there is a surface charge of $\frac{2nC}{m^2}$ on the conductor, determine \bar{E} and \bar{D} at :
- (i) A (3, -2, 2)
- (ii) B(-4, 1, 5). [6]
- (c) Derive the boundary conditions for electric field at an interface between two dielectric media. [8]

Or

8. (a) For θ_1 and θ_2 shown in Fig. 2, prove that : [8]

$$\frac{\tan \theta_1}{\tan \theta_2} = \frac{\mu_{r2}}{\mu_{r1}}$$

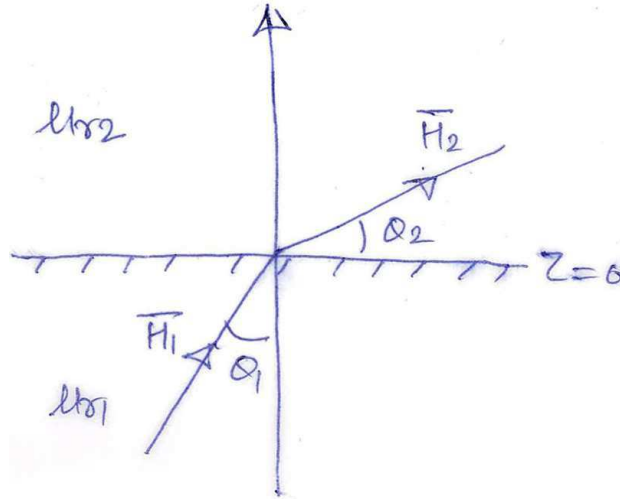


Fig. 2

- (b) Let the permeability be $5 \mu\text{H/m}$ in region 'A' ($x < 0$) and $20 \mu\text{H/m}$ in region B ($x > 0$). If surface current density $\vec{k} = 150 \vec{a}_y - 200 \vec{a}_z$ (A/m). At $x = 0$ and if $\vec{H}_A = 300 \vec{a}_x - 400 \vec{a}_y + 500 \vec{a}_z$ A/m, find : [10]
- (i) $|\vec{H}_{+A}|$
 - (ii) $|\vec{H}_{NA}|$
 - (iii) $|\vec{H}_{+B}|$
 - (iv) $|\vec{H}_{NB}|$
9. (a) What is Ampere's law for time varying fields ? Why is modification required for time varying field ? [8]

- (b) The field intensity $\bar{E} = 250 \sin(10^{10}t)$ V/m for a field propagating in the medium whose $\sigma = 5.0$ S/m and $\epsilon_r = 1.0$. Calculate the displacement current density \bar{J}_d , the conduction current density \bar{J}_c and the frequency at which $\bar{J}_c = \bar{J}_d$. [8]

Or

10. (a) State and prove Poynting theorem. [8]
 (b) In a homogeneous conducting region where, $\mu_r = 1$ find ϵ_r and ω if

$$\begin{aligned} \bar{E} &= 30 \pi e^{j(\omega t - (4/3)y)} \bar{a}_x \quad \text{and} \\ \bar{H} &= 1.0 e^{j(\omega t - (4/3)y)} \bar{a}_y. \end{aligned} \quad [8]$$

11. (a) Explain the method of plotting electric field and Equipotential lines. [8]
 (b) Use the iteration method to find finite difference approximation to the potentials at point 1, 2, 3 and 4. Use three iterations for Fig. 3. [8]

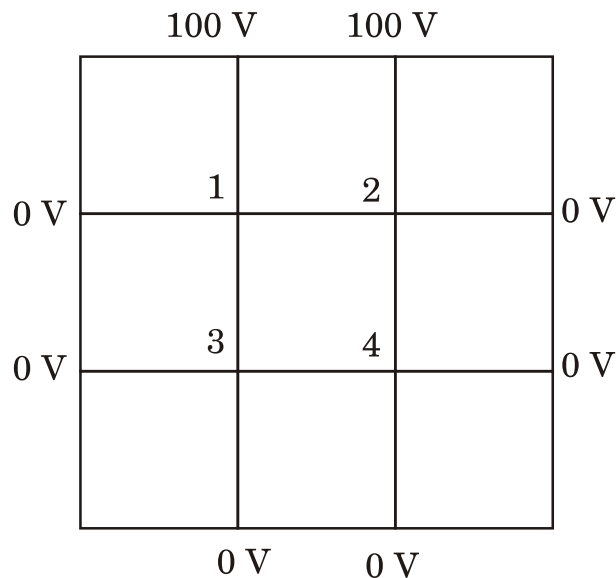


Fig. 3

Or

- 12.** (a) What are the advantages of method of moment over Finite difference method ? Explain the steps to solve any problem by using method of moment. [8]
- (b) What is finite element method ? Explain four step realization. [8]

Total No. of Questions—6]

[Total No. of Printed Pages—4

Seat No.	
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[4657]-47A

S.E. (Electronics/E & TC) (Second Semester)

EXAMINATION, 2014

ELECTROMAGNETICS

(2008 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6.

(ii) Answer all questions in same answer-book.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Assume suitable data, if required.

(vi) Use of calculator is allowed.

1. (a) What is an electric dipole ? Derive the expression for electric field at distant point due to electric dipole. [8]
- (b) Determine D at (4, 0, 3) if there is a point charge -5π mC at (4, 0, 0) and a line charge 3π mC/m along the Y-axis. [8]

P.T.O.

Or

2. (a) State and prove vector form of Gauss's law. [5]
- (b) Find the electric field intensity due to an infinite line charge at an arbitrary point using Gauss's law. [5]
- (c) Verify whether the potential fields given below satisfy Laplace's equation.

(i) $V = 4x^2 - 6y^2 + 2z^2$

(ii) $V = r \cos \Phi + 4z$. [6]

3. (a) Applying Biot-Savart law, find the expression for magnetic field intensity due to finite length current filament. [8]
- (b) A dielectric-free space interface has the equation $3x + 2y + z = 12$ m. The origin side of the interface has $\epsilon_{r_1} = 3$ and $\bar{E}_1 = 2a_x + 5a_z$ V/m. Find \bar{E}_2 . [8]

Or

4. (a) Derive an expression of relaxation time. What is its significance? [5]

(b) An infinite long current filament is placed along Z-axis. The magnetic field intensity at point (3, 4, 0) is $10(-0.8a_x + 0.6a_y)$ A/m. Find the current through the filament. [5]

(c) Find the current I through a square area 2 m on a side with edges coinciding with X and Y axes and one corner at the origin if :

(i) $H = 2y^2 a_x$ A/m

(ii) $H = 3x^2ya_z$ A/m. [6]

5. (a) State and prove Poynting theorem. Explain the significance of the terms involved. [6]

(b) State Maxwell's equations in point and integral form for time varying fields. [6]

(c) A capacitor has a capacitance of 2.5 pF. Find the displacement current at $t = 0$ if a voltage $10 \sin (150 \pi t)$ is applied to it. [6]

Or

6. (a) Write short notes on : [12]

(i) Finite Element Method

(ii) Method of Moments.

(b) Derive the expression for e.m.f. induced in conductor in motion through the time varying field. [6]

Total No. of Questions—8]

[Total No. of Printed Pages—3

Seat No.	
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[4657]-506

S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2014

CONCRETE TECHNOLOGY

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Your answers will be valued as a whole.

(v) Use of electronic pocket calculator is allowed.

(vi) Assume suitable data, if necessary.

(vii) Use of IS Code 10262,456 is not allowed.

1. (a) What are the Bogue's compounds ? State the significance of
each compound. [6]

(b) Explain in detail importance of compaction of concrete. What
are the different methods of compaction ? [6]

P.T.O.

Or

- 2.** (a) Explain Alkali-aggregate reaction. State factors promoting and control of the reaction. [6]
- (b) Explain the difference between bleeding and segregation and state measures to be taken to avoid each. [6]
- 3.** (a) Write short notes on : [6]
- (i) Ultrasonic pulse velocity test
- (ii) Impact echo test.
- (b) Write short notes on : [6]
- (i) Underwater concreting
- (ii) Ready mixed concrete.

Or

- 4.** (a) Write short notes on : [6]
- (i) Fiber reinforced concrete
- (ii) High Density concrete.
- (b) Write the comparison between Ferro cement and RCC construction work. [6]
- 5.** (a) What do you mean by concrete mix design ? What are the objectives in mix design ? [7]
- (b) Write step by step procedure for concrete mix design by using IS Code 10262 method. [6]

Or

6. (a) Explain the factors governing the selection of mix proportions. [7]
- (b) Explain DOE method of mix design in brief. [6]
7. (a) What is durability of concrete ? What is significance of durability ?
What effect w/c ratio makes on durability ? [7]
- (b) What is evaluation of crack ? Why is it necessary ? [6]

Or

8. (a) State and explain factors affecting permeability of concrete. [7]
- (b) Explain process of preparation of surface for repairs along with its importance. [6]

Total No. of Questions—8]

[Total No. of Printed Pages—4+1

Seat No.	
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[4657]-507

S.E. (Civil)(Second Semester) EXAMINATION, 2014

(Architectural Planning and Design of Buildings)

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Assume suitable data if required.

(ii) Figures to the right indicate full marks.

(iii) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4 in the answer-book.

(iv) Solve Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8 on Drawing Sheet only.

1. (a) Write a short note on land use zoning and mention the requirements of each of them. [7]

(b) Explain the following principles of architectural planning with suitable sketches : unity and accentuation. [6]

P.T.O.

Or

2. (a) Write a short note on TDR. [6]
- (b) Elaborate need for earthquake resistant structures in relation with loss of human life property and infrastructure. [7]
3. (a) Write a short note on importance of use of solar energy and rain water harvesting in today's context. [6]
- (b) Differentiate between building line and control line by drawing a suitable sketch. [6]

Or

4. (a) Explain the important aspects of layout of water supply and drainage systems. [6]
- (b) Explain with sketch the following terms : [6]
- (i) SP
- (ii) VP
- (iii) PP
5. Draw to a scale of 1 : 50 or otherwise, detailed plan with the following details : [13]

The type of the structure is R.C.C. with wall thickness of 230 mm

(external) and 100 mm (internal). Mention the schedule of openings.
 (Refer. Fig. 1)

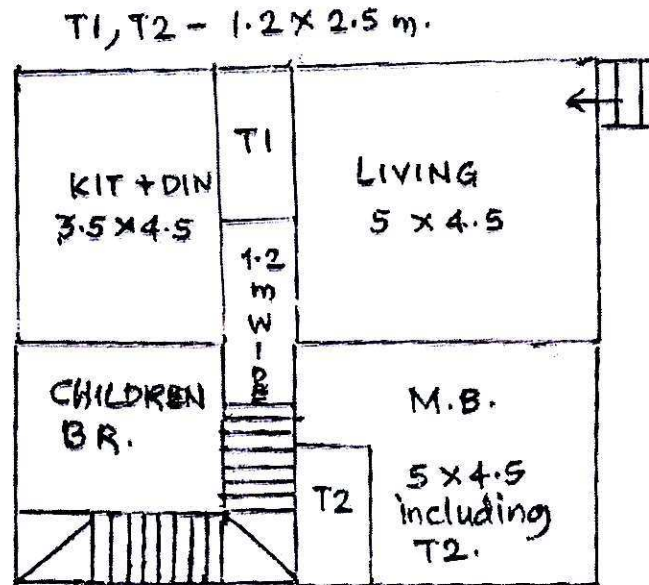


Fig. 1

Or

6. Draw a detailed Floor Plan to a scale of 1 : 50 with the following data : [13]

- (i) Living room 1 no. approx. area 15 m^2
- (ii) Kitchen-cum-Dining 1 no. approx. area 15 m^2
- (iii) Bedrooms 2 no., approx. area 12 m^2 each
- (iv) Floor to floor height 3.3 m

(v) Load bearing structure

(vi) Foundation and Plinth in UCR masonry

(vii) Varandah, Passage, Staircase, W.C. and Bath/attached toilet etc.

of suitable sizes should be provided. Indicate the North.

7. Draw a line plan of a Post Office using the following data : [12]

Entrance and moving space : 30 m²

Public dealing counters : Height 1.6 m – 1.8 m, width 0.7 m – 0.95 m

Post Master's room : 15 m²

Working area for other staff : 30 m²

Post-separation room : 30 m²

Safe custody area for cash : 10 m²

Cash transaction room : 12 m²

Water room and Toilet (separate for male and female) : 7.5 m²

Or

8. Draw a Single-Storeyed Restaurant building on a Highway. [12]

The following units are to be provided :

- (1) Entrance and general stationery shop — 50 m²
- (2) Dining hall — 300 m²
- (3) Service — 35 m²
- (4) Kitchen — 45 m²
- (5) Store-room — 18 m²
- (6) Cloakroom for keeping baggage — 15 m²
- (7) Water closet for gents — 2 nos.
- (8) Water closet for ladies — 2 nos.

Draw a line plan with suitable scale, showing location of Doors and Windows.

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-516

S.E. (Mechanical, Mechanical Sandwich, Automobile)

(Second Semester) EXAMINATION, 2014

ELECTRONICS AND ELECTRICAL ENGINEERING

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary and state the same clearly.

(iv) Neat diagrams must be drawn wherever necessary.

(v) Use of electronic pocket calculator is allowed.

1. (a) Draw and explain the architectural block diagram of 8051 microcontroller. [6]

(b) What is Timer/Counter Control (TCON) register ? Explain the significance of various bits in it. [6]

P.T.O.

Or

- 2.** (a) What is meant by baud rate ? Differentiate between serial and parallel data transfer schemes. [6]
- (b) Explain different addressing modes supported by 8051 microcontroller. [6]
- 3.** (a) State the expression for torque developed in a three-phase induction motor. Hence obtain :
- (i) condition for maximum torque and
- (ii) expression for maximum torque. [6]
- (b) Why is a starter required for d.c. motor ? Discuss the working of three-point starter with the help of neat schematic. [7]

Or

- 4.** (a) Distinguish between squirrel cage and slip ring induction motors. [6]
- (b) A 230 V, 4 pole, lap wound d.c. shunt motor takes no-load current of 4 A when running at 1200 rpm. The resistance of armature winding is 0.1Ω and shunt field winding is

115 Ω . Total brush contact drop is 2 V. If it takes current of 60 A on full load, calculate its full load speed. Assume that flux gets weakened by 5% on full load condition due to armature reaction. [7]

5. (a) Draw the block diagram showing basic structure of CRO and explain the function of various components. [6]
- (b) Explain the working of audio signal generator with the help of block diagram. [6]

Or

6. (a) Explain the working of digital multimeter with the help of block diagram. [6]
- (b) Compare analog and digital voltmeters. [6]
7. (a) Explain single wattmeter method for measuring three-phase reactive power in delta connected balanced load with the help of neat circuit diagram and phasor diagram. [6]
- (b) What is an A.C. bridge ? Enlist A.C. bridges. Derive the general equations for balance of an A.C. bridge. [7]

Or

8. (a) State advantages and disadvantages of electrostatic instruments. [6]
- (b) A 3-phase, 400 V, 50 Hz a.c. motor is working on certain load having 0.5 lag power factor. Two wattmeters are connected to measure input power of the motor which show total power of 40 kW. Find reading of each wattmeter and total reactive power of motor. [7]

Total No. of Questions—8]

[Total No. of Printed Pages—4+2

Seat No.	
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[4657]-517

S.E. (Mechanical) (Automobile) (Second Semester)

EXAMINATION, 2014

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :—** (i) Answers to the two Sections should be written in separate answer-books.
- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Use of calculator is allowed.
- (v) Assume suitable data if necessary.

SECTION I

1. (a) Explain function, material and manufacturing method of the following components : [6]
- (1) Piston

P.T.O.

- (2) Cylinder
- (3) Connecting rod
- (4) Piston rings
- (5) Crankshaft
- (6) Camshaft.

(b) Draw and explain with neat sketch Simple Carburettor. [6]

Or

2. (a) Draw and explain port timing diagram for 2-stroke petrol engine. [6]

(b) Describe with neat sketch stages of combustion in S.I. Engine with the help of P- θ diagram. [6]

3. (a) Explain with neat sketch common rail diesel injection. [6]

(b) A 4-S cycle petrol engine has 6 single acting cylinders of 7.5 cm bore and 9 cm stroke. The engine is coupled to a break having torque arm radius of 38 cm. At 3300 RPM with all cylinders operating, a net brake load is 324 N. When each

cylinder in turn is cut-off average net brake load produced at the same speed by the remaining 5 cylinders is 245 N. Estimate indicated mean effective pressures. With all cylinders operating, the fuel consumption is 0.3 kg/min. Fuel calorific value 42000 kJ/kg. The jacket water flow rate and temperature rise are 65 kg/min and 12°C. On test the engine is enclosed in thermally and acoustically insulated box, through output drive, water, fuel, air and exhaust connections pass. Ventilation air blown up through the box at the rate of 14 kg/min enters at 10°C and leaves at 55°C, draw a heat account of the engine stating the items as % of fuel. [6]

Or

4. (a) Differentiate between knocking in SI and CI engine. [6]
- (b) The air flow to 4 cylinder 4-S gasoline engine was measured by means of 8 cm diameter sharp edge orifice with $C_d = 0.65$. During a test the following data was recorded : [6]

Bore = 10 cm

Stroke = 15 cm

Engine speed = 2500 rpm

Brake power = 36 kW

Fuel consumption = 10 kg/hr

Calorific value of fuel = 42 MJ/kg

Pressure drop across orifice = 4 cm of water

Atmospheric temperature and pressure are 17°C and 1 bar resp.

Calculate :

- (1) Brake thermal efficiency
- (2) Brake mean effective pressure
- (3) Volumetric efficiency based on free air condition.

SECTION II

- 5.** (a) Explain in brief significance of Bharat Stage Norms for pollution control. [6]
- (b) Describe with schematic diagram working of starting system. [7]

Or

- 6.** (a) Explain with neat sketch Evaporative Loss Control system. [6]
- (b) Enlist different types of lubrication system and explain with neat sketch wet sump lubrication system. [7]

7. (a) Explain vane type compressor with neat sketch and P-V diagram. [6]
- (b) A reciprocating compressor of single stage, double acting type delivers $20 \text{ m}^3/\text{min}$ when measured at free air condition of 1 bar, 27°C . The compressor has compression ratio of 7 and the conditions at the end of suction are 0.97 bar, 35°C . Compressor runs at 240 r.p.m. with clearance volume of 5% of swept volume. The L/D ratio is 1.2. Determine the volumetric efficiency and dimensions of cylinder and isothermal efficiency taking the index of compression and expansion as 1.25. Also show the cycle on P-V diagram. [7]

Or

8. (a) Explain the methods of improving efficiency of reciprocating compressors. [6]
- (b) A reciprocating compressor of single stage and double acting type is running at 200 r.p.m. with mechanical efficiency of 85%. Air flows into compressor at the rate of $5 \text{ m}^3/\text{min}$ measured at atmospheric condition of 1.02 bar, 27°C . Compressor has

compressed air leaving at 8 bar with compression following polytropic process with index of 1.3. Compressor has clearance volume of 5% of stroke volume. During suction of air from atmosphere into compressor its temperature rises by 10°C . There occurs pressure loss of 0.03 bar during suction and pressure loss of 0.05 bar during discharge passage through valves. Determine the dimensions of cylinder, volumetric efficiency and power input required to drive the compressor if stroke to bore ratio is 1.5. [7]

Total No. of Questions—8]

[Total No. of Printed Pages—4

Seat No.	
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[4657]-524

S.E. (Mechanical SW) (Second Semester)

EXAMINATION, 2014

MANUFACTURING ENGINEERING

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or
Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or
Q. No. 8.

(ii) All the four questions should be solved in one answer-book
and attach extra supplements if required.

(iii) Figures to the right indicate full marks.

(iv) Neat diagrams must be drawn wherever necessary.

(v) Use of non-programmable electronic pocket calculator is
allowed.

(vi) Assume suitable data, if necessary.

P.T.O.

1. (a) Explain investment casting along with advantages and limitations. [6]
- (b) Explain resistance welding. State the advantages and limitations of the process. [6]

Or

2. (a) Explain with sketch extrusion types. [6]
- (b) Explain welding defects and their remedies. [6]
3. (a) A plain surface is to be milled. Take cutter diameter 90 mm, has 8 teeth. The cutting speed is 20 m/min. If the feed/tooth/rev. is 1 mm, what time will it take for one cut along a workpiece of cast-iron 1000 mm long ? [6]
- (b) Explain construction and working of EDM process. [6]

Or

4. (a) State various taper turning methods on lathe and explain *one* with sketch. [6]
- (b) Explain the factors affecting tool life. [6]

5. (a) Explain methods of reducing cutting forces in sheet metal works. [6]

(b) Describe the following terms : [7]

(i) Centre of pressure

(ii) Strip layout.

Or

6. (a) Explain with sketch Combination die and Compound die. [7]

(b) A cup without flanges and height 25 cm and diameter 10 cm is to be made from sheet metal 1 mm thickness with ultimate tensile strength. Find : [6]

(i) Blank size

(ii) No. of draws

(iii) Dimensions of die and punch for first draw (40% reduction in first draw).

7. (a) Explain 3-2-1 principle of location. [6]

(b) State various types of clamping devices used in jig and fixtures and explain any *one* in detail with neat sketch. [7]

Or

8. (a) Define jig and fixture. Differentiate between them with suitable example. [6]
- (b) State various types of jigs and explain any *one* in detail with neat sketch. [7]

Total No. of Questions—8]

[Total No. of Printed Pages—4+1

Seat No.	
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[4657]-536

S.E. (Electrical) (Second Semester) EXAMINATION, 2014

POWER SYSTEMS-I

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Your answers will be valued as a whole.

(v) Assume suitable data, if necessary.

1. (a) What are the advantages of interconnected grid system of power
generating stations ? [6]

(b) Explain in brief any *one* type of excitation system used for
alternators. [6]

P.T.O.

Or

- 2.** (a) Define string efficiency. Derive the expression for string efficiency of a string consisting of three discs. [6]
- (b) Define Tariff, hence explain desirable characteristics of tariff. [6]
- 3.** (a) Derive the expression for inductance of three phase overhead transmission line when conductors are unsymmetrically placed but transposed. [6]
- (b) An overhead transmission line conductor having parabolic configuration weighs 1.925 kg per meter length, area of cross-section 2.2 cm^2 and an ultimate strength of 8000 kg/cm^2 . When erected between supports 600 m apart and having 15 m difference in height, determine the vertical sag from taller of the two supports which must be allowed so that factor of safety shall be 5 with wire loaded due to 1 kg of ice per meter and no wind pressure. [7]

Or

4. (a) Calculate loop inductance of 500 m long, 1 phase, 2 wire, 50 Hz transmission line. Each wire has identical cross-sectional area of 10 cm^2 and conductors are separated by a distance of 5 m. Also calculate inductive reactance. [7]
- (b) Write a short note on XLPE cables. [6]
5. (a) Explain 'Method of Images' in determining the effect of earth on the capacitance calculation for overhead transmission lines. [6]
- (b) A 250 V, 50 Hz 1 phase 40 km long transmission line consisting of 2 parallel wires each 5 mm in diameter and 1.5 m apart. The height of conductors above ground is 7 m. Determine total capacitance of line : [6]
- (i) Considering effect of earth
- (ii) Neglecting effect of earth.

Or

6. (a) Derive an expression for capacitance per km of a single phase overhead transmission line with distance 'D' between the conductors and radius of each conductor as ' r ' meter. [6]

- (b) Six conductors of a double circuit three phase line are arranged as shown in figure 1. The diameter of each conductor is 2.5 cm. Find capacitance per phase per km assuming that line is transposed. [6]

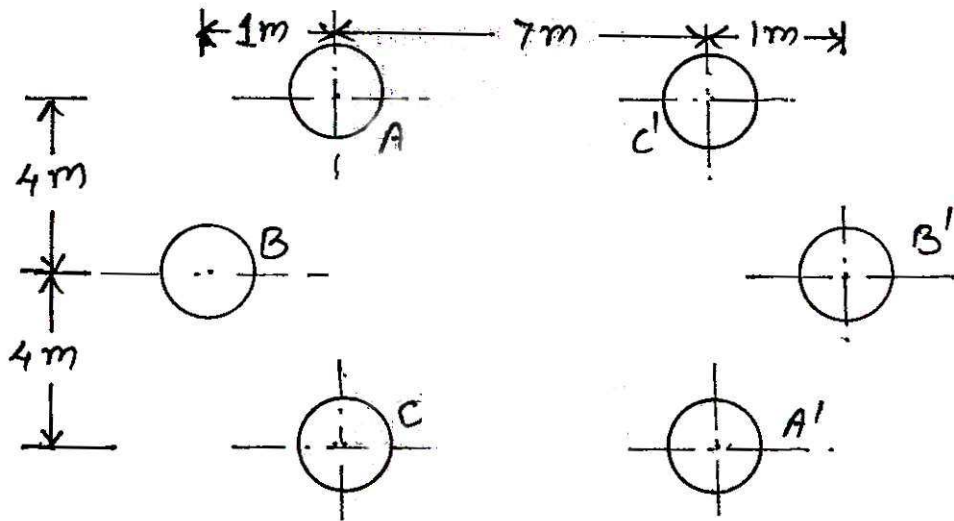


Fig. 1

7. (a) Write a short note on Ferranti Effect. [6]
- (b) A 100 km long 3 phase 50 Hz transmission line has the following line constants :

$$\text{Resistance/phase/km} = 0.1 \, \Omega,$$

$$\text{Reactance/phase/km} = 0.5 \, \Omega,$$

$$\text{Susceptance/phase/km} = 10 \times 10^{-6} \, \text{S}$$

If the line supplies load of 20 MW at 0.9 p.f. lagging at 66 kV at the receiving end, calculate by nominal ' π ' method :

- (i) Sending end voltage
- (ii) Sending end current
- (iii) Sending end power factor. [7]

Or

8. (a) A balanced 3 phase load of 30 MW is supplied at 132 kV, 50 Hz and 0.85 p.f. lagging by means of transmission line. The series impedance of single conductor is $20 + j52$ ohms and total phase neutral admittance is 315×10^{-6} Siemens. Using nominal 'T' method, determine :

- (i) ABCD constants
- (ii) Sending end voltage. [7]

- (b) Classify transmission lines based on voltage, length and line parameters. [6]

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-537

S.E. (Electrical) (II Sem.) EXAMINATION, 2014

ELECTRICAL MACHINES—I

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer *four* questions.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of electronic pocket calculator is allowed.

(v) Assume suitable data, if necessary.

1. (a) Sketch and explain phasor diagram for 1-phase transformer at ON Load. [6]

(b) State and explain the conditions to be satisfied for parallel operation of 1-phase transformers. [6]

Or

2. (a) State and explain standard connections of 3-phase transformer. Write *one* application of each. [6]

P.T.O.

- (b) A 20 kVA, 440/220 V, 50 Hz, 1-phase transformer has core loss of 324 W and copper loss of 100 W at half load. Calculate :
- (i) kVA loading for max. efficiency.
- (ii) Maximum efficiency at p.f. = 0.8 lag. [6]
3. (a) Explain the speed control of D.C. series motor by flux control. [6]
- (b) A 500 V, 6-pole, D.C. shunt motor have arm. and field winding resistance of 0.5Ω and 250Ω respectively. It draws a full load current of 20 A from supply. If rotational losses are 900 W, calculate efficiency of motor. [7]

Or

4. (a) Draw the construction diagram of D.C. machine and explain each part. [9]
- (b) Sketch and explain torque-arm. current characteristics of :
- (i) D.C. shunt motor and
- (ii) D.C. series motor. [4]

5. (a) Compare squirrel-cage and wound rotor of 3-phase induction motor. [6]
- (b) Obtain the equation for torque under running condition for 3-phase induction motor. [6]

Or

6. (a) Obtain the relationship between :
- (i) T_{st}/T_{max}
- (ii) T_{FL}/T_{max} . [6]
- (b) 3-phase, 8-pole, 50 Hz induction motor running at a speed of 710 rpm at a certain load draws a power of 35 kW. The stator and rotor losses amount to be 1200 W and 600 W respectively. Calculate :
- (i) rotor copper loss
- (ii) lost torque
- (iii) efficiency of motor. [6]
7. (a) Sketch the phasor diagram and explain the induction motor as a generalised transformer. [6]
- (b) With neat connection diagram, explain no load and blocked rotor test on 3-phase induction motor. [7]

Or

8. (a) Sketch and explain the circle diagram indicating, full load current, o/p line, torque line, rotor Cu loss, stator Cu loss and fixed losses. [8]
- (b) Explain the operation of star-delta starter used for 3-phase induction motor. [5]

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-546

S.E. (E&TC/Electronics) (Second Semester) EXAMINATION, 2014

INTEGRATED CIRCUITS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of calculator is allowed.

(v) Assume suitable data, if necessary.

1. (a) Define the following characteristics of practical op-amp : [6]

(i) Input offset voltage

(ii) CMMR

(iii) PSSR

(iv) Slew rate.

P.T.O.

- (b) What is slew rate ? What are its causes ? Derive its expression for maximum frequency of operation for a desired output swing in terms of slew rate. [6]

Or

2. (a) Justify, how constant current source is used in place of R_E to improve the CMRR for a differential amplifier. [6]

- (b) What is need for frequency compensation ? State and explain Pole—Zero compensation method of frequency compensation. [6]

3. (a) Why basic Integrator is needed to be modified ? Draw the circuit diagram of Practical Integrator along with frequency response and explain its operation. [6]

- (b) List important characteristics of Comparator ? What are the advantages of Schmitt trigger over Comparator ? [6]

Or

4. (a) Draw circuit diagram of Three op-amp Instrumentation Amplifier and write its output equation. [6]

- (b) Design a Schmitt trigger for $U_{TP} = 3V$ and $L_{TP} = -2V$ with general purpose op-amp 741. Assume $V_{CC} = \pm 12V$. Draw detailed diagram with designed values. [6]

5. (a) Draw a neat schematic of Voltage Controlled Oscillator (VCO) using Op-amp. Derive the expression for output frequency. [6]
- (b) With the help of a neat block diagram, explain operation of Phase Locked Loop (PLL). Define the term “Lock Range” and “Capture Range”. [7]

Or

6. (a) Explain Voltage to Current Converter with grounded load using Op-amp and give its applications. [6]
- (b) Define “Lock Range”, “Capture Range” and “Pull-in time” and explain the transfer characteristics of Phase Locked Loop (PLL). [7]
7. (a) Draw the circuit diagram of Voltage mode R—2R ladder Digital to Analog converter (DAC) and explain its working. [7]
- (b) Calculate output frequency ' f_o ', Lock range ' Δf_L ', Capture range ' Δf_C ' of a PLL, If $R_T = 1 \text{ k}\Omega$, $C_T = 0.1 \text{ }\mu\text{f}$ and filter capacitor $C = 10 \text{ }\mu\text{f}$. Assume $V = 20 \text{ V}$. [6]

Or

8. (a) Explain successive approximation type ADC with neat block diagram. An 8-bit ADC output all 1's, when $V_i = 5.1$ V. Find its : [8]
- (i) Resolution
- (ii) Digital output, when $V_i = 1.28$ V.
- (b) Explain various power supply performance parameters. [5]

Total No. of Questions—8]

[Total No. of Printed Pages—4+1

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[4657]-547

S.E. (Electronics/E&TC) (Second Semester) EXAMINATION, 2014

CONTROL SYSTEMS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

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

(v) Assume suitable data, if necessary.

1. (a) Explain open loop and closed loop systems with real time example. [6]

(b) A unity feedback system has open loop transfer function :

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

P.T.O.

Determine 'K' so that damping factor is 0.5. For this value of 'K' determine :

- (1) Location of closed loop poles,
- (2) Peak overshoot, and
- (3) Peak time.

Assume input is unit step. [6]

Or

2. (a) Find closed loop transfer function $\frac{y(s)}{x(s)}$ if

$$G_1 = G_2 = \frac{1}{s+1} \quad \text{and} \quad G_3 = G_4 = s+1, \quad H_1 = 1$$

for system shown in Fig. Q. 2(a) using block diagram reduction technique. [6]

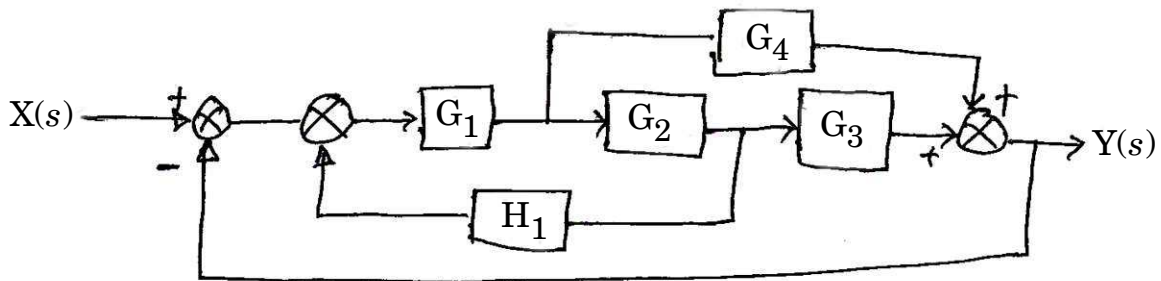


Fig. Q. 2(a)

- (b) If open loop transfer function is $G(s) = \frac{1}{s+1}$, obtain unit step response. Also find output at time $t = 0, 1, 2, 3, 4, 5$. Assume unity feedback and $G(s)$ is in closed loop. [6]

3. (a) Comment on stability using Routh criteria if characteristic equation is :

$$Q(s) = s^5 + 2s^4 + 3s^3 + 4s^2 + 5s + 6 = 0.$$

How many poles lie in right half of s -plane ? [4]

- (b) Construct Nyquist plot and find phase crossover frequency and gain margin if :

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

Also comment on stability. [8]

Or

4. (a) If

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

construct root locus and comment on stability of system. [8]

- (b) Obtain resonance peak and resonance frequency if :

$$G(s) \cdot H(s) = \frac{21}{s(s+5)},$$

with $H(s) = 1$. [4]

5. (a) Obtain controllable and observable canonical state model if :

$$G(s) = \frac{y(s)}{u(s)} = \frac{s^3 + 2s^2 + 5s + 1}{s^4 + 4s^3 + 4s^2 + 7s + 2}. \quad [6]$$

- (b) Find controllability and observability if :

$$A = \begin{bmatrix} -2 & 1 & 0 \\ 1 & -3 & 2 \\ 10 & 0 & -8 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0.1 \\ 1 \end{bmatrix},$$

$$C = [1 \ 0 \ 1], \quad D = [0]. \quad [7]$$

Or

6. (a) List advantages of state space over transfer function. [6]
- (b) Obtain state transition matrix if :

$$\dot{x} = \begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix} x(t). \quad [7]$$

7. (a) Explain Ladder concept in PLC. Draw and explain different symbols used to construct ladder. [6]

- (b) Find pulse transfer function and impulse response for the system shown in Fig. Q. 7(b). [7]

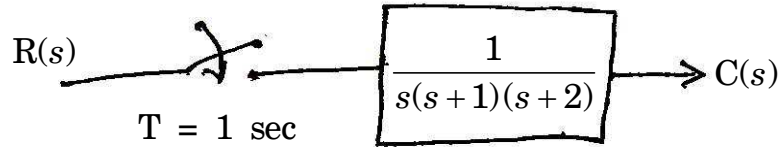


Fig. Q. 7(b)

Or

8. (a) Write PID equation. For unit step input sketch the response of P, I, D action of PID. [6]
- (b) Write a note on digital control system with help of suitable block diagram. [7]

Total No. of Questions—12]

[Total No. of Printed Pages—4

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[4657]-55

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2014

DIGITAL TECHNIQUES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6,
Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of logarithmic table, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(v) Assume suitable data, if necessary.

SECTION I

1. (a) Explain next four numbers in hexadecimal counting : [4]

ACEFD, ACEFE,

P.T.O.

- (b) Convert $(BC66-AF)_{16}$ to octal. [4]
- (c) Determine base x if $(193)_x = (623)_8$. [4]
- (d) Convert $(615.25)_8$ to hexadecimal. [4]

Or

- 2.** (a) Convert $(658.825)_{10}$ to octal. [4]
- (b) Convert $(12.125)_{10}$ to binary. [4]
- (c) Convert Gray Code (101011) to binary. [4]
- (d) Convert $(592)_{20}$ to EX-3 code. [4]

- 3.** (a) Explain characteristics of NMOS. [4]
- (b) Explain NMOS NOR gates. [4]
- (c) Explain interfacing of CMOS to TTL. [8]

Or

- 4.** (a) Compare DTL, TTL, CMOS and ECL. [12]
- (b) Explain interfacing of TTL and CMOS. [4]
- 5.** (a) Explain half subtracter and full subtracter. [10]
- (b) Design BCD to gray code. [8]

Or

- 6.** (a) Draw 3 to 8 decoder. [10]
(b) Explain RBI, RBO, LT in case of 7447. [8]

SECTION II

- 7.** (a) Convert D flip-flop to JK flip-flop. [8]
(b) Convert D to SK flip-flop. [8]

Or

- 8.** (a) Convert T to D flip-flop. [8]
(b) Convert JK to D flip-flop. [8]

- 9.** (a) Write a short note on PROM. [8]
(b) Write a short note on PLA. [8]

Or

- 10.** (a) Implement using PLA. [8]

$$F_1 = \text{Em}(3, 5, 7) \quad F_2 = \text{Em}(4, 5, 7)$$

- (b) Design BCD to EX-3 using PLA. [8]

11. (a) Write a short note on digital clock. [10]
(b) Explain frequency counter with neat diagram. [8]

Or

12. (a) Write a short note on alarm annunciator. [10]
(b) Explain sequence generator. [8]

Total No. of Questions—8]

[Total No. of Printed Pages—3

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[4657]-555

S.E. (Instrumentation and Control)

(II Sem.) EXAMINATION, 2014

DIGITAL TECHNIQUES

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :—**
- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
 - (ii) Neat diagrams must be drawn wherever necessary.
 - (iii) Figures to the right indicate full marks.
 - (iv) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
 - (v) Assume suitable data, if necessary.

- 1.**
- (a) (i) Add $(57)_{10}$ and $(26)_{10}$ in BCD. [3]
(ii) Add $(83)_{10}$ and $(34)_{10}$ in BCD.
 - (b) Obtain Excess-3 Code for $(428)_{10}$. [3]
 - (c) Define the following terms : [6]
 - (1) $V_{IL(\text{Max})}$ — Worst case low level input voltage.
 - (2) $V_{OH(\text{Min})}$ — Worst case high level output voltage.

P.T.O.

- (3) $V_{IH(\text{Min})}$ — Worst case high level input voltage.
- (4) $V_{OL(\text{Max})}$ — Worst case low level output voltage.
- (5) I_{IL} — Low level input current.
- (6) I_{OH} — High level output current.

Or

- 2.** (a) Minimise the following function using K-Map : [6]

$$Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C}.$$

- (b) Explain Resistor Transistor Logic with neat sketch. [6]

- 3.** (a) Implement the following function using 8 : 1 MUX : [6]

$$f(A, B, C, D) = \Sigma M(0, 1, 2, 5, 7, 8, 9, 14, 15).$$

- (b) Design Mod-128 Counter using IC7493. [6]

Or

- 4.** (a) Design Decimal to BCD Encoder. [6]

- (b) Convert SR Flip-Flop to T Flip-Flop. [6]

- 5.** (a) A combinational circuit is defined by the following function : [7]

$$A(X, Y, Z) = \Sigma m(1, 2, 4, 6), B(X, Y, Z) = \Sigma m(0, 1, 6, 7),$$

$$C(X, Y, Z) = \Sigma m(2, 6).$$

Design a circuit with PLA.

- (b) What is PLD ? What is the difference between PAL and PLA ? [6]

Or

6. (a) Explain with neat sketch Architecture of 8085 Microprocessor. [7]

- (b) Write short notes on : [6]

- (1) Data Bus
- (2) Control Bus
- (3) Address Bus.

7. (a) Explain Steeper motor sequence generator with neat sketch. [7]

- (b) Write a short note on frequency counter. [6]

Or

8. (a) Write short notes on : [7]

- (1) CDROM
- (2) Bubble memory.

- (b) Explain, how alarm annunciator are used in Hospitals. [6]

Total No. of Questions—8]

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[4657]-556

S.E. (Instrumentation and Control)

(II Sem.) EXAMINATION, 2014

AUTOMATIC CONTROL SYSTEM

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of non-programmable calculator is allowed.

(v) Assume suitable data, if necessary.

1. (a) Give the difference between : [6]

(1) Feedback and feed-forward system

(2) LTI and LTV system

(3) Stable and Unstable system.

(b) With an example derive the transfer function of any electro-mechanical system. [6]

P.T.O.

Or

2. (a) Give the difference between : [6]

- (1) Causal and Non-causal system
- (2) Open loop and Closed loop system
- (3) SISO and MIMO system.

(b) With an example derive the transfer function of any hydraulic system. [6]

3. (a) For a unity feedback system derive a general expression for steady state error. [5]

(b) Unity feedback system has an open loop transfer function :

$$G(s) = \frac{K}{s(s+2)(s^2+2s+2)}.$$

Determine its ultimate gain and ultimate frequency. [7]

Or

4. (a) A unity feedback system is characterized by an open loop transfer function :

$$G(s) = \frac{K}{s(s+10)}.$$

Determine the gain K so that the system will have a damping factor of 0.5. For this value of K determine T_s (for 2% tolerance band), peak time and time constant of the system. [6]

- (b) How many roots of the following polynomial are in the right half, the left half plane and on the $j\omega$ -axis : [6]

$$s^5 + 2s^4 + 2s^3 + 4s^2 + s + 2.$$

5. (a) Define :

- (1) Resonant frequency
- (2) Resonant peak
- (3) Cut-off frequency
- (4) Bandwidth
- (5) Cut-off rate. [5]

- (b) Open loop transfer of a unity feedback system is :

$$G(s) = \frac{20}{s(s + 10)}.$$

Draw its bode plot and determine gain margin and phase margin and also comment on stability. [8]

Or

6. (a) The forward path transfer function of a unity feedback system is : [5]

$$G(s) = \frac{k}{s(s + 6)}.$$

Find the resonant peak and resonant frequency for $k = 100$.

- (b) Open loop transfer of a unity feedback system is :

$$G(s) = \frac{20}{(s + 10)(s + 20)}.$$

Draw its bode plot and determine gain margin and phase margin and also comment on stability. [8]

7. (a) Sketch polar plot for the unity feedback system with open-loop transfer function : [9]

$$G(s) = \frac{5}{s(s+10)}.$$

- (b) Write a short note on mapping theorem. [4]

Or

8. (a) Sketch polar plot for the unity feedback system with open-loop transfer function : [7]

$$G(s) = \frac{2}{s+25}.$$

- (b) Polar plot of system is given in Figure 1. Determine its Gain Margin (dB) and Phase Margin. [6]

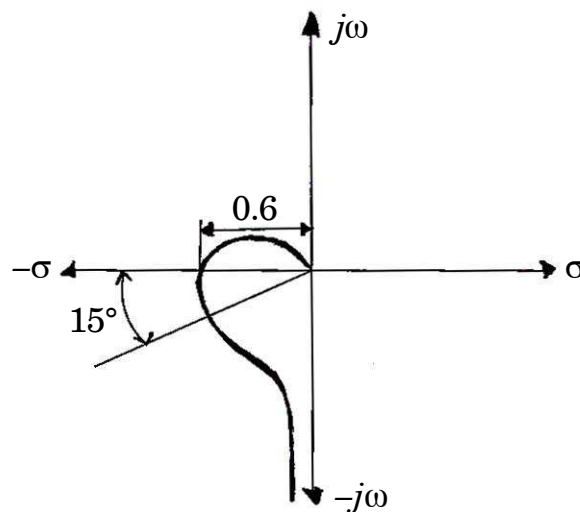


Figure 1 : Polar Plot

Total No. of Questions—12]

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[4657]-56

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2014

APPLIED ELECTRONICS

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—** (i) Answer *three* questions from Section I and *three* questions from Section II.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Your answers will be valued as a whole.
- (vi) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (vii) Assume suitable data, if necessary.

SECTION I

1. (a) Explain Mux-Demux IC CD4051 along with neat circuit diagram. [10]
- (b) Explain 3-bit Flash type ADC circuit with neat circuit diagram. [8]

P.T.O.

Or

- 2.** (a) Explain Electronic Integrator used ADC with suitable block diagram and equations. [10]
- (b) What type of switch is used in Sample and Hold circuit ? Explain with neat circuit diagrams and waveforms. [8]
- 3.** (a) Explain 4-bit binary weighted register type DAC with suitable circuit diagram. [8]
- (b) Design 4-bit binary-weighted register type DAC using Op-Amp 741 for the digital input signal of 1111. Assume one binary equal to 5V, $R_1 = 10 \text{ k}\Omega$, $R_2 = 5 \text{ k}\Omega$, $R_3 = 2.5 \text{ k}\Omega$, $R_4 = 1.25 \text{ k}\Omega$ and feedback resistor $R_f = 1.5 \text{ k}\Omega$. [8]

Or

- 4.** (a) Explain 4-bit R-2R type DAC with output equations and neat diagram. [8]
- (b) Explain the *four* parameters which serves to describe the quality of performance of a DAC. [8]
- 5.** (a) Is the SCR 4-layer device ? Justify answer with neat diagrams. [8]
- (b) Is the MOSFET and IGBT having same gate terminals ? Justify with diagrams. [8]

Or

6. (a) Explain any *one* firing method of SCR in detail. [8]
- (b) How is DIAC used to fire TRIAC ? Explain with neat circuit diagram. [8]

SECTION II

7. (a) How is the energy stored in the form of chemical compound in batteries ? Explain. [6]
- (b) Explain the safety circuit used inside lithium-ion battery. [6]
- (c) What are different performance specifications of batteries ? Explain any *three*. [6]

Or

8. (a) Why are lithium-ion batteries recently used ? Justify. [6]
- (b) Explain any *three* battery charging methods with details. [6]
- (c) How are solar cells used with battery ? Explain with suitable application. [6]
9. (a) A pressure transmitter gives output in the range of 4 to 20 mA. Design I to V circuit that gives output in the range of +1 to +10 Volts. [8]
- (b) What is PLL ? Explain captured range, locked range and tracking range of PLL. [8]

Or

- 10.** (a) Derive output current equation of V to I with grounded load with neat circuit diagram. [8]
- (b) Explain the voltage to frequency conversion technique with neat block diagram. [8]
- 11.** (a) In wireless data transmission, how frequency modulation is used ? Explain. [8]
- (b) Explain ASK with neat diagrams. [8]

Or

- 12.** (a) Describe the concept of TDM with suitable diagrams. [8]
- (b) What is modulation ? Explain AM in detail. [8]

Total No. of Questions—8]

[Total No. of Printed Pages—3

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[4657]-566

S.E. (Chemical) (II Sem.) EXAMINATION, 2014

CHEMISTRY—II

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :—**
- (i) Answer *four* questions.
 - (ii) Neat diagrams must be drawn wherever necessary.
 - (iii) Figures to the right indicate full marks.
 - (iv) Use of calculator is allowed.
 - (v) Assume suitable data, if necessary.

1. (a) Explain mutarotation of glucose. [4]
- (b) What are vitamins and hormones ? [4]
- (c) Give an account of CFT for octahedral complexes. [4]

Or

2. (a) Explain the secondary structure of proteins. [4]
- (b) Explain $[\text{NiCl}_4]^{2-}$ is tetrahedral whereas $[\text{Ni}(\text{CN})_4]^{2-}$ is square planner. [4]
- (c) Manganese forms ions with oxidation state ranging from, 1+ to 7+, explain. [4]

P.T.O.

3. (a) Explain the different types of indicators used in precipitation titrations. [4]
- (b) What are titration curves in acid-base titrations ? [4]
- (c) Explain and derive the Langmuir adsorption isotherm when it is reduced to Freundlich adsorption isotherm. [4]

Or

4. (a) What are acid-base indicators ? Explain the colour change interval of any visual indicators is 2pH units. [4]
- (b) Write a short note on Wacker process. [4]
- (c) What is a zeolite catalyst ? Give its types. Explain the structure of sodalite as building block of zeolites. [4]
5. (a) Discuss the conformations of cyclohexane with the help of energy profile diagram. [5]
- (b) Explain geometrical isomerism with a suitable example. [4]
- (c) Explain staggered conformation of *n*-butane is stable. [4]

Or

6. (a) What do you understand by the term conformations ? Draw all conformations of *n*-butane. [5]
- (b) Draw chair and boat conformations of cyclohexane, showing axial and equatorial hydrogens. [4]
- (c) What is optical isomerism ? Define the term enantiomers, diastereomers giving examples. [4]

7. (a) Explain continuous nitration process. [4]
- (b) Give mechanism and kinetics involved in sulphonation reaction. [5]
- (c) Discuss the commercial processes in preparation of vinyl chloride. [4]

Or

8. (a) Write a note on sulfonating agents and their principal applications. [4]
- (b) Give mechanism and kinetics involved in nitration reaction. [5]
- (c) Discuss the design and construction of equipment for halogenation. [4]

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-567

S.E. (Chemical Engineering) (Second Semester)

EXAMINATION, 2014

CHEMICAL ENGINEERING THERMODYNAMICS—I

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :- (i) Answer Q. Nos. 1 or 2, Q. Nos. 3 or 4, Q. Nos. 5 or 6, Q. Nos. 7 or 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of calculator is allowed.

(v) Assume suitable data if necessary.

1. (a) What are the characteristics of a reversible process ? [4]

(b) Ten kgs of an equimolar mixture of CO and H₂ at 1500 K and 1 bar is cooled at constant pressure to 350 K. Assume that the gases are ideal. Determine the heat given off during cooling, the change in internal energy and the work done on the gas. The specific heats in J/mol K are are : [8]

$$C_{P,H_2} = 29.086 - 8.3694 \times 10^{-4}T + 2.013 \times 10^{-6}T^2 \text{ and}$$

$$C_{P,CO} = 26.553 + 7.6682 \times 10^{-3}T - 1.1727 \times 10^{-6}T^2.$$

P.T.O.

Or

2. (a) What are the limiting conditions for equations of state for real gases ? [6]
- (b) Heat is transferred to 10 kg of air which is initially at 100 kPa and 300 K until its temperature reaches 600 K. Determine the change in internal energy, the change in enthalpy and work done if the process is carried out (i) under constant volume conditions and (ii) under constant pressure conditions. Assume that air behaves ideally. $C_p = 20.099 \text{ J/mol K}$ and $C_v = 20.785 \text{ J/mol K}$. [6]
3. (a) CO at 1000 K is burnt with air at 800 K in 90% excess. The products of combustion leave the reactor chamber at 1250 K. Calculate the heat evolved in the reaction chamber per kmol of CO burned. The standard heat of reaction at 298 K is $-283.028 \text{ kJ/mol CO}$. The mean specific heats applicable in this range of temperature are 29.38, 49.91, 33.13 and 31.43 J/mol K for CO, CO₂, O₂ and N₂ respectively. [7]
- (b) Give the various statements for the Second Law of Thermodynamics. [6]

Or

4. (a) A block of copper at a temperature of 825 K and weighing 5 kg is dropped into water at 300 K. If there are no heat losses, what is the change in entropy of (i) Copper (ii) water and (iii) copper and water both considered together. Specific heats of copper and water are 0.4 and 4.2 kJ/kgK respectively. [7]
- (b) What is Clausius inequality ? [4]
- (c) State the Hess law. [2]
5. (a) Derive the Maxwell relations. [7]
- (b) Develop equations for evaluating the change in internal energy and change in entropy for an ideal gas. [5]

Or

6. (a) Explain the mnemonic diagram. [6]
- (b) Explain the H-S diagram in detail. [6]
7. (a) Explain the vapour compression cycle with diagrams. [7]
- (b) A refrigeration system requires 1 kW of power for a refrigeration rate of 3 kJ/s. Determine the (i) COP, (ii) heat rejected by the system and (iii) the lowest temperature the system can attain if the heat is rejected at 308 K. [6]

Or

8. (a) Give the criteria for the choice of a refrigerant. [6]
- (b) A heat pump is used for heating the inside of a building in the winter and for air-conditioning in summer. The average winter temperatures are 278 K outside and 293 K inside. The average summer temperature are 303 K outside and 299 K inside. A 5 K temperature approach is kept in all cases. Determine the work required in both cases as a fraction of heat input assuming ideal cycle. [7]

Total No. of Questions—8]

[Total No. of Printed Pages—3

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[4657]-576

S.E. (Computer) (Second Semester) EXAMINATION, 2014

OBJECT ORIENTED AND MULTICORE PROGRAMMING

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. (a) What is a friend function ? How do you declare one ? When is friend function compulsory ? Give an example. [6]
- (b) What is virtual function ? Why do we need virtual function ? When do we make a virtual function “pure” ? What are the implications of making a function a pure virtual function ? [6]

Or

2. (a) Write short notes on : [6]
- (a) ‘this’ pointer
- (b) Copy constructor.

P.T.O.

- (b) What is operator overloading ? Name the operators that cannot be overloaded in C++ ? How do you declare an overloaded stream insertion and extraction operator ? [6]
3. (a) Distinguish between overloaded functions and function templates. Write a function template for finding the minimum value contained in an array. [6]
- (b) Draw the state diagram for the process. Explain each process state briefly. [6]

Or

4. (a) What is an exception ? How is an exception handled in C++ ? What are the advantages of using exception handling mechanism in program ? [6]
- (b) How can we create a child process from parent process ? Describe parent-child relation. [6]
5. (a) What do you mean by threads ? Write a threaded program in C++ and explain Pthread_join() function. [7]
- (b) Compare threads and processes. Describe thread attributes. [6]

Or

6. (a) How can we pass command line arguments to the thread function ? Determine the number of threads using command line argument. [7]
- (b) What are the types of thread ? Describe in brief. [6]

7. (a) What is meant by critical section ? How can we manage critical section using mutex semaphore ? [6]

(b) Enlist concurrency models. Write a short note on any *two*. [7]

Or

8. (a) Can all threads in the process share global data, variables, and data structure ? If yes, explain with an example. [6]

(b) Describe the basic functions of POSIX message queue. [7]

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-577

S.E. (Computer Engg.) (Second Semester) EXAMINATION, 2014

MICROPROCESSOR AND INTERFACING TECHNIQUES

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer total *four* questions, Q. No. 1 *or* Q. No. 2, Q. No. 3 *or* Q. No. 4, Q. No. 5 *or* Q. No. 6, Q. No. 7 *or* Q. No. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. (a) Draw and explain programmer's model of 80386. [4]
- (b) Differentiate between FAR and NEAR procedure. [4]
- (c) Explain the concept of DOS loading. [4]

Or

2. (a) What do you mean by Interrupt vector table ? [4]
- (b) What should be the OCW1 if interrupt inputs IRO through IR3 are to be disabled and IR4 through IR7 enabled ? [4]

P.T.O.

- (c) What is the significance of the following pins of 8086 :[4]
- (i) READY
 - (ii) $\overline{\text{LOCK}}$
 - (iii) $\overline{\text{TEST}}$
 - (iv) NMI.
3. (a) Draw the block diagram of 8251 and state the functions of :
- (i) Transmitter
 - (ii) Receiver. [4]
- (b) Draw an interfacing diagram of 4×4 keyboard with 8255 PPI using Port A. [4]
- (c) Explain the following signals for interfacing DMA controller :
- (i) HOLD
 - (ii) HLDA
 - (iii) HRQ
 - (iv) DACK. [4]

Or

4. (a) Prepare a control word to initialize 8279 in the following given keyboard/display mode : [4]
- (i) 16, 8-bit character left entry
 - (ii) Decoded scan n-key rollover.

- (b) List the different mode of operations of 8253 and explain the rate generator mode with the help of timing diagram. [4]
- (c) Explain the following MODEM control signals of 8251 : [4]
- (i) $\overline{\text{DSR}}$
 - (ii) $\overline{\text{DTR}}$
 - (iii) $\overline{\text{CTS}}$
 - (iv) $\overline{\text{RTS}}$.
- 5.** (a) Draw and explain block diagram of 8087. [7]
- (b) Write notes on the following supporting chips : [6]
- (i) 8284
 - (ii) 8286
 - (iii) 8288.

Or

- 6.** (a) Draw and explain the write timing diagram of 8086 maximum mode. [7]
- (b) What is the significance of the following pins of 8087 : [6]
- (i) $\overline{\text{RQ/GT}}_0$
 - (ii) QS_0/QS_1
 - (iii) BUSY.

7. (a) Explain block diagram of intel i5 processor with the help of diagram. [7]
- (b) Explain the following terminologies : [6]
- (i) Hyper-threading technology
 - (ii) Turbo memory
 - (iii) Matrix storage technology.

Or

8. (a) Draw and explain block diagram of x58 chipset. [7]
- (b) Explain the following Intel[®] 82801 IJR I/O controller hub capabilities : [6]
- (i) Direct Media Interface
 - (ii) PCI Express* Interface
 - (iii) Serial ATA (SATA) Controller.

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[4657]-585

S.E. (Information Technology)
(Second Semester) EXAMINATION, 2014
DATA STRUCTURES AND FILES
(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :- (i) Answer *four* questions in all.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data if necessary.

1. (a) Write a C/C++ function to convert infix expression to postfix expression. [6]
- (b) Define circular queue. Explain the advantage of circular queue over linear queue with example. [6]

Or

2. (a) Clearly indicate the content of stack during evaluation of postfix expression : [6]
- ab-cd/*e+, where a=8, b=6, c=10, d=5 and e=7.

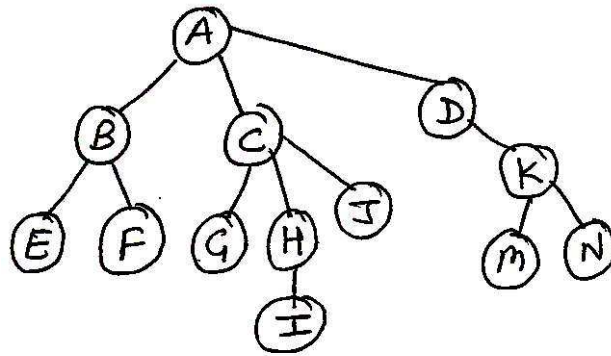
P.T.O.

(b) Define linear queue. How to represent it using linked organization ?

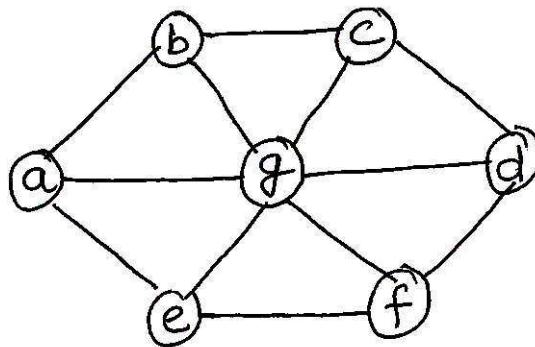
Explain any *one* application in detail. [6]

3. (a) List down the steps to convert general tree to binary tree ?

Convert the given general tree to binary tree— [6]

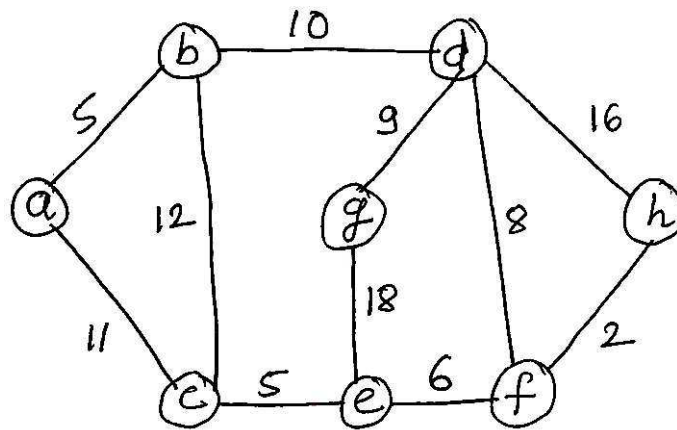


(b) For the graph given below, find BFS and DFS stepwise. [6]



Or

4. (a) Define binary search tree. Draw the BST for given nodes :
38, 14, 56, 23, 82, 8, 45, 70, 18, 15. [4]
- (b) Find the minimum spanning tree using Prim's and Kruskal's method for the following graph : [8]



5. (a) For a given set of values : 9, 45, 13, 59, 12, 75, 88, 11, 105, 46 create a hash table and resolve collision using chaining with and without replacement ? ($H(x) = x \text{ mod } 10$) [8]
- (b) Write short notes on : [6]
- Red black tree
 - Min and max heap.

Or

6. (a) Sort the following number using heap sort and show the sorting stepwise :

44, 66, 33, 88, 77, 55, 22. [6]

- (b) Obtain an AVL tree by inserting one data element at a time in the following sequence :

50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80.

Label the rotations appropriately at each stage. [8]

7. (a) Compare the feature of sequential file, index file and direct access file. [6]

- (b) Write C++ program to perform the following operations on sequential file : [6]

(a) Create & display records

(b) Insert record.

Or

8. (a) Explain various file opening modes with respect to text and binary files. [6]

- (b) Write C++ program to perform the following operations on direct access file : [6]

(a) Create & display records

(b) Insert record.

Total No. of Questions—8]

[Total No. of Printed Pages—3

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[4657]-586

S.E. (Information Technology)

(Second Semester) EXAMINATION, 2014

FOUNDATION OF COMPUTER NETWORKS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

1. (a) Write short note on Analog Signals and Digital Signals with the help of waveforms. [6]
- (b) How is the bandwidth of a signal related to its spectrum ? [6]

Or

2. (a) Explain various transmission impairments present in Data Communication. [6]
- (b) Draw and explain PCM and DM. [6]

P.T.O.

3. (a) Explain Circuit switched network with three phases. [7]
(b) Explain in detail backbone networks. [6]

Or

4. (a) Explain various types of Unguided media in detail. [7]
(b) Explain different addressing schemes in TCP/IP model. [6]
5. (a) What is CRC ? Generate the CRC code for message 1101010101.
Given generator polynomial $g(x) = x^4 + x^2 + 1$. [6]
(b) Explain in detail Stop and Wait and Selective Repeat ARQ
System. [6]

Or

6. (a) Explain in detail Go-Back-N and Selective Repeat ARQ
System. [6]
(b) Explain Error Detection and Correction in Block coding. [6]
7. (a) Explain FDMA, TDMA and CDMA in detail. [6]
(b) Discuss CSMA/CA random access technique. How is collision
avoidance achieved in this technique ? [7]

Or

8. (a) Explain CSMA and CSMA/CD. Also comment on the efficiency of each. [6]
- (b) Discuss Fast Ethernet technology in brief. State its specification. [7]

Total No. of Questions—12]

[Total No. of Printed Pages—4+2

Seat No.	
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[4657]-66

S.E. (Chemical) (Second Sem.) EXAMINATION, 2014

CHEMISTRY-II

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—** (i) Answer *three* questions from Section I and *three* questions from Section II.
- (ii) Answers to the two sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Assume suitable data, if necessary.

SECTION I

1. (a) What are the types of adsorption isotherms ? Explain them briefly. [6]
- (b) Give the mechanism of metal co-ordination compound catalysed reaction in Wacker process. [6]

P.T.O.

- (c) Define the following terms : [4]
- (i) Catalytic poison
- (ii) Catalytic promotor.

Or

- 2.** (a) Explain adsorption theory for heterogeneous catalysis with example. [6]
- (b) Give the B.E.T theory of multilayer adsorption. [4]
- (c) Derive the Langmuir adsorption isotherm. [6]
- 3.** (a) Give evidence against the open chain structure of glucose. [6]
- (b) Draw the structure of starch and cellulose. [4]
- (c) Explain the following terms : [6]
- (i) Zwitterion
- (ii) Peptide linkage.

Or

- 4.** (a) Define carbohydrates. Give their classification and explain each class. [6]
- (b) Explain primary and secondary structures of proteins. [6]
- (c) Write a short note on enzymes. [4]

5. (a) State Beer and Lambert laws and derive the combined law equation. [6]
- (b) Give the principle and instrumentation involved in IR spectroscopy. [6]
- (c) Explain : [6]
- (i) Aniline shows hypsochromic shift in acidic medium.
- (ii) *Trans* stilbene shows UV absorption at higher wavelength than *cis* isomer.

Or

6. (a) Define and explain the following terms : [6]
- (i) Bathochromic shift
- (ii) Hypsochromic shift
- (iii) Auxochrome.
- (b) Deduce structures of the following by IR spectroscopy : [6]
- (i) C_4H_8O (1720 cm^{-1})
- (ii) C_3H_5N (2200 cm^{-1})
- (c) Explain the effect of hydrogen bonding on IR absorption frequency. [6]

SECTION II

7. (a) What are the elements of first transition series ? Explain the following properties of first transition series : [6]
- (i) Colour
 - (ii) Catalytic property
- (b) Explain the CFSE with respect to tetrahedral complexes. [6]
- (c) Give applications of CFT. [4]

Or

8. (a) Draw and explain the diagram showing splitting of *d*-orbital for first transition series in octahedral field. [6]
- (b) Find EAN in the following complexes : [6]
- (i) $[\text{Ni}(\text{NH}_3)_6]^{1+}$
 - (ii) $[\text{Fe}(\text{CN})_6]^{4-}$
 - (iii) $[\text{Cr}(\text{NH}_3)_6]^{2+}$
- (c) Define and explain : [4]
- (i) Co-ordination number;
 - (ii) Chelates.

9. (a) State the basic principles involved in Green Chemistry and explain any *three* of them. [6]

(b) Give the traditional and greener pathway for synthesis of the following : [6]

(i) Polycarbonate

(ii) Indigo

(c) Write a note on membrane bio-reactors. [4]

Or

10. (a) Give the scope and importance of Biotechnology. [6]

(b) Explain the following principles of green chemistry : [4]

(i) Prevention of waste

(ii) Safer solvents.

(c) Explain the various types of fermentations. [6]

11. (a) What are the sources of waste water generation in paper mill? Describe the quality of waste water and methods for its treatment. [6]

(b) Write short notes on the following : [6]

(i) Reverse osmosis;

(ii) Electrodialysis.

- (c) Data from a domestic waste water BOD test is :
- (i) 5 ml of waste water sample was diluted in 300 ml BOD bottle.
- (ii) Initial D.O. = 7.8 mg/litre and 5 day D.O. = 4.3 mg/litre

Estimate :

- (i) BOD_5
- (ii) Ultimate BOD_4

Take K_D = Rate constant = 0.1/day. [6]

Or

- 12.** (a) Draw general layout of Municipal waste water treatment plant and explain the preliminary treatment. [6]
- (b) Write short notes on : [6]
- (i) Chemical Oxygen demand;
- (ii) Disposal of hazardous waste.
- (c) What is tanning ? Explain the quality of tannery industry waste water and various treatment stages. [6]

Total No. of Questions—12]

[Total No. of Printed Pages—8+2

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[4657]-67

S.E. (Chemical) (Second Semester) EXAMINATION, 2014

CHEMICAL ENGINEERING THERMODYNAMICS—I

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) 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) Explain phase rule. How many degrees of freedom has each of the following systems ? [9]

(i) Liquid water in equilibrium with its vapor.

P.T.O.

- (ii) Liquid water in equilibrium with a mixture of water vapor and nitrogen.
- (iii) A liquid solution of alcohol in water in equilibrium with its vapor.
- (b) One mole of an ideal gas is compressed in a piston cylinder assembly from the initial state of 0.1 MPa and 300 K until its volume is reduced to 1/15 of the original volume. The process of compression can be approximated as a polytropic process with $n = 1.2$. Determine the final temperature and pressure of the gas. Also calculate the work done on the gas and the heat interaction. [9]

Or

2. (a) Water at 366.65 K is pumped from a storage tank at the rate of $3.15 \times 10^{-3} \text{ m}^3/\text{s}$. The Motor for the pump supplies work at the rate of 1.5 kW. The water goes through a heat exchanger giving up the heat at the rate of 700 kW and it is delivered to a second storage tank at an elevation 15 m above the first tank. Calculate the enthalpy of the water delivered to the second tank. Enthalpy at 366.65 K is 391.6 kJ/kg. [9]

(b) Nitrogen gas is confined in a cylinder and the pressure of the gas is maintained by a weight on the piston. The mass of the piston and the weight together is 50 kg. The acceleration due to gravity is 9.81 m/s^2 and atmospheric pressure is 1.01325 bar. Assume frictionless piston.

Determine :

(i) The force exerted by atmosphere, the piston and the weight on the gas if piston is 100 mm in dia.

(ii) The pressure of the gas. [9]

3. An ideal gas initially at 600 K and 10 bar undergoes a four step mechanically reversible cycle in a closed system. In step 12 pressure decreases isothermally to 3 bar, in step 23 pressure decreases at constant volume to 2 bar, in step 34 volume decreases at constant pressure and in step 41, the gas returns adiabatically to its initial state. Calculate Q, W, ΔE and ΔH for each step of cycle. Take $C_p = (7/2) R$ and $C_v = (5/2)R$. [16]

Or

4. (a) A particular gas obeys the relation $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where a , b , c are constants. Suppose the gas is allowed to expand reversibly and at constant temperature from V_1 to V_2 , calculate the work done by the gas. [6]

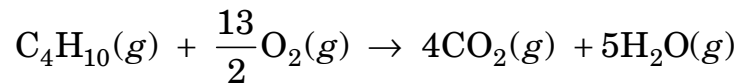
(b) One mole of a gas which obeys the relation $PV = RT$ is initially at 300 K and 0.1 MPa. The gas is heated at constant volume till the pressure rises to 0.5 MPa and then allowed to expand at constant temperature till the pressure reduces to 0.1 MPa. Finally the gas is returned to its original state by compressing at constant pressure. Calculate the work done by the gas in each of the processes and also estimate the net work done by the gas. $R = 8.314 \text{ J/mol.K}$. [10]

5. (a) Ethylene gas and steam at 593 K and atm. pressure are fed to reaction process in an equimolar mixture $C_2H_4(g) + H_2O(g)$

→ C₂H₅OH(*l*) liquid ethanol exits the process at 298 K. What is the heat transfer associated with this overall process per mole of ethanol produced. Use the following data : [10]

	ΔH_{f298} J/mol	A	B×10 ³	C×10 ⁶	D×10 ⁻⁵
C ₂ H ₄ (<i>g</i>)	52510	1.424	14.394	-4.392	—
H ₂ O(<i>g</i>)	-241818	3.470	1.45	—	0.121
C ₂ H ₅ OH(<i>l</i>)	-277690	3.518	20.00	-6.002	—

(b) Calculate the standard enthalpy change at 298.15 K for the reaction : [6]



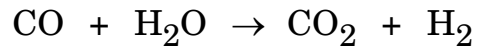
from the following standard enthalpies of formation at 298.15K.

Compound	C ₄ H ₁₀ (<i>g</i>)	CO ₂ (<i>g</i>)	H ₂ O(<i>g</i>)
ΔH_{f298}° (kJ)	-74.943	-393.978	-241.997

Or

6. It is desired to carry out the following reaction at 800°C. Estimate the standard enthalpy change of the reaction at 800°C if the standard

enthalpy change at 298 K is -41.116 kJ.



$$C_p^\circ = a + bT + cT^2 + dT^3 + eT^{-2}, \text{ J/mol.K.}$$

T is in K. The constants in the heat capacity equation are as follows : [16]

Compound	a	$b \times 10^3$	$c \times 10^6$	$d \times 10^9$	$e \times 10^{-5}$
CO	28.068	4.631	—	—	-0.258
H ₂ O	28.850	12.055	—	—	1.006
CO ₂	45.369	8.688	—	—	-9.619
H ₂	27.012	3.509	—	—	0.690

SECTION II

7. (a) Explain third law of thermodynamics with entropy concept. [6]
- (b) Hydrocarbon oil is to be 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/kgK respectively.

- (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 surrounding at 295 K, how much work would be available ? [12]

Or

8. (a) Prove that entropy is state function. [6]
- (b) What are the limitations of First Law of Thermodynamics ? [4]
- (c) A 40 kg steel casting ($C_p = 0.5$ kJ/kgK) at a temperature of 450°C is quenched in 150 kg of Oil ($C_p = 2.5$ kJ/kgK) at 25°C. If there are no heat losses, what is the change in entropy of :
- (i) the casting
 - (ii) the oil
 - (iii) both considered together ? [8]

9. (a) Write a note on Thermodynamic Diagrams. [8]

(b) Show that for a gas obeying van der Waals' equation of state :

$$C_P - C_V = \frac{R}{1 - 2a (V - b)^2 / (RTV^3)}$$

where a and b are van der Waals' constants. [8]

Or

10. (a) Define :

(i) Isothermal compressibility.

(ii) Volume expansivity [6]

(b) Show that : [10]

$$(i) \quad dE = C_V dT + \left(\frac{\beta}{K} T - P \right) dV$$

$$(ii) \quad ds = \frac{C_V}{T} dT + \frac{\beta}{K} dV$$

11. (a) Why is liquefaction of gas needed ? Explain Claude process for gas liquefaction. [8]

(b) A heat pump is used to maintain the temperature inside the building at 295 K by pumping heat from the outside air at

275 K. The unit has an overall efficiency of 25%. The pump is driven electrically and the electric power is generated by the combustion of certain fuel gas. The heat of combustion of the fuel is 890.9 kJ/mol. It is estimated that only 33% of the heat of combustion of the fuel is converted into electricity. Determine the amount of fuel burned for delivering 1000 MJ of heat to building. [8]

Or

12. (a) What are properties of refrigerant which are required to be considered for its selection ? [8]
- (b) A vapour-compression refrigeration cycle in which the refrigerant HFC -134a enters the compressor as superheated vapour at 0.18 MPa and -10°C at a rate of 0.06 kg/s and leaves at 1.0 MPa and 45°C . The refrigerant is cooled in the condenser to 29°C and 0.75 MPa and is throttled to 0.2 MPa.

Determine :

- (i) The amount of heat removed from the cold space

(ii) The power input required

(iii) The COP of the refrigeration cycle.

Given that :

Enthalpy of superheated vapour at -10°C and $0.18\text{ MPa} = 245.16$
kJ/kg

Enthalpy of superheated vapour at 45°C and $1.0\text{ MPa} = 277.22$
kJ/kg

Enthalpy of superheated liquid at 29°C and $0.75\text{ MPa} = 92.22$
kJ/kg

[8]

Total No. of Questions—12]

[Total No. of Printed Pages—4+1

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[4657]-75

S.E. (Computer) (Second Semester) EXAMINATION, 2014

DATA STRUCTURES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :- (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Assume suitable data, if necessary.

SECTION I

1. (a) What is binary tree ? What is a binary search tree ? How is it different from a basic tree ? Explain with figures. [8]
- (b) What is binary tree traversal ? Write recursive function for any *two* traversal algorithms. [8]
- (c) Write any *four* applications of binary trees. [2]

P.T.O.

Or

2. (a) Construct Huffman tree based on the following character weights :

E = 15 T = 12 A = 10 O = 08 R = 07 N = 06 S = 05

U = 05 I = 04 D = 04 M = 03 C = 03 G = 02 K = 02

Also give Huffman code assignment at each node. [8]

- (b) What is binary tree traversal ? Write Pseudo code for inorder traversal of the threaded binary tree. [10]

3. (a) What is minimum spanning tree ? Find out minimum spanning tree for the given graph step-by-step. (Refer Fig. 1) [8]

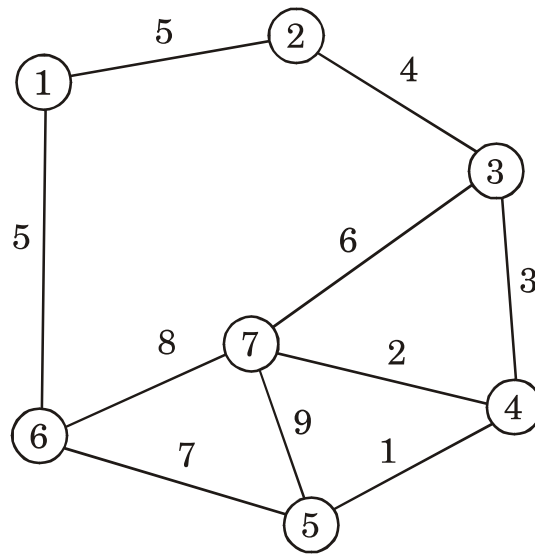


Fig. 1

- (b) What are graph storage structures ? Explain in detail. [8]

Or

4. (a) Write algorithm for Breadth First Traversal of the graph and give suitable example for the same. [8]
- (b) Write Dijkstra's Algorithm for finding shortest path and explain it with example. [8]
5. (a) What is bucket hashing ? Explain with example. [8]
- (b) Explain with example LL, LR, RR, RL rotation for AVL tree. [8]

Or

6. (a) What is hash function ? What are characteristics of a good hash function ? Explain any *two* hash function. [8]
- (b) (i) What is AVL tree ? Explain with *one* example. [4]
- (ii) Explain static and dynamic tree tables. [4]

SECTION II

7. (a) Explain in brief MAX heap and MIN heap. Write a step-by-step solution to create a MAX heap for given list of elements {35 75 30 85 40 45 65}. [10]

- (b) What is B tree ? Explain the process for deleting a particular value from B tree. [8]

Or

8. (a) Write stepwise solution to sort above data (Q. 7 (a)) using heapsort. Write complexity of heapsort. [10]
- (b) What is multiway tree ? State need of multiway trees. Explain B+ tree in brief. [8]
9. (a) (i) What is file ? Explain types of files. [4]
- (ii) Explain different primitive operations on a file. [4]
- (b) Write short notes on inverted and cellular partition. [8]

Or

10. (a) Explain in detail sequential file organization and direct file organisation. [8]
- (b) What is a indexing ? Write *one* advantage of indexing and write types of indexing. [8]
11. (a) (i) Differentiate between structures and classes. [4]
- (ii) What is STL ? What are the components of STL ? [4]

- (b) Write a 'C++' program using STL to perform sorting of given array of integers using bubble sort technique. [8]

Or

- 12.** (a) Explain the following terms : [2×4=8]

(i) Containers

(ii) Iterations

(iii) Algorithms

(iv) Generic programming.

- (b) Give the implementation of a queue using list in a STL with respect to : [8]

(i) Insertion of an element

(ii) Deletion of an element.

Total No. of Questions—12]

[Total No. of Printed Pages—4+2

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[4657]-76

S.E. (Computer) (Second Semester) EXAMINATION, 2014

MICROPROCESSORS AND INTERFACING TECHNIQUES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answers to the two Sections should be written in separate answer-books.

(ii) Answer any *three* questions from each Section.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Use of calculator is allowed.

(vi) Assume suitable data, if necessary.

SECTION I

1. (a) Draw and explain functional block diagram of 8086 micro-processor. [8]

P.T.O.

- (b) Explain the following 8086 signals : [4]
- (i) NMI
 - (ii) MN/MX
 - (iii) BHE/S7
 - (iv) CLK.
- (c) Explain memory segmentation in 8086 microprocessor with a neat diagram. [4]

Or

2. (a) Draw and explain the READ cycle timing diagram of 8086 in Maximum mode. [6]
- (b) Explain how 20-bit physical address is obtained in 8086 microprocessor. [4]
- (c) Explain flag register of 8086. [6]
3. (a) Explain the following addressing modes : [8]
- (i) Direct Addressing Mode
 - (ii) Immediate Addressing Mode
 - (iii) Register Indirect Addressing
 - (iv) Base Register Addressing.

- (b) Explain with example the following instructions for 8086 : [8]
- (i) PUSH
 - (ii) MOVSB/MOVSX
 - (iii) DAA
 - (iv) STOS/LODS.

Or

4. (a) Explain with example 8086 instruction : [6]
- (i) LOOPZ
 - (ii) LODSB.
- (b) Differentiate between the following : [6]
- (i) MACRO and PROCEDURE with examples
 - (ii) NEAR and FAR Procedure.
- (c) Explain the use of PUSH and POP instruction in 8086 microprocessor. [4]
5. (a) What is interrupt vector table of 8086 ? Draw and explain its structure. [8]
- (b) What is a TSR ? How is it made resident in the memory ? Can we remove it ? If yes, how ? [6]
- (c) What is the difference between DOS and BIOS calls ? [4]

Or

- 6.** (a) What are the different components of MS-DOS ? With the help of neat diagrams, explain how MS-DOS gets loaded. [10]
- (b) What is PSP ? Explain in detail. [8]

SECTION II

- 7.** (a) With the help of block diagram explain various modes of operations of 8255. [8]
- (b) What is A/D converter ? Which are different methods for A/D conversion ? Explain successive approximation ADC with block diagram. [8]

Or

- 8.** (a) Draw and explain the functional internal block diagram of 8251. What is the use of the IC ? [8]
- (b) Draw and explain the BSR and I/O mode word format of 8255 PPI. [8]
- 9.** (a) Draw and explain the complete interface diagram between 8086 and 8279 keyboard/display controller with 4×4 keyboard matrix. Also write the instructions in 8086 assembly to initialize 8279. [8]

(b) Discuss the following modes of DMA transfer : [8]

(i) Single transfer mode

(ii) Block transfer mode

(iii) Demand transfer mode

(iv) Cascade mode.

Or

10. (a) Explain the various modes of operation for DMA in detail. [8]

(b) Draw and explain a detail block diagram of 8279. [8]

11. (a) Draw the 8086 Maximum mode system configuration. Give the necessity of each chip used in the system. [10]

(b) Explain the working of LVDT with the help of neat diagram. [8]

Or

12. (a) Draw the 8086 minimum mode system configuration. Give the necessity of each chip used in the system. [10]

(b) Explain the following instructions of NDP : [8]

(i) FMUL

(ii) FSTP

(iii) FILD

(iv) FISUB.

Total No. of Questions—12]

[Total No. of Printed Pages—7

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[4657]-83

S.E. (I.T.) (Second Semester) EXAMINATION, 2014

DATA STRUCTURES AND FILES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4 and Q. No. 5 or Q. No. 6 from Section I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10 and Q. No. 11 or Q. No. 12 from Section II.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn whenever necessary.
- (iv) Assume suitable data, if necessary.

SECTION I

1. (a) Assume a hash table of size 15 and hash function $H(X) = X \bmod 50$, perform linear probing with and without replacement for the given set of values : [8]
- 0, 1, 2, 4, 72, 65, 85, 87, 90, 58, 52, 53, 42, 44, 91

P.T.O.

(b) Write a program in 'C' for sequential file and perform the following operations : [8]

(i) Copy all data from one file to another

(ii) Count number of characters in a file

(iii) Count number of words in file

(iv) Search a particular word in a file.

Or

2. (a) State advantages and disadvantages of sequential file, index sequential file and direct file. [8]

(b) Write a 'C' program to copy contents of one file to another file using command line arguments. [8]

3. (a) Write an algorithm to convert an infix expression to postfix form. [8]

(b) Transform each of the following prefix expression to infix form.

Show clearly the contents of stack : [8]

(i) $*+ a-bc/-de+ -fgh$

(ii) $- +/a \wedge bc*de*ac$

Or

4. (a) Write a 'C' program to convert decimal number to binary using stack. [8]

(b) Clearly indicate the contents of stack for evaluating the following postfix expressions :

Assume $A = 1, B = 2, C = 3$ [8]

(i) $AB + C - BA + C$

(ii) $ABC + * CBA - + *$

5. (a) Define linear queue. What are the disadvantages of linear queue? Write a 'C' program to implement linear queue using linked organization. [10]

(b) Write a pseudo C code for implementation of circular queue using array. [8]

Or

6. (a) Define deque. Write a 'C' program to implement deque using linked organization. [10]

- (b) Write a pseudo C code for implementation of priority queue. [8]

SECTION II

7. (a) Define the following with respect to trees with examples : [8]

(i) Complete binary tree

(ii) Predecessor and successor

(iii) Height of tree

(iv) Skewed binary tree.

- (b) Write functions for non-recursive inorder and preorder traversals for binary trees. [8]

Or

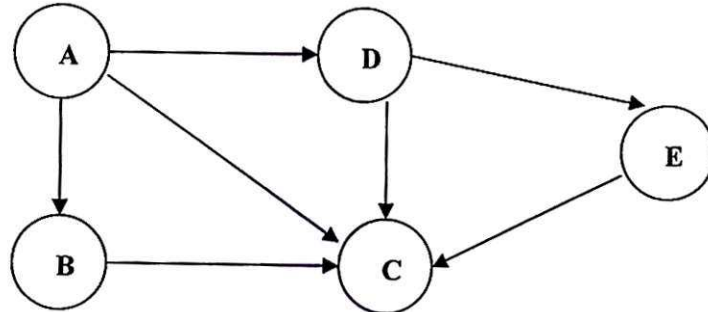
8. (a) Construct a binary tree from the given traversals : [8]

Preorder : * + a - bc/-de - + fgh

Inorder : a + b - c * d - e/f + g - h

- (b) Write non-recursive preorder traversal algorithm for in-order threaded binary tree. [8]

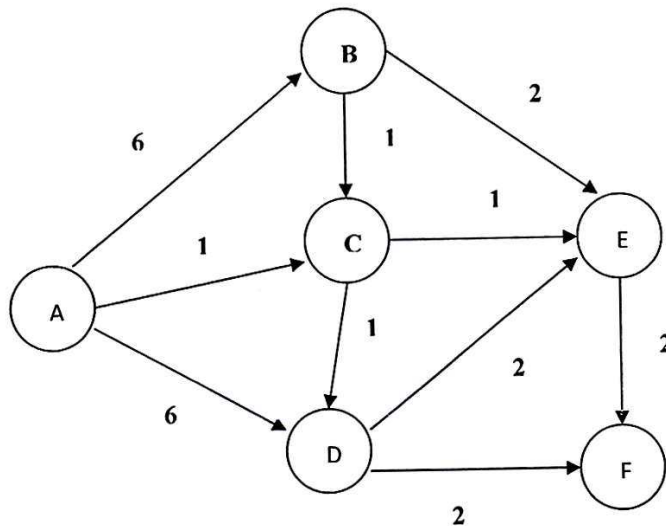
9. (a) Write an algorithm to perform DFS traversal for a graph. Perform the same for the given graph : [8]



- (b) Define the following with respect to graph with examples : [8]
- (i) Degree of node
 - (ii) Isolated node
 - (iii) Path
 - (iv) Cycle.

Or

10. (a) For the graph given below find minimum spanning tree using Prim's algorithm. Show stepwise representation : [8]



- (b) Define a graph. For the given adjacency matrix draw the graph and its adjacency list : [8]

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	0	0	1	0	0	0
C	1	0	0	1	0	1	0	0
D	0	0	1	0	0	0	0	1
E	0	1	0	0	0	0	1	0
F	0	0	1	0	0	0	1	1
G	0	0	0	1	0	1	0	0
H	0	0	0	1	0	1	0	0

11. (a) Define AVL tree. For the given data, build an AVL tree and show the balance factor and type of rotation at each step : [10]

64, 1, 44, 26, 13, 110, 98, 85

- (b) For the data given below build a Huffman tree and find code of each symbol : [8]

Character	Weight	Character	Weight	Character	Weight
A	10	I	4	R	7
C	3	K	2	S	5
D	4	M	3	T	12
E	15	N	6	U	5
G	2	O	8		

Or

12. (a) Sort the following numbers in ascending order using heap sort.

Show the sorting stepwise : [10]

77, 62, 14, 9, 30, 21, 80, 25, 70, 55

(b) Distinguish between Huffman's tree, OBST and AVL in terms of their definition and application. [8]

Total No. of Questions—12]

[Total No. of Printed Pages—4

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[4657]-84

S.E. (I.T.) (Second Semester) EXAMINATION, 2014

DATA COMMUNICATIONS

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :- (i) Answers to the two Sections should be written in separate answer-books.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of calculator is allowed.

(v) Assume suitable data, if necessary.

SECTION I

1. (a) Compare ISO-OSI model with TCP-IP model. Which model is prepared in internet ? Why ? [8]

(b) State and explain Nyquist theorem and Shannon's channel capacity theorem. Consider a channel with 1MHz bandwidth, The SNR for this channel is 63. What is appropriate bit rate and signal level ? [10]

P.T.O.

Or

- 2.** (a) Explain serial and parallel transmission modes used in Data Communication. [8]
- (b) List and explain various line coding techniques with examples. [10]
- 3.** (a) Derive an expression for AM wave in time domain and plot frequency spectrum of AM. [8]
- (b) Compare Direct sequence-SS and Frequency hopping-SS. [8]

Or

- 4.** (a) What is FDM ? Draw and explain FDM multiplexing and De-multiplexing process. [8]
- (b) Explain the following shift keying techniques with suitable examples : [8]
- (i) ASK
- (ii) FSK
- (iii) PSK
- (iv) QAM.

5. (a) Explain various types of unguided media in detail. [8]
(b) Compare Circuit switching, Message switching, Packet switching. [8]

Or

6. (a) Explain types of fiber and compare them. [8]
(b) Explain the terms ADSL, ADSL lite, HDSL and SDSL. [8]

SECTION II

7. (a) Explain with suitable example, generation of Hamming codes. [8]
(b) What is CRC ? Explain CRC generator and CRC checker with suitable example. [10]

Or

8. (a) Discuss Point to Point (PPP) protocol stack with its appropriate frame formats. [8]
(b) Explain in detail Basic Stop and Wait, Go-Back-N, and Selective repeat ARQ system. [10]

9. (a) Explain the following physical layer implementation in fast Ethernet : [8]
(i) 100BaseTX

(ii) 100BaseFX

(iii) 100BaseT4

with respect to media, maximum length and line encoding.

(b) Compare and contrast FDMA, TDMA and CDMA. [8]

Or

10. (a) Write short notes on : [8]

(i) IEEE 802.4 (Token bus)

(ii) IEEE 802.5 (Token ring).

(b) Discuss fast Ethernet technology in brief. State its specification. [8]

11. (a) Compare Hub, Repeaters, Bridge, Routers in detail. [8]

(b) Draw and explain BUS and STAR backbone network. [8]

Or

12. (a) What is virtual LAN ? State the advantages of VLAN. [8]

(b) Write short notes on : [8]

(i) SONET layers

(ii) SONET Multiplexing.

Total No. of Questions—6]

[Total No. of Printed Pages—2

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[4657]-96

S.E. (Printing) (Second Semester) EXAMINATION, 2014

REPRODUCTION TECHNIQUES

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :—Solve *three* questions from each Section.

SECTION I

1. Write in detail ideal properties of originals for printing. [16]

Or

Describe concept of final artwork process in detail. [16]

2. What are the elements of electronic progress ? [18]

Or

Describe working of CTP system in detail. [18]

3. What is process color printing ? Compare with spot color process. [16]

Or

Explain in detail UCR and GCR with examples of applications. [16]

P.T.O.

SECTION II

4. How is density measured ? Discuss the instrument used in detail. [16]

Or

Discuss in detail color setting on a press with QC aids. [16]

5. Discuss advantages of digital input devices for imaging. [18]

Or

Write notes on : [18]

(1) Scanners

(2) Digital camera

6. What are advantages of digital printing ? Discuss with examples. [16]

Or

Describe in brief any *two* various digital printing processes. [16]

Total No. of Questions—6]

[Total No. of Printed Pages—3

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[4657]-97

S.E. (Printing) (II Sem.) EXAMINATION, 2014

PRINT FINISHING

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) *All* questions are compulsory.

(ii) Answers to the two sections should be written in separate answer-book.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) 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. (1) Draw a neat labelled diagram of constructional parts of a book. [18]

Or

- (2) Draw and explain the tools and equipments used in book binding.

P.T.O.

2. (1) List down the raw materials used in print finishing. Also explain the properties and requirements of the material. [16]

Or

- (2) Write short notes on the following (any *two*) :
- (a) Reinforcing material
 - (b) Covering material
 - (c) Securing materials
 - (d) Miscellaneous material.

3. (1) Explain stages of forwarding and pre-forwarding operations. [16]

Or

- (2) Write short notes on (any *two*) :
- (i) Numbering
 - (ii) Perforating
 - (iii) Spiral binding.

SECTION II

4. (1) Draw a plant Layout for an ideal print finishing setup. [18]

Or

- (2) Explain the general responsibilities of a storekeeper.

5. (1) State considerations for costing of a book binding job. [16]

Or

(2) What care will you take to protect the paper in storage ?

6. (1) Draw a neat labelled diagram of cutting machine. [16]

Or

(2) Write short notes on the following (any *two*) :

(a) Wire stitching machine

(b) Wet and heat seal lamination

(c) Cutting machine

(d) Perfect binding.