Total No. of Questions—**12**]　　　　　　[Total No. of Printed Pages—**3**

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**[4957]-138**

**S.E. (Production/Indus. Engineering) (Second Semester)**
**EXAMINATION, 2016**

**INDUSTRIAL ORGANISATION AND MANAGEMENT**

**(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*) Name the common types of organizations used in Industry. Describe line and staff organization with the help of a line diagram. [8]

(*b*) Compare the following types of business organizations : [8]

(*i*) Private limited company

(*ii*) Public limited company.

*Or*

**2.** (*a*) What is "Partnership firm" ? What are the salient features, advantages, disadvantages of partnership firm ? [8]

(*b*) Discuss the contribution of Henry Fayol in respect to 14 principles of scientific management. [8]

**3.** (*a*) What are the similarities and differences in Maslow's theory of Need Hierarchy and Alderfer's ERG theory ? [9]

(*b*) Define cohesiveness. Explain factors affecting cohesiveness. [9]

*Or*

**4.** (*a*) Discuss the McGregor's theory of X and Y. What are its implications for motivational practices ? [9]

(*b*) Explain Fiedler's contingency theory. [9]

**5.** (*a*) Explain Venture capitalist and Angel investors as important sources of finance for an entrepreneur. [8]

(*b*) Explain the importance of break even analysis in a business plan. [8]

*Or*

**6.** (*a*) List down and explain various government supporting agencies to finance entrepreneurial activities. [8]

(*b*) What are various obstacles facing an entrepreneur ? Explain any *two* growth strategies available to entrepreneur. [8]

## Section II

**7.** (*a*) List and explain steps in the buyer decision process. [8]

(*b*) Define marketing research. What are important steps in marketing research. [8]

*Or*

**8.** (*a*) Describe the major decisions involved in developing an advertising program. [8]

(*b*) Describe how marketing strategies change during the product's life cycle. [8]

**9.** (*a*) Define selection and describe various steps in the selection procedure. [8]

(*b*) Explain various types and methods of training. [8]

*Or*

**10.** (*a*) Define manpower planning and discuss the process of manpower planning. [8]

(*b*) Why is recruitment called as positive process and selection as negative process ? Explain any *three* methods of recruitment. [8]

**11.** (*a*) Discuss the scope and important aspects of the Industrial Disputes Act. [9]

(*b*) Define merit rating. List and explain various merit rating methods. [9]

*Or*

**12.** (*a*) Explain the difference between job evaluation and merit rating. Discuss the basic steps of job evaluation process. [9]

(*b*) Define wage. Explain any *three* wage incentive plans. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-141

**S.E. (First Semester) (Prod. Sandwich) EXAMINATION, 2016**

**MANUFACTURING PROCESSES**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer to the two Sections should be writen in separate-books.

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

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

### Unit I

**1.** (*a*) What is pattern ? Describe different allowances provided on pattern in short. [9]

(*b*) Make a neat cross sectional sketch of a cupola indicating its various zones and describe the following :

(*i*) It's construction

(*ii*) It's different zones and their functions. [9]

*Or*

**2.** (*a*) Describe the different defects that are occuring in casting ? State its causes and remedies. [9]

(*b*) Describe the lost wax process of casting with neat sketches. State the advantages, limitations and application of process. [9]

## Unit II

**3.** (*a*) Explain with help of neat sketch the working of "Board Drop Hammer". [8]

(*b*) Explain continuous rolling mill with neat sketch ? What are its advantages ? [8]

*Or*

**4.** (*a*) Write short notes on "Spinning of Metals". [8]

(*b*) Explain cold forging and swaging. Describe the process of rotary swaging with the help of neat sketch. [8]

## Unit III

**5.** (*a*) Explain with suitable diagram the following processes : [8]

(*i*) Friction welding

(*ii*) Seam welding

(*b*) Write short notes on : [8]

(*i*) Brazing

(*ii*) Adhesive welding.

*Or*

**6.** (*a*) Compare the merits and demerits of using. AC and DC for arc welding. [8]

(*b*) Describe the 'Electron beam welding' with neat sketch stating its advantages disadvantages and area of application. [8]

## SECTION II

### Unit IV

**7.** (*a*) What ar desirable properties of cutting tool ? Describe any *four* cutting tool material in short ? [10]

(*b*) Sketch and describe backgeared headstock of lathe. [8]

*Or*

**8.** (*a*) Explain the following operations performed on lathe with the help of simple sketch : [9]

(*i*) Eccentric turning

(*ii*) Facing

(*iii*) Parting off

(*b*) State the function of the following in lathe : [9]

(*i*) Half centre

(*ii*) Follower rest

(*iii*) Chasing Dial.

### Unit V

**9.** (*a*) Index 87 division by compound indexing method. The hole circle available are : [8]

Plate I : 15, 16, 17, 18, 19, 20

Plate II : 21, 23, 27, 29, 31, 33

Plate III : 37, 39, 41, 43, 47, 49

(*b*) What is twist drill ? Draw neat sketch of twist drill showing various parts and name it properly. [8]

*Or*

**10.** (*a*) Describe the various types of milling cutter with neat sketches (any *four*) : [8]

(*b*) Sketch and describe in brief a 'Radial drilling' machine. [8]

## Unit VI

**11.** (*a*) Compare the honing and lapping process with respect to : [8]

(*i*) Principle of working

(*ii*) Types of abrasive

(*iii*) Area of application

(*iv*) Surface finish

(*b*) Explain "Grain, Grit and structure" of grinding wheel ? [8]

*Or*

**12.** (*a*) What is centreless grinding ? Draw a working set of centreless external grinding process and explain in short. [8]

(*b*) Define abrasive and differentiate between aluminium oxide and silicon carbide grinding wheel in respect of : [8]

(*i*) Hardness of wheel

(*ii*) Application

(*iii*) Types of bond

(*iv*) Cost of wheel.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

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# [4957]-142

**S.E. (Production) (S/W) (Second Semester)**
**EXAMINATION, 2016**
**PRODUCTION AND INDUSTRIAL MANAGEMENT-I**
**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Write Section I and Section II separately.

## SECTION I

**1.** (*a*) Explain along with example functions of Management. [8]

(*b*) Write short notes on the following : [8]

(*i*) Types of Organization.

(*ii*) List out single line 14 Principle of H. Fayol.

*Or*

**2.** (*a*) Explain principle of Scientific Management. [8]

(*b*) Explain the role of Public and Private firms in Indian Society. [4]

(*c*) Write a short note on Group Dynamics. [4]

**3.** (*a*) What are the different basic techniques used in Industrial Engineering ? [8]

(*b*) Explain along with example different types of production. [4]

(*c*) Write a short note on factors affecting the producitivity. [4]

*Or*

**4.** (*a*) Explain the significance of industrial engineering in manufacturing sector. [8]

(*b*) Define Productivity. Explain what is meant by Factor productivity and Tool productivity and explain Productivity of Material. [8]

**5.** (*a*) What do you mean by plant layout ? Explain the characteristics of plant layout. [8]

(*b*) Write a short note on types of Maintenance. [4]

(*c*) Explain steps involved in productsion planning. [6]

*Or*

**6.** (*a*) What are work elements ? Explain various types of work element in detail. [8]

(*b*) Explain micro-motion study. How is it carried out ? What are different symobls used in micro-motion study ? [10]

## SECTION II

**7.** (*a*) Explain aim and objective of time study. [6]

(*b*) The element data for a typical time job is given below : [8]

| **Element** | **Cycle time(Min)** | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| A | 0.36 | 0.31 | 0.39 | 0.33 | 0.34 |
| B | 0.76 | 0.87 | 0.94 | 0.76 | 0.77 |
| C | 0.31 | 0.38 | 0.36 | 0.36 | 0.39 |
| D | 0.43 | 0.50 | 0.41 | 0.43 | 0.43 |

(1) Element C is machine paced

(2) The operator is rated at 110%

Allowance for this job is 12%. Calculate standard time of the job.

(*c*) Explain different recording media used in time study. [4]

*Or*

**8.** (*a*) Write a short note on different types of allowance used in time study. [6]

(*b*) A stopwatch study of a clerical operation gave the following elemental data :

| **Element** | **Cycle time** | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| A | 0.13 | 0.21 | 0.13 | 0.14 | 0.14 |
| B | 0.56 | 0.57 | 0.54 | 0.56 | 0.57 |
| C | 0.21 | 0.18 | 0.18 | 0.16 | 0.17 |
| D | 0.23 | 0.30 | 0.31 | 0.33 | 0.33 |

(*i*) Element B is machine paced

(*ii*) The operator is rated at 114%

Allowance for this job is 12%. Calculate standard time of the job. [12]

**9.** (*a*) What is meant by leadership ? Explain the Contingency Theory of leadership. [8]

(*b*) Explain the Trait Theory of leadership. [4]

(*c*) Explain the qualities of good entrepreneur. [4]

*Or*

**10.** (*a*) Write short notes on the following : [12]

(*i*) Job Evaluation

(*ii*) Types of different Incentive schemes.

(*b*) Explain various functions of HR Department. [4]

**11.** (*a*) Explain the Break–Even analysis in detail along with example. [8]

(*b*) Explain various sources of finance and role of financial institutes in Indian industry. [8]

*Or*

**12.** (*a*) Explain along with example different types of overhead costs. [8]

(*b*) Compare and contrast costing and cost control. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

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# [4957]-151

## S.E. (Electrical) (First Semester) EXAMINATION, 2016

## POWER PLANT ENGINEERING

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Use separate answer-book for each Section.

(*iii*) Use of steam tables, Mollier charts, electronic pocket calculator is allowed.

(*iv*) Assume suitable data, if necessary.

## SECTION I

### Unit 1

**1.** (*a*) Explain the pulverized coal firing system with neat sketch. [8]

(*b*) The percentage composition of sample of liquid fuel by weight is C = 84.8% and $H_2$ = 15.2%. Calculate (i) The weight of air needed for the composition of 1 kg of fuel. (ii) The volumetric composition of the products of combustion if 15%t excess is supplied. [8]

*Or*

**2.** (*a*) Explain the Boy's gas calorimeter with neat sketch. [8]

P.T.O.

(*b*) Write notes on :

(*i*) Excess air and Theoretical air

(*ii*) Stoichiometric air-fuel ratio [8]

**Unit 2**

**3.** (*a*) Explain the working of thermal power plant with neat block diagram. [8]

(*b*) Discuss any *two* fuel handling system with neat sketch used in thermal power plant. [8]

*Or*

**4.** (*a*) Explain the working of any *two* ash disposal system used in thermal power plant. [8]

(*b*) Write notes on :

(*i*) Types of boilers

(*ii*) Feed water and its treatment [8]

**Unit 3**

**5.** (*a*) Explain the working of hydro power plant with neat sketch. [10]

(*b*) Write notes on :

(*i*) Hydrographs

(*ii*) Types of Spillways [8]

*Or*

**6.** (*a*) A Pelton wheel of 3 m runner works under a head of 800 m. It runs at 60 rpm. The discharge rate into runner is 3 $m^3$/sec. Find :

(*i*) Input power to runner

(*ii*) Shaft power from runner having mechanical efficiency of 92%

(*iii*) Number of turbines needed to generate 100 MW. [10]

(*b*) Explain the working of Francis turbine with neat sketch. [8]

## SECTION II

### Unit 4

**7.** (*a*) Write a short note on 'nuclear waste disposal'. [6]

(*b*) Explain CANDU reactor power plant. [6]

(*c*) State advantages and disadvantages of Diesel Power Plant. State the applications of Diesel Power Plants. [6]

*Or*

**8.** (*a*) With the help of neat sketch, explain the working of a Boiling Water Reactor (BWR). [6]

(*b*) What are the functions of the following in nuclear power plant ? [6]

(*i*) Moderator

(*ii*) Control rod

(*iii*) Coolant

(*c*) Draw a typical layout of a diesel power station and explain. [6]

## Unit 5

**9.** (*a*) Write a short note on materials used for different parts of a gas turbine. [6]

(*b*) Discuss the methods to improve thermal efficiency of gas turbine power plants. [6]

(*c*) Write a short note on geothermal power generation. [4]

*Or*

**10.** (*a*) Discuss the operation of intercoolers and regenerators used in gas turbine with a neat sketch. [6]

(*b*) Discuss Solar Power Plants in detail. [6]

(*c*) Explain open loop and closed loop gas turbine power plants. [4]

## Unit 6

**11.** (*a*) Explain the following terms :

(*i*) Input-output curve

(*ii*) Heat rate and incremental rate curve. [8]

(*b*) The output of a generating station is $450 \times 10^6$ kWh per year and average load factor is 0.65. If the annual fixed charges are Rs. 45/kW of installed plant and annual running charges are 4.5% kWh, what is the cost per kWh of energy at the bus bar ? [8]

*Or*

**12.** (*a*) What are base load and peak load plants ? Explain the methods by which economic load sharing between base load and peak load plants can be determined. [8]

(*b*) Discuss the various fixed charges and running charges which are used for calculation of cost of electrical energy. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-152

**S.E. (Electrical) (I Sem.) EXAMINATION, 2016**

**MATERIAL SCIENCE**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

***Physical Constants* :—**

(*i*) Angstrom Unit (AU) = $1 \times 10^{-10}$ metres

(*ii*) Boltzmann's Constant (k) = $1.380 \times 10^{-23}$ joule. degree–1.

(*iii*) Charge on Electron (e) = $1.601 \times 10^{-19}$ coulomb.

(*iv*) Mass of Electron (m) = $9.107 \times 10^{-31}$ kg

(*v*) Electron volt (eV) = $1.602 \times 10^{-19}$ joules

(*vi*) Mass of Proton ($m_p$) = $1.627 \times 10^{-27}$ kg

(*vii*) Velocity of light (c) = $2.998 \times \times 10^{8}$ m/sec

(*viii*) Dielectric Constant of free space ($\varepsilon_0$) = $8.854 \times 10^{-12}$ F/m.

(*ix*) Permeability of free space ($\mu_0$) = $4\pi \times 10^{-7}$ H/m.

(*x*) Debye Unit = $3.33 \times 10^{-30}$ coulomb. metre.

## SECTION I

**1.** (*a*) What do you mean by polarization ? Explain different types of polarization. [8]

(*b*) Explain with a neat sketch photo emissive cell. [8]

*Or*

2. (*a*) Derive Clausius - Mossotti relation as applied to dielectric materials in static field. State clearly the assumptions made. [8]

   (*b*) Define dielectric loss tangent and explain it with phasor diagram. [8]

3. (*a*) Write a short note on crystal defects. [9]

   (*b*) Explain factors affecting breakdown of solid insulating material. [8]

*Or*

4. (*a*) Write down properties and applications : [8]

   (*i*) Ceramics

   (*ii*) Paper

   (*iii*) Varnish

   (*iv*) $SF_6$

   (*b*) Write properties of insulating materials used in Capacitors and Cables. [9]

5. (*a*) What is Curie temperature ? Explain Ferro-magnetic behaviour below Critical temperature. [9]

   (*b*) Define Magnetic dipole moment, magnetization, and magnetic susceptibility with their units. [8]

*Or*

6. (*a*) Write a short note on Magnetic Recorders. [8]

   (*b*) Classify magnetic materials along with magnetic dipoles. [9]

## SECTION II

7. Describe Thermocouple and Superconductors with their properties and applications. [16]

*Or*

8. Write down properties and applications of Thermal Bimetals, Silver and Copper Alloys. [16]

9. (*a*) Draw figures of BN Nano tubes. Explain it. Where are they used ? [8]

   (*b*) Write short note on-Carbon Nano tybes. [8]

*Or*

10. (*a*) Describe carbon molecules and carbon clusters. [8]

    (*b*) With neat diagrams describe : [8]

    (*i*) Nano wires

    (*ii*) Molecular machines

**11.** (*a*) Explain various tests conducted on High Voltage Bushings. [9]

(*b*) Describe Measurement of Dielectric Strength of Solid Insulating Material with reference to - IS 2584. [9]

*Or*

**12.** (*a*) Describe Measurement of Dielectric Strength of Gaseous Insulating Material as per IS. [9]

(*b*) Explain measurement of Tangent of Dielectric Loss Angle (tan $\delta$) by Schering Bridge IS 13585-1994. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-153

**S.E. (Electrical) (First Semester) EXAMINATION, 2016**

**ANALOG AND DIGITAL 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*) 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 CE configuration of BJT amplifier with input and output characteristics. [8]

(*b*) Draw and explain transfer characteristics and drain characteristics of FET. [8]

*Or*

**2.** (*a*) Give comparison between BJT and FET. [8]

(*b*) With neat diagram explain working of transformer coupled BJT amplifier. [8]

P.T.O.

3. (*a*) Explain with neat diagram and output waveform OPAMP as a : [9]

(*i*) Integrator

(*ii*) Precision rectifier

(*b*) List and explain ideal and practical parameters of OPAMP. [9]

*Or*

4. (*a*) Draw block diagram of OPAMP and Explain each block. [9]

(*b*) Explain OPAMP as a : [9]

(*i*) Instrumentation amplifier

(*ii*) V-I and I-V converter

5. (*a*) Draw and explain pin and block diagram of IC555 [8]

(*b*) Explain 78XX and 79XX voltage regulator with their output voltage range. [8]

*Or*

6. (*a*) Draw and explain frequency response of active High pass filter. [8]

(*b*) Draw neat diagram and explain OPAMP as a square wave. [8]

## SECTION II

7. (*a*) Convert the following : [12]

(*i*) What is the decimal equivalent of octal 314.73410 ?

(*ii*) Convert given number to Octal equivalent 1E7B16 ?

(*iii*) Convert following binary number to Gray code 111011 binary

(*iv*) Excess-3 code. 111011 binary

(*b*) Perform the following operation : [6]

(*i*) Add the following numbers 0FACH and 387FH

(*ii*) Subtract using 2's complement 12510 – 6810

*Or*

**8.** (*a*) What is a comparator ? Design and draw a 1 bit comparator circuit using K-map. [9]

(*b*) Draw and Explain 8 : 1 Multiplexer circuit using 4 : 1 multiplexer. [9]

**9.** (*a*) Draw and discuss logic diagram of JK flip flop and how to build T flip flop using JK Flip flop. Write the truth tables for both. [8]

(*b*) Explain 4 bit S I S 0 shift register and hence explain twisted ring counter. Draw Timing diagram. [8]

*Or*

**10.** (*a*) What is the Modulus of counter ? Design a MOD - 10 counter draw circuit diagram, Truth table of 4 bit ripple counter. [8]

(*b*) Design 1 : 4 De-multiplexer using K-map [8]

**11.** (*a*) Give the complete classification of memories. [8]

(*b*) Differentiate between synchronous and Asynchronous counter. Draw the circuit diagram of Synchronous counter using JK flip-flops. [8]

*Or*

**12.** (*a*) Differentiate between Multiplexer and Demultiplexer with its applications. [8]

(*b*) Explain R-2R ladder Digital to Analog converter. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-154

## S.E. (Electrical) (I Sem.) EXAMINATION, 2016
## ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

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

(*iii*) Neat diagrams must be drawn wherever necessary.

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

(*v*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Explain construction and working of permanent magnet moving coil instrument, comment on shape of scale. [10]

(*b*) Which three forces are required for satisfactory operation of an analog indicating instrument ? State the function of each force. [8]

*Or*

**2.** (*a*) What are shunts and multipliers ? What are the disadvantages of shunt ? [10]

(*b*) Explain the terms—Accuracy, Linearity, Drift and Reproducibility. [8]

3. (*a*) Explain the working construction of Kelvin's Double Bridge. Derive the expression to find the unknown resistance. [8]

(*b*) Give classification of resistance. Give suitable method of measurement for each category. [8]

*Or*

4. (*a*) Draw circuit diagram of Anderson's bridge. Derive the equation for unknown inductance. [8]

(*b*) What are the different detectors used in a.c. bridges ? Elaborate each type in brief. [8]

5. (*a*) Explain one wattmeter and two-way switch method to measure active and reactive power measurement. Draw phasor diagram. [8]

(*b*) Write a short note on Digital Frequency-meter. [8]

*Or*

6. (*a*) Draw and explain working principle of dynamometer type wattmeter and derive its torque equation. [8]

(*b*) Power supplied to a three phase load was measured by two wattmeters. The reading were 7.8 kW and –2.55 kW. The supply voltage being 400 Volts. Determine load PF, Total power supplied, and line current. [8]

## SECTION II

7. (*a*) Prove that the total number of, revolutions made by an induction type energy meter is proportional to energy consumed. [10]

(*b*) Explain the terms - transformation ratio, turns ratio, nominal ratio, and burden. [8]

*Or*

8. (*a*) A single phase energy meter has a constant of 1200 rev/kWh when a load of 200 W is connected. The disc rotates at 4.2 rpm. If the load is on for 10 hrs. how many units are recorded ? Also find the % error given by the energy meter. [10]

(*b*) What is meant by creeping in an energy-meter and how is it prevented ? [8]

9. (*a*) What is the base for classification of pressure measurement ? How can the pressure be measured using piezoelectric transducer ? [8]

(*b*) Explain Pirani gauge for measurement of low pressure. Also state advantages and disadvantages. [4]

*Or*

10. (*a*) Explain measurement of voltage, current, phase angle, frequency using CRO. [8]

(*b*) Explain with neat sketch, the working of Mcleod Gauge for vacuum measurement. [8]

11. (*a*) Explain construction and working of LVDT with neat diagram. [10]

(*b*) Classify level measuring devices and state their importance. Explain electrical method for level measurement. [8]

*Or*

12. (*a*) What is a strain gauge ? How is it classified ? Explain any *one* type of strain gauge in detail. [10]

(*b*) Explain the construction and working of semiconductor strain gauge. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

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# [4957]-155

**S.E. (Electrical) (Second Semester) EXAMINATION, 2016**

**POWER SYSTEM—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*) Write a short note on time of day tariff. [6]

(*b*) What is meant by tariff ? What are the objectives of tariff ? What type of tariff is employed for domestic consumers ? [6]

(*c*) Write a short note on H.T. and L.T. customer. [6]

*Or*

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

(*b*) Explain how to fit available generating stations in power plants under the area of load duration curve. [6]

(*c*) Define the following terms : [6]

(*i*) Demand factor

(*ii*) Diversity factor

(*iii*) Plant capacity factor.

3. (*a*) Define the term string efficiency. Why is string efficiency of suspension type insulators less than 100% ? State different methods of equalization of potential across each unit of a string of suspension insulators and explain any *one* in brief. [8]

(*b*) Discuss the necessity of excitation system used for alternators. Explain *one* of the types of excitation system used for alternators in brief. [8]

*Or*

4. (*a*) Explain in brief, features of the following equipments in power plant along with the various ratings available on name plate : [8]

(*i*) Alternators

(*ii*) Power transformers

(*iii*) Isolators

(*iv*) Reactors.

(*b*) Derive the expression for the string efficiency of three suspension insulators. [8]

**5.** (*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*) What is the effect of using bundled conductors on line inductance ? [6]

*Or*

**6.** (*a*) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are unsymmetrically spaced but transposed. [8]

(*b*) Write notes on : [8]

(*i*) Skin effect

(*ii*) Proximity effect.

## SECTION II

**7.** (*a*) Derive the expression for the capacitance per phase of a three phase overhead transmission line with unsymmetrical 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. [8]

(*b*) Explain the 'Method of Images' in determining the effect of earth on the capacitance calculation for overhead transmission lines. [8]

*Or*

**8.** (*a*) An overhead transmission line consists of three conductors each of diameter 2 cm and spaced 2.5 m apart. Calculate the capacitance per phase per km for the following arrangement : [8]

(*i*) Equilateral spacing

(*ii*) Horizontal spacing with transposition.

(*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*'. [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. [9]

(*b*) Give classification of transmission line. Explain the effect of load power factor on regulation and efficiency. [9]

*Or*

**10.** (*a*) Derive the expression for parameters of equivalent Tee circuit in terms of line parameters for a long transmission line, also draw phasor diagram. [10]

(*b*) The following data refers to a 20 km, 50 Hz single-phase transmission line : [8]

(*i*) Load delivered at receiving end is 4 MW at 0.8 power factor lagging

(*ii*) Resistance of each conductor is 0.025 Ω/km

(*iii*) Inductance is 0.7 mH/km

(*iv*) The voltage at receiving end is required to be kept at 10 kV.

Calculate the sending end voltage.

**11.** (*a*) Derive an expression for capacitance of a single core cable. [8]

(*b*) What are the types of cable faults ? Explain any *one* method of location of faults in underground cable. [8]

*Or*

**12.** (*a*) What is meant by Sag in an overhead line ? Derive the expression for sag when supports are at equal level. [8]

(*b*) The capacitance of a three core belted type cables are measured as detailed : [8]

(*i*) Between three cores bunched together and sheath is 10 μF.

(*ii*) Between a conductor and the other two connected to sheath together is 8μF.

Calculate the capacitance per phase.

Total No. of Questions—**12**]  [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-156

## S.E. (Electrical) (Second Semester) EXAMINATION, 2016

## ELECTRICAL MACHINES-I

## (2008 PATTERN)

**Time : Three Hours**  **Maximum Marks : 100**

***N.B.* :—** (*i*) Solve *two* sections on separate answer-sheet.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams are necessary to draw.

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

(*v*) Assume suitable data if necessary.

### Section I

**1.** (*a*) With neat connection diagram, explain the S.C. test and O.C. test on 1-ph transformer to determine efficiency and voltage regulation. [10]

(*b*) What is an autotransformer ? Compare it with two winding transformer for saving in copper. [8]

*Or*

**2.** (*a*) Draw the exact and approximate equivalent circuit of 1-ph transformer, reffered on primary side. Obtain the necessary equations for the same. [10]

P.T.O.

(*b*) Draw the connection diagram and explain the polarity test on 1-ph transformer. [8]

**3.** (*a*) What is the necessity of parallel operation of transformer. State and explain the necessary conditions. [8]

(*b*) What are the standard connections of 3-ph transfomers. Explain :

(*i*) YYO &

(*ii*) $\Delta$-Y 30º [8]

*Or*

**4.** (*a*) With neat connection diagram, explain Scott connection to convert 3-ph to 2-ph ac supply. [8]

(*b*) What is V-V connection ? Explain. [8]

**5.** (*a*) Sketch the construction diagram of D.C. machine. Lable it & explain various parts. [10]

(*b*) Explain the significance of back emf. [6]

*Or*

**6.** (*a*) Obtain the equation for armature torque of d.c. motor and hence shaft forque. [8]

(*b*) Draw the power flow diagram of d.c. motor and explain. [8]

## Section II

7. (*a*) Sketch and explain :

   (*i*) Torque-armature current and

   (*ii*) Torque speed characteristics of DC series motor. [8]

   (*b*) Draw the connection diagram of 3-point starter used for d.c. shunt motor and explain each part. [10]

*Or*

8. (*a*) Explain the speed control of d.c. shunt motor using : 10

   (*i*) Flux control

   (*ii*) arm. voltage control.

   (*b*) What is commutation? Explain the remedies on it. [8]

9. (*a*) Compare squirrel cage rotor and wound rotor used in 3-ph induction motor. [8]

   (*b*) Sketch and explain family of torque-slip characteristics of 3-ph induction motor. [8]

*Or*

10. (*a*) Obtain the equation for torque under running condition for 3-ph induction motor. [8]

    (*b*) Obtain the relationship between rotor copper loss and mechanical power development for 3-ph induction motor. [8]

**11.** (*a*) With neat diagram, explain 3-ph induction motor as a generalized transformer. [8]

(*b*) Explain :

(*i*) No load test &

(*ii*) Blocked rotor test on 3-ph induction motor. [8]

*Or*

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

(*i*) Star-delta starter

(*ii*) Rotor-resistance starter.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

| Seat No. | |
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# [4957]-157

**S.E. (Elect.) (Second Semester EXAMINATION, 2016**

**NETWORK ANALYSIS**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

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

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

(*iii*) Neat diagram 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*) Explain the following terms : [10]

(*i*) Bilateral network and unilateral network.

(*ii*) Linear network and non-linear network.

(*iii*) Lumped network and distributed network.

(*iv*) Dependent and independent current sources.

(*v*) Dependent and independent voltage sources.

(*b*) Using source transformation and source shifting, simplify the Fig. 1. Determine the current through simplified circuit : [8]

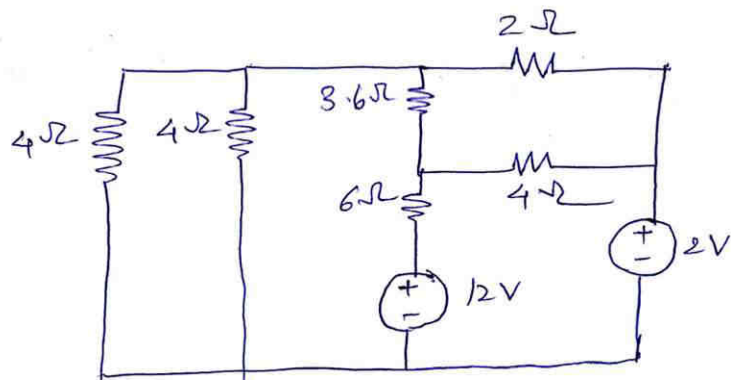


Fig. 1

*Or*

**2.** (*a*) Explain the concept of duality. [4]

(*b*) Explain the concept of supermesh and supernode with example. [6]

(*c*) For the circuit shown in Fig. 2 determine : [8]

(*i*) $V_{AB}$

(*ii*) $V_{AC}$

(*iii*) $V_{AE}$

(*iv*) $V_{AD}$

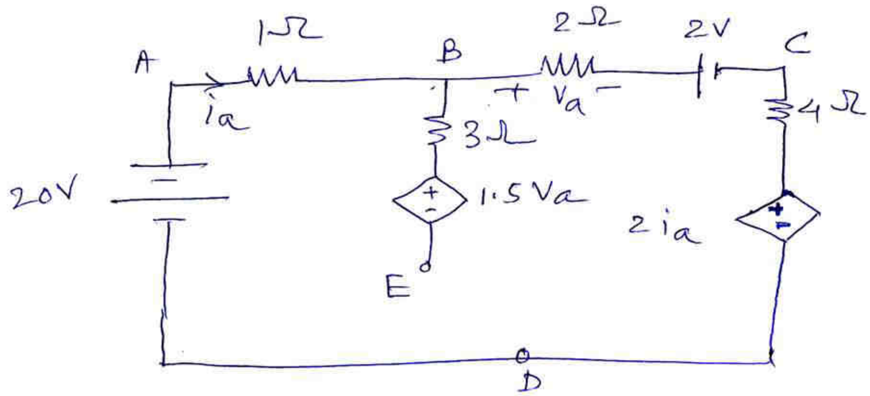


Fig. 2

3. (*a*) Use superposition theorem to find current 'I' in the circuit shown below Fig. 3. [8]

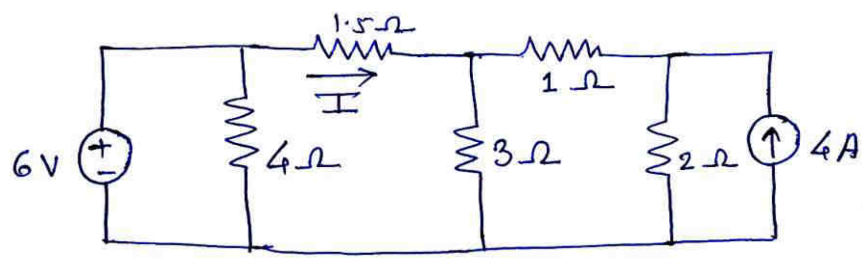


Fig. 3

(*b*) Find the current through 4 ohm resistor using Thevenin's theorem. (Refer. Fig. 4) : [8]

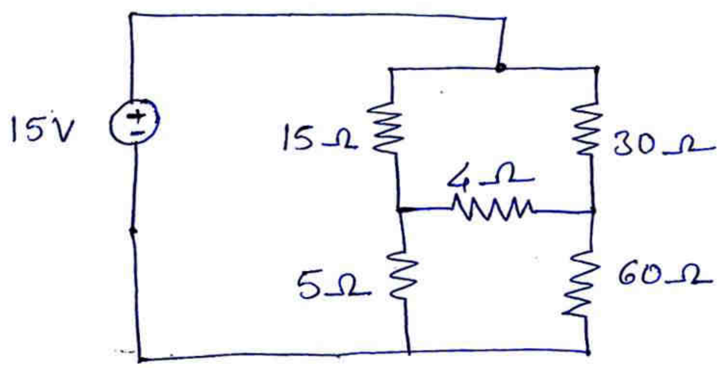


Fig. 4

*Or*

4. (*a*) Find Norton's equivalent of the circuit shown in Fig. 5. [8]

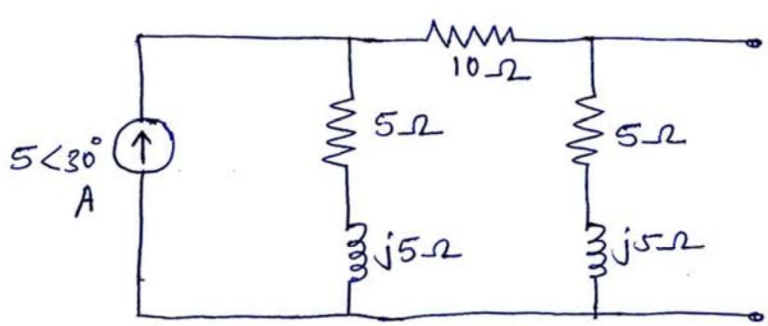


Fig. 5

(*b*) Verify reciprocity theorem for the following network (Fig. 6) : [8]

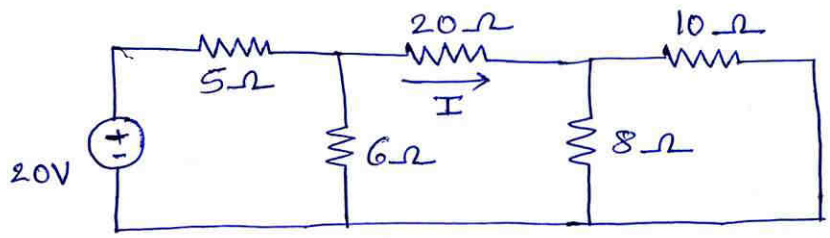


Fig. 6

**5.** (*a*) For the network shown, the switch is moved from position 1 to position 2 at $t = 0$ the steady state has been reached before switching. Calculate $i$, $di/dt$, $d^2i/dt^2$ at $t = 0^+$. (Refer Fig. 7) : [8]

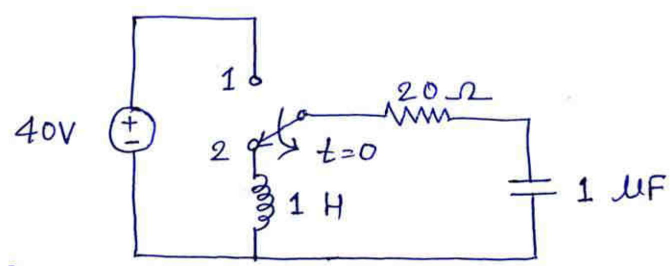


Fig. 7

(*b*) In the circuit shown the switch K is moved from position $a$ to $b$ at $t = 0$. Find $i$, $di/dt$, $d^2i/dt^2$ for Fig. 8. [8]

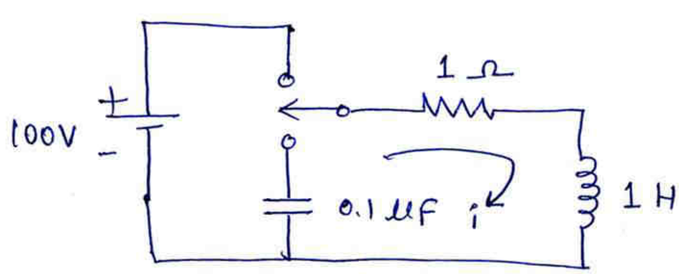


Fig. 8

*Or*

**6.** (*a*) State all the properties of Laplace transform. [6]

(*b*) Find the inverse Laplace transform : [10]

(*i*) $$F(s) = \frac{(s+2)}{s(s+3)(s+4)}$$

(*ii*) $$F(s) = \frac{(s-2)}{s(s+1)^3}.$$

## SECTION II

**7.** (*a*) Explain the following parameters of two-port network : [6]

(*i*) Hybrid parameters

(*ii*) Transmission parameters.

(*b*) Derive the inter-relationship between z parameters and ABCD parameters. [4]

(*c*) Obtain Y parameters for the n/w shown in Fig. 9 : [8]

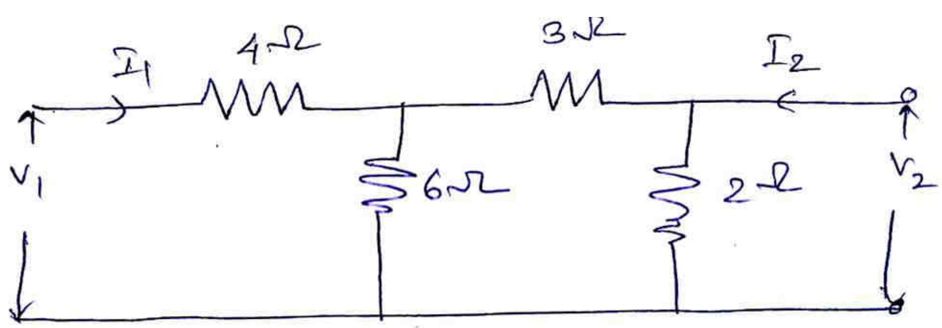


Fig. 9

*Or*

**8.** (*a*) Explain the cascade connection of two-port n/w parameters using transmission parameters. [8]

(*b*) Explain maximum power transfer theorem for AC n/w. [10]

**9.** (*a*) Explain : [8]

(1) Even symmetry

(2) Odd symmetry

(3) Half wave symmetry

(4) Quarter wave symmetry.

(*b*) Explain trigonometric Fourier series for the periodic signal. [8]

*Or*

**10.** (*a*) Explain how Fourier coefficients are evaluated. [8]

(*b*) Write a short note on high pass and low pass filters. [8]

**11.** (*a*) State the restrictions on pole and zero locations for driving point function and transfer function. [8]

(*b*) Write a short note on location of pole-zeros and time domain response [8]

*Or*

**12.** (*a*) For the given n/w function, give the pole-zero locations and also draw the pole-zero plot on s-plane : [8]

$$F(s) = \frac{2(s+2)}{s(s+3)\,(s+2+j2)\,(s+2-j2)}.$$

(*b*) Determine the driving point impedance at terminals 1 – 1' for the network shown in Fig. 10 : [8]

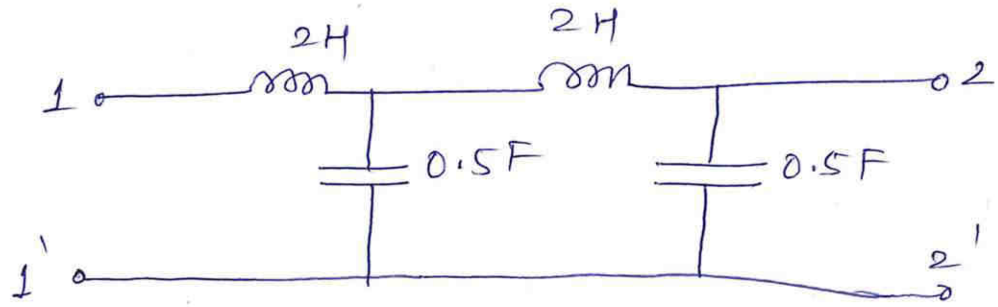


Fig. 10

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4**

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# [4957]-158

## S.E. (Electrical) (II Sem.) EXAMINATION, 2016
## DIGITAL COMPUTATIONAL TECHNIQUES
## (2008 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Answer 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 truncation and round off error with suitable examples. [6]

(*b*) Explain Descrate's rule of sign with suitable examples. [6]

(*c*) Use synthetic division to obtain $f(2)$, $f'(2)$, $f''(2)$ and $f'(2)$ for $f(x) = 2x^3 - 6x + 13 = 0$ [6]

*Or*

**2.** (*a*) Find real root of the following equation by Birge Vieta method. Show 2 iterations.

$f(\text{x}) = \text{x}^3 - 7\text{x} - 6 = 0$ Take $\text{x}_0 = 2.5$ [6]

(*b*) Using normalized floating point algebra, perform the arithmetic operations :

(*i*) 0.3942163E7– 0.24132E7

(*ii*) 0.471923E7 + 0.783329E7

(*iii*) $47.31834 \times 10^{15} \times 3.194 \times 10^{12}$ [6]

(*c*) Explain numerical stability. How can it be avoided ? [6]

3. (a) Use bisection method to find root of $f(x) = \cos x - 1.3x = 0$ in the interval [0,1]
Show 4 iterations [8]

(b) Use Newton-Raphson method to find root of equation $8x^3 - 6x - 1 = 0$ using initial guess as 0.95. Show 4 iterations. [8]

*Or*

4. (a) Use secant method to determine the root of the following equation $f(x) = \text{Cos}x - xe^{x} = 0$. Take $x_0 = 0$, $x_1 = 1$. Show 4 iterations. [8]

(b) Using Chebyshev method find $3\sqrt{9}$. Take initial approximation as 2. Show 2 iterations. [8]

5. (a) Find the inverse of the matrix : [8]

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$$

(b) Solve using Jacobi's method at the end of the 4th iteration : [8]

$$2x + 2y + 10z = 14$$
$$10x + y + z = 12$$
$$x + 10y + 2z = 13$$

*Or*

6. (a) Solve using Gauss-Seidel method at the end of 4th iteration : [8]

$$2x + 2y + 10z = 14$$
$$10x + y + z = 12$$
$$x + 10y + 2z = 13$$

(b) Explain Gauss Elimination method for solution of linear algebraic simultaneous equations. [8]

## SECTION II

7. (*a*) From the given data, find the value of $y$ at $x = 4.5$ [8]

| | | | | | |
|---|---|---|---|---|---|
| $x$ | 1 | 2 | 3 | 4 | 5 |
| $y$ | 2.38 | 3.65 | 5.85 | 9.95 | 14.85 |

(*b*) Derive Newton's divided difference formula for unequally spaced data with '$n$' number of values. [8]

*Or*

8. (*a*) From the given data, find value of $y$ at $x = 3$ using Lagrange's interpolation formula : [8]

| | | | | |
|---|---|---|---|---|
| $x$ | 0 | 1 | 2 | 4 |
| $y$ | 1 | 1 | 2 | 5 |

(*b*) Derive Newton's forward interpolation formula. [8]

9. (*a*) Usint Euler's method, obtain the solution of $\frac{dy}{dx} = x - y$ given $y(0) = 1$ at $x = 0.4$ taking $h = 0.2$ [8]

(*b*) Find $f(1.1)$ using Taylor series method for $\frac{dy}{dx} = x + y$ $y(1) = 0$ taking $h = 0.05$ [8]

*Or*

10. (*a*) Solve the following by Modified Euler's method $\frac{dy}{dx} = 1 + xy$ $y(0) = 1$, find $y(0.1)$ taking $h = 0.1$ [8]

(*b*) Find $f(0.1)$ by Runge-Kutta 4th order method $\frac{dy}{dx} = x + y$ $y(0) = 1$, $h = 0.1$. [8]

**11.** (*a*) Prove $\frac{d^2 y}{dx^2} = \frac{1}{h^2}\left[\nabla^2 y_n + \nabla^3 y_n + \frac{11}{12}\nabla^4 y_n + \ldots\right]$ using Newton's backward difference formula for equal interval data points. [8]

(*b*) Evaluate the intergral $\int_0^{\pi} (4 + 2\sin x)dx$ taking $n = 5$ by : [10]

(*i*) Simpson's 3/8 Rule

(*ii*) Simpson's 1/3 Rule.

*Or*

**12.** (*a*) Derive the equation of trapezoidal rule for numerical integration using Newton's Cote's quadrature formula. [8]

(*b*) Find the first and second derivative of the function tabulated below at $x = 1.5$ [10]

| | | | | | | |
|---|---|---|---|---|---|---|
| $x$ | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
| $y$ | 3.375 | 7 | 13.625 | 24 | 38.875 | 59 |

Total No. of Questions—**12**]    [Total No. of Printed Pages—**3**

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# [4957]-159

**S.E. (Electrical) (II Sem.) EXAMINATION, 2016**
**MICROPROCESSOR FUNDAMENTALS & APPLICATIONS**
**(2008 COURSE)**

**Time : Three Hours**    **Maximum Marks : 100**

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

(*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 books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

## SECTION I

**1.** (*a*) Draw interfacing diagram to interface 4K×8 RAM ( starting address 0000H) to 8085 microprocessor. Clearly indicate the address decoding. [8]

(*b*) Explain the function of the following pins of 8085 microprocessor : [6]

(*i*) $IO/\overline{M}$

(*ii*) RESET IN

(*iii*) READY

(*c*) Explain the following instructions of 8085 microprocessor with *one* example : [4]

(*i*) LXI

(*ii*) RAR.

P.T.O.

*Or*

2. (*a*) Explain various flags with format of status flag register. [8]

   (*b*) State the difference between memory mapped input-output and input-output mapped input-output. [4]

   (*c*) Explain any *three* addressing modes of 8085 microprocessor. Give *one* example of each. [6]

3. (*a*) Explain with timing diagram Memory. Write cycle of 8085. [8]

   (*b*) Explain interrupt structure of 8085. [8]

*Or*

4. (*a*) Explain SIM and RIM instructions. [8]

   (*b*) Write an assembly language program for counting number of negative numbers from an array of ten elements. [8]

5. (*a*) Explain command instruction and status word format of 8251. [8]

   (*b*) Explain the different parallel data transfer techniques. [8]

*Or*

6. (*a*) Draw and explain block diagram of 8251. [8]

   (*b*) What are the different standards used in serial data transfer ? Explain standard serial transfer R5232. [8]

## SECTION II

7. (*a*) With the help of functional block diagram explain in detail of 8254 PIT. [10

   (*b*) Explain in detail BSR operation of 8255 PPI. [8]

*Or*

8. (*a*) Draw and explain in detail functional block diagram of 8255 PPI. [10]

(*b*) Explain in detail mode 2 operation of 8254 PIT. [8]

9. (*a*) Explain the procedure of interfacing of ADC 0809 to 8085 microprocessor. Draw the relevant block diagram. [8]

(*b*) With the help of block diagram, explain the measurement of current using 8085 microprocessor. [8]

*Or*

10. (*a*) Explain the interfacing of DAC 0808 with 8085 microprocessor. [8]

(*b*) Explain the measurement of frequency using 8085 microprocessor. Draw the relevent diagram. [8]

11. (*a*) Explain with a schematic diagram and flowchart how 8085 can be used for flow measurement. [8]

(*b*) With the help of diagram explain the control of DC motor with 8085 microprocessor. [8]

*Or*

12. (*a*) With relevant flowchart explain the speed measurement application of 8085 microprocessor. [8]

(*b*) Explain with a schematic diagram how 8085 can be used for temperature measurement. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-161

**S.E. (Electronics/E&TC) (SEMESTER I) EXAMINATION, 2016**

**SIGNALS AND SYSTEMS**

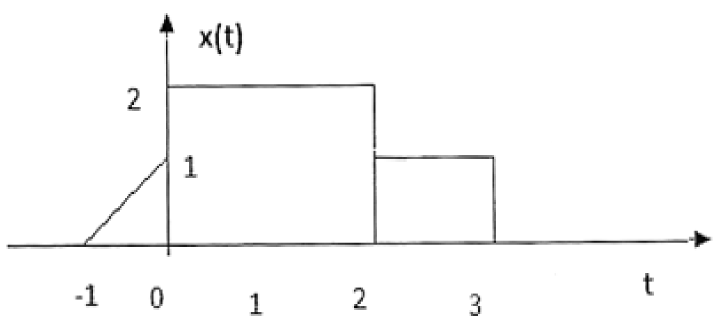
**(2008 COURSE)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** 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.**

## SECTION I

**1.** (*a*) Sketch even and odd parts of the following signal : [8]




(*b*) Classify the following signals are energy/power signals and hence find appropriate value : [8]

(*i*) $x(n) = \cos(\pi n), \; -4 \leq n \leq 4$

$= 0$ otherwise

(*ii*) $x(t) = (2e^{-t} - 6e^{-2t})u(t)$.

*Or*

**2.** (*a*) Determine whether system is : [8]

(*i*) Memoryless

(*ii*) Causal

(*iii*) Stable

(*iv*) Time Invariant

P.T.O.

(v) Linear with proof. If their input-output relations are :

(1) $y(t) = \sin[x(t + 2)]$

(2) $2y(n) = x(-n + 2)$

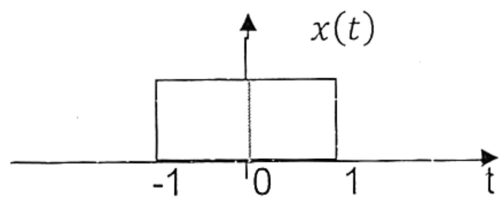
(b) Perform the following operations on signals : [8]

(i) $y(t) = 3x(t)$

(ii) $y(t) = x(2t)$

(iii) $y(t) = x(t-1)$

(iv) $y(t) = x(-t)$




3. (a) Find output $y(t)$ if $x(t) = e^{-4t} u(t)$ and $h(t) = u(t - 4)$ by graphical method of convolution integral. [9]

(b) Evaluate convolution sum if : [9]

$x(n) = n/3 \quad 0 \le n \le 6$

$\quad = 0$ otherwise and

$h(n) = 1 \quad -2 \le n \le 2$

$\quad = 0$ otherwise

*Or*

4. (a) Determine whether system is : [9]

(i) Memoryless

(ii) Causal

(iii) Stable.

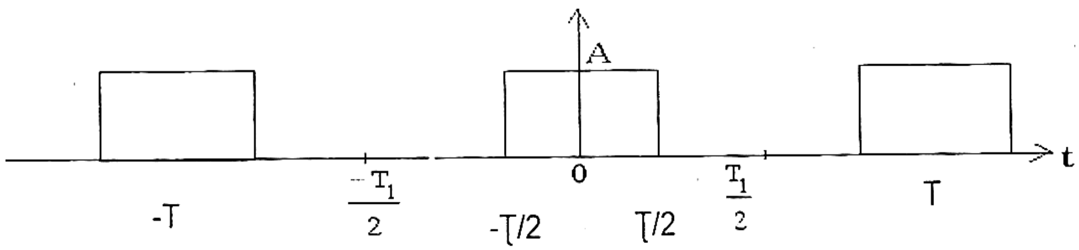
If impulse responses are :

(1) $h(t) = u(t + 2)]$

(2) $h(n) = u(n) - u(n - 1)$

(*b*) Find output $y(t)$ if $x(t) = 2u(t)$ and $h(t) = 3\text{rect}(t/4)$ by graphical method of convolution integral. [9]

**5.** (*a*) Find quadrature Fourier series of the following signal : [8]




(*b*) Find $X(f)$ and plot spectrum if $x(t) = e^{-xt}\ u(t)$ [8]

*Or*

**6.** (*a*) State and prove the convolution property of Fourier Transform. [8]

(*b*) Find output $y(t)$ by using appropriate property of Fourier Transform if $x(\mathrm{t}) = 2u(t)$ and $h(t) = 3u(t - 2)$ [8]

## SECTION-II

**7.** (*a*) State and prove the time scaling property of Laplace Transform. [8]

(*b*) Obtain Laplace transform of the following signal if :

$$X(s) = 2s/(s + 1)$$ [8]

Find :

(*i*) $y(t) = x(2t - 1)$

(*ii*) $y(t) = t\ x(t)$

*Or*

**8.** (*a*) State and prove the time shifting and frequency shifting property of Laplace Transform. [8]

(*b*) Continuous time LTI system is initially relaxed represented by equation $y''(t) + 5y'(t) + 6y(t) = 2x(t)$ [8]

Use Laplace transform to find :

(1) Transfer function $H(s)$ and impulse response $h(t)$ of system.

(2) Find response $y(t)$ of system if $x(t) = 4e^{-3t}\ u(t)$.

9. (a) Draw correllogram between $x(t) = \sin(2\pi ft)$ and $y(t) = \sin(4\pi ft)$ [6]

(b) State and prove properties of autocorrelation of CT energy signal. [10]

*Or*

10. (a) Find autocorrelation : Power Spectral density and power of following CT signal : $x(t) = 6 \sin(2t)$. [8]

(b) If $x(t) = e^{-xt} u(t)$, then find energy spectral density and energy. [8]

11. (a) Consider experiment consists of tossing three coins. The random variable defined as assign 0 to tail and assign 1 to head then adding the numbers. Write sample space, random varriable, CDF, PDF and Plot PDF and CDF. [10]

(b) PDF of random variable $x$ is given by : [8]

$$
\begin{aligned}
fx(x) &= k(1 - x^2) \quad 0 \leq x \leq 1 \\
&= 0 \quad \text{otherwise}
\end{aligned}
$$

Find :

(i) $k$

(ii) CDF.

*Or*

12. Explain any *three* distribution functions w.r.t. CDF and PDF equations : [18]

(i) Binomial Distribution

(ii) Uniform Distribution

(iii) Gaussian Distribution

(iv) Poisson's Distribution.

Total No. of Questions—**8**]  [Total No. of Printed Pages—**4**

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| Seat No. | |

# [4957]-161A

**S.E (E&TC/ELECTRONLCS) (Second Semester)**

**EXAMINATION, 2016**

**SIGNALS AND SYSTEMS**

**(2008 PATTERN)**

**Time : Two Hours**  **Maximum Marks : 50**

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

(*ii*) Use of non-programmable calculator is allowed.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

**1.** (*a*) A discrete time signal is given below. Check for the following system properties : [6]

(1) Static/Dynamic

(2) Linearity

(3) Causility

(4) Stability

$$y[n] = 8 . \cos x[n]$$

P.T.O.

(*b*) State and prove the convolution integral property with block diagram and mathematical equation. [3]

(*c*) Find even and odd components for given signal : [3]

$$x(t) = 1 + 3t + 4\sin(t) + 6\cos(3t).$$

*Or*

**2.** (*a*) Find given signal is whether energy signal or power signal. Find its value $x(t) = t.u(t)$. [3]

(*b*) Define conuolution sum. Find $y[n] = x[n] * h[n]$ if :

$$x[n] = h[n] = u[n].$$ [3]

(*c*) Determine the step response of the following systems whose impulse response is : [4]

$$h[t] = e^{-st} . u[t].$$

(*d*) Given any *two* examples of neither even nor odd signals. [2]

**3.** (*a*) State and prove the following properties of Laplace transform : [6]

(*i*) Time scaling

(*ii*) Time shifting.

(*b*) Show that rectangular function in time domain to become sine function in frequency domain. [6]

*Or*

**4.** (*a*) Find the Fourier transform of $x(t) = rect\left(\frac{t}{t}\right)$ and sketch the magnitude and phase spectrum. [6]

(*b*) Find the initial value and final value of the signal $x(t)$ if its Laplace transform is : [6]

$$X(s) = \frac{2s+3}{s^2+5s-7}.$$

**5.** (*a*) Find the following for the following signal : [6]

$$x(t) = A \, . \, e^{-at} . u(t)$$

(*i*) Autocorrelation

(*ii*) Energy from autocorrelation

(*iii*) Energy spectral density.

(*b*) Determine the cross correlation between two sequences which are given below : [4]

$$x_1(n) = \{1, 2, 3, 4\}$$

$$x_2(n) = \{3, 2, 1, 0\}.$$

(*c*) State and describe any *three* properties of energy spectral density (ESD). [3]

*Or*

**6.** (*a*) Prove that autocorrelation and energy spectral density form Fourier transform pair of each other and verify the same for : [9]

$$x(t) = e^{-at} . u(t).$$

(*b*) State and explain any *four* properties of power spectral density (PSD). [4]

7. (*a*) Draw and explain the following probability distribution model : [8]

   (*i*) Gaussian Distribution Model

   (*ii*) Uniform Distribution Model.

   (*b*) A random variable has a probability distribution function given by : [5]

$$F(X) = 0 \qquad -\infty < x \leq 0$$
$$= 1 - e^{-2x} \quad 0 \leq x < \infty$$

   Find :

   (*i*) The probability that X > 0.6

   (*ii*) The probability that X ≤ 0.25

   (*iii*) The probability that 0.4 < X ≤ 0.8

*Or*

8. (*a*) Explain the properties of probability, CDF and PDF. [8]

   (*b*) A student arrives late for a class 40% of the time. Class meets five times each week. Find : [5]

   (*i*) Probability of students being late for at three classes in a given week.

   (*ii*) Probability of students will not be late at all during a given week.

Total No. of Questions—**12**]    [Total No. of Printed Pages—**8**

| Seat No. | |
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# [4957]-162

**S.E. (Electronics/E&TC) (First Semester) EXAMINATION, 2016**
**SOLID STATE DEVICES AND CIRCUITS**
**(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 side indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Explain construction, operation and characteristics of photo diode. [8]

(*b*) For the circuit shown in Fig.1 calculate the currents $I_1$ and $I_2$. Consider both diodes having $R_f = 10\ \Omega$ and $V_r = 0.6$ V. [8]

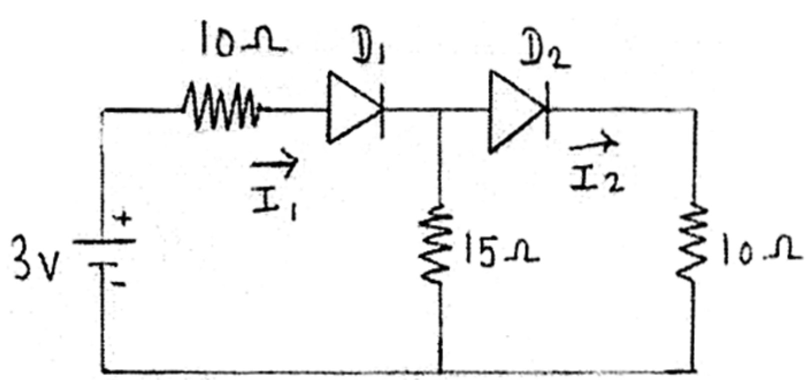


Fig. 1

*Or*

2. (*a*) With the help of a necessary diagram explain the operation of an n-channel enhancement type MOSFET. [8]

(*b*) Explain non-ideal current voltage characteristics of MOSFET. [8]

3. (*a*) Explain with neat diagram BiCMOS inverter. [8]

(*b*) For the circuit shown in Fig. 2 determine $I_{DQ}$, $V_{GSQ}$ and $V_{DSQ}$ and state the region of operation with $V_{GS(TH)} = 2V$, $K_n = 0.5\ mA/V^2$. [10]

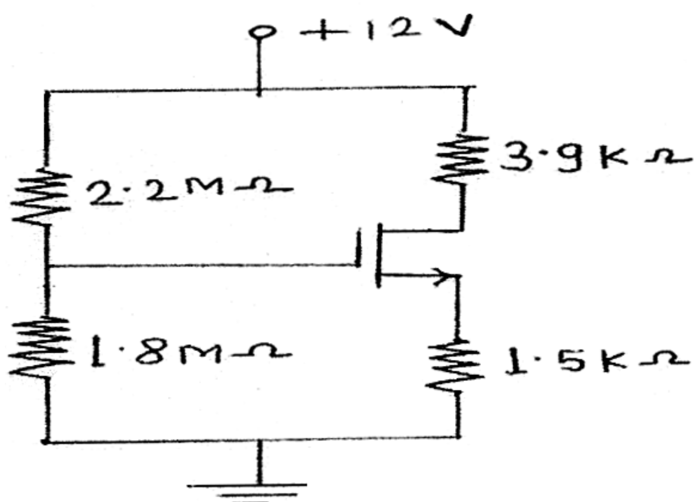


Fig. 2

*Or*

4. (*a*) For Common Source Amplifier circuit shown in Fig. 3 determine $g_m$, $r_o$, $A_v$, $R_i$. Given $V_T = 0.8$ V, $K = 1.2$ mA/V$^2$, $\lambda = 0$. [10]

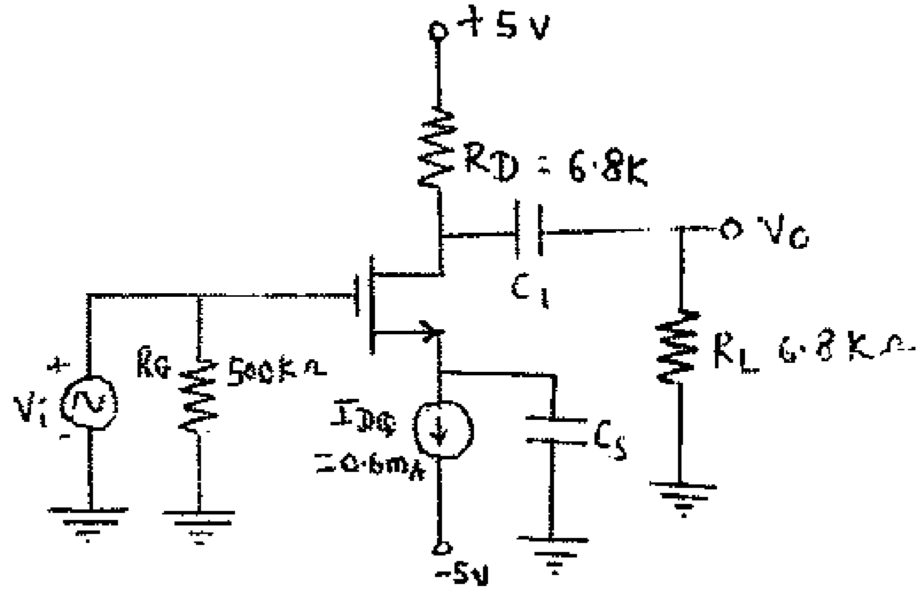


Fig. 3

(*b*) What is enhancement load device ? Explain the circuit with enhancement load device and MOSFET driver. [8]

5. (*a*) Define Bias stabilization and Bias compensation. What are commonly used Bias compensation Techniques ? Explain any *one* in detail. [8]

(*b*) In the circuit shown in Fig. 4 determine the coordinates of operating point of the transistor. [8]

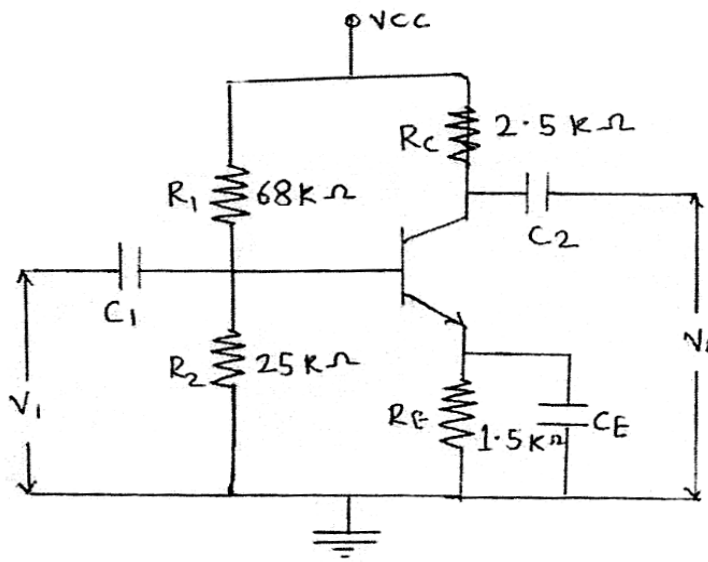


Fig. 4

*Or*

**6.** (*a*) For the circuit shown in Fig. 5 calculate the $A_i$, $A_v$, $R_i$ and $R_o$'. The *h* parameters are $h_{ie}$ = 1.1 kΩ, $h_{fe}$ = 50, $h_{re} = 2.5 \times 10^{-4}$ and $h_{oe}$ = 25 μA/V [8]

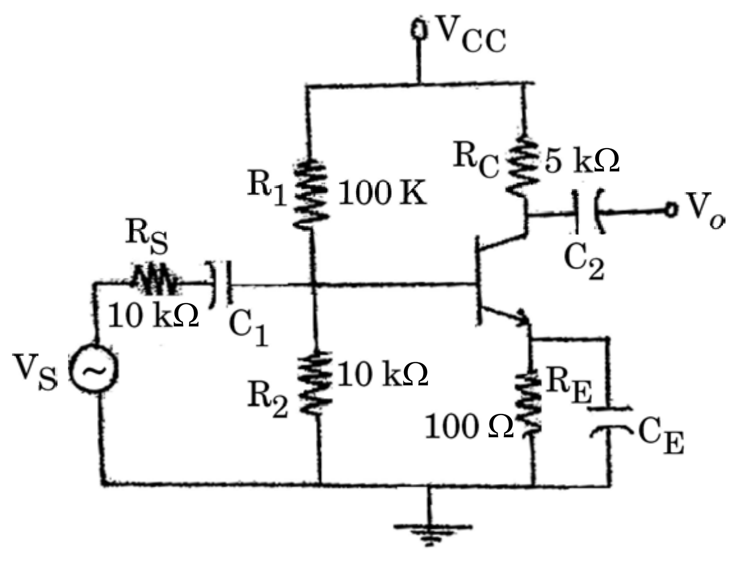


Fig. 5

(*b*) Compare CE, CC, CB configuration of transistor. [8]

## SECTION II

**7.** (*a*) Draw the hybrid Π equivalent circuit of transistor and derive the expression for [8]

(*i*) $g_{b'e}$

(*ii*) $g_{b'c}$

(*b*) The high frequency amplifier shown in Fig. 6 uses a transistor with the following parameter $g_m$ = 50 mA/V, $r_{b'b}$ = 1 kΩ, $r_{b'e}$ = 1 kΩ, $C_e$ = 50 pf, $C_c$ = 2 pf, $r_{ce}$ = 80 kΩ Assume coupling and bypass capacitors to be very large. Calculate :

(*i*) $F_\beta$

(*ii*) $F_T$

(*iii*) $A_{vs}$

(*iv*) Draw complete hybrid Π equivalent circuit amplifier. [8]

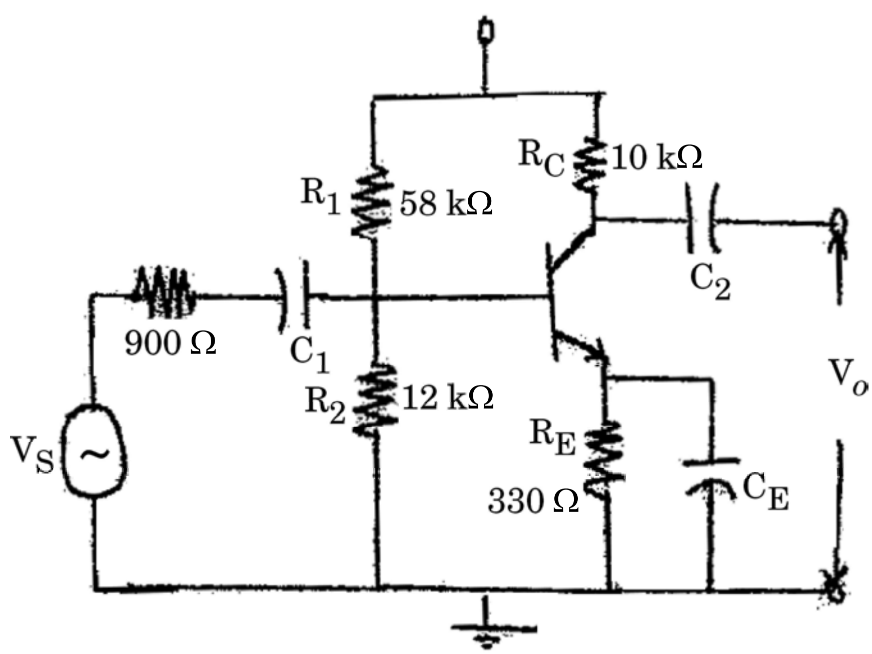


Fig. 6

*Or*

**8.** (*a*) For RC coupled CE amplifier, derive the expression for lower cut-off frequency decided by the input RC network. [8]

(*b*) List the advantages of square wave testing. In an RC coupled amplifier derive the following relation : $t_r = 0.35/F_H$ [8]

**9.** (*a*) What is feedback ? Compare positive and negative feedback. Explain why negative feedback is used in feedback amplifier. [10]

(*b*) Explain Barkhausen criteria in detail. Draw RC phase shift oscillator and explain in detail. [8]

*Or*

**10.** (*a*) The circuit shown in Fig. 7 has the following parameters $h_{ie} = 1.1$ k, $h_{fe} = 50$, $h_{re} = h_{oe} = 0$. [12]

Find :

(*i*) $\beta$

(*ii*) $A_I$

(*iii*) $A_{If}$

(*iv*) $R_i$

(*v*) $R_{if}$

(*vi*) $R_{of}$.

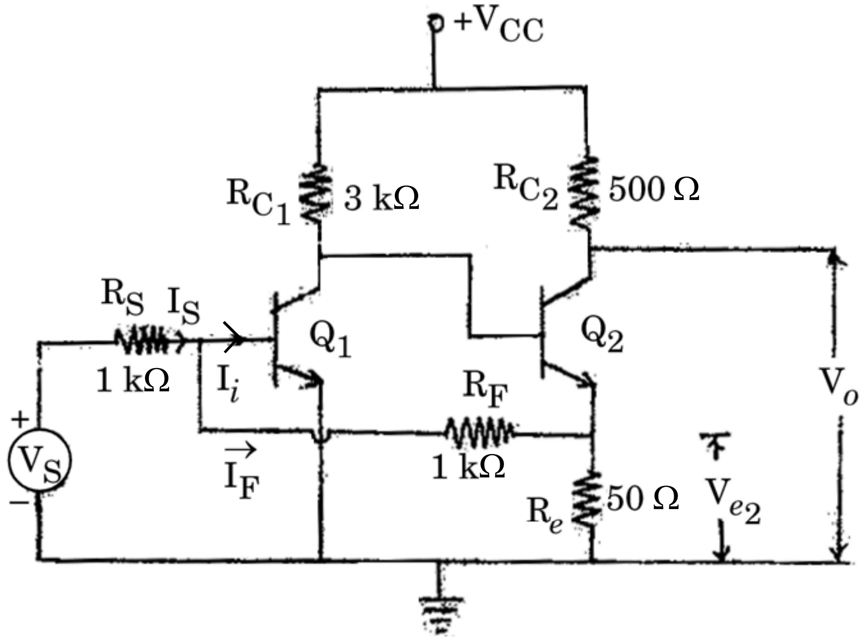


Fig. 7

(*b*) Write short notes on :

(*i*) Crystal oscillator

(*ii*) Hartley oscillator [6]

**11.** (*a*) Compare power BJT and simple BJT. [4]

(*b*) Discuss the safe operating area of transistor. [4]

(*c*) Explain advantages and disadvantages of class B push pull power amplifier. What modification in this circuit may eliminate most of disadvantages of it ? What the modified power amplifier is known as ? [8]

*Or*

**12.** (*a*) In a class A amplifier $V_{CE}$ max = 25 V, $V_{CE}$min = 5 V find the overall efficiency for :

(*i*) Series fed load

(*ii*) Transformer coupled load. [8]

(*b*) Write short note on Thermal Resistance. [4]

(*c*) Write short note on Crossover Distortion. [4]

Total No. of Questions—**12**]　　　　[Total No. of Printed Pages—**7**

| Seat No. | |
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# [4957]-163

## S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2016

## NETWORK ANALYSIS

## (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*) State and explain maximum power transfer theorem for A.C. Circuirts. [6]

(*b*) Explain the concept of super node. [5]

(c) For the network shown in Fig. 1, find current in 6 Ω resistance using loop current analysis. [6]

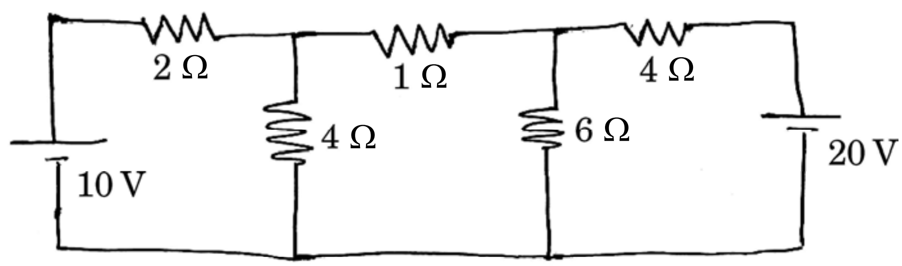


Fig. 1

*Or*

**2.** (a) State and explain Norton's theorem. [5]

(b) Explain source transformation in electrical networks. [5]

(c) For the network shown in Fig. 1 use superposition theorem to find current in 6 Ω resistance. [7]

**3.** (a) Prove that the bandwidth of series resonant circuit is given by : [7]

$$\text{B.W.} = \frac{R}{2\Pi L}.$$

(b) State the properties of parallel resonant circuit. [4]

(c) A resistor and a capacitor are in series with a variable inductor. When this circuit is connected to 230 V, 50 Hz supply, the maximum current obtained by varying the inductor is 0.366 A. The voltage across the capacitor at that time is 300 V. Find the circuit components. [6]

*Or*

**4.** (*a*) Explain the effect of generator resistance on bandwidth and selectivity of series resonant circuit. [7]

(*b*) Define voltage magnification factor and hence derive its expression. [4]

(*c*) A RLC series of 8 Ω resistance should be designed to have bandwidth of 50 Hz. Determine the values of L and C so that the circuit resonates at 250 Hz. [6]

**5.** (*a*) Define : [4]

(*i*) Characteristics impedance

(*ii*) Propagation constant

(*iii*) Iterative impedance

(*iv*) Image impedance.

(*b*) Derive design equations for constant K low pass filter. [6]

(*c*) Derive design equations for symmerical T attenuator. [6]

*Or*

**6.** (*a*) Show that for symmerical T network : [6]

$$Z_0 = \sqrt{\frac{z_1^2}{4} + z_1 z_2}$$

where

$Z_1 \rightarrow$ Series arm impedance

$Z_2 \rightarrow$ Shunt arm impedance.

(*b*) A prototype LPF has a cut-off frequency of 5 kHz and is terminated into matched impedance of 600 Ω. Find the element values of the filter. Also find attenuation in dB and phase shift in degree at a frequency of 8 kHz. [6]

(*c*) Derive relation between neper and dB. [4]

## SECTION II

**7.** (*a*) State Initial and final value theorems for Laplace Transform. [4]

(*b*) Find LT of :

(*i*) $\cos \omega t$

(*ii*) $t^n$. [6]

(*c*) Derive LT for R, L and C. [6]

*Or*

**8.** (*a*) Find inverse LT if : [8]

$$F(S) = \frac{(S-2)}{S(S+1)^3}.$$

(*b*) In the circuit shown in Fig. 2, the switch is kept in position '*a*' for long period to establish the steady state conditions.

The switch is then moved to position '*b*' at $t = 0$. Find out the expression for the current, after switching the switch to position '*b*'. [8]

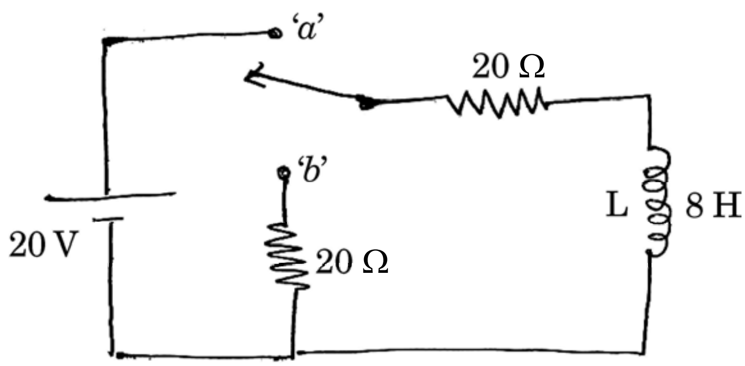


Fig. 2

**9.** (*a*) Define '*h*' parameters and hence derive condition for symmetry and reciprocity. [8]

(*b*) For the network shown in Fig. 3, find :

(*i*) Driving point impedance function

(*ii*) Plot the poles and zeros of Z(S) on S-plane. [9]

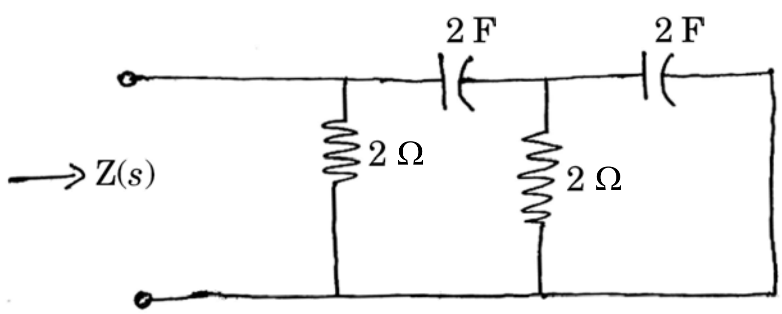


Fig. 3

*Or*

**10.** (*a*) Define 'Y' parameters and hence derive the condition for symmetry and reciprocity. [8]

(*b*) For the network shown in Fig. 4, find A, B, C and D paraemters. [9]

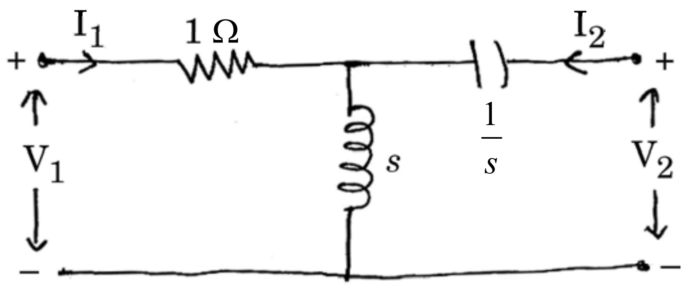


Fig. 4

**11.** (*a*) Define primary and secondary constants of transmission line and hence derive relationship between them. [6]

(*b*) Derive relation between standing wave voltage ratio (S) and coefficient of reflection (K). [4]

(*c*) A generator of 1 V, 1 kHz supplies power to a 100 m open wire transmission line terminated in 200 Ω resistance. The line parameters are [7]

$R = 10.4\ \Omega/\text{m}$, $L = 0.00367\ \text{H/km}$,

$G = 0.8 \times 10^{-6}\ \text{mho/m}$, $C = 0.00835\ \mu\text{f/m}$

Find $Z_0$, $\gamma$ reflection coefficient $k$, $\alpha$ and $\beta$.

*Or*

**12.** (*a*) State general solution transmission line equation *i* and hence explain their physical significance. [8]

(*b*) The characteristic impedance of a uniform transmission line is 2040 $\Omega$ at a frequency of 800 Hz. At this frequency, the propagation is $0.054 < 87.9°$. Determine the values of R, L, G and C. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

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# [4957]-164

**S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2016**

**DIGITAL LOGIC DESIGN**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) In Section II : Attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

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

(*iv*) Figures to the right side indicate full marks.

(*v*) Neat diagrams must be drawn wherever necessary.

## SECTION I

**1.** (*a*) Design and implement the following function using 8 : 1 MUX : [10]

$$Y = \sum m\ (1, 4, 6, 8, 10, 11, 13, 14)$$

(*b*) Minimize the following equation using K-map and realize it using NAND gates only : [8]

$$Y = \sum m\ (0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$$

*Or*

**2.** (*a*) Design and implement full adder using suitable decoder. [10]

(*b*) Design 1-digit BCD adder using binary adder ICs. [8]

P.T.O.

3. (*a*) Draw and explain JK flip-flop. [8]

(*b*) Convert D to T flip-flop and vice versa. [8]

*Or*

4. (*a*) Design and implement the following counter-state using JK flip-flop and avoid the lockout condition : [8]

0–2–4–6–7–0

(*b*) Design of MOD 6 ripple up counter using T flip-flop. [8]

5. (*a*) Write a VHDL code for 8 : 1 multiplexer using behavioral modeling style. [8]

(*b*) Explain the following statements used in VHDL with suitable examples : [8]

(*i*) Process

(*ii*) Case

(*iii*) if else

(*iv*) with select.

*Or*

6. (*a*) Write a VHDL code for 4 bit ALU. [8]

(*b*) Explain in detail single and variable with example in VHDL. [8]

## SECTION II

7. (*a*) Draw ASM chart for a 2 bit up-down counter having mode control input M. M = 1 Up counter, M = 0 Down counter. [10]

(*b*) Design 3 bit synchronous counter using JK FF. [8]

*Or*

8. (*a*) Design a sequential circuit suing Mealy machine and D flip-flop for detecting the sequence .... 1101 ... [10]

(*b*) Explain Moore circuit with example. Also compare Moore and Mealy circuit. [8]

9. (*a*) Write a short note on classification of logic families in detail. [8]

(*b*) State the following characteristics of digital IC's (TTL). [8]

(*i*) Speed of operation

(*ii*) Fan-in fan-out

(*iii*) Noise margin

(*iv*) Voltage parameter.

*Or*

10. (*a*) Draw and explain two input totempole output TTL NAND gate. [8]

(*b*) Draw and explain CMOS circuit for NOR gate. [8]

11. (*a*) Design a BCD to excess-3 code converter and implement it using PAL. [8]

(*b*) Draw and explain the working of static and dynamic RAM. [8]

*Or*

12. (*a*) Design 2 K × 8 memory using 1 K × 8 memory. [8]

(*b*) Explain in detail EPROM. State its advantages and disadvantages. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

| Seat No. | |
|---|---|

# [4957]-166

## S.E. (Electronics/E&TC) (Second Semester) EXAMINATION, 2016

## ENGINEERING MATHEMATICS-III

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**. In Section II answer Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

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

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Neat diagrams must be drawn wherever necessary.

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

## SECTION I

**1.** (*a*) Solve any *three* : [12]

(*i*) $(D^3 + D^2 + D - 1)y = 2 \sin x \cos x$

(*ii*) $(D^2 + 1)\, y = \operatorname{cosec} x$ [By variation of parameter method]

(*iii*) $(3x+2)^2 \dfrac{d^2y}{dx^2} + 3(3x+2)\dfrac{dy}{dx} - 36y = 3x^2 + 4x + 1$

(*iv*) $\dfrac{dx}{1} = \dfrac{dy}{3} = \dfrac{dz}{5z + \tan(y - 3x)}$.

P.T.O.

(*b*) An uncharged condenser of capacity C is charged by applying e.m.f. of value $E \sin \frac{1}{\sqrt{LC}}$ through the leads of inductance L and negligible resistance. Find the charge at any time '*t*' [5]

*Or*

2. (*a*) Solve (any *three*) : [12]

(*i*) $(D^2 - 2D + 1)\, y = xe^x \sin 2x$

(*ii*) $(D^2 - D - 2)y = 2 \log x + \frac{1}{x} + \frac{1}{x^2}$

(*iii*) $(D^2 - 2D + 2)y = e^x \tan x$ [By variation of parameter method]

(*iv*) $x^3 \frac{d^2 y}{dx^2} + 3x^2 \frac{dy}{dx} + xy = \sin (\log x).$

(*b*) Solve : [5]

$$\frac{dx}{dt} - wy = a \cos pt$$

$$\frac{dy}{dt} + wx = a \sin pt\,.$$

3. (*a*) If *f*(*z*) = *u* + *iv* is analytic function and $u = \frac{1}{2} \log (x^2 + y^2)$ find *f*(*z*) in terms of *z* hence find *v*. [5]

(*b*) Evaluate :

$$\oint_C \frac{e^{2z}}{(z+1)^4}\, dz$$

where C is $|z| = 3$ [5]

(*c*) Find image of triangular region bounded by $x = 0$, $y = 0$, $x + y = 1$ under the transformation $w = z^2$. [6]

*Or*

4. (a) If $f(z)$ is analytic function, show that : [5]

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|\ f'(z)|^2$$

(b) Evaluate : [5]

$$\int_0^{2\pi} \frac{d\theta}{5 + 3\cos\theta}.$$

(c) Find bilinear transformation which maps $z = 1, i, -1$ to $0, 1, \alpha$ respectively in $w$ plane. [6]

5. (a) Using Fourier integral representation show that : [6]

$$e^{-kx} = \frac{2}{\pi}\int_0^{\infty} \frac{k\cos\lambda x}{\lambda^2 + k^2}\, d\lambda,\ x > 0$$

(b) Find Fourier sine transform of : [5]

$$\begin{aligned} f(x) &= x & 0 \le x \le 1 \\ &= 2 - x & 1 \le x \le 2 \\ &= 0 & x > 2 \end{aligned}$$

(c) Find $z$ transform of the following (any *two*) : [6]

(i) $f(k) = k^2\ a^k\ \ k \ge 0$

(ii) $f(k) = 3^k \sin(2k + 3)\ \ k \ge 0$

(iii) $f(k) = (1/2)^{|k|}\ \ \forall\ k.$

*Or*

6. (a) Find inverse $z$ transform (any *two*) : [6]

(i) $\dfrac{3z^2 + 2z}{z^2 + 3z + 2}\quad 1 < |z| < 2$

(*ii*) $\dfrac{z+1}{(z-1)^2}$ $|z| > 1$

(*iii*) $\dfrac{z^2}{z^2+1}$ $|z| > 1$

(*b*) Obtain $f(k)$ such that : [5]

$$f(k+2) + 3f(k+1) + 2f(k) = 0,\ f(0) = 0,\ f(1) = 1$$

(*c*) Solve integral equation : [6]

$$\int_0^\infty f(x) \sin \lambda x \, dx = e^{-\lambda} \quad \lambda > 0$$

## SECTION II

**7.** (*a*) For the following tabulated data, find $y$ at $x = 0.5$. [5]

| $x$ | $y$ |
|---|---|
| 0 | 1.12 |
| 1 | 3.45 |
| 2 | 6.67 |
| 3 | 10.8 |
| 4 | 16.12 |
| 5 | 24.52 |

(*b*) Use Simpson's $\frac{1}{3}$rd rule, with ten intervals to evaluate : [5]

$$\int_1^2 \frac{1}{x} \, dx$$

(*c*) Compute $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of 4th order for the differential equation : [6]

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

*Or*

**8.** (*a*) Evaluate : [5]

$$\int_0^{\pi} \frac{\sin^2\theta}{5+4\cos\theta}\, d\theta$$

by Simpson's $\frac{3}{8}$th rule. (Take $h = \frac{\pi}{6}$)

(*b*) Use Euler's modified method to find the value of $y$ satisfying the equation : [5]

$$\frac{dy}{dx} = \log_e(x+y),\ y(1) = 2$$

for $x = 1.2$ correct upto three decimal places (Take $h = 0.2$).

(*c*) With usual notation establish : [6]

(*i*) $\Delta\nabla = \nabla\Delta = \delta^2$

(*ii*) $y_6 = y_5 + \Delta y_4 + \Delta^2 y_3 + \Delta^3 y_2 + \Delta^4 y_1 + \Delta^5 y_0 + \Delta^6 y_0$

**9.** (*a*) The position vector of a particle at any time '*t*' is : [5]

$$\bar{r} = \cos(t-1)\, i + \sinh(t-1)\, j + m t^3 k.$$

Find the values of $m$ such that at $t = 1$, the acceleration is normal to the position vector.

(*b*) Find directional derivative of the function : [6]

$$\phi = e^{2x-y-z} \text{ at } (1, 1, 1)$$

in the direction of the tangent to the curve :

$$x = e^{-t},\ y = 2\sin t + 1,\ z = t - \cos t \text{ at } t = 0$$

(*c*) Show that the vector field given by : [6]

$$\bar{F} = (y^2\cos x + z^2)\, i + (2y\sin x)\, j + 2xz\, k$$

is conservative and find scalar field $\phi$ such that $\bar{F} = \nabla\phi$.

*Or*

**10.** (*a*) Find the constant $a$ and $b$ so that the surface : [5]

$$ax^2 - byz = (a + 2)x$$

will be orthogonal to the surface :

$$4x^2z + z^3 = 4$$

at the point (1, –1, 2).

(*b*) Show that $\overline{F} = r^2\ \overline{r}$ is conservative and obtain the scalar potential associated with it. [6]

(*c*) Prove (any *two*) : [6]

(*i*) $\nabla^4 (r^2 \log r) = \dfrac{6}{r^2}$

(*ii*) $\overline{a} \,.\nabla\, [\overline{b} \,.\, \nabla \left(\dfrac{1}{r}\right)] = \dfrac{3(\overline{a}\,.\,\overline{r})\,(\overline{b}\,.\,\overline{r})}{r^5} - \dfrac{\overline{a}\,.\,\overline{b}}{r^3}$

(*iii*) If $\overline{u}$ and $\overline{v}$ are irrotational vectors, prove that $\overline{u} \times \overline{v}$ is solenoidal vector.

**11.** (*a*) Verify Green's theorem for the field $\overline{F} = x^2 i + xyj$ over the region R enclosed by $y = x^2$ and the line $y = x$. [6]

(*b*) Prove that : [5]

$$\iint_S (\phi \nabla\psi - \psi\, \nabla\phi)\,.\, d\overline{s} = \iiint_V (\phi \nabla^2 \psi - \psi \nabla^2 \psi)\, dv$$

(*c*) Maxwell's equations are given by : [6]

$$\nabla\,.\,\overline{E} = 0, \nabla\,.\,\overline{H} = 0 \quad \nabla\times\overline{E} = \frac{-\partial\overline{H}}{\partial t}, \nabla\times\overline{H} = \frac{\partial\overline{E}}{\partial t}$$

show that $\overline{E}$ and $\overline{H}$ satisfy $\nabla^2 U = \dfrac{\partial^2 u}{\partial t^2}$.

*Or*

**12.** (*a*) Find work done in moving a particle along a straight line from O(0, 0, 0) to A(1, 2, 3) in a force field : [6]

$$\overline{F} = (3x^2 - 6yz)\, i + (2y + 3xz)\, j + (1 - 4xyz^2) k.$$

(*b*) Evaluate : [5]

$$\iint_S (x^3\, i + y^3\, j + z^3\, k) \cdot d\overline{S}$$

where S is the surface of the sphere :

$$x^2 + y^2 + z^2 = 9$$

(*c*) Apply Stokes' theorem to evaluate : [6]

$$\int_C (x - y^2)\, dx + 2xy\, dy$$

where C is the curve bounded by $x = 0$, $x = 2$ and $y = x$.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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**[4957]-167**

**S.E. (E&TC/Electronics) (II Sem.) EXAMINATION, 2016**

**INTEGRATED CIRCUITS AND APPLICATIONS**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers any 3 questions from each Section.

(*ii*) Answer 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*) Draw the block diagram of op-amp and explain the function of each block in detail. [8]

(*b*) Draw and explain output stage of operational amplifier. [8]

*Or*

**2.** (*a*) Draw and explain level shifter stage of operational amplifier. [8]

(*b*) Write short notes on what are the configurations of differential amplifier ? [8]

3. (*a*) Draw circuit diagram for inverting amplifier using op-amp LM 741. Calculate RF and R1 for gain of 5. [8]

(*b*) Define the following parameters of an Op-Amp. Give their typical values for IC 741 : [8]

(*i*) Input bias current

(*ii*) CMRR

(*iii*) Slew Rate

(*iv*) Input Offset voltage.

*Or*

4. (*a*) Define the following parameters of an Op-Amp with their typical value for IC 741 : [8]

(*i*) Slew Rate

(*ii*) Input bias current

(*iii*) Input resistance

(*iv*) Output resistance.

(*b*) Draw equivalent circuit of Op-Amp and explain with ideal voltage transfer curve. [8]

5. (*a*) Design a practical integrator to integrate an input signal for given Fa = 1 KHz. Assume Fb is 10 times Fa. [8]

(*b*) Draw circuit diagram of Voltage to current convertor with Grounded Load. [8]

*Or*

6. (*a*) Draw circuit diagram and Explain Op-amp as a : [12]

(1) Unity Gain Amplifier

(2) Non-inverting summing amplifier.

(*b*) Draw and explain subtractor with output voltage equation. [6]

## SECTION II

7. (*a*) Draw circuit diagram of the Inverting Schmitt trigger. Give equation for UPT and LTP and Draw input and output waveforms. Also comment on Hysteresis loop. [12]

(*b*) Explain Peak detector circuit using op-amp. [6]

*Or*

8. (*a*) Draw and explain the zero crossing detectors using op-amp with necessary waveforms. [8]

(*b*) Draw and explain positive small signal full wave rectifier. [8]

9. (*a*) Draw neat diagram of D/A convertor with R and 2R resistor and explain. [8]

(*b*) List the various methods of A to D Conversion. Explain successive approximation type ADC with neat block diagram. [8]

*Or*

10. (*a*) Explain the operation of Sigma Delta Converter with neat circuit diagram. [8]

(*b*) Draw neat diagram of D/A convertor with binary weighted resistor and explain. [8]

**11.** (*a*) Design first order active high pass filter Fl = 1 KHz and gain = 2. [8]

(*b*) Draw circuit diagram of 2nd order Low pass filter. [4]

(*c*) PLL as a FSK Demodulator. [4]

*Or*

**12.** (*a*) Draw block diagram of PLL and explain. [8]

(*b*) Design first order active low pass filter Fl = 2 KHz and gain = 3. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

**[4957]-168**

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**S.E. (E&TC and Electronics) (II Semester) EXAMINATION, 2016**

**ELECTROMAGNETICS**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two sections must 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data whenever necessary.

## SECTION I

**1.** (A) Derive an expression for electric field intensity $\overline{\mathrm{E}}$ due to infinite line charge placed on Z axis. The charge distribution has uniform charge density of $\rho_L \mathrm{C/m}$. [9]

(B) Determine the flux crossing 1 mm by 1 mm area on cylindrical surface sheet of : [9]

$$r = 20 \text{ m}, \ \phi = 55^\circ, \ z = 5\text{m}, \text{ if :}$$

$$\overline{\mathrm{D}} = 4x\overline{a}_x + 2(1-y)\overline{a}_y + 4z\overline{a}_z \ \mathrm{C/m^2}$$

*Or*

**2.** (A) State and prove Gauss's law. [9]

(B) The spherical region $0 \le r \le 10$ cm contains a uniform volume charge density $\rho_v = 4 \mu C/m^3$: [9]

(*i*) Find total charge in the region $0 \le r \le 10$ cm

(*ii*) Find $\bar{D}_r$ in the region $0 \le r \le 10$ cm.

(*iii*) The non-uniform volume charge density :

$$\rho_V = \frac{-3}{r^3 + 0.001} \mu C/m^3$$

exists for $10 cm < r < r_0$. Find $r_0$ so that total charge in the region $0 \le r \le r_0$ is 0.

**3.** (A) Derive an expression to find energy stored per unit volume volume in an electric field. [8]

(B) A point charge of 5 nC is located at the origin. If V = 2V at (0, 6, –8). Find : [8]

(*i*) The potential at A(–3, 2, 6)

(*ii*) The potential at B(1, 5, 7)

(*iii*) The potential difference VAB.

*Or*

**4.** (A) Define electric potential. Explain the relationship between E and V. [8]

(B) If

$$J = \frac{1}{r^3}(2\cos\theta a_r + \sin\theta a_\theta) \text{ A/m}^2,$$

calculate the current passing through :

(*i*) A hemispherical shell of radius 20 cm.

(*ii*) A spherical shell of radius 10 cm. [8]

**5.** (A) State and explain Biot-Savart's law. [8]

(B) Given points are A(1, 2, 4), B(–2, –1, 3) and C(3, 1, –2). Let the differential current element with I = 6A and $|\overline{dL}| = 10^{-4}$ m is located at point A. The direction of $|\overline{dL}|$ is from A to B. Find $|\overline{dH}|$ at C. [8]

*Or*

**6.** (A) Using the concept of curl, obtain point form of Ampere's circuital law. [8]

(B) Find the vector magnetic field intensity in Cartesian coordinates at P(1, 2, 3) caused by current filament carrying current of 10 A in $\overline{a}_z$ direction on the $z$ axis and extending from :

(*i*) $z = 0$ to $z = 5$ m

(*ii*) $z = 5$m to $z = +\infty$ [8]

## SECTION II

7. (A) Derive the expression for magnetic boundary condition at an interface between two mediums having permeability $\mu_1$ and $\mu_2$. [8]

(B) The region $z < 0$ contains a dielectric material for which $\varepsilon_{R1} = 2.5$ while $\varepsilon_{R2} = 4$ for $Z > 0$. If

$$\overline{E}_1 = -30\overline{a}_x + 50\overline{a}_y + 70\overline{a}_z \text{ V/m}.$$

Find :

(a) $\overline{E}_{t1}$

(b) $E_{N1}$

(c) $E_{t1}$

(d) $D_2$. [10]

*Or*

8. (A) Derive the boundary condition for static electric field at an interface between two dielectric materials. [8]

(B) The XY plane serves as the interface between two different media. Medium 1(Z < 0) is filled with a material whose $\mu_s = 6$ and medium 2(Z > 0) is filled with a material whose $\mu_s = 4$. If the interface carries current $(1/\mu_0)a_y$ mA/m and

$$\overline{B}_2 = 5a_x + 8a_z m \text{ W}b/m^2.$$

Find $\overline{H}_1$ and $\overline{B}_1$. [10]

**9.** (A) State and explain Poynting theorem. [8]

(B) Given :

$$\bar{H} = H_m e^{j(\omega t+\beta z)} a_x \text{ A/m}$$

in free space. Find $\bar{E}$.

*Or*

**10.** (A) Write Maxwell's equation in point from and integral form for time varying field. [8]

(B) In charge free region the magnetic field intensity is given by : [8]

$$\bar{E} = E_m \sin(\omega t + \beta z)\bar{a}_y \text{ V/m}.$$

Calculate $\bar{H}, \bar{D}$ and $\bar{B}$.

**11.** (A) Explain the procedure to draw electric field lines by numerical methods. [8]

(B) Discuss in detail about Method of Moments. What are its applications ? [8]

*Or*

**12.** (A) Explain finite difference method in detail with suitable examples. [8]

(B) Describe the steps in finite element method for solving differential equation. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

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# [4957]-168-A

## S.E. (Electro & TC) (Second Semester) EXAMINATION, 2016

## ELECTROMAGNETIC

## (2008 PATTERN)

**Time : Two Hours** **Maximum Marks : 50**

***N.B.*** **:—** (*i*) Answer *all* questions in same answer book.

(*ii*) Attempt Q.No.**1** *or* Q.No. **2**, Q.No. **3** *or* Q.No. **4**, Q.No. **5** *or* Q.No. **6**

(*iii*) Neat diagrams must be drawn wherever necessary.

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

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

(*vi*) Assume suitable data, if necessary.

**1.** (*a*) Derive the expression for electric field intensity ($\bar{E}$) due to infinite line charge distribution at any point 'P' along XY plane. [8]

(*b*) Two thin conducting half plane at $\phi = \pi$ and $\phi = \frac{\pi}{6}$ are insulated from each other along Z axis. Given that potential function for $\phi > 0$ and $\phi \le \frac{\pi}{6}$ is V = $-\frac{60}{\pi}\phi$ volts. Find the energy stored in the field. [8]

P.T.O.

*Or*

2. (*a*) Derive the expression for parallel plate capacitor. [8]

(*b*) Given that $\overline{D} = \frac{10}{4} r^3 \; \hat{a}_r$ c/m$^2$ in the clindrical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed by $r$ = 1 m to 2 m and $z$ = 0 to 10 m. [8]

3. (*a*) Obtain the expression for H at the center of a circular conductor carrying current 'I' using Biot-Savart's law. [8]

(*b*) The region $x < 0$ contains dielectric medium for which $\in_1 = 4$, while the region $x > 0$ is characterised by $\in_2 = 2$. If $\overline{E}_1 = 50\hat{a}_x - 30\hat{a}_y + 60\hat{a}_z$ V/m, find : [8]

(*a*) $\overline{E}_{N1}$

(*b*) $\theta_1$

(*c*) $\overline{E}_{t1}$

(*d*) $\overline{E}_2$

(*e*) $\theta_2$.

*Or*

4. (*a*) Derive the boundary condition for electric field at an interface between dielectric—dielectric in terms of both electric field intensity and electric flux density. [8]

(*b*) A current density $6\hat{a}_x$ A/m lies in the $z$ = 0 plane and a current filament is located at $y$ = 0, $z$ = 4 m. Determine the current and its direction if $\overline{H} = 0$ at (0, 0, 1.5) m. [8]

**5.** (*a*) State the Maxwell's equation in point form for static electric and steady magnetic fields. Explain how these are modified for time varying fields. [10]

(*b*) In free space $\bar{E}(z, t) = 50 \cos(\omega t - \beta z)\hat{a}_x$ V / m. Find the average power crossing circular area of radius 2.5 m in a plane $z$ = constant. [8]

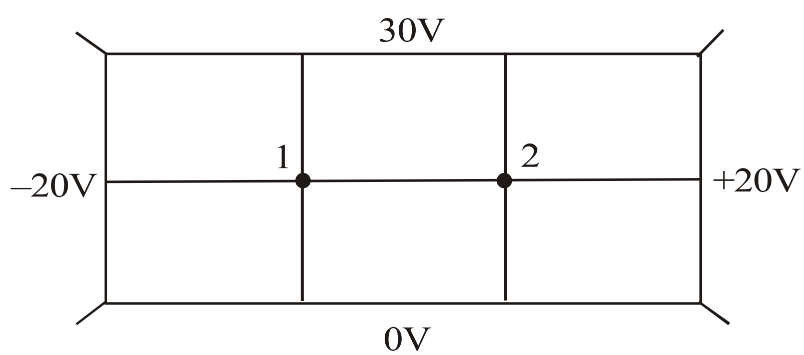
*Or*

**6.** (*a*) Write a short note on (any *one*) :

(*i*) Finite difference method

(*ii*) Method of moments. [8]

(*b*) Using finite difference method calculate the potential at node 1 and 2 as shown in figure below : [10]



Total No. of Questions—**12**]                    [Total No. of Printed Pages—**4**

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# [4957]-169

## S.E. (Electronics/E&TC) EXAMINATION, 2016

## DATA STRUCTURE

## (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 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*) Define an array. Store and display your roll no. and name using array. [6]

(*b*) Explain sequential search and binary search method. [6]

(*c*) Write different types of functions. Write program for addition of two nos. using parameter passing and no return value. [6]

*Or*

**2.** (*a*) What is difference between ADT and DS. [6]

(*b*) Write function of bubble sort. [6]

(*c*) Write a recursive function for finding factorial of number. [6]

P.T.O.

**3.** (*a*) Explain with example passing parameter and return value using call by value method. [6]

(*b*) Explain structure with a suitable example. [6]

(*c*) Explain pointer with a suitable example. [4]

*Or*

**4.** (*a*) What is difference between structure and union. [6]

(*b*) How the polynomial stored in an array. Explain it with a suitable example. [6]

(*c*) Define array and structure. [4]

*Or*

**5.** (*a*) How the node create insert and delete in SLL ? Explain it in detail. [8]

(*b*) Represent in the following polynomial using GLL. Explain node structure in GLL : [8]

$$5x^3 y^3 z^2 + 30\ x^2 y^2 z^2 + 45x^2yz^2 + 90\,x^2yz$$

*Or*

**6.** (*a*) How to create and display node in DLL ? Explain it. [8]

(*b*) Explain Circular Linked List (CLL). How to insert node in CLL ? [8]

## SECTION II

**7.** (*a*) Explain stack. Which operations are performed on it ? Explain in detail. [8]

(*b*) What are different applications of queue ? Explain any *one* application. [8]

*Or*

8. (*a*) Explain stack implementation using linked list. [8]

   (*b*) Explain circular queue and operations performed on it. [8]

9. (*a*) Draw the binary tree using the following data : [6]

   100 20 80 60 120 50 90 130

   (*b*) Write a function for deletion of element in BST. [6]

   (*c*) Create an AVL tree for the following data : [6]

   90 80 60 20 40 30

*Or*

10. (*a*) What is AVL tree ? Explain RL and LL rotations with example. [6]

    (*b*) Explain BST in detail. [6]

    (*c*) Draw binary tree for the following data : [6]

    P Q M Z U S T N

11. (*a*) Explain DFS and BFS in detail. [8]

    (*b*) Explain the following terms with examples : [8]

    (*i*) Path

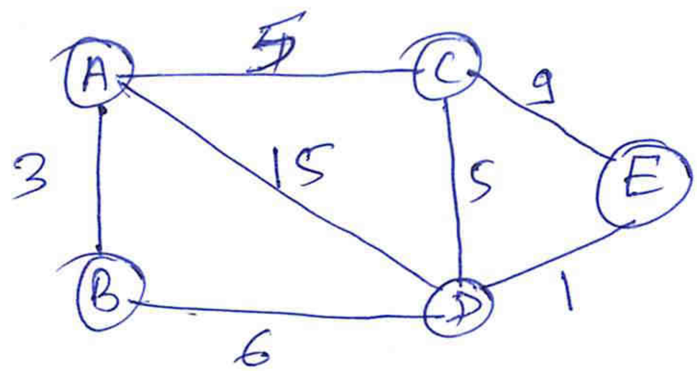
    (*ii*) Simple path

    (*iii*) Cycle

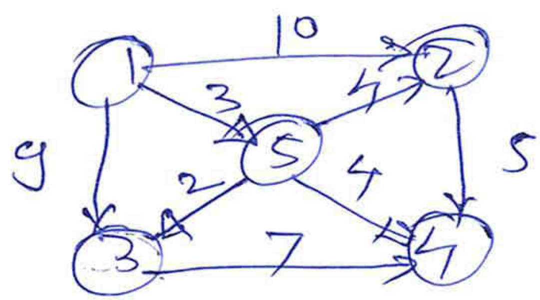
    (*iv*) Loop.

*Or*

**12.** (*a*) Find minimum spanning tree for the following using Prims and Kruskal algorithm : [8]




(*b*) For the following construct : [8]




(*i*) Adjacency matrix

(*ii*) Adjacency list

(*iii*) DFS search

(*iv*) BFS search.

Total No. of Questions—**12**] [Total No. of Printed Pages—**5**

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# [4957]-170

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

**EXAMINATION, 2016**

**COMMUNICATION THEORY**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* 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*) Draw well-labelled diagram.

## SECTION-I

**1.** (*a*) State different methods of DSB-SC Amplitude modulated signal. Explain Non-Linear amplitude Modulation using Square-Law Modulator. [8]

(*b*) A 12 kW carrier wave is Modulated at depth of 80% (percent). Calculate Total Power transmitted wave & Power Efficiency in the following cases : [6]

(*i*) Standard AM

(*ii*) SSBSC

(*c*) Explain AM Broadcasting technical standards. [4]

*Or*

**2.** (*a*) Explain Independent Sideband system with suitable block diagram. [8]

(*b*) In a Typical AM transmission the voices frequency range is 300 Hz to 3000 Hz. Carrier signal used is 3 MHz. Draw frequency spectrum of AM wave & calculate bandwidth of the same. [6]

(*c*) Derive expression for Modulation Index with Various Methods. [4]

**3.** (*a*) Explain Basic Reactance Modulator for AM generation. [8]

(*b*) A carrier is frequency modulated with a sinusoidal signal of 4 kHz resulting deviation of 5 kHz.

(*i*) Find Bandwidth of modulated signal.

(*ii*) The amplitude of modulating signal increased by a factor 3 & frequency is halved. Find Maximum frequency deviation & bandwidth of new modulated signal. [8]

*Or*

**4.** (*a*) An Armstrong FM Modulator uses a primary oscillator of 1 MHz frequency maximum phase deviation is restricted to 10º, when minimum modulating frequency 100 Hz. [8]

(*i*) Calculate Frequency Deviation.

(*ii*) Starting with above Modulator transmitter is to work at 120 MHz with frequency deviation of 30 kHz. Determine the required multiplication factor.

(*iii*) If any doublers & triplers are to be used which is combination to achieve this multiplication factor.

(*b*) Explain with Block diagram how wideband FM differs from signal can be obtained from Narrowband FM signal. Explain operation of each block. [8]

**5.** (*a*) Draw & explain Rectifier & Envelope detection methods for AM. [8]

(*b*) Explain FM detection using PLL with suitable equations. [8]

*Or*

**6.** (*a*) Define & explain : [8]

(*i*) Sensitivity

(*ii*) Selectivity

(*iii*) Fidelity

(*iv*) IFRR

(*b*) Explain Demodulation of DSB-SC signal using Costas Receiver Method. [8]

## SECTION-II

**7.** (*a*) What is Noise factor ? Derive Noise factor for Amplifier in Cascade. [8]

(*b*) Three resistors of 10 k$\Omega$, 22 k$\Omega$, 33 k$\Omega$ are at Room temperature of 27ºC for a bandwidth of 100 kHz, calculate the thermal noise voltage generated by : [8]

(*i*) Each Resistor.

(*ii*) Three Resistors in Series

(*iii*) Three Resistors in Parallel.

*Or*

**8.** (*a*) Explain in detail : [8]

(*i*) Johnson Noise

(*ii*) Flicker Noise

(*iii*) Partition Noise

(*iv*) Avalanche Noise

(*b*) Explain how to find Noise Figure of a system for Noiseless & Noisy Amplifier. [8]

**9.** (*a*) Explain how Noise triangle plays vital role to understand effect of Noise on FM signal. [8]

(*b*) Derive equation of Figure of Merit for Noise contaminated AM system for Envelope detection. [8]

*Or*

**10.** (*a*) Three Amplifier 1,2,3 having the following characteristics :

$F_1$ = 9 dB $G_1$ = 48 dB

$F_2$ = 6 dB $G_2$ = 45 dB

$F_3$ = 4 dB $G_3$ = 25 dB

Three amplifiers are connected in Tandem. Determine which combination gives lowest Noise factor preferred to Input. [8]

(*b*) Derive expression for signal to noise ratio in SSB-SC system. [8]

**11.** (*a*) Explain Band limited & time limited signal. [6]

(*b*) Compare between PAM, PWM, PPM. [6]

(*c*) With the help of block diagram explain PCM Transmitter & Receiver System. [6]

*Or*

**12.** (*a*) Give comparison between Ideal Sampling, Natural Sampling & Flat-top Sampling. [6]

(*b*) With the help of Block diagram explain Pulse width Modulation. Give its advantages & disadvantages. [6]

(*c*) Explain DPCM system with Transmitter & receiver block diagram. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

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# [4957]-171

## S.E. (Instrumentation & Control) (First Semester) EXAMINATION, 2016

## FUNDAMENTALS OF INSTRUMENTATION

## (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.

## SECTION I

**1.** (*a*) What are the different types of errors ? Explain in detail. [8]

(*b*) Explain accuracy and precision. [8]

*Or*

**2.** (*a*) Open circuit voltage is = 43.58 volts. If a voltmeter is used to measure this voltage having internal resistance of 500 kΩ calculate % error in measurment. The output resistance of the circuit is 1800 Ω. [8]

(*b*) What is traceability ? Explain with the help of chart. [8]

**3.** (*a*) Draw a neat labelled diagram of basic DC potentiometer and explain. [10]

(*b*) Explain any *four* errors present in single phase induction type energy meter. [8]

P.T.O.

*Or*

**4.** (*a*) Design multirange voltmeter using individual series multiplier which uses basic PMMC instrument having $I_{fsd}$ = 1000 μA and $R_m$ = 1.8 kΩ. The desired voltage ranges are 5 V, 50 V, 100 V and 250 V. Also draw neat circuit diagram. [10]

(*b*) Differentiate between PMMC and Moving iron instrument type instruments. [8]

**5.** (*a*) Draw Schering bridge. Derive the equation for unknown capacitance. [8]

(*b*) Differentiate between null type bridge and deflection type bridge. [8]

*Or*

**6.** (*a*) Draw neat diagram of Wheatstone bridge, explain its operation. State applications and errors present in it. [12]

(*b*) Differentiate between DC bridge and AC bridge. [4]

## SECTION II

**7.** (*a*) Write a note on Digital Energy meter. [10]

(*b*) Explain function of each block in Digital Thermometer. [6]

*Or*

**8.** (*a*) Draw block diagram and explain function of each block in Digital Phase meter. [8]

(*b*) Write a note on 'Digital Tachometer'. [8]

**9.** (*a*) How frequency and phase can be measured by Lissajous method ? [8]

(*b*) Draw constructional diagram of CRT and explain function of each part. [10]

*Or*

**10.** (*a*) With suitable waveforms, explain ALT and CHOP modes in dual trace CRO. [10]

(*b*) Draw block diagram of DSO and explain its working. Explain its advantages. [8]

**11.** (*a*) Write a note on virtual instrumentation. [8]

(*b*) Classify recorders. Explain with neat diagram galvanometric type recorder. [8]

*Or*

**12.** (*a*) Explain with neat block diagram of function generator. [10]

(*b*) What is X-Y recorder ? Enlist its various applications. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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|---|---|

**[4957]-172**

**S.E. (Instrumentation and Control) (I Sem.) EXAMINATION, 2016**

**LINEAR INTEGRATED CIRCUITS—I**

**(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 any five characteristics of op-amp with their ideal values. [10]

(*b*) Define slew rate of op-amp. Explain the experimental method for measuring slew rate. [8]

*Or*

**2.** (*a*) What is noise ? Explain any four types of noise. [10]

(*b*) Explain internal block diagram of op-amp. [8]

3. (*a*) Derive the voltage gain equation for voltage series feedback amplifier. [8]

(*b*) Explain the voltage follower circuit with its application. [8]

*Or*

4. (*a*) Derive the relation for input resistance of voltage series feedback amplifier. [8]

(*b*) Derive the gain equation for voltage shunt feedback amplifier. [8]

5. (*a*) Derive the relation for Inverting summing amplifier with three inputs. [8]

(*b*) Differentiate between basic and practical integrator circuit. [4]

(*c*) Draw the circuit diagrams of practical and basic integrator. [4]

*Or*

6. (*a*) Explain the circuit of practical differentiator with its frequency response plot. [8]

(*b*) Explain Voltage to Current converter circuit with floating load. [8]

## SECTION II

**7.** (*a*) Explain the working of Schmitt trigger with neat circuit diagram. [10]

(*b*) Explain the working of precision half wave rectifier. [8]

*Or*

**8.** (*a*) Explain the working of RC phase shift oscillator with neat circuit diagram. [8]

(*b*) Explain the working of precision full wave rectifier. [10]

**9.** (*a*) List out any four applications of astable multivibrator. Explain any one in detail. [8]

(*b*) Draw the pin diagram of IC 555. Explain the function of any three pins. [8]

*Or*

**10.** (*a*) Explain the monostable operation of IC555 with neat circuit diagram and waveforms. [8]

(*b*) Write note on IC 7805. [8]

**11.** (*a*) Define any four types of filters. [8]

(*b*) Draw the ideal and practical frequency response plots of four types of filters. [8]

*Or*

**12.** (*a*) Write short note on any *two* of the following : [8]

(*i*) Butterworth filter

(*ii*) Chebyshew filter

(*iii*) Bessel approximation.

(*b*) Design first order low pass filter with cut off frequency of 1KHz and pass band gain of 2. [8]

Total No. of Questions—**12**]  [Total No. of Printed Pages—**7**

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# [4957]-174

**S.E. (Instrumentation & Control) (I Sem.) EXAMINATION, 2016**

**AUTOMATIC CONTROL SYSTEMS**

**(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*) Find out the Transfer function of R-L-C network as shown in Fig. 1. [6]

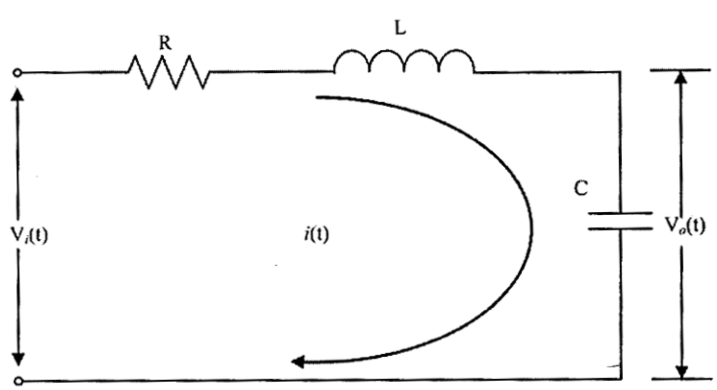


Fig. 1

P.T.O.

(*b*) Define transfer function and state its advantages and disadvantages. [4]

(*c*) Obtain equivalent electrical circuits for the given mechanical systems in Fig. 2. Using force to voltage and force to current analogy. [8]

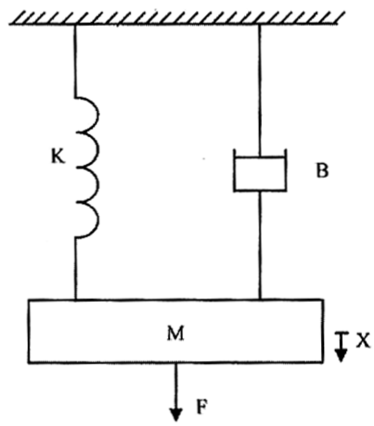


Fig. 2

*Or*

**2.** (*a*) For mechanical system shown in Fig. 3, write system equations at balance condition. Draw voltage and current analogous circuit. [10]

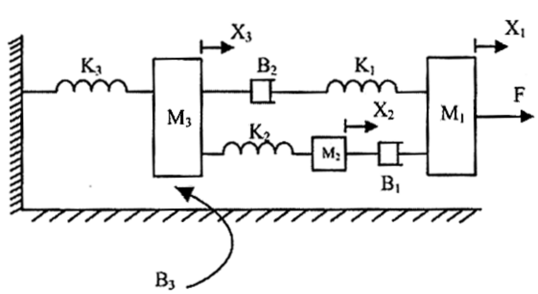


Fig. 3

(*b*) What is control system ? Differentiate the following control system : [8]

(*i*) Feedback and feed forward control systems.

(*ii*) Time variant and time invariant control systems.

(*iii*) Stable and unstable control systems.

(*iv*) Linear and non-linear control systems.

**3.** (*a*) The transfer function of a system is given by [8]

$$T(s) = \frac{10(s + 8)}{s(s + 4)(s^2 + 6s + 25)}$$

Obtain its :

(*i*) Poles

(*ii*) Zeros

(*iii*) Order

(*iv*) Type, sketch its pole zero plot.

(*b*) Find the transfer function of the control system given by its signal flow graph as shown in Fig. 4. [8]

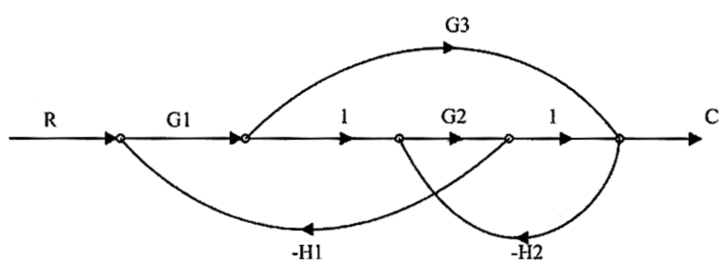


Fig. 4

*Or*

**4.** (*a*) Explain Mason's gain formula with a suitable example. [8]

(*b*) Determine overall transfer function of the system as shown in Fig. 5. [8]

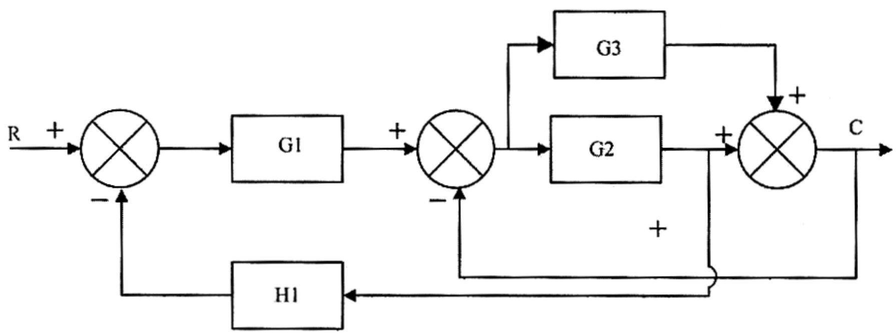


Fig. 5

**5.** (*a*) Define the following systems and sketch its output waveform for a unit step input : [8]

(*i*) Underdamped system

(*ii*) Undamped system

(*iii*) Overdamped system

(*iv*) Critically damped system

(*b*) A system has open loop transfer function as [8]

$$G(s)H(s) = \frac{16}{s(s+6)},$$

Find the undamped natural frequency, the damping ration, damped natural frequency, rise time, peak time, peak overshoot and settling time with 2% criterion.

*Or*

6. (*a*) A unity feedback control system has its forward path transfer function as [8]

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

The maximum overshoot in the unit step response of this system is to be reduced from 60% to 20%. Determine the change in factor K to achieve this reduction.

(*b*) For a system

$$G(s)H(s) = \frac{K}{s^2(s + 2)(s + 3)},$$

find the value of K to limit steady state error [8] to 10 when input to system is $1 + 10t + \frac{40}{2}t^2$.

## SECTION II

7. (*a*) Explain the effect of locations of closed loop poles on the response and the stability [8]

(*b*) The open-loop transfer function of a unity feedback system is [10]

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

find the range of K for stability. For what value of K, system will oscillate and what is the frequency of oscillation ?

*Or*

**8.** (*a*) The system characteristics equation is given by : [6]

$$s^5 + 2s^4 + 3s^3 + 6s^2 + 10s + 15 = 0$$

Comment on stability using Routh's array method.

(*b*) Sketch the root locus of a unity feedback system with, [12]

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

and determine marginal K.

**9.** (*a*) What is frequency response ? State the advantages and disadvantages of frequency response method. [6]

(*b*) A unity feedback control system has [10]

$$G(s) = \frac{40}{s(s+2)(s+20)}.$$

Draw the Bode plot and comment on the stability.

*Or*

**10.** (*a*) State and explain the various frequency domain specifications [6]

(*b*) For a unity system [10]

$$G(s) = \frac{K}{s(s+2)(s+10)}.$$

Determine marginal value of 'K' for which system will be marginally stable, using Bode plot.

**11.** (*a*) Define : [6]

(*i*) State

(*ii*) State variables

(*iii*) State space

(*iv*) State equation.

(*b*) For the system having open loop transfer function [10]

$$G(s)H(s) = \frac{K}{s(s+4)(s+8)}$$

Sketch the Nyquist plot and hence calculate the range of values of K for stability.

*Or*

**12.** (*a*) Explain Nyquist stability criterion [6]

(*b*) The state space representation of a system is given below :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 3 \\ -6 \\ 3 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}.$$

Determine the overall transfer function. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

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# [4957]-175

**S.E. (Instrumentation and Control)**
**(Second Sem.) EXAMINATION, 2016**
**DIGITAL TECHNIQUES**
**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

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

(*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. **10**, Q. **11** *or* Q. No, **12**.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) (*i*) Perform $(9)_{10} - (4)_{10}$ using 1s complement. [4]

(*ii*) Represent 634 in power of 8.

(*b*) Convert the following : [6]

(*i*) Convert $(1010)_{\text{Gray}}$ to Binary

(*ii*) Convert $(1000)_{\text{Binary}}$ to Gray

(*iii*) $(1100)_2$ to Excess-3

(*c*) (*i*) Convert (10100011) BCD to binary. [6]

(*ii*) $(0100010)_2$ to BCD. [6]

*Or*

**2.** (*a*) Subtract $(5)_{10} - (5)_{10}$ using 1s complement. [4]

(*b*) Convert given expression in standard SOP form. [6]

$$y = BC + \bar{A}C + \bar{A}B$$

(*c*) Sketch the following expression using NOR-NOR logic : [6]

$$F = \prod M\ (0, 1, 2, 4, 6)$$

**3.** (*a*) Reduce the following Boolean expression : [6]

(*i*) $F\,(A, B, C, D) = \bar{D} + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}C\bar{D}$

(*ii*) $Y = \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}\bar{D} + AB\bar{C}D + A\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D}$

(*b*) Reduce the following expression using Quine Mcluskey method : [12]

(*i*) $F(A, B, C, D) = \prod M\ (1, 4, 5, 6, 7, 8, 12) + d\ (3, 9, 11, 14)$

(*ii*) $F(A, B, C, D) = \prod M\ (0, 1, 3, 5, 7, 9)$

*Or*

**4.** (*a*) (*i*) Convert D flip-flop to T flip flop. [10]

(*ii*) Convert Jk flop to SR flip flop.

(*b*) Compare SRAM and DRAM. [8]

**5.** (*a*) Design 3 bit synchronous counter using T-flip flop. [8]

(*b*) Design MOD-8 counter using IC 7490. [8]

*Or*

**6.** (*a*) Design MOD-32 counter using IC 7493.

(*b*) Explain 4 bit synchronous up counter, also draw timing waveform. [8]

## SECTION II

7. (*a*) Design 16 : 1 multiplexer using 8 : 1 multiplexer. [8]

(*b*) Design 16 : 1 following Boolean expression : [8]

$$F(A, B, C D) = \sum m\ (2, 4, 5, 7, 10, 14, 15, 16, 17, 25, 26, 30, 31)$$

*Or*

8. (*a*) Design 8 : 1 multiplexer for the following function :

$$F(A, B, C D) = \sum m\ (0, 3, 5, 6, 10, 12)$$

(*b*) Design 4 : 16 Decoder using 2 line to 4 line Docoder. [8]

9. (*a*) Explain DTL logic family with neat sketch. [8]

(*b*) Explain the term open collector output (TTL) with neat sketch. [10]

*Or*

10. (*a*) Compare TTL and CMOS logic family. [8]

(*b*) Explain ECL logic family with neat sketch. [10]

11. (*a*) Design Pulse train generator to generate pulse train 110011 using D-flip flop. [8]

(*b*) Explain frequency counter with neat sketch. [8]

*Or*

12. (*a*) Explain alarm announciator with neat sketch. [8]

(*b*) Write a short notes on :

(*i*) EPROM

(*ii*) EEPROM.

Total No. of Questions—**12**]  [Total No. of Printed Pages—**4**

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# [4957]-176

## S.E. (Instru. & Control) (Second Semester) EXAMINATION, 2016

## APPLIED ELECTRONICS

## (2008 PATTERN)

**Time : Three Hours**  **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer 3 questions from Section I and 3 questions from Section II.

(*ii*) Answers to the *two* sections should be written in *separate* books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) 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 Ramp or Counter type Analog to Digital Converter with neat diagrams. [10]

(*b*) How Sample and Hold circuit is useful with ADC's ? Explain the concept using neat circuit diagram. [8]

P.T.O.

*Or*

2. (*a*) Design 2-bit flash type ADC, when analog input is changes from 0 to 5 Volts and $V_{ref}$ is 5 Volt. Write necessary observation table with diagrams. [10]

(*b*) Explain the following performance characteristics of ADC : [8]

(*i*) Linearity

(*ii*) Resolution

(*iii*) Quantization Error

(*iv*) Accuracy.

3. (*a*) Derive output equation for 4-bit binary weighted register type DAC with neat circuit diagram. [8]

(*b*) What is Pulse Width Modulation type DAC ? Explain it with suitable diagrams. [8]

*Or*

4. (*a*) Using Thevenin's theorem, derive output voltage equation for 4-bit, R-2R type DAC. [8]

(*b*) Explain following performance characteristics of DAC's :

(*i*) Resolution

(*ii*) Accuracy

(*iii*) Full-Scale Range (FSR)

(*iv*) Monotonacity. [8]

5. (*a*) Explain the SCR as a voltage controlled controlled device ? [8]

(*b*) Explain any one type of MOSFET along with neat Diagrams. [8]

*Or*

6. (*a*) How TRIAC is different than SCR ? Explain with neat diagrams. [8]

(*b*) Draw and explain the symbol and characteristics of IGBT. [8]

## Section II

7. (*a*) List out primary and secondary types of batteries. Explain the concept battery monitoring system with neat diagram. [10]

(*b*) Explain the Taper, Pulsed, Trickle and Float charging methods in details ? [8]

*Or*

8. (*a*) How the IC L-200 is used as a adjustable voltage and current regulator charger ? Explain with neat diagrams. [10]

(*b*) What is memory effect and Capacity of battery ? Explain. [8]

9. (*a*) A Temperature transducer gives output in the range of 1V to 5V. Design suitable circuit that gives output in the range of 4 to 20 mA. Assume suitable data. [8]

(*b*) Why VCO needs a constant current source ? Explain VCO with neat block diagram. [8]

*Or*

**10.** (*a*) Derive output current equation of grounded load type V to I convertor. [8]

(*b*) Explain the voltage to frequency (V to F) conversion technique with neat block diagram. [8]

**11.** (*a*) In data transmission and telemetry how Amplitude modulation is useful ? Explain. [8]

(*b*) Explain FDM technique using neat block diagram. [8]

*Or*

**12.** (*a*) How ASK is useful in wireless telegraphy ? Explain with neat diagram coherent and non-Coherent detector. [8]

(*b*) Explain TDM technique using neat block diagram. [8]

Total No. of Questions—**12**]                [Total No. of Printed Pages—**4**

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# [4957]-177

**S.E. (Instrumentation & Control) (II–Semester) EXAMINATION, 2016**

**TRANSDUCERS AND SIGNAL CONDITIONING**

**(2008 PATTERN)**

**Time : Three Hours**                **Maximum Marks : 100**

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

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

(*iii*) Draw neat sketches wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, electronic pocket calculator is permitted.

## Section I

**1.** (*a*) Explain the following stages of signal conditioner :

(*i*) Linearization

(*ii*) Signal conversions

(*iii*) Filtering

(*iv*) Analog to digital converter. [9]

(*b*) Explain optical pyrometer with a neat diagram. [9]

P.T.O.

*Or*

**2.** (*a*) Discuss with neat circuit diagram how LM35 can be used in Thermocouple signal conditioning circuits for cold junction compensation. [9]

(*b*) Discuss different causes that generate error in temperature measurement with RTD. How can these errors be avoided ? [9]

**3.** (*a*) Prove that sensitivity increases if we use half and full bridge configuration over quarter bridge configuration. [8]

(*b*) Explain the excitation and detection technique for strain gauge load cell. [8]

*Or*

**4.** (*a*) Explain charge amplifier in detail.

(*b*) Discuss different source of error in strain gauge. How can they be eliminated ? [8]

**5.** (*a*) Explain working and signal conditioning of inductive proximity switch. [8]

(*b*) Explain working of stroboscope with neat diagram. [8]

*Or*

**6.** (*a*) Explain signal conditioning of LVDT in respect to phase demodulation and phase detection. [8]

(*b*) Explain working of optical tachometer with necessary signal conditioning circuit. [8]

## Section II

**7.** (*a*) Explain the signal conditioning scheme for ultrasonic level transducer. [9]

(*b*) For certain level measurement system electromechanical level gauge is used to measure level. The output of sensor is 0 to 10 k ohm for the level of 0 to 20 meter.

Design suitable signal conditioning circuit for having output 0 to 10 V. [9]

*Or*

**8.** (*a*) Explain capacitive level measurement with necessary signal conditioning circuit. [9]

(*b*) Explain different radiation detection techniques in nuclear level sensors. [9]

**9.** (*a*) Explain working of turbine flow meter along with excitation and detection technique. [8]

(*b*) Explain working principle of DP cell along with necessary signal condititioning blocks. [8]

*Or*

**10.** (*a*) Explain working principle of vortex flow meter.

Explain the detection technique for it ? [8]

(*b*) Explain principle and working of mass flow meter with a neat diagram. Give its applications. [8]

**11.** Write short notes on : [16]

(*a*) Conductivity meter.

(*b*) pH combined electrode.

*Or*

**12.** (*a*) Explain electromagnetic vibration sensor in detail. [8]

(*b*) List different types of microphones and explain any *one*. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-178

**S.E. (Instru. & Cont.) (Semester-II) EXAMINATION, 2016**

**PHOTONICS & INSTRUMENTATION**

**(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 electromagnetic spectrum of light and give wavelength in nanometer. [10]

(*b*) Calculate the frequency of the light if the energy contained by that light is 50 KeV. [6]

*Or*

**2.** Compare the following terms : [2×8]

(*i*) Reflection and Refraction

(*ii*) Interference and Diffraction.

**3.** (*a*) With neat diagram explain any *one* gas discharge lamp. [10]

(*b*) What is Spectra ? Explain the types of spectra. [6]

*Or*

**4.** (*a*) With neat diagram explain the construction and working of incandescent lamp. [10]

(*b*) For an incandescent lamp the design parameters are : [6]

(*i*) Design voltage = 5 V

(*ii*) Design current = 0.145 Amp

(*iii*) M.S.C.P. at design voltage = 0.16

(*iv*) Lamp life = 10,000 Hrs.

If this lamp is operated at 4.5 V, then calculate :

(1) Rerated M.S.C.P.

(2) Rerated life.

**5.** (*a*) What do you understand by a term radiation pattern of emitting diode ? Suggest experimental set up and procedure to draw it. [12]

(*b*) List out the different applications of LASER. [6]

*Or*

**6.** (*a*) Explain working of light emitting diode. Explain any *two* structures of LED. [12]

(*b*) With a neat diagram explain semiconductor laser. [6]

## SECTION II

**7.** (*a*) Define Optical Detector. Explain Bolometer. [8]

(*b*) Explain with diagram : [8]

(*i*) Photomultiplier tube.

(*ii*) Photoelectromagnetic detector.

*Or*

**8.** (*a*) Explain any *two* types of quantum detector with suitable diagram. [8]

(*b*) Explain in short Charge coupled Devices. [8]

**9.** (*a*) Explain the diffraction grating equation with its application. Suggest experimental set up to determine the unknown wavelength. [12]

(*b*) Write a short note on holographic grating. [4]

*Or*

**10.** (*a*) Explain the Interference filter with its applications. [4]

(*b*) Write short notes on : [2×6]

(*i*) Beam Splitter

(*ii*) Prism.

**11.** Explain working principle of the following with suitable diagram : [2×9]

(*a*) Astronomical Telescope

(*b*) Camera.

*Or*

**12.** (*a*) Draw the neat diagram of monochromator and explain functions of various components of monochromator. Which components contributes to the resolution of monochromator. [9]

(*b*) Explain with a neat diagram optical projection system. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

| Seat No. | |
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# [4957]-179

## S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2016

## DRIVES AND CONTROL

## (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*) Figures to the right side indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data if necessary.

### Section I

**1.** (*a*) Explain the losses in dc generator. [8]

(*b*) A shunt generator delivers 450A at 230V and the resistance of the shunt field and armature are 50 ohm and 0.03 ohm respectively. Calculate the generated emf. [8]

*Or*

**2.** (*a*) Explain the characteristics of the DC series motor. Write *two* applications of it. [8]

(*b*) A 440V shunt motor has armature resistance of 0.8 ohm and the field resistance of 200 ohm. Determine the back emf when giving an output of 7.46 kW at 85% efficiency. [8]

P.T.O.

3. (*a*) Write the differences between squirrel cage and phase wound motor. [8]

(*b*) Draw and write the relation between torque and slip. [8]

*Or*

4. (*a*) Explain the working and construction of three phase induction motor. [8]

(*b*) Explain the types of rotors used in alternator in detail. [8]

5. Write short notes on :

(*i*) Servomotors [6]

(*ii*) Universal motor [6]

(*iii*) Applications of stepper motors. [6]

6. Write short notes on :

(*i*) Synchronous motor [6]

(*ii*) Single phase induction motor [6]

(*iii*) Role of stepper motors in automation industry. [6]

## Section II

7. (*a*) Explain the specifications of SCR. [8]

(*b*) Explain in detail the construction of SCR and also the necessity of gate triggering in SCR. [8]

*Or*

8. (*a*) Write the construction, working and characteristics of UJT. [8]

(*b*) Explain Class 'B' commutation of SCR. [8]

**9.** (*a*) Explain the working of full wave controlled rectifier with inductive load. [9]

(*b*) Write a short note on inverters. [9]

*Or*

**10.** (*a*) Explain the six-phase half-wave rectifier with waveforms. [9]

(*b*) Write a short note on inverters. [9]

**11.** (*a*) Braking of induction motor. [8]

(*b*) Three-phase SCR drive in DC motor control. [8]

*Or*

**12.** (*a*) With a neat block diagram, explain the controlled slip system for closed loop control of 3-phase induction motor. [8]

(*b*) Give the methods by which speed of the induction motors can be varied. Explain any *one* in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

| Seat No. | |
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# [4957]-181

## S.E. (Printing Technology) (First Semester) EXAMINATION, 2016
## STRENGTH OF MACHINE ELEMENTS
## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : ??**

***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

### Unit I

**1.** (*a*) A rigid bar ABC is hinged at A and supported by steel and copper rods as shown in Fig. 1. If the temperature of the system is raised by 60 degrees Celsius, determine the stresses in the two rods. Take $\alpha_s = 11 \times 10^{-6}/^{o}C$, $\alpha_c = 17 \times 10^{-6}/^{\circ}C$, $E_s = 200$ GPa, $E_c = 100$ GPa. [8]

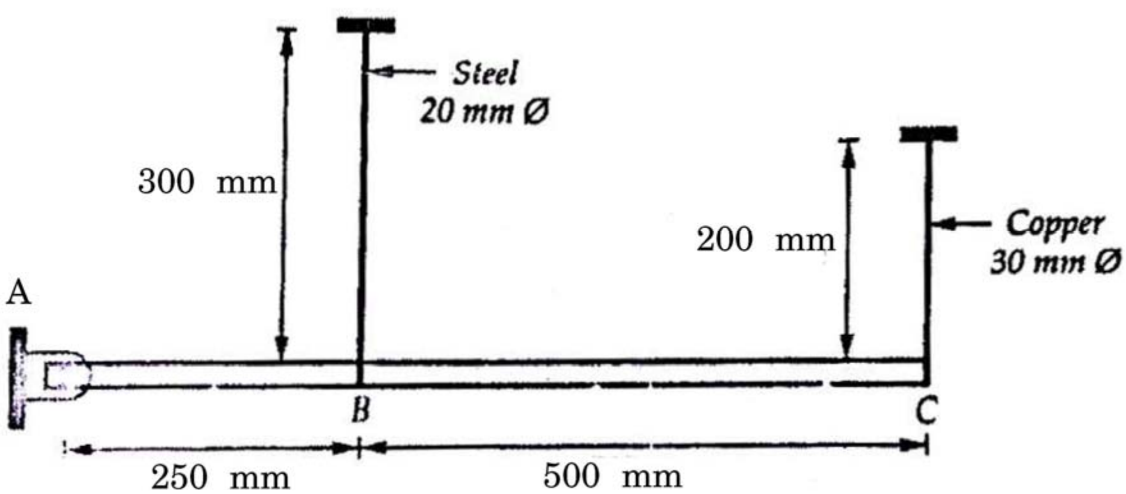


Fig. 1

P.T.O.

(*b*) Define Linear Stress, Poisson's Ratio, Modulus of rigidity, Factor of safety. [8]

*Or*

**2.** (*a*) Steel bar of cross-sectional area 400 $mm^2$ is surrounded by a copper tube, of area 200 $mm^2$ as shown in Fig. 2. The comosite structure carries a load W. If the maximum stress in steel and copper are not to exceed 120 MPa and 80 MPa repectively, determine the maximum load W that can be supported. $E_s$ = 200 GPa, $E_c$ = 100 GPa. [8]

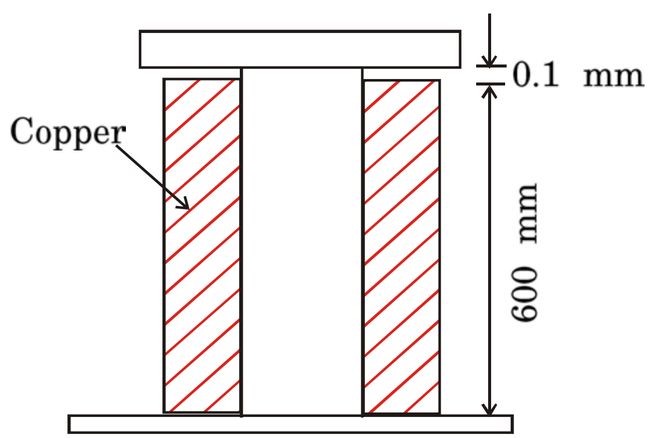


Fig. 2

(*b*) Derive the relationship between E, K and G. Also explain Margin of Safety. [8]

## Unit II

3. (*a*) Draw the shear force and bending moment diagram for the cantilever as shown in Fig. 3. [8]

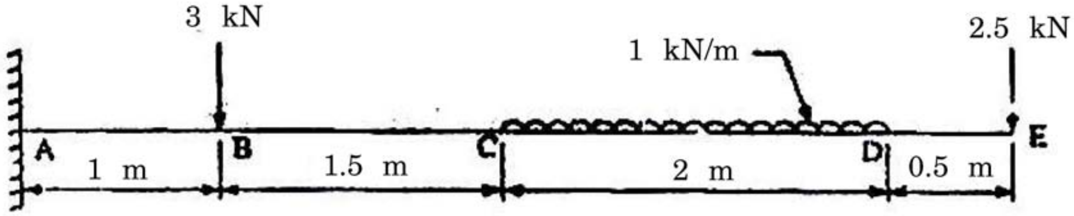


Fig. 3

(*b*) Draw the shear force and bending moment diagram for the beam as shown in Fig. 4. Also locate the point of contra-flexure if any. [10]

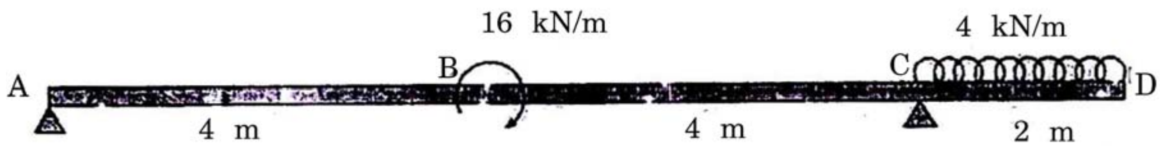


Fig. 4

*Or*

4. (*a*) Draw the shear force and bending moment diagram for the beam as shown in Fig. 5. Locate the point of contraflexure if any and also locate the maximum bending moment with its magnitude. [10]

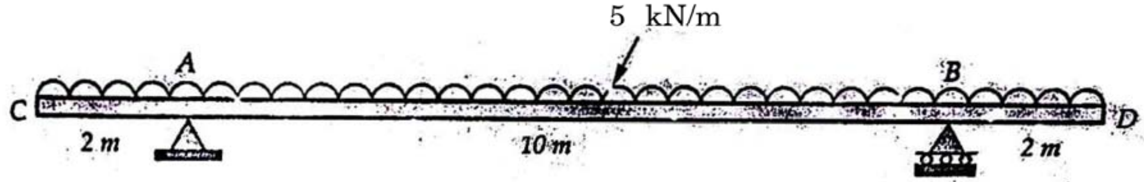


Fig. 5

(*b*) Draw the shear force and bending moment diagram for the beam as shown in Fig.6. Locate the point of contra-flexure if any and also locate the maximum bending moment with its magnitude. [8]

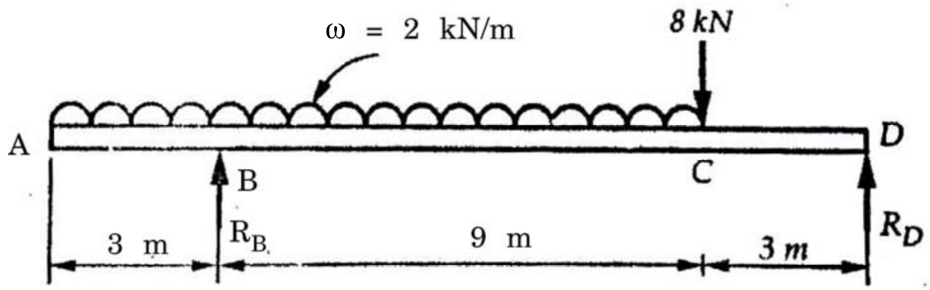


Fig. 6

## Unit III

**5.** (*a*) Derive the relationship for Shear stress intensity in beams i.e. $\tau$ = SAy/bI. Mention the assumptions taken. [8]

(*b*) Determine the maximum tensile and compressive bending stresses when the beam whose rectangular cross-section as shown in Fig. 7, is subjected to an *udl* of 2kN/m. Span of the beam is 3 m. Calculate for both : [8]

(*i*) Cantilever condition

(*ii*) Simply supported condition.

The beam resists bending moment about neutral horizontal axis.

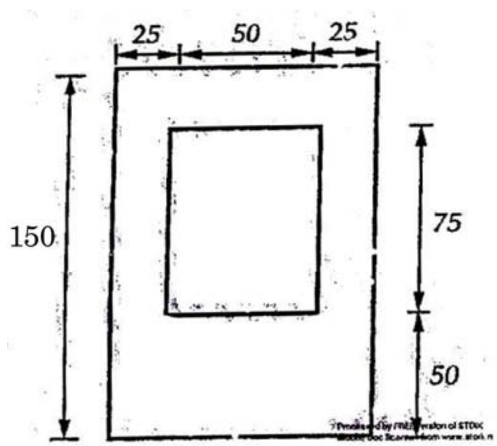


Fig. 7

*Or*

**6.** (*a*) For the section shown in Fig. 8. find the shear stresses at A,B,C,D for a shearing force of 200 kN and find the ratio of the maximum to mean shear stressses. [8]

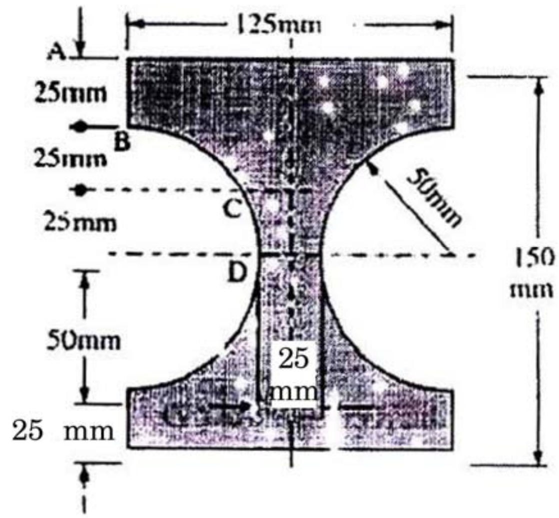


Fig. 8

(*b*) Derive the relationship : M/I = E/R = $\sigma/y$. Also state the assumptions made. [8]

## SECTION II

### Unit IV

**7.** (*a*) A hollow shaft having I.D. 60% of O.D. is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in the material, if the material to be used is also the same. [8]

(*b*) Derive the relationship for the crippling load for column with one end fixed and other end hinged (pinned). [8]

*Or*

**8.** (*a*) Derive the expression for the maximum torque transmitted by a hollow circular shaft. State clearly the assumptions made. [8]

(*b*) Detemine the crippling load for a timber section 15 cm × 20 cm having a length of 6 meters and both ends fixed, if the E for timber is 17.5 kN/mm$^2$. Also calculate the safe load for the same column if FOS is 3. [8]

## Unit V

**9.** (*a*) Write short notes on :

(1) Maximum shear stress theory [4]

(2) Maximum principal stress theory. [4]

(*b*) A load of 100 N falls through a height of 2 cm onto a collar rigidly attached to the lower end of a vertical bar 1.5 m long and of 1.5 cm$^2$ c/s area. The upper end of the vertical bar is fixed. Determine : [8]

(1) Max. instantaneous stress induced in the vertical bar

(2) Max. instantaneous elongation.

(3) Strain energy stored in the vertical bar.

*Or*

**10.** (*a*) A bolt is subjected to an axial pull of 9 kN and a transverse shear force of 4.5 kN. Determine the diameter of the bolt based on : [8]

(1) Max. Principal stress theory

(2) Max. Principal strain theory.

Assume elastic limit in simple tension as 225 N/mm$^2$ and Poisson's ratio = 0.3, with FOS = 3.

(*b*) The normal stress in two mutually perpendicular directions are 600 N/mm$^2$ and 300 N/mm$^2$ both tensile. The complementary shear stresses in these directions are 450 N/mm$^2$. Find the normal and the tangential stresses on the two planes which are equally inclined to the planes carrying the normal stresses mentioned above. [8]

**Unit VI**

**11.** (*a*) Derive the relationship for max. slope and deflection of a centilever beam with uniformly varying load from the fixed end. [8]

(*b*) Determine the slope and deflection at point C for the beam as shown below. Take E = 2 × 10$^5$ N/mm$^2$ and I = 5 × 10$^8$ mm$^4$. Use Maculay's method. [10]

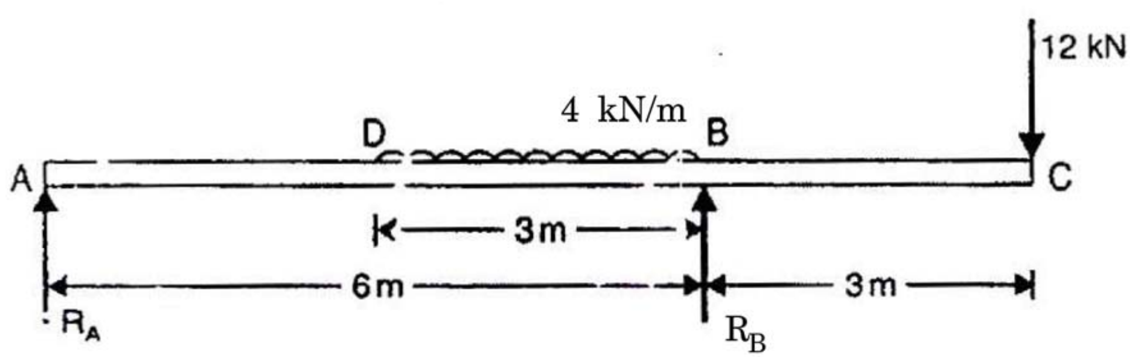


Fig. 9

*Or*

**12.** (*a*) Calculate the slope and deflections at the free end for the cantilever beam shown in figure below. Take E = $10^5$ N/mm$^2$ and I = $10^3$ mm$^4$. Use Maculay's method : [10]

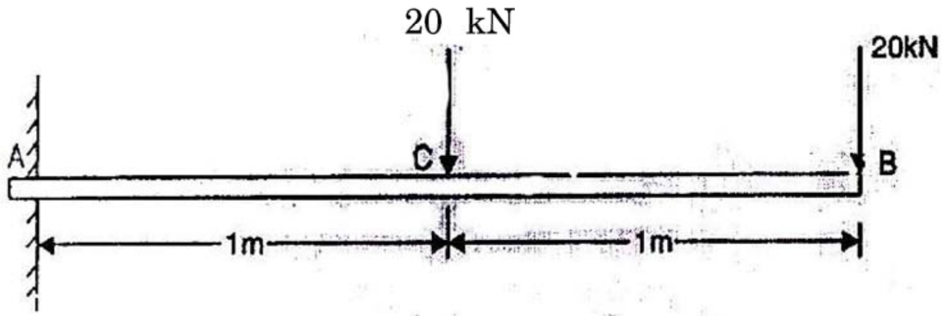


Fig. 10

(*b*) Derive the expression for the max. slope and max. deflection for a simply supported beam with UDL. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
|---|---|

# [4957]-183

## S.E. (Printing) (First Semester) EXAMINATION, 2016

## PRINTING DIGITAL ELECTRONICS

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer question Q. Nos. **1** *or* **2, 3** *or* **4, 5** *or* **6** from Section I and Q. Nos. **7** *or* **8, 9,** *or* **10, 11** *or* **12** from Section II.

(*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.** Perform the following conversions : [18]

(*a*) (456)10 to binary

(*b*) (126)8 to Decimal, Binary and Excess-3

(*c*) (AFB)16 to BCD, Binary, Excess-3.

*Or*

**2.** (*a*) Find the circuit to cenvert 4 bits binary numbers to 4 bits BCD codes. Write Truth table, K-Maps and circuit [10]

(*b*) Write short notes on : [8]

(*i*) Bar code and its applications

(*ii*) ASCII code.

**3.** (*a*) Implement using NOR-NOR logic : [8]

$$Y = AC + BC + AB + D.$$

(*b*) The functionality of a hand held machine is expressed as : [8]

$$f(A, B, C, D) = \Sigma m(8, 9, 10, 12, 13, 15) + d(1, 3, 4).$$

Minimize using k-map and draw the simplified diagram.

*Or*

**4.** (*a*) Compare TTL, CMOS, and ECL logic families on the basis of the following : [4]

(*i*) Propagation delay

(*ii*) Noise margin.

(*b*) Prove that : [12]

(*i*) $A. (\underline{B} + C) = (\underline{A}.B) + A.C$

(*ii*) $A + A.B + A.B = A+B$

(*iii*) $A + (B + C) = (A + B) + C.$

**5.** (*a*) Design a full adder using 2 half adders. [4]

(*b*) Design a half subtractor. [4]

(*c*) Design a logic circuit that has 3 inputs and one output. The output is high when the sum of all the bits in a number is 1. The output is low otherwise. [8]

*Or*

**6.** (*a*) Design a one bit comparator. [4]

(b) Perform the following : [12]

(i) $(111101)_2 - (100)_2$

(ii) Perform BCD addition and write your answer in BCD $(24)_{10} + (76)_{10}$

(iii) $(11100)_2/(110)_2$.

## SECTION II

**7.** (a) Explain clocked SR Flip-Flop with the help of truth table. Using SR flip flop Explain T flip flop [10]

(b) Design and explain mod 3 counter. Draw timing diagrams. [8]

*Or*

**8.** (a) Design and explain J-K flip flop. Write truth table. [10]

(b) Explain any one application of counter in printing. [8]

**9.** (a) What is DAC ? Explain the working of any one type of DAC with a neat diagram. [8]

(b) Explain Programmable logic array with example. [8]

*Or*

**10.** (a) Explain seven segment LED display. [8]

(b) What are memories ? State and explain various types of memories. [8]

**11.** (a) Applications of digital electronics in printing. [8]

(*b*) Write short notes on (any *two*) : [8]

(*i*) Joystick

(*ii*) Floppy Disk

(*iii*) Digital camera.

*Or*

**12.** Write short notes on (any *four*) : [16]

(*a*) Digital scanner

(*b*) Operation of mouse

(*c*) Input-Output devices of a computer

(*d*) Serial and Parallel ports.

(*e*) Keyboard.

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

| Seat No. | |
|---|---|

# [4957]-184

## S.E. (Printing) (I Sem.) EXAMINATION, 2016

## TECHNOLOGY OF PRINTING MATERIALS

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Assume suitable data, if necessary.

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

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

(*v*) Neat diagrams must be drawn wherever necessary.

(*vi*) Figures to the right indicate full marks.

## SECTION I

**1.** What is Polymerization ? Explain the use of polymers in the printing industry. [16]

*Or*

What is Photopolymer ? Explain the use of the same in printing. [16]

**2.** Explain the procedure of processing of the photographic films to obtain negative or positive. [16]

*Or*

Explain the procedure of manufacturing the silver halide film. [16]

3. Explain the basic printing principles with diagram. [18]

*Or*

Explain the major components of printing ink with suitable examples. [18]

## SECTION II

4. Explain any *four* End use properties of the ink. [16]

*Or*

Explain the method of measuring the viscosity of liquid inks. [16]

5. Draw a neat diagram of multivat cylinder mould machine for the production of duplex board. [16]

*Or*

Comment on any *two* : [16]

(*i*) Chemical pulp

(*ii*) Mechanical pulp

(*iii*) Soda pulp

(*iv*) Sulphate pulp.

6. State the importance of any *two* of the following properties of paper in the printing industry : [18]

(*i*) Density

(*ii*) Tensile strength

(*iii*) Moisture content

(*iv*) Opacity.

*Or*

State the importance of any *two* of the following in the printing industry : [18]

(*i*) BIS Standards

(*ii*) Grain Direction

(*iii*) Recycles Paper

(*iv*) Coated paper.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-185

**S.E. (Printing) (Second Semester) EXAMINATION, 2016**

**ELECTRICAL MACHINES AND UTILIZATION**

**(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 must 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*) Draw cross-sectional view of a DC machine. Mention major parts of it and their functions. [8]

(*b*) Draw and explain the characteristic curves of DC shunt motor and DC series motor. [8]

*Or*

**2.** (*a*) What is principle of operation of a DC generator ? Derive an expression for emf induced in a DC generator. [8]

(*b*) A 230 V, 4 pole lap wound DC shunt motor takes no-load current of 4 A when running at 1200 r.p.m. The resistance of armature winding is 0.1 Ω 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. [8]

**3.** (*a*) Derive the expression for torque developed in an induction motor under running conditions. Hence obtain the condition for maximum torque. [8]

(*b*) Explain the construction and working of a shaded pole induction motor with the help of neat sketches. Enlist its applications. [6]

*Or*

**4.** (*a*) Compare squirrel cage and slip ring induction motors taking into account their constructional details, performance, cost, maintenance and applications. [8]

(*b*) The power input to a 3-phase induction motor is 40 kW. The stator losses are 1 kW and the friction and windage losses are 2 KW. If the slip of the motor is 4%, find (*i*) the mechanical power output (*ii*) the rotor copper loss per phase and (*iii*) the efficiency of motor. [8]

**5.** (*a*) What is a drive ? Elaborate features of individual and group drives. State merits offered by electrical drives. [8]

(*b*) Discuss selection of electrical motors taking into consideration various types of machineries and their load characteristics found in printing industries. [10]

*Or*

**6.** (*a*) What is a universal motor ? Explain construction and working of universal motor with the help of neat diagram. Enlist its applications. [8]

(*b*) Write short notes on : [10]

(*i*) Stepper motor

(*ii*) Servo motor.

## Section II

**7.** (*a*) Derive the equation for Active power with two wattmeter method for 3 phase balanced load. Also draw a neat circuit and phasor diagram with advantages and disadvantages. [8]

(*b*) Two wattmeter are connected to measure the input power in balanced 3 ph load gives 500W and 200W respectively. Find the Active power, Reactive power and Power factor (1) when both readings are positive and (2) when $W_2$ reading is obtained after reversing the connection of current coil or pressure coil. [10]

*Or*

**8.** (*a*) Derive the equation for Reactive power with one wattmeter method for 3-phase balanced load. Also draw a neat circuit and phasor diagram. [8]

(*b*) Explain in detail micro switches, contactors and Limit Switches. [10]

**9.** (*a*) State the advantages of electric heating. [8]

(*b*) A 21 kW, 1 ph, 220V resistance oven is to employ circular Ni wire for its heating element. If wire temperature is not to exceed 1170ºC and temperature of charge is to be 400°C, calculate '*d*' and '*l*' of wire. Take $k = 0.57$, $e = 0.95$ and $\rho = 1.09\ \mu\Omega m$. What would be the temperature of element when charge is cold. [10]

*Or*

**10.** (*a*) Explain Direct Arc Heating with a neat diagram. [8]

(*b*) Explain with neat diagram Ajax Watt Furnace. [10]

**11.** (*a*) Define the following terms of illumination : [8]

(*i*) Luminous flux

(*ii*) Illumination

(*iii*) Coefficient of Utilization

(*iv*) Maintenace factor.

(*b*) Explain different methods of energy conservation and its application in printing industry. [8]

*Or*

**12.** (*a*) Explain in detail flood lighting scheme. [8]

(*b*) Write a short note on safety and maintenance of printing industry. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
|---|---|

# [4957]-188

## S.E. (Printing) (Second Semester) EXAMINATION, 2016
## MICROPROCESSOR AND MICROCONTROLLER TECHNIQUES IN PRINTING
## (2008 COURSE)

**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*) 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*) Differentiate between the following : [8]

(*i*) I/O mapped I/O and memory mapped I/O

(*ii*) Software and hardware interrupts.

(*b*) Explain the flag register of 8085 in detail. [8]

*Or*

**2.** (*a*) Draw and explain the block diagram of 8085 in detail. [10]

(*b*) Explain the following pins of 8085 microprocessor. [6]

(*i*) ALE

(*ii*) HLDA

(*iii*) HOLD.

3. (a) Explain unconditional jump and different conditional jump instructions in 8085. [10]

(b) Explain various addressing modes of 8085 with proper examples. [8]

*Or*

4. (a) Explain what operation will take place when the following instructions are executed ? [12]

(i) STAX D

(ii) LAXI H

(iii) RAL

(iv) MVI, A 40h

(v) ORI 20

(vi) ADD C.

(b) Draw and explain the timing diagram for the instruction MVI A, 32. [6]

5. (a) Draw pin diagram of 8051 microcontroller and explain different pins in detail. [10]

(b) Explain SCON (Serial port control register) in 8051 microronctroller. [6]

*Or*

6. (a) Explain memory organization in 8051 microcontroller. [10]

(b) Explain program status word (PSW) in 8051 microcontroller. [6]

## SECTION II

**7.** (*a*) Explain different addressing modes in 8051 microcontroller. [10]

(*b*) Explain the following instructions in 8051 : [6]

(*i*) DA A

(*ii*) ADDC A, # 12.

*Or*

**8.** (*a*) Explain the following instructions in 8051 : [8]

(*i*) MOV A, Rn

(*ii*) MUL AB

(*iii*) DIV AB

(*iv*) SWAP A

(*v*) ADD A, @ Rn

(*vi*) MOV A, data

(*vii*) MOV A, @ A+DPTR

(*vii*) CLR A.

(*b*) Write short notes on : [8]

(*i*) RS 232

(*ii*) IEEE 488.

**9.** (*a*) Explain control word in 8255 programmable peripheral interface. Explain model in 8255. [10]

(*b*) Draw and explain block diagram of IC 8251 (Programmable communication interface). [8]

*Or*

**10.** (*a*) Explain control word for 8253 programmable timer controller. [6]

(*b*) Explain different priority modes in 8259 programmable interrupt controller. [6]

(*c*) Explain mode 2 of 8253 programmable interval timer in detail. [6]

**11.** (*a*) Explain concept of PLC. [8]

(*b*) Explain printer interfacing with 8085. [8]

*Or*

**12.** (*a*) Explain application of microprocessor in field of printing in detail. [8]

(*b*) Write program for stepper motor interface with 8085 microprocessor. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

| Seat No. | |
|---|---|

# [4957]-189

## S.E. (Printing) (Second Semester) EXAMINATION, 2016
## THEORY OF PRINTING MACHINES
## (2008 PATTERN)

**Time : Four Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two sections should be written in separate 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
## UNIT-I

**1.** (*a*) Explain Geneva Mechanism with neat sketch. [8]

(*b*) State the inversions of single slider crank chain. Explain any *two*. [8]

*Or*

**2.** (*a*) Explain Ratchet and pawl arrangement with a neat sketch. [8]

(*b*) Define and state *one* application of the following :

(*i*) Kinematic link

(*ii*) Kinematic pair

(*iii*) Kinematic chain

(*iv*) Machine [8]

## UNIT-II

**3.** Fig. I shows configuration of an engine mechanism. The dimensions are the following :

Crank OA = 200 mm, connecting rod AB=600 mm, distance of center of mass from crank end, AD=200 mm. At the instant, crank has an angular velocity 50 rad/s clockwise and an angular acceleration of 800 rad/$s^2$. Calculate the :

(*i*) Velocity of D and angular velocity of AB

(*ii*) Acceleration of D and angular acceleration of AB [16]

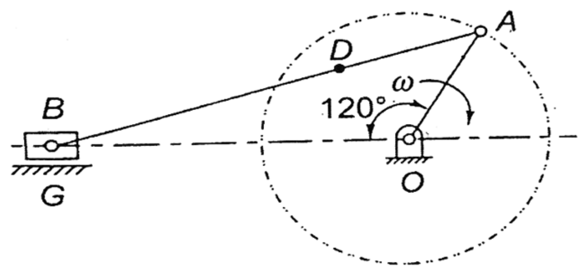


Fig. 1

*Or*

**4.** In a toggle mechanism shown in Fig. 2, the crank OA rotates at 210 rpm counter-clockwise increasing at the rate of 60 rad/$s^2$. For the given configuration, determine :

(*i*) Velocity of slider D and the angular velocity of the link BD.

(*ii*) Acceleration of slider D and the angular acceleration of link BD. [16]

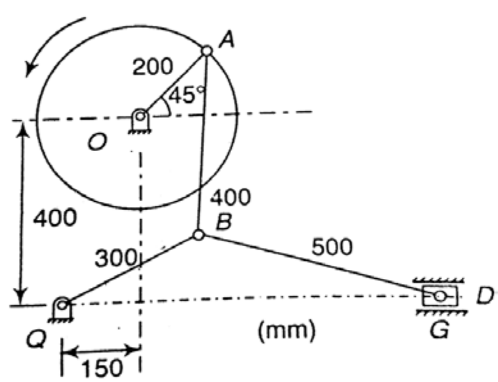


Fig. 2

## UNIT-III

**5.** In the mechanism shown in Fig. 3 OA = 400 mm, OP=200 mm, AR=700 mm, RS=300 mm for the configuration shown, determine the acceleration of the cutting tool at S and the angular acceleration of the link RS. The crank OP rotates at 210 rpm. [18]

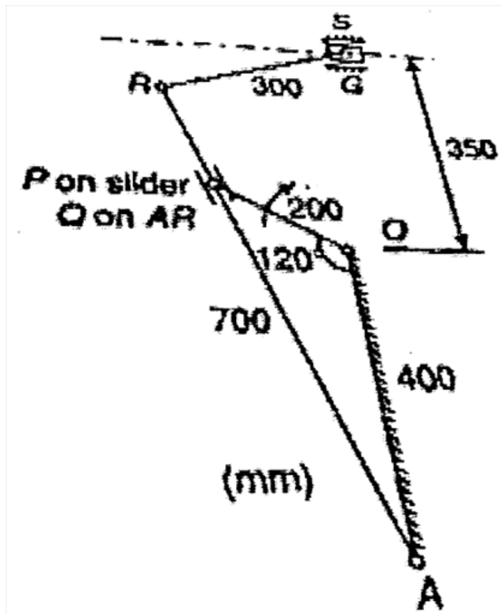


Fig. 3

*Or*

**6.** (*a*) What is the Coriolis acceleration component ? How is it determined ? [4]

(*b*) A Whitworth quick-retun mechanism has been shown in the Fig. 4. The dimensions of the link are OP (crank) = 240 mm, OA = 150 mm, AR = 165 mm and RS = 430 mm. The crank OP has an angular velocity of 2.5 rad/s and angular deceleration of 20 rad/$s^2$ at the instant.

Determine the :

(*i*) Acceleration of the slider S

(*ii*) Angular acceleration of the links AR and RS. [14]

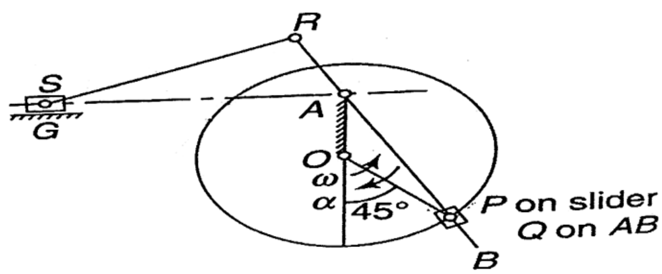


Fig. 4

## SECTION II

## UNIT-IV

**7.** (*a*) A single-plate clutch transmits 25 kW at 900 rpm. The maximum pressure intensity between the plates is 85 kN/$m^2$. The outer diameter of the plate is 360 mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine the : [8]

(*i*) Inner diameter of the plate

(*ii*) Axial force to engage the clutch

(*b*) Explain the principle with appropriate sketch : [8]

(*i*) Hydrodynamic lubrication

(*ii*) Hydrostatic lubrication

*Or*

**8.** (*a*) Explain the working of the multi-plate clutch with the neat sketch and also state its application. [8]

(*b*) Derive the expression for the torque transmitting capacity of cone clutch with uniform wear and pressure theory as well. [8]

## UNIT-V

**9.** (*a*) What do you understand by self-locking of the brakes ? [6]

(*b*) A differential band brake has a drum with a diameter of 800 mm. The two ends of the band are fixed to the pins on the opposite sides of the fulcrum of the lever at distances of 40 mm and 200 mm from the fulcrum. The angle of contact is 270 degree and the coefficient of friction is 0.2. Determine the brake torque when a force of 600 N is applied to the lever at a distance of 800 mm from the fulcrum. [10]

*Or*

**10.** (*a*) Derive the expression for the ratio of tensions on tight and the slack sides of band and block brake ? [8]

(*b*) A band and block type of brake having 14 blocks each of which subtends an angle of 14º at the drum center, is applied to a rotating drum of diameter of 750 mm, the blocks are 65 mm thick. The two ends of the band are fixed to the pins on the lever at distances of 50 mm and 210 mm from the fulcrum on the opposite sides. Determine the least force required to be applied at the lever at distances of 600 mm from the fulcrum if the power absorbed by the blocks is 180 kW at 175 rpm, coefficient of friction between the blocks and the drum is 0.35. [8]

## UNIT-VI

**11.** (a) Derive the expression of limiting tension ratio for the V- belt drive. [8]

(*b*) Derive the expression for the maximum power transmission for the belt drive. [8]

(*c*) Define for V-belt :

(*i*) Pitch width

(*ii*) Pitch length [2]

*Or*

**12.** (*a*) Derive expression for the length of flat cross belt drive. [8]

(*b*) In an open belt drive, the diameters of the larger and the smaller pulleys are 1200 mm and 800 mm respectively. The smaller pulley rotates at 320 rpm. The center distance between the shafts is 4000 mm. When stationary, the initial tension in the belt is 2.8 kN. The mass of the belt is 1.8 kg/m and the coefficient of friction belt and the pulley is 0.25. Determine the power transmitted. [8]

(*c*) State the law of belting. [2]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

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# [4957]-191

**S.E. (Biotech./Chemical/Printing/Poly/Petroleum/Petrochem)**

**(I Sem.) EXAMINATION, 2016**

**ENGINEERING MATHEMATICS—III**

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

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic calculator is allowed.

(*v*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Solve the following (any *three*) : [12]

(*i*) $(D^3 + 1) y = \sin (2x - 1)$

(*ii*) $(D^2 + 3D + 2) y = \cos e^x$

(*iii*) $(D^2 - 2D + 5) y = x^2$

(*iv*) $(D^2 + 1)\, y = \operatorname{cosec} x$ (by method of variation of parameters)

(*v*) $x^2 \dfrac{d^2 y}{dx^2} - 4x \dfrac{dy}{dx} + 6y = x^5.$

(*b*) Solve : [5]

$$\frac{dx}{1} = \frac{dy}{1} = \frac{dz}{(x + y)\,(e^{xy} + \sin xy)}.$$

*Or*

**2.** (*a*) Solve the following (any *three*) : [12]

(*i*) $(D^2 - 4D + 4)\, y = \cos 2x$

(*ii*) $(D^4 - 4D^3 + 6D^2 - 4D + 1)\, y = e^{2x} + 2^x$

(*iii*) $(D^2 - 4)\, y = x \sinh x$

(*iv*) $(D^2 + 4)\, y = \sec 2x$ (by method of variation of parameters)

(*v*) $(x + 1)^2 \dfrac{d^2 y}{dx^2} + (x + 1) \dfrac{dy}{dx} + y = 4 \cos [\log(x + 1)]$

(*b*) Solve : [5]

$$\frac{dx}{dt} + y = \sin t,$$

$$\frac{dy}{dt} + x = \cos t.$$

**3.** (*a*) A body of weight W = 3 N stretches a spring to 15 cm. If the weight is pulled down 10 cm below the equilibrium position and then given a downward velocity 60 cm/sec, determine the amplitude, period and frequency of motion. [8]

(b) Solve [8]

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

subject to the conditions :

(i) $u$ is finite for all $t$

(ii) $u(0, t) = 0$

(iii) $u(l, t) = 0$

(iv) $u(x, 0) = x^2, 0 \leq x \leq l$.

*Or*

4. (a) A flexible string of length $\pi$ is tightly stretched between $x = 0$, $x = \pi$, on $x$-axis, its ends being fixed at these points. When set into small transverse vibration, the displacement $y(x, t)$ from $x$-axis of any point $x$ at time $t$ is given by :

$$\frac{\partial^2 y}{\partial t^2} = 4 \frac{\partial^2 y}{\partial x^2}.$$

Find the solution of the equation which satisfies :

(i) $y(0, t) = 0$

(ii) $y(\pi, t) = 0$

(iii) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$

(iv) $y(x, 0) = \sin x$. [8]

(*b*) In a heat exchange, the temperatures $u$ and $v$ of two liquids, satisfy the equations : [8]

$$4\frac{du}{dx} = v - u = 2\frac{dv}{dx}.$$

Determine $u$ and $v$, given that $u = 20$, $v = 100$ when $x = 0$.

**5.** (*a*) By considering Fourier cosine integral of $e^{-mx}$ $(m > 0)$, prove that : [5]

$$\int_0^\infty \frac{\cos \lambda x}{\lambda^2 + m^2}\, d\lambda = \frac{\pi}{2m} e^{-mx}, \quad m > 0,\ x > 0.$$

(*b*) Solve the integral equation : [5]

$$\int_0^\infty f(x) \sin \lambda x \, dx = \begin{cases} 1, & 0 \le \lambda < 1 \\ 2, & 1 \le \lambda < 2 \\ 0, & \lambda \ge 2 \end{cases}$$

(*c*) Using Fourier cosine transform, solve the equation : [7]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \infty,\ t > 0$$

where $u(x, t)$ satisfies the conditions :

(*i*) $\left(\frac{\partial u}{\partial x}\right)_{x=0} = 0, \quad t > 0$

(*ii*) $u(x, 0) = \begin{cases} x, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$

(*iii*) $|u(x, t)| < M.$

*Or*

**6.** (*a*) Find the Fourier sine integral representation for the function : [5]

$$f(x) = \begin{cases} x^2, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$$

(*b*) Find the Fourier cosine transform of the function : [5]

$$f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$$

(*c*) Find the Fourier sine transform of : [7]

$$f(x) = \begin{cases} 1, & 0 \le x \le 1 \\ 0, & x > 1 \end{cases}$$

and hence evaluate :

$$\int_0^\infty \frac{\sin^3 x}{x}\, dx.$$

## SECTION II

**7.** (*a*) Obtain Laplace transform (any *three*) : [12]

(*i*) $\dfrac{\cos 2t - \cos 3t}{t}$

(*ii*) $\displaystyle\int_0^t \frac{e^t - \cos 2t}{t}\, dt$

(*iii*) $e^{-4t}[\cos 3t + 6 \sin 2t]$

(*iv*) $\sin t\ U(t - 4) + te^{-2t}\ \delta(t - 2)$.

(*b*) Using Laplace transform evaluate : [4]

$$\int_0^{\infty} \frac{\cos 6t - \cos 4t}{t}\, dt.$$

*Or*

**8.** (*a*) Obtain Inverse Laplace transform (any *three*) : [12]

(*i*) $\log\left(1 + \frac{1}{s^2}\right)$

(*ii*) $\frac{1}{(s+3)(s^2+3s+2)}$

(*iii*) $\frac{e^{-4s}}{(s^2+9)}$

(*iv*) $\frac{1}{s(s^2+4)}$.

(*b*) Use convolution theorem to find the inverse Laplace transform of : [4]

$$\frac{s}{(s^2+a^2)(s+1)}.$$

**9.** (*a*) Find the directional derivative of $\phi = e^{2x - y - z}$ at point (1, 1, 1) in direction of vector $2\overline{i} + \overline{j} - 3\overline{k}$. [6]

(*b*) Prove that :

$\overline{F} = (y \sin z - \sin x)\overline{i} + (x \sin z + 2yz)\overline{j} + (xy \cos z + y^2)\overline{k}$

is irrotational and find scalar field $\phi$ such that $\overline{F} = \nabla\phi$. [6]

(*c*) Evaluate :

$$\iint_S \left(\nabla \times \overline{F}\right) \cdot d\overline{s},$$

where :

$$\overline{F} = (x - y)\overline{i} + \left(x^2 + y^2\right)\overline{j} - 3xy^2\overline{k}$$

and S is surface of cone $z = 4 - \sqrt{x^2 + y^2}$ above X o Y plane. [6]

*Or*

**10.** (*a*) Show that (any *two*) : [6]

(*i*) $\nabla \cdot \left[r\nabla\left(\frac{1}{r^n}\right)\right] = \frac{n(n-2)}{r^{n+1}}$

(*ii*) $\nabla^2\left(r^2 \log r\right) = 5 + 6 \log r$

(*iii*) $\nabla \cdot \left(\frac{\overline{a} \times \overline{r}}{r}\right) = 0.$

(*b*) Evaluate :

$$\int_C \overline{F} \cdot d\overline{r}$$

where :

$$\overline{F} = \left(2xy + 3z^2\right)\overline{i} + \left(x^2 + 4yz\right)\overline{j} + \left(2y^2 + 6xz\right)\overline{k}$$

and C is curve joining points (0, 0, 0) and (1, 1, 1). [6]

(*c*) By using Gauss divergence theorem evaluate :

$$\iint_S \overline{F} \cdot d\overline{s}$$

where :

$$\overline{F} = x\overline{i} + y\overline{j} + z^2\overline{k}$$

over a cylindrical region bounded by $x^2 + y^2 = 4$ and $z = 0$, $z = 2$. [6]

**11.** (*a*) Solve :

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t}, \quad y(0) = 0, \; y'(0) = 1,$$

using Laplace transform. [5]

(*b*) The velocity potential of fluid motion is given by $\phi = \log(xyz)$, find equations of streamlines. [5]

(*c*) The transfer function of second order system is given by :

$$G(s) = \frac{20}{4s^2 + 0.6s + 1},$$

find overshoot, period of oscillation and $y(t)_{\max}$. [6]

*Or*

**12.** (*a*) Solve :

$$\frac{dy}{dt} + 2y(t) + \int_0^t y(t)\, dt = \sin t, \quad y(0) = 1$$

using Laplace transform. [5]

(*b*) Velocity distribution for a fluid is given by $u = -x$, $v = 2xy$, $w = 3 - z$. Determine equation of streamlines. [5]

(*c*) Determine steady state value of H in liquid level when flow rate Q($t$) changes according to a unit step change. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

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# [4957]-192

## S.E. (Chemical) (First Semester) EXAMINATION, 2016

## CHEMISTRY-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-book.

(*iii*) Neat labelled diagrams msut be drawn wherever necessary.

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

(*v*) Assume suitable data if necessary.

## SECTION I

**1.** (*a*) Draw and describe molecular orbital diagram and find the bond order for comolecule. [6]

(*b*) Which of the following compounds are aromatic and why ? [6]

(*i*) Naphthalene

(*ii*) Furan.

(*c*) Explain the structure and stability of free radical. [4]

*Or*

2. (*a*) What is the effect of resonance and inductive effect on Pka values of acids and bases. [6]

(*b*) Give reasons for the following :

(*i*) Aniline is a weaker base than aliphatic amines. [6]

(*ii*) *p*-methoxy phenol is weaker acid than phenol.

(*c*) Discuss the delocalisation phenomena in 1, 3-butadiene. [4]

3. (*a*) Give the mechanism of nitration of benzene. [6]

(*b*) Explain why $SO_3H$ group acts as meta director and deactivating. [6]

(*c*) Write a short note on Claisen rearrangement. [4]

*Or*

4. (*a*) Explain why alkenes undergo addition reaction whereas benzene undergoes electrophilic substitution reaction. [6]

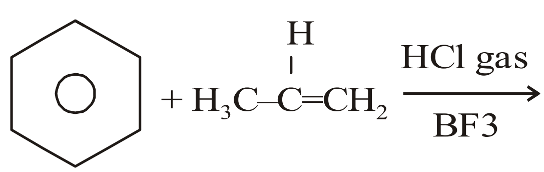
(*b*) Give the mechanism of E1 and E2 elimination. [6]

(*c*) Predict the product : [4]

(*i*)


(*ii*)


(*iii*)



(*iv*) $\begin{array}{c} CH_3 \\ | \\ H_3C\text{—}C\text{—}OH \\ | \\ CH_3 \end{array} \xrightarrow{20\%\, H_2SO_4}$

**5.** (*a*) Describe the method for conductance measurement. Explain their advantages. [6]

(*b*) Explain the principle and instrumentation in flame photometry. [6]

(*c*) Explain Kohlrousch's law of independent migration of ions. Mention its applications. [6]

*Or*

**6.** (*a*) What is an ion selective electrode ? Explain construction and application of glass electrode. [6]

(*b*) Describe the titration curves in conductometric titration for the following : [6]

(*i*) Strong acid with strong base.

(*ii*) Weak acid with strong base.

(*c*) Write a short note on Redox titration. [6]

## SECTION II

**7.** (*a*) Derive an integrated rate equation for first order reaction and give its characteristics. [6]

(*b*) Explain the activated complex theory. [6]

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

(*i*) Molecularity of reaction

(*ii*) Zero order reaction

*Or*

8. (*a*) Derive Arrhenius equation and explain energy of activation. How is it calculated graphically ? [6]

(*b*) Derive integrator rate equation for second order kinetics with same initial concentration. [6]

(*c*) Quantum efficiency of photochemical reaction between $H_2$ and $Cl_2$ is $10^5$, with wavelength of 4800 A°. Calculate the number of moles of HCl formed from 1 Joule of the energy. [4]

9. (*a*) Give the instrumentation of high performance liquid chromatography. [6]

(*b*) Explain construction, working and application of $H_2$-$O_2$ fuel cell. [6]

(*c*) Explain application of gas chromatography. [4]

*Or*

10. (*a*) Explain in detail the principles, technique and application of TLC. [6]

(*b*) Write a note on PEMFC. [6]

(*c*) Explain thermal conductivity detector with suitable diagram. [4]

11. (*a*) Explain classification of dyes on the basis of mode of application. [6]

(*b*) Explain any *two* methods of synthesis of : [6]

(1) Furan

(2) Pyrrole.

(*c*) Write a note on Skraup synthesis of quinoline. [6]

*Or*

**12.** (*a*) Describe the method of synthesis for the following dyes :

(*i*) Alizarin

(*ii*) Crystal violet. [6]

(*b*) Explain diazotization reaction and application in the synthesis of azo dyes. [6]

(*c*) Draw orbital picture of pyrrole, furan and pyridine. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

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**[4957]-193**

**S.E. (Chemical) (I Sem.) EXAMINATION, 2016**

**CHEMICAL ENGINEERING FLUID MECHANICS**

**(2008 PATTERN)**

**Time : Three Hours** **Maximum Marks : 100**

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

(*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-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*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*) Discuss the following : [06]

(*i*) Rotational and irrotational flow.

(*ii*) Streak line and path line

(*iii*) Laminar and turbulent flow.

(*b*) What is difference between dynamic viscosity and kinetic viscosity ? State their units of measurement. [06]

(*c*) Define density and specific weight, specific volume, and specific gravity. [06]

*Or*

**2.** (*a*) Define the terms : [06]

(*i*) Surface tension

(*ii*) Capillarity

(*iii*) Vapour pressure.

(*b*) What is fluid ? How are fluids classified ? [06]

(*c*) Find the kinematic viscosity of an oil having density 981 $kg/m^3$. The shear stress at a point in a oil is 0.2452 $N/m^2$ and velocity qradient at that point is 0.2 per second. [06]

**3.** (*a*) Derive an expression for the pressure difference across two limbs of a differential manometer, containing two guage fluids, mutually immiscible. [08]

(*b*) Express pressure intensity of 500 mm of water column into : [08]

(*i*) Height of liquid of density 600 $kg/m^3$.

(*ii*) Oil of specific weight 8 $kN/m^3$.

*Or*

4. (*a*) State desirable properties of a good manometric fluid along with their examples. [08]

   (*b*) Explain with neat sketch, the working of an Inclined single column manometer. [08]

5. (*a*) Show that for the laminar flow of incompressible fluid flowing through a circular pipe.

$$f = \frac{16}{\text{Re}}$$

   where, $f$ is friction factor and Re is Reynolds' Number. [08]

   (*b*) For laminar flow through circular pipe, prove that the mean velocity is half the maximum velocity. [08]

*Or*

6. (*a*) Derive Hagen-Poiseuille equation, highlighting the assumption made. [08]

   (*b*) Write short notes on (any *two*) : [08]

   (*i*) Friction loss due to sudden enlargement.

   (*ii*) Friction loss due to sudden contraction.

   (*iii*) Friction loss due to pipe fittings and valves.

## SECTION II

7. (*a*) Derive the expression for the following : [10]

    (*i*) Displacement thickness

    (*ii*) Momentum thickness.

   (*b*) Describe the Rayleigh method of dimensional analysis. [08]

*Or*

8. (*a*) With suitable examples describe in detail the method of dimensional analysis using Buckingham's $\pi$ theorem. [10]

   (*b*) Explain in detail the concept of Drag and Drag coefficient. [08]

9. (*a*) Derive relations for Reynolds number and friction factor and establish the Ergun equation for single-phase flow of fluid through packed bed. [08]

   (*b*) Explain different types of fluidization. [08]

*Or*

10. (*a*) Differentiate between loading and flooding. How will you estimate the flooding velocity in a packed tower. [08]

    (*b*) For Stokes' law region show that : [08]

$$C_D = \frac{24}{N\,Re}$$

**11.** (*a*) Draw a neat sketch and explain the working of rotameter. [08]

(*b*) A venturimeter is used to measure flow rate of water. Calculate the flow rate of water in lit/sec, if mercury manometer reads 18 cm. The pipe diameter is 75 mm while throat diameter is 25 mm. Take coefficient of venturimeter = 0.97 and specific gravity of mercury is 13.6.

*Or*

**12.** (*a*) Draw and explain working principle and characteristics of centrifugal pump. [08]

(*b*) What are the different types of values ? Write its specific applications. [08]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-194

## S.E. (Chemical) (First Semester) EXAMINATION, 2016
## CHEMICAL ENGINEERING MATERIALS
## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Answer *three* questions from Section I and *three* questions from Section II.

(*iii*) Answer to the two Sections should be writen in separate-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right side indicate full marks.

(*vi*) Use of logarithmic tables slide rules, Mollier charts, electronic pocekt calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Define Poissons ratio and its applications. [3]

(*b*) Define the following terms : [8]

(*i*) Malleability

(*ii*) Ductility

(*iii*) Resilience

(*iv*) Toughness

(*c*) Draw stress-strain curve showing elastic and plastic limit of metal. [5]

P.T.O.

*Or*

2. (*a*) Write the classification of Engineering materials. [3]

(*b*) Explain necking in brief. [4]

(*c*) Define factor of safety and give its applications. [6]

(*d*) Define the term Hardness. [3]

3. (*a*) Write a short note on Brinell Hardness test. [6]

(*b*) Explain Impact test in detail. [10]

*Or*

4. (*a*) Write a short note on Brinell hardness test. [6]

(*b*) Explain Rockwell Hardness of materials. Draw a neat sketch. [10]

5. (*a*) Draw Iron-Iron carbide equilibrium diagram. [6]

(*b*) Explain various phases observed in Iron-Iron carbide equilibrium diagram. [6]

(*c*) Explain different reaction involved in Iron-Iron carbide equilibrium diagram. [6]

*Or*

6. Write short on (any *three*) : [18]

(*i*) Insulations

(*ii*) Refractories

(*iii*) Types of steels

(*iv*) Methods of welding

(*v*) Bending

(*vi*) Rolling.

## SECTION II

**7.** (*a*) Explain the different methods of prevention of corrosion. [12]

(*b*) Write a short not on dry corrosion. [4]

*Or*

**8.** (*a*) Find out the nature of film when chromium oxides to chromium oxide. The atomic weight of chromium and oxygen is 52 and 16 respectively. Density of chromium and chromium oxide is 7.2 gm/cm$^3$ and 10.28 gm/cm$^3$. [6]

(*b*) What is an oxide film ? Explain its formation and growth mechanism. [10]

**9.** Write short notes on : [16]

(*i*) Vulcanization of rubber

(*ii*) Nylon-6

(*iii*) Application of Teflon

(*iv*) Stress relaxation.

*Or*

**10.** (*a*) Define polymerization. Explain addition and condensation polymerization. [10]

(*b*) Define vulcanization of rubber. [6]

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

(*i*) Process of vitrification

(*ii*) Application of ceramic materials.

(*b*) Explain the different mechanical properties of ceramics. [10]

*Or*

**12.** Explain the following: [18]

(*a*) Refractories

(*b*) Glass and its types in detail.

(*c*) Applications of ceramics and Glasses in chemical industries.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

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# [4957]-195

## S.E. (Chemical) (First Semester) EXAMINATION, 2016

## PROCESS CALCULATIONS

## (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*) The strength of an aqueous soda ash solution is given as 12% $Na_2O$ by weight. Express the composition in weight percent of soda ash. [6]

(*b*) Partial pressure of $O_2$ and $H_2$ in a mixture of gases is 33 kPa and 67 kPa respectively, at 303 K. Calculate the mass fraction of the two. [5]

(*c*) A closed vessel contains a mixture of 40% $NO_2$ and 60% $N_2O_4$ at a temperature of 311 K and a pressure of 531.96 kPa. When the temperature is increased to 333 K some of the $N_2O_4$ dissociates to $NO_2$ and the pressure rises to 679.95 kPa. Calculate the composition of the gases at 333 K. [7]

*Or*

**2.** (*a*) 2000 ml solution of strength 0.5 N $H_2SO_4$ is to be prepared by adding 98% $H_2SO_4$ (Sp. Gr. 1.84) to water. Calculate the volume of 98% $H_2SO_4$ to be added. [6]

(*b*) A producer gas has the following by volume : CO = 21%, $CO_2$ = 5%, $O_2$ = 3% and rest $N_2$. Calculate the volume of gas in $m^3$ at 298 K and 99.325 kPa per kg carbon present. [8]

(*c*) Define molarity and normality. [4]

**3.** (*a*) A single effect evaporator is fed with 10000 kg/h of weak liquor containing 15% caustic by weight and is concentrated to get thick liquor containing 40% caustic soda by weight. Calculate the rate of evaporation and product rate. [8]

(*b*) Groundnut seeds containing 45% oil and 45% solids are fed to an extractor. The cake leaving the extractor is found to contain 80% solids and 5% oil. Find the percentage recovery of oil. [8]

*Or*

**4.** (*a*) A sample of coal is found to contain 63% carbon and 24% ash on weight basis. The analysis of the refuse after combustion shows 7% Carbon and rest ash. Calculate the percentage of carbon remaining unburnt. [8]

(*b*) A dilute acid containing 25% $H_2SO_4$ is concentrated by commercial grade sulphuric acid containing 98% $H_2SO_4$ to obtain an acid containing 65% $H_2SO_4$. Find the quantity of the acids to prepare 1000 kg of desired acid. [8]

**5.** (*a*) In the production of sulfur trioxide, 100 kmol of $SO_2$ and 100 kmol of $O_2$ are fed to the reactor. If the percent conversion of $SO_2$ is 80 calculate the composition of the product by mole%. [6]

(*b*) Benzene reacts with nitric acid to produce nitrobenzene and water. $C_6H_6 + HNO_3 \rightarrow C_6H_5NO_2 + H_2O$ Nitrobenzene may further undergo nitration to produce dinitrobenzene. $C_6H_5NO_2 + HNO_3 \rightarrow C_6H_6\ (NO_2)_2 + H_2O$. $H_2SO_4$ acts as a catalyst.

The percentage conversion of benzene is 90%. Nitric acid is used in 65% excess of that theoretically required. Mononitrobenzene is the desired product. The ratio of mononitrobenzene to dinitrobenzene is 17 : 1. Calculate the quantities of benzene and nitric acid required for the production of 2000 kg/h of mononitrobenzene. [10]

*Or*

**6.** (*a*) Formaldehyde is produced by dehydrogenation of methanol. $CH_3OH \rightarrow HCHO + H_2$. Per pass conversion is 67%. Product leaving the reactor is fed to a separation unit where formaldehyde is separated from methanol and hydrogen. The separated methanol is recycled to the reactor. If the production rate of formaldehyde is 1000 kg/h, calculate the combined feed ratio and fresh feed rate. [8]

(*b*) Define per pass conversion, overall conversion, recycle ratio, mixed feed ratio. [4]

(*c*) How are bypass operations advantageous ? [4]

## SECTION II

**7.** (*a*) Define heat of dissolution, heat of crystallization, relation between heat of solution and heat of crystallization, heat of reaction, heat of dissolution, heat of fusion, sensible heat and latent heat. [9]

(*b*) In a liquid phase heating system a thermic fluid is used. It enters an indirect fired heater at a temperature of 453 K and leaves at a temperature of 533 K. Calculate the heat supplied per kg of liquid. $C_p = .436 + 2.18 \times 10^{-3}T$ kJ/kg K. T is in Kelvin. If the heat capacity of thermic fluid at 453 K is 2.03 kJ/kgK and at 533 K it is 2.206 kJ/kg, K, find the percentage error involved in calculation of the heat load if a mean value of specific heat is used. [9]

*Or*

**8.** (*a*) A stream of nitrogen flowing at the rate of 100 kmol/h is heated from 303 K to 373 K. Calculate the heat that must be transferred if specific heat of gas is given by

$$C_p^0 = 29.5909 - 5.141 \times 10^{-3}T + 11.1829 \times 10^{-6}T^2 - 4.968 \times 10^{-9}T^3$$

kJ/kmolK. [6]

(*b*) Calculate the heat of formation of glycerol liquid ($C_3H_8O_3$) at 298.15 K using the following data : Standard heat of formation of $CO_2$ (g) = –393.51 kJ/mol, Standard heat of formation of $H_2O$ (l) = –285.83 kJ/mol, standard heat of combustion of glycerol = –1659.1 kJ/mol. [4]

(*c*) Methane is oxidized with air to produce formaldehyde : $CH_4$ (g) + $O_2$ (g) $\rightarrow$ HCHO (g) + $H_2O$(g). $\Delta H_R^0$ = –283.094 kJ/mol. 100 mol of methane are fed to the reactor at

311 K, air is used in 50% excess and supplied at 373 K. If conversion is 60% calculate the heat that must be removed from the product stream to emerge at 478 K. Data : $C^0_{pm}$ for air (373 – 298 K) = 29.2908 kJ/kmolK [8]

| **Components** | **$C^0_{pm}$(311 – 298 K) kJ/kmol K** | **$C^0_{pm}$(478 – 298 K) kJ/kmol K** |
|---|---|---|
| $CH_4$ | 36.044 | 40.193 |
| $N_2$ | – | 29.2866 |
| $O_2$ | – | 30.0821 |
| HCHO | – | 41.2902 |
| $H_2O$ | – | 34.2396 |

**9.** (*a*) A solution of ferric cholride in water contains 64% $FeCl_3$ by weight. Calculate the amount of $FeCl_3.6H_2O$ which will crystallize at 300 K from 1000 kg of feed. The solubility of $FeCl_3$ at 300 K is 68.3% by weight in water. [8]

(*b*) Define dew point, wet bulb and dry bulb temperature. What is the relation between relative humidity and percentage humidity ? At what condition is DBT = WBT ? [8]

*Or*

**10.** (*a*) Wet solids containing 20% water is sent through a dryer in which 80% of the water is removed. Based on 100 kg of feed calculate the mass fraction of dry solids in the dried product leaving the dryer. Also calculate the weight ratio of water removed to the total product leaving the dryer. [4]

(*b*) A gas mixture containing 15 mol% A and 85 mol% inerts is fed to an absorption column where it is contacted with a solvent B. The mole ratio of solvent to gas entering the tower is 2 : 1. Gas leaving the tower contains 3% A, 2% B and the rest inerts. Calculate the percentage recovery of A and fraction of B fed to the tower which is lost in the gas leaving the tower. [8]

(*c*) Define tie humid heat and adiabatic saturation temperature. [4]

**11.** (*a*) A producer gas has the following composition by volume : CO – 28%, $CO_2$ – 3.5%, $O_2$ – 0.5% and $N_2$ – 68%. The gas is burned with air which contains oxygen 20% in excess of the net oxygen required. If the combustion is 95% complete calculate the weight of gaseous product formed per 100 kg of gas burned. [10]

(*b*) Define % calorific value and the two types of calorific values. What is the relation between them ? [6]

*Or*

**12.** (*a*) What is the difference between proximate and ultimate analysis ? [8]

(*b*) A sample of coke is found to contain 80% carbon and 20% non-combustible ash by weight. For 100 kg coke how many mole of oxygen are required theoretically ? If 20% excess air is used give the analysis of flue gases. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

| Seat No. | |
|---|---|

# [4957]-196

## S.E. (Chemical Engineering) (Second Sem.) EXAMINATION, 2016

## CHEMISTRY-II

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Answer to the two Sections should be written in separate-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of logarithmic table or electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) What is an adsorption isotherm ? Derive mathematical expression for Langmuir adsorption isotherm. [6]

(*b*) Give the mechanisms of metal coordination compound catalysed reaction in Wacker process. [6]

(*c*) Explain the terms :

(*i*) Zeolite catalyst

(*ii*) Activation energy. [4]

P.T.O.

*Or*

2. (*a*) Explain adsorption theory for heterogeneous catalysis. [6]

   (*b*) Write a short note on Enzyme catalysis. [6]

   (*c*) Give BET theory of multilayer adsorption. [4]

3. (*a*) What is the action of the following on Glucose ?

   (*i*) Bromine water

   (*ii*) Hydroxyl amine

   (*iii*) Conc. $HNO_3$. [6]

   (*b*) Explain secondary and tertiary structures of protein. [6]

   (*c*) Explain the terms : [4]

   (*i*) Coenzyme

   (*ii*) Vitamins.

*Or*

4. (*a*) Define carbohydrates. Give their classification and explain each class with *one* example. [6]

   (*b*) Explain the factors affecting the enzyme activity. [6]

   (*c*) Draw the Haworth ring form of : Maltose and Cellobiose. [4]

5. (*a*) State Lambert's and Beer's law. Define the following terms : [6]

   (1) Chromophore

   (2) Auxochrome

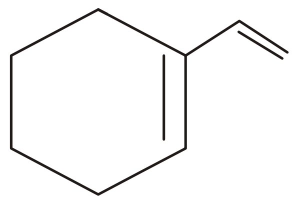
   (3) Bathochromic shift

   (4) Hypsochromic shift

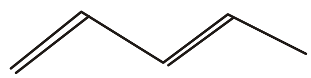
(*b*) Give the principle and explain the instrumentation of IR spectrophotometer. [6]

(*c*) Calculate $\lambda_{max}$ of the following structures by using Woodward-Fieser rule : [6]

(*i*)



(*ii*)



*Or*

**6.** (*a*) Explain the terms B-band, R-band, K-band and E-band in reference of UV spectroscopy. [6]

(*b*) How will you distinguish the following by using IR spectroscopy ? [6]

(*i*) Acetaldehyde and acetone

(*ii*) Phenol and Cyclohexanol.

(*c*) Explain the effect of hydrogen bonding with an example on IR absorption frequency. [6]

## SECTION II

**7.** (*a*) Explain the following properties of transition metals :

(*i*) Tendency to form complexes

(*ii*) Coloured compounds of transition metals. [6]

(*b*) Write a note on low spin and high spin complexes. [6]

(*c*) Using IUPAC nomenclature name the following : [4]

(*i*) $K_3[Al(C_2O_4)_3]$

(*ii*) $Cr(H_2O)_6]Cl_3$

*Or*

**8.** (*a*) Calculate CFSE for the octahedral complex containing $d^5$, $d^6$, $d^7$ electrons in high spin state. [6]

(*b*) Explain the applications of CFT. [6]

(*c*) Calculate the EAN for : [4]

(*i*) $[CoCl_6]^{3-}$

(*ii*) $[Ni(CO)_4]$.

**9.** (*a*) Explain any *two* principles of green chemistry. [6]

(*b*) Give the traditional and green routes of Indio dye. [6]

(*c*) Write a note on bioremediation. [4]

*Or*

**10.** (*a*) Explain working of membrane bioreactor. [6]

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

(*c*) Give the scope and importance of biotechnology. [4]

**11.** (*a*) Draw general labelled layout of municipal waste water treatment plant. [6]

(*b*) Write notes on :

(*i*) Reverse osmosis

(*ii*) Electrodialysis. [6]

(*c*) Define and explain the terms BOD and COD. [6]

*Or*

**12.** (*a*) What are the sources of waste generation in papermill. Describe the quality of waste water and method for its treatment. [6]

(*b*) What is ultrafiltration ? What are its application areas ? What are the advantages. [6]

(*c*) Write a note on hazardous waste. [6]

Total No. of Questions—**12**]  [Total No. of Printed Pages—**6**

| Seat No. | |
|---|---|

# [4957]-197

## S.E. (CHEMICAL) (SECOND SEMESTER) EXAMINATION, 2016

## HEAT TRANSFER

## (2008 COURSE)

**Time : Three Hours**  **Maximum Marks : 100**

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

(*ii*) Answer to the *two* Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.

## SECTION-I

**1.** (*a*) Explain Fourier's law of heat conduction and 'Newton's of Cooling' [5]

(*b*) What are the applications of dimensional Analysis ? [4]

(*c*) It is necessary to insulate a flat surface so that the rate of heat loss per unit length of this surface does not exceed 450 $W/m^2$. The temperature difference across the insulating layer is 400 K. Evaluate the thickness of insulation if :

(*i*) The insulation is made of asbestos cement having thermal conductivity of 0.11 W/(m K) and

(*ii*) The insulation is made of fire clay having thermal conductivity of 0.84 W/(m K).

*Or*

2. (*a*) What is dimensional analysis ? Explain different methods of dimensional analysis ? [9]

(*b*) By dimensional analysis derive the following relationship for forced convection heat transfer process :

$Nu = A \ (Re)^{a} \ (Pr)^{e}$ [9]

**3.** (*a*) Derive expression for rate of heat flow through composite sphere constructed from different material. [8]

(*b*) A steam pipe 15cm O.D. is to be insulated by two layers of insulations each 3.00 cm thick. The material 'A' has conductivity K and the material 'B' has conductivity of 3K. Assuming that the inner and outer temperatures of composite insulation to be fixed find : [8]

(*i*) Which arrangement would give less heat loss rate, 'A' near the pipe surface and 'B' as outer layer or vice versa ?

(*ii*) What is the percent reduction in heat loss rate ?

*Or*

4. (*a*) Derive an expression for the rate of heat transfer through a composite plane wall considering the three heterogeneous layers having thermal conductivities $K_1$, $K_2$ and $K_3$ respectively. [8]

(*b*) A furnace is constructed with 0.23m thick of fire brick, 0.115m of insulating brick and then 0.23m of building brick. The inside temperature of the furnace is 1213K and the outside temperature is 318K. The thermal conductivities of fire brick, insulating brick and building brick are 6.047, 0.581 and 2.33 W/(mK). Find the heat loss per unit area. [8]

**5.** (*a*) Saturated water at 35 ºC flows across 20 mm diameter cylinder at a velocity of 5 m/Sec. The surface of the cylinder is maintained at 170 ºC. Calculate the heat loss rate per unit length of the cylinder ? [8]

The properties of saturated water at mean film temperature are

Density = 956 $Kg/m^3$ ; Specific heat = 4.223 KJ/Kg K ;

Thermal conductivity = 0.683 W/mK; Pr = 1.71;

Dynamic viscosity = $276.7 \times 10^{-6}$ kg/m sec

C = 0.0239; n = 0.805

(*b*) Describe [8]

(*i*) Reynolds Analogy

(*ii*) Thermal boundary Layer

*Or*

6. (*a*) Describe pool boiling curve with neat sketch. [8]

   (*b*) Air at temperature of 250 ºC flows over a flat plate 0.3m wide and 1 m long at a velocity of 8m/s. If the plate is to be maintained at 80ºC, Calculate the rate of heat transferred to both sides of the plate. [8]

   Date :

   Properties of air at mean temperature 165ºC

   Kinematic Viscosity : $3.9 \times 10^{-4}$ $m^2/s$

## SECTION-II

7. (*a*) Define : [8]

   (*i*) Stefan Boltzmann's law

   (*ii*) Monochromatic emissive power

   (*iii*) Irradiation

   (*iv*) Radiosity

   (*b*) Two very large parallel planes with emissivities 0.8 and 0.7 exchange the heat. Estimate the percent reduction in heat transfer when a polished aluminium radiation shield with emissivity 0.03 is placed between them. [10]

*Or*

8. (*a*) Explain the concept of black body and gray body. [6]

   (*b*) Define radiation and explain the Radiation Shield. [6]

   (*c*) Describe the Radiation Shape Factor. [6]

9. (*a*) What is heat exchanger ? Explain detail classification of Heat Exchanger ? [8]

(*b*) Water at the rate of 1.133 kg/sec. is heated from 35 ºC to 75 ºC by oil having a specific heat of 1.9 KJ/Kg ºC. The fluids are used in a counter flow double pipe heat exchanger, & the oil enters the exchanger at 10 ºC & leaves at 75 ºC. The overall heat transfer coefficient is 320 W/$m^2$ C. Calculate the heat exchanger area. Specific heat of water is 4.18 KJ/Kg ºC. [8]

*Or*

10. (*a*) 20 kg/sec. of water at 360 ºK entering a heat exchanger is to be cooled to 340 ºK by using cold water at 300 ºK flowing at rate of 25 kg/sec & leaving at 316 ºK. If the overall heat transfer coefficient is 1500 W/$m^2$ ºK. Calculate heat transfer area required in co-current flow concentric pipe heat exchanger? [8]

(*b*) Draw neat sketch of double pipe heat exchanger and Shell and Tube Heat Exchanger and explain in brief. [8]

11. (*a*) What is evaporation ? Explain Calendria type evaporator with neat sketch. [8]

(*b*) Explain the vacuum evaporation. [4]

(*c*) Describe the different factors affecting the evaporation operation. [4]

*Or*

12. (*a*) Write on the following : [6]

    (*i*) Capacity and Steam Economy of Evaporator.

    (*ii*) Boiling point Elevation and Duhring's rule

    (*b*) An evaporator operating at atmospheric pressure (101.325kPa) is fed at the rate of 10000 kg/hr of weak liquor containing 4% caustic soda. Thick liquor leaving the evaporator contains 25% caustic soda. Find the capacity of the evaporator ? [6]

    (*c*) Differentiate between single effect and multiple effect evaporators. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**5**

| Seat No. | |
|---|---|

# [4957]-198

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

## EXAMINATION, 2016

## PRINCIPLES OF DESIGN

## (2008 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Neat diagram must be drawn wherever necessary.

(*ii*) Figure to the right indicate full marks.

(*iii*) Assume suitable data, if necessary.

(*iv*) Use of cauculator is allowed.

(*v*) Write any *three* questions from Section I and any *three* questions from Section II.

## SECTION-I

**1.** (*a*) With neat flow sheet explain general procedure in machine design. [6]

(*b*) A wooden tie 80 mm long, 100 mm wide and 120 mm thick is subjected to an axial pull of 50 kN and stretch is 4 mm. Calculate value of E for the material. [6]

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

(*i*) Poisson's ratio

(*ii*) Volumetric strain

(*iii*) Bulk modulus

P.T.O.

*Or*

2. (*a*) The piston rod of a steam engine is 50 mm in diameter and 600 mm long. The diameter of the piston is 400 mm and the maximum steam pressure is 0.9 $N/mm^2$. Find the compression of the piston rod if the Young's modulus for the material of the piston rod is 210 $kN/mm^2$. [8]

   (*b*) Derive an expression for the impact stress induced due to falling load. [8]

3. (*a*) A hollow shaft is required to transmit 600 kW at 110 rpm the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 meters not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to external diameter is 3/8. Take modulus of rigidity as 84 GPa. [8]

   (*b*) A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m. Determine the diameter of the shaft using two different theories of failure and assuming a factor of safety of 2. Take E = 210 GPa and Poisson's ratio = 0.25. [8]

*Or*

4. (*a*) A simply supported beam 6 m long carries a gradually varying load, zero at end A to 1000 N/m at end B. Draw S.F. and B.M diagram for the beam. [8]

(*b*) A bar of uniform cross-section 50 mm × 75 mm is subjected to an axial tensile force of 500 kN applied at each end of the bar. Determine the maximum shear stress existing in the bar. Also determine the normal and shearing stress acting on a plane inclined at 200 to the line of action of the axial load. [8]

**5.** (*a*) Define equivalent twisting moment and equivalent bending moment. State when these two terms are used in desing of shafts ? [6]

(*b*) Design a cast iron protective type flange coupling to transmit 15 kW at 900 rpm from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used : [12]

Shear stress for shaft, bolt and key material = 40 MPa.

Crushing stress for bolt and key = 80 MPa.

Shear stress for cast iron = 8 MPa.

*Or*

**6.** (*a*) Describe various steps to design shaft : [6]

(*b*) Design a clamp coupling to transmit 30 kW at 100 rpm. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolt is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3. [12]

## SECTION-II

**7.** (*a*) Discuss the different types of pulleys used in belt drives. [6]

(*b*) A caste iron pulley transmits 20 kW at 300 rpm. The diameter of pulley is 550 mm and has four straight arms of elliptical cross-section in which the major axis is twice the minor axis. Find the dimensions of the arm if the allowable bending stress is 15 MPa. Mention the plane in which the major axis of the arm should lie. [10]

*Or*

**8.** (*a*) What are rolling contact bearings ? Discuss their advantages over sliding contact bearings. [6]

(*b*) The rolling contact ball bearings are to be selected to support the overhung countershaft. The shaft speed is 720 rpm. The bearings are to have 99% reliability corresponding to a life of 24000 hours. The bearing is subjected to an equivalent radial load of 1 kN. Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue specified at 90% reliability. [10]

**9.** (*a*) Classify welded joints based on orientation of surfaces to be welded. [8]

(*b*) Explain with diagram different pipe joints. [8]

*Or*

**10.** (*a*) A knuckle joints is required to withstand a tensile load of 25 kN. Design the joints if the permissible stress are, tensile stress 56 MPa, shear stress 40 MPa and crushing stress 70 MPa. [10]

(*b*) State the basic difference between manual welding, semi-automatic welding and automatic welding. [6]

**11.** (*a*) Write short notes on NPSH. [9]

(*b*) Write short notes on valve characteristics. [9]

*Or*

**12.** (*a*) Give difference between positive displacement pumps and centrifugal pump. [9]

(*b*) Describe with neat diagram Globe valve. [9]

Total No. of Questions—**12**]                    [Total No. of Printed Pages—**6**

| Seat No. | |
|---|---|

# [4957]-199

**S.E. (Chemical Engineering) (Second Semester) EXAMINATION, 2016**

**CHEMICAL ENGINEERING THERMODYNAMICS-I**

**(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. **1** *or* 2, Q. **3** *or* **4**, Q. **5** *or* **6** from section **1** and Q. **7** *or* **8**, Q. **9** *or* **10**, Q. **11** *or* **12** from section II.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of Calculator is allowed.

(*vi*) Assume Suitable data if necessary.

## Section I

**1.** (*a*) State and explain First Law of Thermodynamics. [5]

(*b*) The steam supplied to an engine liberates 5000 J of heat. If the engine efficiency is only 40% to what height a body of mass 10 kg can be lifted using the work output from the engine ? [5]

(*c*) Ten kgs of an equimolar mixture of CO and $H_2$ at 1500 K

P.T.O.

and 1 bar is cooled at constant pressure to 350 K. Assume that the gases are ideal. Determine the head given off during cooling, the change in internal energy and the work done on the gas. The specific heats in J/molK are

$C_{P,H2} = 29.086 - 8.3694 \times 10^{-4}\ T + 2.013 \times 10^{-6}T^2$ and

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

*Or*

**2.** (*a*) What are the characteristics of a reversible process ? [5]

(*b*) Nitrogen gas is confined in a cylinder and the pressure of the gas is maintained by a weight placed on the piston. The mass of the piston and the weight together is 100 kg. The atmospheric pressure is 101.325 kPa. Determine the force exerted by the atmosphere, the piston and the weight of the gas if the piston diameter is 200 mm. Also determine the pressure of the gas. [6]

(*c*) A 10 g lead ball at 300 K is dropped from a height of 10 m. calculate the kinetic energy and speed of the ball as it reaches the ground. The temperature rise of the ball if its kinetic energy transforms into internal energy as the ball is suddenly stopped after 10m, given that the specific heat of lead is 125.6 J/kg K. [5]

**3.** (*a*) What are the limiting conditions for equations of state for real gases ? [6]

(*b*) Estimate the molar volume of carbon dioxide at 500K and 100 bar using van der Waals equation. The constants are $a = 0.364$ $m^4$ $N/mol^2$ and $b = 4.267 \times 10^{-5}$ $m^3/mol$. [5]

(*c*) What is the significance of the constants '*a*' and '*b*' in van der Waals equation ? [5]

*Or*

**4.** (*a*) 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 (*a*) under constant volume conditions and (*b*) under constant pressure conditions. Assume that air behaves ideally. Cp = 20.099 J/mol K and $C_V$ = 20.785 J/mol K. [8]

(*b*) Calculate the pressure developed by 1 kmol gaseous ammonia contained in a vessel of 0.6 $m^3$ capacity at a constant temperature of 473 K by using : (*i*) ideal gas equation, (*ii*) van der Waals equation ($a = 0.4233$ $m^4$ $N/mol^2$ and $b = 3.73 \times 10^{-5}$ $m^3/mol$). [6]

(*c*) State the Redlich Kwong equation and give the equations for the constants in it. [2]

**5.** (*a*) The standard heat of combustion of graphite is –393.778 kJ/mol at 298 K. [10]

Carbon : $11.19 + 1.096 \times 10^{-2}$ T – ($4.984 \times 10^5/T^2$)

Oxyen : $34.62 + 1.08 \times 10^{-2}$ T – ($7.589 \times 10^5/T^2$)

Carbon Dioxide : $43.29 + 1.147 \times 10^{-2}$ T – ($8.185 \times 10^5/T^2$)

(*b*) Carbon Monoxide at 1000 K is burned with air at 800 K in 90% excess air. The products of combustion leave the reaction chamber at 1300 K. Calculate the heat evolved in the reaction chamber per kmol of CO burned. $\Delta H_R^0$ = –283.028 kJ/mol CO at 298 K. The mean heat capacities applicable in the temperature range are 29.38, 49.91, 33.13 and 31.43 J/mol K for CO, $CO_2$, $O_2$ and $N_2$. [8]

*Or*

**6.** (*a*) Calculate the heat of the following gas phase reaction : [12]

$$H_2 + \tfrac{1}{2}\ O_2 \rightarrow H_2O; \Delta H_R^{\ 0} = -242 \text{ kJ/mol at } 298 \text{ K}$$

If the reactants are at 473 K and the products are at 993 K. The specific heat $Cp = a + bT + cT^2$ J/mol K.

| Component | $a$ | $b \times 10^3$ | $c \times 10^6$ |
|---|---|---|---|
| $H_2$ | 29.09 | –0.8374 | 2.0139 |
| $O_2$ | 25.74 | 12.987 | –3.864 |
| $H_2O$ | 30.38 | 9.621 | –1.185 |

(*b*) Explain the effect of temperature on heat of reaction. [6]

## Section II

**7.** (*a*) Explain all the steps in an ideal Carnot cycle giving the equations for work done in each step and the overall work done. [8]

(*b*) An engine using hot water at 330 K as the heat source receives 420 kJ of heat and rejects 335 kJ to melting ice at 273K. Comment on the engine efficiency. [5]

(c) Three moles of hydrogen and none mole of nitrogen, both at 10 bar and 373 K are separately admitted, mixed and then heated to 773 K in a heat exchanger with increase in pressure. Calculate the entropy change in a process. Assume $C_V$ = 21 J/mol K for the mixture. [5]

*Or*

**8.** (a) A block of copper at 825 K weighing 5 kg is dropped into 50 kg water at 300 K. If there are no heat losses what is the change in entropy of copper, water and copper and water together ? Specific heats of copper and water are 0.4 and 4.2 kJ/kmol K respectively. [8]

(b) State and explain the Kelvin Planck and Clausius statements for the second law of Thermodynamics. Explain the equivalence of the two statements. [10]

**9.** (a) Mercury has a density of 13690 kg/m$^3$ in the liquid state and 14193 kg/m$^3$ in the solid state, both measured at the boiling point of 234.33 at 1 bar. If the heat of fusion of mercury is 9.7876 kJ/kg what is the melting point of mercury at 10 bar ? [8]

(b) Derive the Maxwell's equations. [8]

*Or*

**10.** (a) Draw and label the Mnemonic diagram. [8]

(b) The volume coefficient of expansion of water at 373 K is 7.8 × $10^{-4}$ $K^{-1}$. Calculate the change in entropy when pressure is increased from 1 bar to 100 bar. At 373 K density of water is 958 kg/m$^3$. [8]

**11.** (*a*) Explain the T-S and P-H diagrams. [8]

(*b*) An air refrigeration machine rated at 12 ton is used to maintain the temperature of the cold room at 261K. Cooling water is available at 293 K. The machine operates between the pressures of 1.013 bar and 4.052 bar. Assume a 5 K approach in the cooler and the refrigerator. Sp. Heat of air is 1.008 kJ/kg K and $\gamma = 1.4$ Calculate the COP and the air circulation rate. [8]

*Or*

**12.** (*a*) Give the criteria for choice of refrigerant. [8]

(*b*) A refrigerating machine uses ammonia as a refrigerant. It is used for producing 500 kg/h of ice from water. Ammonia boils at 266 K and condenses at 293 K. The water in the condenser gets heated from 283 K to 288 K. Calculate the theoretical minimum power required in the compressor and the cooling water circulation rate. The latent heat of fusion of water is 339.1 kJ/kg. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
|---|---|

# [4957]-200

## S.E. (Chemical) (Second Semester) EXAMINATION, 2016

## MECHANICAL OPERATIONS

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*ii*) Answer 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 why size reduction is necessary in chemical industries. What do you mean by open circuit grinding and closed circuit grinding ? [4]

(*b*) Explain the factors affecting size of product in a crusher. [4]

(*c*) A material is crushed in a Blake jaw crusher such that the average size of particle is reduced from 50 mm to 10 mm with the consumption of energy of 13.0 kW/(kg/s). What would be the consumption of energy needed to crush the same material of average size 75 mm to an average size of 25 mm :

(*i*) assuming Rittinger's law applies.

(*ii*) assuming Kick's law applies ?

Which of these results would be regarded as being more reliable and why ? [10]

*Or*

**2.** (*a*) Explain the terms screen efficiency and screen effectiveness. [4]

(*b*) Explain open circuit grinding and closed circuit grinding with suitable flow sheets. [6]

(*c*) How the screen is selected for specific screening operation ? Explain the screening operation in detail. [8]

**3.** (*a*) Explain with a neat sketch construction of pneumatic conveyor and its advantages and disadvantages. [8]

(*b*) Describe with neat sketch the construction of belt conveyors. [8]

*Or*

**4.** (*a*) Describe with neat sketch construction of screw conveyors. [6]

(*b*) State the advantages and limitations of Bucket elevators. [6]

(*c*) Differentiate between crushing and grinding. [4]

**5.** (*a*) Describe with neat diagram "Banbury mixer". [8]

(*b*) With the help of neat sketch distinguish between radial flow and axial flow impellers. [8]

*Or*

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

(*i*) Mixing index

(*ii*) Kneading machines and their applications.

(*b*) Describe the neat sketches "Swirling and vortex formation." How it can be prevented ? [8]

## SECTION II

7. (*a*) Glass particles of 4 mm diameter are fluidised by water at a velocity of 0.25 m/s. What will be the voidage of the bed ? The density of glass = 2500 $kg/m^3$, the density of water = 1000 $kg/m^3$, and the viscosity of water = 1 m $Ns/m^2$. [8]

(*b*) Explain construction, working and applications of plate and frame filter press with neat diagram. [10]

*Or*

8. (*a*) Describe centrifuging. Explain the operating cycle of centrifuge filter. [6]

(*b*) What are filter aids ? How are they used ? Give applications of filter aids. [6]

(*c*) Explain constant rate filtration and constant pressure filtration. [6]

9. (*a*) Differentiate between aggregate fluidization and particulate fluidization. [8]

(*b*) What is fluidization ? Derive an expression for minimum fluidization velocity. [8]

*Or*

**10.** (*a*) Explain gas-liquid-solids fluidized beds. [6]

(*b*) Distinguish between free settling and hindered settling. [4]

(*c*) Describe the centrifugal fluidized bed. State the applications of fluidization. [6]

**11.** (*a*) Explain the principle of magnetic separation methods. [6]

(*b*) Explain tabling and its applications with neat diagram. [4]

(*c*) Explain upward stroke and downward stroke in Jigging with neat diagram. [6]

*Or*

**12.** (*a*) Describe electrostatic precipitator and its applications. [6]

(*b*) Explain gravity separators and venture scrubbers. [4]

(*c*) Describe with neat sketches operation of hydrocyclone and cyclone separators. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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|---|---|

# [4957]-202

## S.E. (Comp. Engg.) (First Semester) EXAMINATION, 2016

## PROGRAMMING AND PROBLEM SOLVING

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 50**

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

(*ii*) Answer three questions from Section I and *three* questions from Section II.

(*iii*) Answers to the two Sections should be writen in separate-answer-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right side indicate full marks.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Write a short note on top-down design. [6]

(*b*) Develop a flowchart for the instructions for withdrawing money from an ATM machine. Be sure to include all steps such as card validation. [8]

(*c*) State and explain any *four* difficulties with problem solving. [4]

*Or*

**2.** (*a*) What do you mean by flowchart ? Give the meaning of each symbol used in flowchart. Draw a flowchart to compute sum of elements from a given integer array. [8]

P.T.O.

(*b*) Evaluate for P = true, Q = true, R = false, S = false : [4]

(*i*) A = (P AND Q) OR R

(*ii*) A = Q OR S AND P

(*iii*) A = NOT P OR NOT Q AND S

(*iv*) A = P AND NOT R OR NOT S

(*c*) What is function ? Explain any *two* types of functions. [6]

**3.** (*a*) What do you mean by cohesion and coupling ? How are these important to programmers ? [6]

(*b*) Take three integers and find the minimum integer among three. Create a decision table to solve this problem. [4]

(*c*) What are the two ways to send data from one module to another through the use of parameters with a suitable example. [6]

*Or*

**4.** (*a*) Using first positive and then negative logic, write the algorithm and draw flow charts for the following set of conditions. [12]

R = 50 for S < 1000

R = 100 for S = 1001-4000

R = 250 for S = 4001-8000

R = 75 for S > 800

(*b*) Name the major types of modules and explain their function. [4]

5. (*a*) Design an algorithm that for the integers in the range 1 to 100 finds the number that has the most divisors. [8]

(*b*) Design an algorithm for exchanging values of two variables. Explain one application in detail in which we use this algorithm. [8]

*Or*

6. (*a*) Design pseudo algorithm that converts binary numbers to octal. [8]

(*b*) Give an integer n devise pseudo algorithm that will find its smallest exact divisor other than one. [8]

## SECTION II

7. (*a*) Write a pseudo algorithm for removal of duplicates from an ordered array. [8]

(*b*) Design an algorithm to find the second largest value in an array of n elements. [8]

*Or*

8. (*a*) Design an algorithm to search an integer number from an array of 'N' elements. Use binary search. [8]

(*b*) Write pseudo algorithm to rearrange the elements in an array to that they appear in reverse order. [8]

9. (*a*) Explain algorithm for text line length adjustment. [8]

(*b*) Explain algorithm for left right justification of given text. [8]

*Or*

**10.** (*a*) Write pseudo algorithm for linear pattern search. [8]

(*b*) Design and implement an algorithm that reverses the justification process by removing multiple blanks. Paragraph indentations should be preserved. [8]

**11.** (*a*) Write a C++ program, to find the average of five numbers. [6]

(*b*) Explain essential characteristics of an object-oriented programming language. [4]

(*c*) Write a program in C++ for a Video CD library that need to track customers, Video CD's and its rentals and late fees : [8]

(*i*) Design classes you would create the application

(*ii*) Write what methods would be needed for the classes.

(*iii*) Print the customer and its rentals.

*Or*

**12.** (*a*) Explain the following concepts : [8]

(*i*) Parameterized constructors

(*ii*) Copy constructor

(*iii*) Destructor

(*iv*) Encapsulation and Data Abstraction.

(*b*) Explain with a suitable example how code reusability is achieved in C++. [6]

(*c*) Explain the following terms : [4]

(*i*) Access specifier

(*ii*) Static member functions.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-203

## S.E. (Computer/IT) (I Sem.) EXAMINATION, 2016

## DIGITAL ELECTRONICS AND LOGIC DESIGN

## (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 calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Convert the following octal numbers into their equivalent binary, hexadecimal and decimal numbers : [12]

(*i*) 87

(*ii*) 0.3467

(*iii*) 1234

(*iv*) 87.02

(*b*) Express the following number in decimal. Show your step by step equation and calculations. [6]

(*i*) $(10110.0101)_2$

(*ii*) $(16.5)_{16}$

*Or*

**2.** (*a*) Express the following number in binary. Show your step by step equation and calculations. [6]

(*i*) $(1010.11)_{10}$

(*ii*) $(428.10)_{10}$

(*b*) Solve the following equations using corresponding minimization techniques. [12]

(*i*) $Z = f(A,B,C,D) = \pi M\ (4, 5, 6, 7, 14, 15)$

(*ii*) $Z = f(A,B,C,D) = \Sigma M(0, 2, 5, 6, 8, 10, 13, 15)$

**3.** (*a*) Solve by Quine-McClusky technique : [10]

$$Z = f(A,B,C,D) = \Sigma(0, 3, 8, 9, 10, 12, 15)$$

(*b*) Explain standard TTL characteristics in brief. [6]

*Or*

**4.** (*a*) Draw 2-i/p standard TTL NAND gate with Totem Pole. Explain operation of transistor (ON/OFF) with suitable input conditions and truth table. [8]

(*b*) Compare TTL and CMOS logic family (Any 4 points). Also draw CMOS-NOR gate. [8]

**5.** (*a*) Design and implement 4-bit Gray to Binary code converter using basic gates. [8]

(*b*) Draw 4-Bit BCD Adder by using IC 7483 and logic gates. [8]

*Or*

6. (*a*) Design 16:1 mux using 4:1 multiplexers (with enable inputs). Explain the truth table of your circuit in short. [8]

(*b*) What do you mean by half-adder and full adder ? How will you implement full adder using half-adder. Explain with circuit diagram. [8]

## SECTION II

7. (*a*) What is MOD counter ? Explain MOD-15 counter using IC 7490. Draw design for the same. [8]

(*b*) What is the defference between Asynchronous and Synchronous Counter ? Draw a 3-bit Synchronous counter. Explain timing diagram for the same. [10]

*Or*

8. (*a*) Explain the difference between combinational and sequential circuit. Also convert D Flip-Flop into JK-F/F and T-F/F. Show the Truth Table. [10]

(*b*) Give any four applications of Shift Registers. Also explain 4-Bit Ring Counter. [8]

**9.** (*a*) What is ASM chart ? Design ASM chart for 3-Bit Up-Down counter. [8]

(*b*) What is VHDL ? Explain entity architecture declaration for 2-Bit AND gate. [8]

*Or*

**10.** (*a*) What is ASM chart ? Give its application and explain the MUX controller method with the suitable example. [8]

(*b*) List any four sequential statements used in VHDL ? [8]

**11.** (*a*) Explain basic characteristics of FPGA. [8]

(*b*) Explain basic microprocessor architecture. [8]

*Or*

**12.** (*a*) Explain in brief, the working of Address bus, Data Bus and Control bus by assuming a basic operation. [8]

(*b*) What is the difference between CPLD and FPGA ? [8]

Total No. of Questions—**12**]                    [Total No. of Printed Pages—**4**

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# [4957]-204

**S.E. (Computer) (I Sem.) EXAMINATION, 2016**

**DATA STRUCTURES AND ALGORITHM**

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

(*iv*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Write and explain any *five* string functions. [10]

(*b*) Write a function to swap the data of two variables without using third variable. [6]

*Or*

**2.** (*a*) Write a recursive function in "C" to find the factorial of given number. [6]

(*b*) Explain with example fread, fwrite, ftell and fseek functions for file handling in "C". [10]

P.T.O.

3. (*a*) What is the frequency count of the following : [6]

```
int avg (int n)
{    for(i=0; i<n, i++)
     sum = sum +i;
     sum/n;
}
```

Find out the time complexity.

(*b*) Write 'C' function to perform the matrix multiplication. What is the time complexity. [6]

(*c*) State the following statement is true or false. Justify your answer : [4]

(1) $6n + 5 = O(n^2)$

(2) $3n^2 + 4n + 9 = O(n)$.

*Or*

4. (*a*) What is row major and column major representation of matrix. Explain with example. [6]

(*b*) Write an ADT for array. [6]

(*c*) Explain any *two* asymptotic notations. [4]

5. (*a*) Write an ADT for sparse matrix. Explain function for sparse matrix addition. [8]

(*b*) Explain multidimensional arrays in 'C'. Give suitable example. [6]

(*c*) Find the address of a[10][5]th element if array starts from 1000 location and array declared as int a[15][15]. [4]

*Or*

6. (*a*) Write an ADT for polynomial. Write and explain function for polynomial nultiplication. [12]

   (*b*) What is sparse matrix ? What are the advantages of sparse matrix over simple matrix. [6]

## SECTION II

7. (*a*) Sort the following numbers step by step using Quick Sort Method : [10]

   15, 10, 25, 8, 7, 2, 28, 21, 19, 09

   (*b*) Explain different searching methods. Write space and time complexity of each. [6]

*Or*

8. (*a*) Write and explain function for merge sort. State its time and space complexity. [10]

   (*b*) Apply Binary search on following data to search 29, 14, 02. Write how many comparisons need to search these items : [6]

   02, 05, 06, 08, 14, 15, 20, 21, 28, 29.

9. (*a*) What is GLL ? Explain the node structure and ADT. [8]

   (*b*) What are teh advantages of circular linked list over linear linked list. [8]

*Or*

**10.** (*a*) Show Graphical representation for the following GLL : [10]

(1, (2, 3, (4), 5, 6, 7), (8))

(*b*) Write node structure to represent polynomial with GLL. [6]

**11.** (*a*) Convert the following infix expression to postfix expression : [10]

(a +b) ^ e * d – f/n

(*b*) Write and explain applications of priority queue. [8]

*Or*

**12.** Write short note on : [18]

(1) Applications of stack

(2) Josephus problem and its 'C' function.

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

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# [4957]-205

## S.E. (Comp. Engg./IT) (I Sem.) EXAMINATION, 2016

## HUMANITIES AND SOCIAL SCIENCES

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

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

(*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-books.

(*iv*) Figures to the right indicate full marks.

### SECTION I

**1.** (*a*) Explain in brief importance of sociology. [6]

(*b*) Explain in brief : [10]

(*i*) Panchayat Raj for rural development

(*ii*) Structure of Indian Society.

*Or*

(*a*) Explain the institutions of marriage and types of families with their salient features. [10]

(*b*) India is a land of diversified culture. Discuss. [6]

2. (*a*) Explain the salient features of Policy of National Education in brief. [8]

(*b*) India needs to improve upon Health Sector. Comment. [8]

*Or*

(*a*) Explain the Social impact of Industrial Development in brief. [8]

(*b*) Differentiate between Social Change and Social Progress. [8]

3. Write short notes on the following : [18]

(*i*) Consumer Awareness

(*ii*) Private Sector in India for Economic Development

(*iii*) Green Revolutions in India.

*Or*

(*a*) Technology can change the Indian Agriculture Sector to increase production. Explain. [9]

(*b*) India is a land of greater opportunities for investments in Infrastructure sector. Explain. [9]

## SECTION II

4. Explain in brief :

(*i*) Energy Resources in India [5]

(*ii*) Global Population Growth [5]

(*iii*) Global Warming. [6]

*Or*

(*i*) Air Pollution [5]

(*ii*) Components of Ecosystem [5]

(*iii*) Loss of Bio Diversity. [6]

**5.** (*a*) Discuss the Priorities and Problems in the Five Year Plans. [8]

(*b*) Explain the need for Planned Economic Development of India. [8]

*Or*

(*a*) Discuss the challenges faced by Indian Economy. [8]

(*b*) Explain the Law of Demand and Supply. [8]

**6.** Wirte short notes on the following : [18]

(*i*) Financial Institutions of India

(*ii*) Budget Analysis

(*iii*) Cost Analysis.

*Or*

(*i*) Reserve Bank of India

(*ii*) Ratio Analysis

(*iii*) International Economy.

Total No. of Questions—**12**]                    [Total No. of Printed Pages—**3**

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# [4957]-206

**S.E. (Comp.) (Second Semester) EXAMINATION, 2016**

**MICROPROCESSOR AND INTERFACING TECHNIQUES**

**(2008 PATTERN)**

**Time : Three Hours**                    **Maximum Marks : 80**

***N.B.* :—** (*i*) Answer any **3** questions from each section.

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

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

## Section I

**1.** (*a*) Draw and explain programmers model of 8086 microprocessor system. [8]

(*b*) Explain even and odd memory bank along with BHE and Ao signals. [8]

*Or*

**2.** (*a*) Explain with a neat diagram of memory segmentation in 8086. [8]

(*b*) List out the signals of the 8086 which have different meanings in minimum and maximum mode. [8]

P.T.O.

3. (*a*) Explain all rotate instruction with example. [8]

(*b*) Write an 8086 ALP to separate even and odd Nos. in the array. [8]

*Or*

4. (*a*) Explain the following assembler directives with example : [8]

(*i*) EXTRN

(*ii*) LABEL

(*iii*) PUBLIC

(*iv*) MACRO & ENDM.

(*b*) Write an 8086 ALP to generate a delay of 100 ms if 8086 system running at 10 MHz. [8]

5. (*a*) Explain what is TSR ? Explain the structure of TSR in detail. [10]

(*b*) What is IVT of 8086 ? Explain its structure in detail. [8]

*Or*

6. (*a*) Draw and explain 8259 block diagram in brief. [10]

(*b*) Compare DOS and BIOS calls ? [8]

## Section II

7. (*a*) Draw and explain 8255 in brief. [8]

(*b*) Explain BSR and I/O mode with control word format. [8]

*Or*

8. (*a*) Draw and explain 8251 in brief. [8]

(*b*) Explain dual slope ADC with block diagram. [8]

**9.** (*a*) Draw and explain 8279 in brief. [8]

(*b*) Explain different I/O modes available in 8279. [8]

*Or*

**10.** (*a*) Explain various modes of 8237 in detail. [8]

(*b*) Draw and explain 8253/8254 in brief. [8]

*Or*

**11.** (*a*) Draw and explain 8087 NDP in detail. [10]

(*b*) Explain stack of 8087 with example. [8]

*Or*

**12.** (*a*) Explain status word and control word of 8087 NDP. [10]

(*b*) Draw and explain internal block diagram of 8288 in details. [8]

Total No. of Questions—**12**]　　　　[Total No. of Printed Pages—**4**

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# [4957]-207

**S.E. (Comp.) (Second Semester) EXAMINATION, 2016**

**210250 : 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*) Answer to the two Sections should be written in separate-answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Assume suitable data, if necessary.

## SECTION I

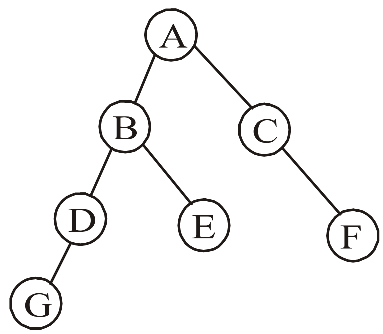
**1.** (*a*) Define General Tree, Binary Tree, Full Binary Tree, Complete Binary Tree, Skewed Binary Tree and explain in how many ways binary tree can be traversed. Explain with a suitable example. [10]

(*b*) Write and show how recursive algorithms for inorder and postorder traversal of binary tree works with suitable example having at least 6 nodes ? [8]

P.T.O.

*Or*

2. (*a*) What is the solution to avoid more number of null links in binary tree. How node is represented in linked structure in threaded binary tree. Convert the following tree into threaded binary tree. [10]




(*b*) What is Binary Search Tree (BST). Write algorithms of insertion and deletion of a node. [8]

3. (*a*) Write Kruskal's algorithm and its working with suitable example. [8]

(*b*) Which algorithms are used to find the shortest path ? Explain Dijakstra's algorithm with an example. [8]

*Or*

4. (*a*) Write an algorithm to print Depth First Search (DFS) traversal for graphs give its time complexity. [8]

(*b*) Write an ADT of graph. Explain how graph can be represented, explain with suitable example and write applications of the graph. [8]

**5.** (*a*) What are the features of the AVL tree ? Write an algorithm to insert node in AVL tree ? [8]

(*b*) What is symbol table ? Write an ADT for symbol table. [8]

*Or*

**6.** (*a*) Define height balance tree. What do you mean by balance factor of tree ? What is the condition for any node in tree to be balanced and how it is satisfied ? [8]

(*b*) What hashing is required ? Explain different hash functions and discuss about a way to handle overflow in hashing. [8]

## SECTION II

**7.** (*a*) What is heap ? Write an algorithm to insert an element to heap and explain the process with suitable example to insert 6 elements. [10]

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

*Or*

**8.** (*a*) Define max heap and min heap and draw max heap for 35, 72, 20, 85, 41, 55, 70. [8]

(*b*) Define B+ tree. Write a node deletion method for B+ tree. [10]

**9.** (*a*) What is file ? Is it a data structure ? List different file operation modes. [8]

(*b*) What do you mean by index file organization ? State its advantages. [8]

*Or*

**10.** (*a*) Write an algorithm to perform create, insert, display and search operation for sequential file organization. [8]

(*b*) Explain in brief linked and direct the organization. [8]

**11.** (*a*) Write a program in C++ to implement stack using STL. [8]

(*b*) What do you mean by genetic programming ? How is it achieved ? [8]

*Or*

**12.** (*a*) Explain the following terms : [8]

(*i*) Containers

(*ii*) Iterators

(*iii*) Inheritance in C++

(*iv*) Algorithms and characteristics

(*b*) Give the implementation of deque in a STL. [8]

Total No. of Questions—**12**]　　　　　[Total No. of Printed Pages—**4**

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# [4957]-208

**S.E. (Computer Engineering) (Second Semester)**

**EXAMINATION, 2016**

**COMPUTER GRAPHIC**

**(2008 PATTERN)**

**Time : Three Hours**　　　　　**Maximum Marks : 100**

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

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

## SECTION I

**1.** (*a*) Explain DDA line drawing algorithm. Consider the line from (0, 0) to (–8, –4), use DDA line drawing algorithm to rasterize the line. [10]

(*b*) Define Aspectratio, Random scan display, Raster scan display. [6]

(*c*) What is aliasing ? [2]

*Or*

**2.** (*a*) Explain Breseham's line drawing algorithm with example. [8]

(*b*) What a short note on display file ? [6]

(*c*) Describe frame buffer in computer graphics. [4]

3. (*a*) Name with example different types of polygons. [4]

(*b*) Explain any *one* method for testing given point is inside or outside the polygon. [4]

(*c*) Explain Sutherland Hodgeman polygon clipping with example. [8]

*Or*

4. (*a*) What is dipping ? Explain Cohen-Sutherland outcode algorithm. [8]

(*b*) Explain scan-fill method of polygon filling with example. [8]

5. (*a*) Derive transformation matrix for rotation about an arbitrary point in 2D. Give example. [8]

(*b*) Write the transformation matrix in 3-D for : [8]

(*i*) Translation

(*ii*) Scaling

(*iii*) Rotation about $x$-axis

(*iv*) Rotation about $z$-axis

*Or*

6. (*a*) Explain rotation of an object about an arbitrary axis in 3-D. [10]

(*b*) What is Vanishing point ? Explain perspective projection types. [6]

## SECTION II

7. (*a*) State and explain the methods of controlling animation (any *two*). [8]

(*b*) Explain how segmentation is used in animation with suitable example. [8]

*Or*

8. (*a*) Describe in brief basic guidelines of animation with suitable examples. [8]

(*b*) Explain segment with its different functions needed to maintain a segmentation file. [8]

9. (*a*) Explain Warnock's algorithm for Hidden surfaces. [8]

(*b*) Describe :

(*i*) Diffused illumination

(*ii*) Point source illumination. [8]

*Or*

10. (*a*) Explain Gouraud shading. [8]

(*b*) Write short notes on :

(*i*) Shadows

(*ii*) Transparency. [8]

11. (*a*) What is interpolation ? Explain lagrangian interpolation method. [8]

(*b*) Explain Bezier curves with mathematical equations and example. [10]

*Or*

**12.** Write short notes on any *three* of the following : [18]

(*i*) Hilbert's curve

(*ii*) Fractal line

(*iii*) Fractal surfaces

(*iv*) Fractal geometry.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-209

**S.E. (Semester-II) (Computer Engineering)**

**EXAMINATION, 2016**

**COMPUTER ORGANIZATION**

**(2008 Pattern)**

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** **:—** (*i*) Answer question number 1 *or* 2, 3 *or* 4, 5 *or* 6 from section I.

(*ii*) Answer question number 7 *or* 8, 9 *or* 10, 11 *or* 12 from section II.

(*iii*) Neat diagram must be drawn whenever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

## SECTION-I

**1.** (*a*) Draw and explain the flowchart for floating point addition and explain. [6]

(*b*) Write neat diagram explain in detail functional units of computer system. [4]

(*c*) Perform the following divisions using restoring division :[8]

(*i*) Dividend = 12

(*ii*) Divisor = 4.

P.T.O.

*Or*

2. (*a*) Represent (187.1875) in single and double precision floating point format. [10]

   (*b*) Show the general structure of IAS computer. Explain stored program concept. [8]

**3.** (*a*) Draw and explain CPU architecture of Intel processor. [8]

   (*b*) Write a control sequence for the execution of the instruction ADD $(R_s)$, $R_1$ [8]

*Or*

4. (*a*) What are the different design methods for hardwired control units ? Explain any *one*. [8]

   (*b*) Explain the design of ALU using combinational circuits. [8]

**5.** (*a*) Explain the register architecture of 68000 processor. [8]

   (*b*) Explain in detail horizontal and vertical organization of micro-instruction. [8]

*Or*

6. (*a*) Draw and explain single bus organization of CPU. [8]

   (*b*) Explain instruction cycle. How will you represent instruction cycle with interrupts ? Explain. [8]

## SECTION-II

7. (*a*) What is virtual memory concept ? Explain the role of TLB in virtual memory organization. [10]

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

(*i*) RAID

(*ii*) Magnetic Memory.

*Or*

8. What is addressing mode ? Explain the following addressing modes with example : [18]

(*a*) Immediate Addressing

(*b*) Base Register Addressing

(*c*) Intex Addressing

(*d*) Register Addressing.

9. (*a*) Explain synchronous and asynchronous bus in an input operation with timing diagrams. [8]

(*b*) Explain programmed I/O and Interrupt Driven I/O. [8]

*Or*

10. (*a*) Explain in detail DMA data transfer mode. [8]

(*b*) Explain in detail how scheduling and memory management is done by operating system with its types. [8]

11. (*a*) Explain the SISD, SIMD and MIMD systems. [8]

(*b*) What is the use of Message Passing Protocol ? [8]

*Or*

12. (*a*) Write short note on : SMP and Clusters. [8]

(*b*) Enlist the characteristics of Non-uniform Memory Access (NUMA). [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

| Seat No. | |
|---|---|

# [4957]-210

## S.E. (Electrical/Inst./Comp./I.T.) (I Sem.) EXAMINATION, 2016

## ENGINEERING MATHEMATICS—III

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I, solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**. In Section II, solve Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

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

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Neat diagrams must be drawn wherever necessary.

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

## SECTION I

**1.** (*a*) Solve any *three* of the following : [12]

(*i*) $(D^2 - 4D + 3)y = x^3 e^{2x}$

(*ii*) $(D^2 + D + 1)y = x \sin x$

(*iii*) $(D^2 - 2D + 2)y = e^x \tan x$ (by using method of variation of parameters)

(*iv*) $(1 + x)^2 \dfrac{d^2y}{dx^2} + (1 + x) \dfrac{dy}{dx} + y = 2 \sin[\log(1 + x)]$

(*b*) Solve : [5]

$$\frac{dx}{dt} + 2x - 3y = t,$$

$$\frac{dy}{dt} - 3x + 2y = e^{2t}.$$

*Or*

**2.** (*a*) Solve any *three* of the following : [12]

(*i*) $(D^2 + 2D + 1)y = xe^{-x} \cos x$

(*ii*) $(D^2 + 1)y = x^2 \sin 2x$

(*iii*) $(D^2 + 9)y = \dfrac{1}{1 + \sin 3x}$ (by using method of variation of parameters)

(*iv*) $\dfrac{dx}{3z - 4y} = \dfrac{dy}{4x - 2z} = \dfrac{dz}{2y - 3x}$.

(*b*) An electric current consists of an inductance 0.1 henry, a resistance R of 20 Ω and a condenser of a capacitance 25 microfarads. If the differential equation of electric circuit is :

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = 0$$

then find the charge $q$ and current $i$ at any time $t$, given that at $t = 0$, $q = 0.05$ coulombs, $i = \dfrac{dq}{dt} = 0$ when $t = 0$. [5]

3. (a) If $v = 3x^2y - y^3$, find its harmonic conjugate $u$. Find $f(z) = u + iv$ in terms of $z$. [5]

(b) Show that the transformation $w = z + \frac{1}{z} - 2i$ maps the circle $|z| = 2$ into an ellipse. Find the centre of the ellipse and its semi-major and minor axes. [5]

(c) Evaluate :

$$\oint_C \frac{4z^2 + z}{(z-1)^2}\, dz$$

where 'C' is the contour $|z - 1| = 2$. [6]

*Or*

4. (a) Determine $k$ such that the function :

$$f(z) = e^x \cos y + ie^x \sin ky$$

is analytic. [5]

(b) Find the bilinear transformation, which maps the points $z = -1, 0, 1$ onto the points $w = 0, i, 3i$. [5]

(c) Evaluate :

$$\int_0^{2\pi} \frac{\sin 2\theta}{5 + 4\cos\theta}\, d\theta$$

using Cauchy's theorem. [6]

5. (a) Find the Fourier transform of : [6]

$$f(x) = \begin{cases} 1 - x^2 & , \quad |x| \le 1 \\ 0 & , \quad |x| > 1 \end{cases}$$

Hence show that :

$$\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3}\right)\cos\frac{x}{2}\,dx = \frac{-3\pi}{16}.$$

(*b*) Find the Fourier cosine transform of the function : [5]

$$f(x) = \begin{cases} \cos x & , \quad 0 < x < a \\ 0 & , \quad x > a \end{cases}$$

(*c*) Find *z*-transform of (any *two*) : [6]

(*i*) $f(k) = 4^k \cdot \sin(2k + 3),\ k \geq 0$

(*ii*) $f(k) = k \cdot 5^k,\ k \geq 0$

(*iii*) $f(k) = 4^k + 5^k,\ k \geq 0.$

*Or*

**6.** (*a*) Find inverse *z*-transform of (any *two*) : [8]

(*i*) $F(z) = \frac{1}{(z-2)(z-3)},\ 2 < |z| < 3$

(*ii*) $F(z) = \frac{z^2}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)},\ |z| > \frac{1}{2}$

(*iii*) $F(z) = \frac{z(z+1)}{z^2 - 2z + 1},\ |z| > 1.$

(*b*) Solve the difference equation : [4]

$12f(k+2) - 7f(k+1) + f(k) = 0,\ k \geq 0,\ f(0) = 0,$

$f(1) = 3.$

(*c*) By considering Fourier sine integrals of $e^{-mx}$ $(m > 0)$ prove that : [5]

$$\int_0^\infty \frac{\lambda \sin \lambda x}{\lambda^2 + m^2} d\lambda = \frac{\pi}{2} e^{-mx}, \quad m > 0, \ x > 0.$$

## SECTION II

**7.** (*a*) Compute the first four moments about the mean, coefficient $\beta_1$ and $\beta_2$ for the following frequencies distribution : [8]

| **Number of Jobs Completed** | **Number of Workers** |
|---|---|
| 0—10 | 6 |
| 10—20 | 26 |
| 20—30 | 47 |
| 30—40 | 15 |
| 40—50 | 6 |

(*b*) The equation of two lines of regression are given by :

$$2x = 8 - 3y \text{ and}$$

$$2y = 5 - x.$$

Find the mean values of $x$ and $y$. Also obtain the value of correlation coefficient. [9]

*Or*

**8.** (*a*) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both kings if :

(*i*) The first card drawn is replaced

(*ii*) The first card is not replaced. [6]

(*b*) The probability that a bomb dropped from a plane will strike the target is $\frac{1}{5}$. If six bombs are dropped find the probability that exactly two will strike the target. [6]

(*c*) In a sample of 1000 cases, the mean of certain test is 14 and S.D. is 25. Assuming the distribution is normal, find how many scores above 18, given, $A(z = 0.16) = 0.0160$. [5]

**9.** (*a*) Find the directional derivative of

$$\phi = xy^2 + yz^3$$

at (1, –1, 1) along the vector $\overline{i} + 2\overline{j} + 2\overline{k}$. [5]

(*b*) Show that :

$$\overline{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$$

is irrotational. Find scalar $\phi$ such that $\overline{F} = \nabla\phi$. [6]

(*c*) Show that : [5]

$$\nabla^2\left[\nabla \cdot \left(\frac{\overline{r}}{r^2}\right)\right] = \frac{2}{r^4}.$$

*Or*

**10.** (*a*) For the curve :

$$x = e^t \cos t,$$
$$y = e^t \sin t,$$
$$z = e^t$$

find the velocity and acceleration of the particle moving on the curve at $t = 0$. [5]

(*b*) If $\phi = x^3 + y^3 + z^3 - 3xyz$, then find : [6]

(*i*) div(grad $\phi$)

(*ii*) curl(grad $\phi$).

(*c*) Find angle between normal to surfaces $x \log z = y^2 - 1$ and $x^2 y = 2 - z$ at the point (1, 1, 1). [5]

**11.** (*a*) Evaluate :

$$\int_C \overline{F} \cdot d\overline{r} \quad \text{for} \quad \overline{F} = 3x^2\overline{i} + (2xz - y)\overline{j} + z\overline{k}$$

along the path of the straight line joining (0, 0, 0) and (2, 1, 3). [5]

(*b*) Using Green's theorem, find :

$$\oint u\,dx + v\,dy$$

for the vector field :

$$\overline{F} = x^2\overline{i} + xy\overline{j}$$

over the region R enclosed by $y = x^2$ and then line $y = x$. [6]

(c) Using divergence theorem, evaluate :

$$\iint_S \overline{F} \cdot \hat{n} \, dS, \quad \text{for} \quad \overline{F} = \left(x + y^2\right)\overline{i} - 2x\overline{j} + 2yz\overline{k}$$

where S : surface bounded by coordinate planes at the plane $2x + y + 2z = 6$. [6]

*Or*

**12.** (a) Evaluate :

$$\iint \overline{r} \cdot \hat{n} \, dS$$

where S is a closed surface. [5]

(b) Find the work done in moving a particle once round the circle $x^2 + y^2 = a^2$; $z = 0$ under the field of force : [6]

$$\overline{F} = \sin y \, i + x\left(1 + \cos y\right) j.$$

(c) Evaluate :

$$\iint \left(\nabla \times \overline{F}\right) \cdot \hat{n} \, dS$$

where

$$\overline{F} = (x + y)i + \left(x^2 + yz\right)j - 3xy^2k$$

and S is surface of cone $z = 4 - \sqrt{x^2 + y^2}$ above X o Y plane. [6]

Total No. of Questions—**12**]    [Total No. of Printed Pages—**4**

| Seat No. | |
|---|---|

# [4957]-211

**S.E. (Information Technology) (I Sem.) EXAMINATION, 2016**

**COMPUTER ORGANIZATION**

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

## SECTION I

**1.** (*a*) Draw IEEE standard single precision and double precision floating point formats and state various fields in it with their size and significance. [6]

(*b*) Draw flowchart of Booth's algorithm for signed multiplication and multiply the following signed 2's complement numbers. Justify your answer.

Multiplicand = 11011 Multiplier = 00101 [12]

P.T.O.

*Or*

2. (*a*) Compare Restoring and Non-Restoring division algorithm. Perform the division using non-restoring division algorithm. Dividend = 23, Divisor = 05 [10]

   (*b*) Draw IAS (Von Neumann) Architecture and explain function of register in it. [8]

3. (*a*) Draw and explain programmer's model of 8086. [8]

   (*b*) Explain with examples the following addressing modes of 8086 : [8]

   (*i*) Register addressing mode

   (*ii*) Immediate addressing mode

   (*iii*) Register indirect

   (*iv*) Base index with displacement.

*Or*

4. (*a*) Draw timing diagram for memory read cycle of 8086 and list operations in each T state. [8]

   (*b*) Write a short note on minimum mode of 8086. [8]

5. (*a*) Draw and explain single bus organization of the CPU, showing all the registers and data paths. [8]

   (*b*) Write a control sequence for the execution of instruction ADD (R3), R1. [8]

*Or*

**6.** (*a*) Explain the design of multiplier control unit using Delay Element method. [8]

(*b*) Compare :

(*i*) Horizontal and Vertical microinstruction representation.

(*ii*) Hardwired and micro-programmed control. [8]

## SECTION II

**7.** (*a*) What is page fault ? Discuss page replacement strategies in detail. [8]

(*b*) Discuss direct mapping technique with respect to mapping function, address structure, merits and demerits. [10]

*Or*

**8.** (*a*) What is virtual memory ? Explain address translation mechanism for converting virtual address into physical address with neat diagram. [10]

(*b*) Write short notes on (any *two*) : [8]

(*i*) SDRAM

(*ii*) DVD

(*iii*) EEPROM

(*iv*) RAID

9. (*a*) List the techniques for performing I/O. Explain interrupt driven I/O in detail. [8]

(*b*) List the features of IC8255 and IC8251. [8]

*Or*

10. (*a*) Explain working principle of the following : [8]

(*i*) Laser Printer

(*ii*) Scanner.

(*b*) What is DMA ? Explain sigle transfer mode and block transfer mode of DMA data transfer. [8]

11. (*a*) Draw and explain closely coupled and loosely coupled multiprocessor configurations. [10]

(*b*) Give comparison between RISC and CISC. [6]

*Or*

12. Write short notes on (any *four*) : [16]

(*i*) Superscalar Architecture

(*ii*) Instruction pipelining

(*iii*) CISC

(*iv*) RISC

(*v*) UMA

(*vi*) NUMA

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-212

## S.E. (IT) (I Sem.) EXAMINATION, 2016

## FUNDAMENTAL OF DATA STRUCTURE

## (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*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Explain arrays with example. [6]

(*b*) Explain enumerated data type with example. [4]

(*c*) What is Macro ? What are its advantages and disadvantages ? [6]

*Or*

2. (*a*) Write a C program to swap two numbers using call by reference. [6]

(*b*) Compare structure and union. [4]

(*c*) What is Static variable in 'C' ? Explain the use of static variable with suitable example. [6]

3. (*a*) Explain call by value and call by reference with example. [8]

(*b*) Write a C program to accept, display and find topper from a list of n students using functions. [8]

*Or*

4. (*a*) Write a C program to compare two strings without using library function. [8]

(*b*) What is a pointer variable ? Explain declaration, initialization and accessing a pointer variable with an example. [8]

5. (*a*) Explain the following terms with examples : [6]

(*i*) Data object

(*ii*) Data type

(*iii*) Data structure.

(*b*) Write C functions for the following on a list of n numbers stored in an array : [12]

(*i*) Find sum of all elements

(*ii*) Find maximum number

(*iii*) Print reverse recursively.

*Or*

**6.** (*a*) Explain non-linear data structures with example. [6]

(*b*) Define time and space complexity of an algorithm. Write C program for bubble sort and analyze its time complexity using big-oh notation. [12]

## SECTION II

**7.** (*a*) Write a C program for selection sort. Analyze its time complexity. Compare selection and bubble sort. [10]

(*b*) What are advantages of sorting data ? Explain insertion sort with an example. [6]

*Or*

**8.** (*a*) Write C program for bubble sort. Show output of each pass to arrange the following numbers in ascending order : [10]

–10, 29, 38, –67, 6, 65, 84, 3, 2, –1.

(*b*) Explain linear and binary search techniques with examples. [6]

**9.** (*a*) Represent sparse matrix using suitable data structure. Write a C program for addition of two sparse matrices. Analyze its time complexity. [12]

(*b*) Explain the concept of row major address calculation for multidimensional array with the suitable example. [6]

*Or*

**10.** (*a*) Write a C program to obtain transpose of sparse matrix using fast transpose algorithm. Discuss its time complexity. [12]

(*b*) What is sparse matrix ? What are its applications ? [6]

**11.** (*a*) Write a C program for inserting a node at start and at the end in SLL. [10]

(*b*) Explain applications of circular linked list. [6]

*Or*

**12.** (*a*) Write a C program for deletion of node from DLL from first and last position. [10]

(*b*) Represent the following GLL using linked lists : [6]

(*i*) G = $((a, b), ((c, d), e))$

(*ii*) $(p, q, (r, s, (t, u, v), w), x, u)$.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
|---|---|

# [4957]-213

## S.E. (Information Technology) (II Semester)

## EXAMINATION, 2016

## COMPUTER GRAPHICS

## (2008 Course)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** **:—** (*i*) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4 or Q.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*) Assume suitable data if necessary.

## SECTION-I

**1.** (*a*) Explain the following [9]

(*i*) Frame Buffer

(*ii*) Joystik

(*iii*) Touch Panel

(*b*) Rasterize the line from (3,3) to (9,7) using DDA line drawing algorithm. [7]

P.T.O.

*Or*

2. (*a*) Explain the difference between random scan and raster scan. [4]

   (*b*) Explain Bresenham circle drawing alogrithm. State advantages and limitations of it. [12]

3. (*a*) Explain the following : [12]

   (*i*) 2D Scaling

   (*ii*) 2D Shearing

   (*iii*) Homogenous coordinate system

   (*b*) Explain 3D rotation. [4]

*Or*

4. (*a*) Explain the following : [8]

   (*i*) Even-odd method

   (*ii*) Winding number method

   (*b*) Explain boundary fill polygon filling method. State its limitations. [8]

5. (*a*) Explain Projection taxonomy. [6]

   (*b*) Explain Polygon Surfaces. [6]

   (*c*) Explain concept of vanishing point. [6]

*Or*

**6.** Write short notes on : [18]

(*i*) Paralled projection with mathematical treatment

(*ii*) Parametric cubic curves

(*iii*) B-Spline Curve

## SECTION-II

**7.** (*a*) Explain the following color model : [12]

(*i*) HSV color model

(*ii*) RGB color model

(*iii*) Conversion from HSV to RGB

(*b*) Explain double buffering [4]

*Or*

**8.** (*a*) Explain the following : [8]

(*i*) Morphing process

(*ii*) Types of computer animation

(*b*) Explain different steps used in design of animation sequence. [8]

**9.** (*a*) Explain Phong shading model in detail. State advantages and limitations of it. [8]

(*b*) Explain different components of local illumination model. Explain different basic light sources. [10]

*Or*

**10.** (*a*) Explain ray tracing algorithm [8]

(*b*) Explain the following illumination model : [10]

(*i*) Point source illumination

(*ii*) Diffuse reflection

**11.** (*a*) Explain features of any Graphics tool that you have studied. [8]

(*b*) Explain use of fractals to generate fractal surfaces. [8]

*Or*

12. Write short notes on : [16]

(*i*) Hilbert's Curve

(*ii*) Bezier curves

(*iii*) Fractal dimensions and topological dimensions

(*iv*) Monte-Carlo method for rendering

Total No. of Questions—**12**]　　　　[Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-214

**S.E. (Second Semester) (Information Technology)**

**EXAMINATION, 2016**

**PROCESSOR ARCHITECTURE AND INTERFACING**

**(2008 Pattern)**

**Time : Three Hours**　　　　**Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q.1 or Q.2, Q.3 or Q.4 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*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Assume suitable data if necessary.

## SECTION-I

**1.** (*a*) Draw and explain different Control Registers of 80386 Microprocessor in detail. [10]

(*b*) List the Features of 80386 Microprocessor and Draw functional block diagram of 80386. [8]

*Or*

2. (*a*) Draw and explain non pipelined read cycle of 80386 Microprocessor [10]

P.T.O.

(*b*) Explian significance of following signals of 80386 [8]

(*i*) NA'

(*ii*) ERROR'

(*iii*) BS16'

(*iv*) PREQ

**3.** (*a*) Explain significance of the following Assembler Directives : [8]

(*i*) .Model Small

(*ii*) .Stack

(*iii*) EXTRN

(*iv*) MACRO

(*b*) Compare and contrast : [8]

(*i*) Procedure and Macro

(*ii*) .COM and .EXE

*Or*

4. (*a*) Draw and explain block diagram of 8255. [8]

(*b*) Explain the following addressing modes of 80386 with suitable examples. [8]

(*i*) Register Addressing Mode

(*ii*) Immediate Addressing Mode

(*iii*) Based Indexed Addressing Mode

(*iv*) Scaled Addressing Mode

**5.** (*a*) Draw and explain how 80386 Processor translates Logical address into Linear address. [8

(*b*) Write down the steps to switch from PM to RM. [8]

*Or*

6. (*a*) What is Descriptor Table? Write the significance of the following registers with diagram. [8]

   (*i*) GDTR

   (*ii*) LDTR

   (*iii*) IDTR

   (*b*) What is TLB ? Why it is necessary ? Explain with the help of diagram. [8]

## SECTION-II

7. (*a*) What is a Task ? What is Multitasking ? What is a Task State Segment ? What is its Size and Contents ? Explain clearly indicating checks and its usage by 80386 processor. {10]

   (*b*) What is virtual mode ? Explain in detail. [8]

*Or*

8. (*a*) Write short notes on : [18]

   (*i*) I/O permission bit map.

   (*ii*) Task Switching without Task Gate

   (*iii*) Privileged levels in 80386

9. (*a*) Draw and Explain architectural block diagram of 8051 Microcontroller. [8]

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

(*i*) AJMP Address

(*ii*) RET and RETI

(*iii*) MUL AB

(*iv*) MOV A,Rn

*Or*

10. (*a*) How many Register banks does 8051 have ? Explain with the help of diagram. [8]

(*b*) Explain interrupt structure of 8051 microcontroller with priority structure. [8]

11. (*a*) Describe features of PIC Microcontroller. [6]

(*b*) List the operating modes of Timer of 8051 and explain any *two* of them. [10]

*Or*

12. (*a*) For Serial Communication, What are the SFR's used in 8051 ? Explain in detail with its structure. [8]

(*b*) Explain IE and IP registers of 8051 Microcontroller. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

| Seat No. | |
|---|---|

# [4957]-215

**S.E. (Information Technology) (Second Semester) EXAMINATION, 2016**

**DATA STRUCTURES AND FILES**

**(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 A and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. **10**, Q. **11** *or* Q. No. **12** from Section B.

(*ii*) Figures to the right side indicate full marks.

## SECTION I

**1.** (*a*) Write a note on command line arguments. [4]

(*b*) Compare between the following file write functions : [8]

fprintf, fwrite, fputs and fputc

(*c*) Compare sequential and index sequential files. [4]

*Or*

**2.** (*a*) Write C implementation of all primitive operations on sequential file. [8]

(*b*) What are the characteristics of good hash function ? Explain collision resolutions techniques. [8]

**3.** (*a*) Imagine we have two empty stacks of integers s1 and s2. Draw a picture of each stack after the following operations : [8]

(1) pushStack (s1, 3)

(2) pushStack (s1, 5)

(3) pushStack (s1, 7)

(4) pushStack (s1, 9)

(5) pushStack (s1, 11)

(6) pushStack (s1, 13)

(7) loop not emptyStack (s1)

(*a*) popStack )s1, x)

(*b*) pushStack (S2, x)

(8) end loop.

(*b*) Write an algorithm to convert an infix expression to prefix form. [8]

*Or*

**4.** (*a*) Clearly indicate the contents of stack during evaluation of the following postfix expression : [8]

a b – cd/* e +

The values are a = 8, b = 6 c = 10, d = 5, e = 7

(*b*) What is stack ? Give the data structures for implementation of stack using both sequential and linked organization. Give applications of stack. [8]

**5.** (*a*) What would be the contents of queue Q1 and queue Q2 after the following code is executed and the following data are entered : [10]

(1) Q1 = createQueue

(2) Q2 = createQueue

(3) loop (not end of file)

(*a*) read number

(*b*) enqueue (Q1, number)

(c) enqueue (Q2, number)

(d) loop (not empty $Q_1$)

(i) dequeue (Q1, x)

(ii) enqueue (Q2, x)

(e) end loop

(4) end loop

The data are 5, 7, 12, 4, 0, 4, 6.

(b) Write an algorithm that reverses the contents of a queue. [8]

*Or*

**6.** (a) Define linear queue. What are the disadvantages of linear queue? Write a pseudo C code for implementation of linear queue using linked organization. [10]

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

## SECTION II

**7.** (a) Write non-recursive preorder and inorder traversals for binary trees. [8]

(b) A binary tree has 10 nodes. The preorder and inorder travesals of the tree are shown below. Draw the tree : [8]

Preorder : J C B A D E F I G H

Inorder : A B C E D F J G I H

*Or*

**8.** (a) Write recursive algorithm to find smallest node in binary search tree and to count number of leaf nodes. [8]

(b) For the following postfix expression draw equivalent tree : [8]

AB + D* EFAD* +/+C+

**9.** (*a*) Find the Depth-first-search traversal for the given graph. Refer fig. 1. Write an algorithm for depth-first search traversal.[8]

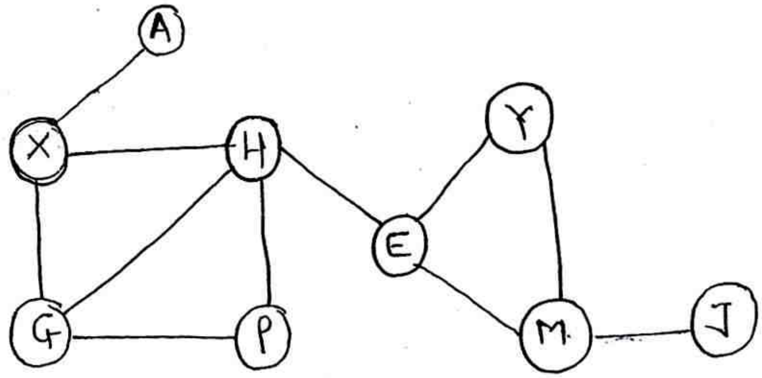


Fig. 1

(*b*) Define Graph. Describe various ways in which graphs are represented with the help of example. [8]

*Or*

**10.** (*a*) Find the MST using Prime's algorithm for the given graph. Refer figure 2. [8]

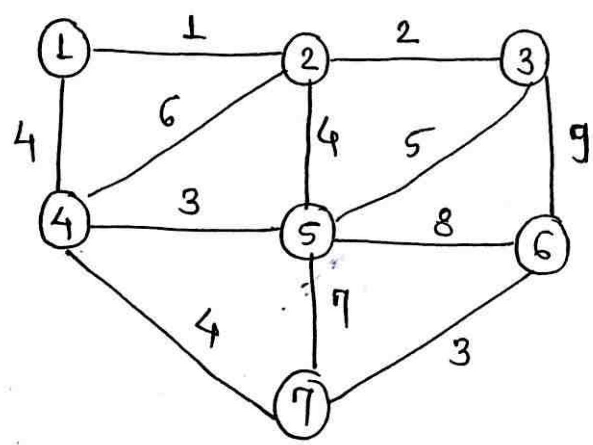


Fig. 2

(*b*) Write a pseudo code for Kruskal's algorithm. [8]

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

MP, MBS, MMT, NCP, AI, OOCS, DC, DS, OOP, OOMD

(*b*) Sort the following numbers in ascending order using heap sort algorithm : [8]

17, 25, 8, 0,1, 250, 1008, 65, 48, 101

*Or*

**12.** (*a*) Write short notes on following : [8]

(1) OBST

(2) AVL tree.

(*b*) For the data given below build a Huffman tree and find code of each symbol : [10]

| 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 | | |

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-216

## S.E. (I.T.) (Second Semester) EXAMINATION, 2016

## DATA COMMUNICATION

## (2008 PATTERN)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, *or* Q. **6**, From section **1** 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*) 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*) Draw an ISO-OSI Layered model and explain functions of following layers ?

(*i*) Physical Layer

(*ii*) Network Layer

(*iii*) Transport Layer

(*iv*) Application layer. [10]

(*b*) Explain various addressing schemes used in TCP/IP layered Model ? [8]

P.T.O.

*Or*

2. (*a*) Explain Block Coding with help of suitable block diagram. Also explain 4B/5B Encoding Scheme ? [10]

(*b*) Explain Serial and Parallel transmission Modes used in Data communication ? [8]

3. (*a*) What is Amplitude modulation (AM) Discuss terms w. r. to AM.

(*i*) Equation of AM wave

(*ii*) Modulation Index

(*iii*) Freq spectrum and Bandwidth of modulated signal. [8]

(*b*) Draw and explain FDM multiplexing and De-multiplexing process. [8]

*Or*

4. (*a*) What is constellation Pattern ? Draw the constellation diagrams for the ASK, PSK, FSK and 4-QAM. [8]

(*b*) Compare : Direct Sequence-SS modulation and Frequency Hopping-SS modulation. [8]

5. (*a*) What is Guided Media ? Name types of guided media ? Explain any *two* ? [8]

(*b*) What is DSL Technology ? What are its advantages over other technology ? explain Asynchronous DSL technology with help of DMT. [8]

*Or*

**6.** (*a*) What is switching ? Name different methods of Switching ? Explain Packet switching with help of its advantages over other methods. [8]

(*b*) Explain various types of Switches used in switching Network ? [8]

## Section II

**7.** (*a*) What are the types of error in transmission ? Name error detection methods used ? Explain Parity checks method with help of its generator and checker. [10]

(*b*) What is Hamming code ? Explain with suitable example, generation (7, 4) Hamming codes ? [8]

*Or*

**8.** (*a*) What is ARQ ? Explain various methods of ARQ system with help of suitable Diagrams ? [10]

(*b*) Write short notes on :

(*i*) High level data link control (HDLC) protocol

(*ii*) Point to Point (PPP) protocol. [8]

**9.** (*a*) Explain following physical layer implementation in standard Ethernet :

(*i*) 10 Base 5

(*ii*) 10 Base 2

(*iii*) 10 Base T

(*iv*) 10 Base F.

With respect to media, Maximum Length and Line encoding. [8]

(*b*) Describe different controlled Access protocol mentioned below :

(*i*) Reservation

(*ii*) Token Passing. [8]

*Or*

**10.** (*a*) What is mean by CSMA protocols. Explain various CSMA Protocols. [8]

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

**11.** (*a*) Explain functions of Hub, Repeater, Bridges and Routers. [8]

(*b*) What are bridges ? Why bridges are called self learning devices ? How it is different than Repeater ? [8]

*Or*

**12.** Write short notes on :

(*i*) SONET layers and Multiplexing [6]

(*ii*) Backbone Networks [6]

(*iii*) Virtual LAN. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

| Seat No. | |
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# [4957]-221

**S.E. (Polymer/Petroleum/Petrochemical Engineering)**

**(First Sem.) EXAMINATION, 2016**

**ENGINEERING CHEMISTRY—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*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Explain the following terms with suitable example : [6]

(*i*) Nucleophile

(*ii*) Homolysis

(*iii*) Carbanion.

(*b*) Write a short note on 'Huckel Rule'. [6]

(*c*) Explain why aliline is weaker base than aliphatic amines. [4]

*Or*

2. (*a*) Write a short note on inductive effect. [6]

(*b*) Explain mesomeric effect with suitable example. [6]

(*c*) Explain why formic acid is stronger acid than acetic acid. [4]

3. (*a*) Explain Claisen ester condensation with suitable example. [6]

(*b*) Explain Friedel-Craft acylation reaction. [6]

(*c*) Predict the product (any *two*) : [4]

(*i*) Acetone $\xrightarrow{\text{dil.NaOH}}$

(*ii*) $CH_3-\overset{\displaystyle CH_3 \atop |}{C}=CH_2 \xrightarrow{\text{HCl}}$

(*iii*) *n*-Propyl bromide $\xrightarrow[\Delta]{\text{Na/ether}}$

*Or*

4. (*a*) Give mechanism of $S_N1$ reaction with suitable example. [6]

(*b*) What is Grignard Reagent ? Explain its use in synthesis of primary, secondary and tertiary alcohols. [6]

(*c*) Explain mechanism of $E_1$ reaction with suitable example. [4]

5. (*a*) Explain geometrical isomerism with the suitable example. [6]

(*b*) Define and explain the following terms : [6]

(*i*) Meso

(*ii*) Threo

(*iii*) Erythro

(*c*) Give *one* method for synthesis of : [6]

(*i*) Pyrrole

(*ii*) Indole

(*iii*) Pyridine

*Or*

**6.** (*a*) Explain optical isomerism with suitable example. [6]

(*b*) Predict the product (any *three*) : [6]

(*i*) $n\text{–butane} + S \xrightarrow{650°C}$

(*ii*) $\text{Pyrrole} \xrightarrow[\Delta]{H_2/Ni}$

(*iii*) $\text{Pyridine} \xrightarrow[300°C]{KNO_3/H_2SO_4}$

(*iv*) $\text{Quinoline} \xrightarrow{NaNH_2}$

(*c*) Draw conformations of *n*-butane. Explain their stability. [6]

## SECTION II

**7.** (*a*) Derive using kinetic gas equation : [6]

(*i*) Graham's law of diffusion

(*ii*) Boyle's law.

(*b*) Derive van der Waals' equation of state for real gases. [6]

(*c*) Calculate pressure exerted by 7 g of $N_2$ occupying volume of 0.1 litres at 27°C using van der Waals' equation.

$(a = 1.39 \text{ atm. litre}^2. \text{ mol}^{-2},$

$b = 0.391 \times 10^{-1} \text{ litre.mole}^{-1}).$

(Given $R = 0.082 \text{ L atm K}^{-1} \text{ mole}^{-1}$) [4]

*Or*

**8.** (*a*) Explain Andrew's experiment for carbon dioxide. [6]

(*b*) Derive kinetic gas equation. [6]

(*c*) Normal B.P. of benzene is 80°C while $\Delta H_V$ for benzene is 30.8 kJ/mole. Find the vapour pressure of benzene.

($R = 8.3145 \text{ JK}^{-1}\text{mole}^{-1}$) [4]

**9.** (*a*) What is meant by galvanic cell ? Explain reversible and irreversible cell with proper example. [6]

(*b*) Write a short note on lead acid battery. [6]

(*c*) Explain how fuel cell is advantageous over the conventional fuel cells. [4]

*Or*

**10.** (*a*) What is battery ? Explain Zn-$MnO_2$ battery with proper example. [6]

(*b*) Give construction and working of $H_2$-$O_2$ fuel cell. [6]

(*c*) What is need for storage of electrical energy. [4]

11. (*a*) Explain how osmotic pressure is determined experimentally. [6]

(*b*) Show that relative vapour pressure lowering is a colligative property. [7]

(*c*) 1.5 g of substance when dissolved in 60 g of water, lowered the freezing point of slution by 0.136 °K. The molal depression constant for 1000 g water is 1.86. Calculate molecular weight of the solute. [5]

*Or*

12. (*a*) Explain any *three* characteristic properties of colloidal solutions. [6]

(*b*) Explain experimental set-up for depression in freezing point. [7]

(*c*) Osmotic pressure of cane sugar at 24°C is 2.51 atm. Calculate the concentration of cane sugar in grams per litre.

($R = 0.082$ L atm $K^{-1}$ $mole^{-1}$) [5]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4957]-223

**S.E. (Petroleum/Petrochemical/Polymer)**

**(I Sem.) EXAMINATION, 2016**

**CHEMICAL PROCESS CALCULATIONS**

**(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 Chemist is interested in preparing 500 ml of 1 normal, 1 molar and 1 molal solution of $H_2SO_4$. Assuming the density of $H_2SO_4$ solution to be 1.075 g/cm$^3$, calculate the quantities of $H_2SO_4$ to be taken to prepare these solutions. [16]

*Or*

**2.** A sample of $Na_2CO_3.H_2O$ weighing 0.62 grams is added to 100 ml of 0.1N $H_2SO_4$ solution. Using numerical method, comment on result. [16]

**3.** The $NH_3$–air mixture containing 0.2 kg $NH_3$ per kg air enters into absorption system where ammonia is absorbed in water. The gas leaving the system is found to contain 0.004 kg $NH_3$ per kg of air. Find the percentage recovery of ammonia. [16]

*Or*

**4.** 2000 kg of wet solids containing 70% solids by weight are fed to a tray dryer where it is dried by hot air. The product finally obtained is found to contain 1% moisture by weight. Calculate : [16]

(*i*) The kg of water removed from wet solids

(*ii*) The kg of product obtained.

**5.** Centrifuge is fed with a slurry containing 25% solids by weight and wet solids obtained after filtration are analyzed to contain 8% moisture by weight and filtrate is found to contain 200 ppm solids. If centrifuge machine produces 100 kg per hour desired wet product and quantity of slurry to be handled is 5000 kg per batch, calculate : [18]

(*i*) The time required for filtration of slurry

(*ii*) Loss of solids in filtrate per batch.

*Or*

**6.** In production of sulphur trioxide, 100 kmol of $SO_2$ and 100 kmol of $O_2$ are fed to a reactor. If the percent conversion of $SO_2$ is 80, calculate the composition of the product stream on mole basis. [18]

## SECTION II

**7.** Formaldehyde is produced by dehydrogenation of methanol.

$$CH_3OH \rightarrow HCHO + H_2$$

The per pass conversion is 67%. The product leaving the reactor is fed to separation unit battery where formaldehyde is separated from methanol and hydrogen. The separated methanol is recycled to reactor. If the production rate of formaldehyde is 1000 kg/h, calculate : [16]

(*i*) Combined feed ratio,

(*ii*) Flow rate of methanol required to the process as fresh feed.

*Or*

**8.** Wet solids containing 50% water and 50% solids are to be dried to get solids with 5% water by weight. Fresh air contains 0.010 kg water vapor per kg dry air and the air leaving the dryer contains 0.05 kg water vapor per kg dry air. If 100 kg dry air enters the dryer for every kg of dry solids, calculate the quantity of freah air and the fraction of the air recirculated and recycle ratio. [16]

**9.** Methane gas is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol methane using $C^\circ_p$ data given below :

$C^\circ_p = 19.2494 + 52.1135 \times 10^{-3}\ T + 11.973 \times 10^{-6}\ T^2 - 11.3173 \times 10^{-9}\ T^3$, kJ/kmol.K [16]

*Or*

**10.** Pure ethylene is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol ethylene using the heat capacity data given below :

$C^\circ_p = 4.1261 + 155.0213 \times 10^{-3}\ T - 81.5455 \times 10^{-6}\ T^2 + 16.9755 \times 10^{-9}\ T^3$ [16]

**11.** The heat of dilution of one mol $KClO_3$ in 5.66 mol of water at 291 K is –37.3 kJ permol $KClO_3$. Calculate the heat absorbed when 1000 kg of solution is to be prepared at 291 K having the above composition. [18]

*Or*

**12.** Calculate the standard heat of reaction at 800 K for the complete combustion of pentane gas ($C_5H_{12}$). The mean heat capacities of $C_5H_{12}$, $O_2$, $CO_2$ and $H_2O$ are 247, 33.62, 52.32 and 38.49 J/mol.K. respectively. The standard heat of combustion at 298 K is –3271.71 kJ/mol. [18]

Total No. of Questions—**12**]  [Total No. of Printed Pages—**4+2**

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# [4957]-225

**S.E. (Polymer/Petroleum/Petrochemical) (I Sem.) EXAMINATION, 2016**

**STRENGTH OF MATERIALS**

**(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 electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Derive the relationship between the elastic constants E and K using usual notations. [9]

(*b*) A collar at the end of a vertical steel rod is 25 mm in diameter check the fall of a weight of 2.5 kN which falls through a height of 4 mm before it strikes the collar. Find the shortest length of the rod which will bear the impact if the stress is not to exceed 125 $N/mm^2$. E = 210 GPa. [8]

*Or*

**2.** (*a*) A flat bar of Aluminium alloy 25 mm wide and 5 mm thick is placed between two steel bars each 25 mm wide and 10 mm thick of form a composite bar 25 mm × 25 mm. The three bars are fastened together at their ends when the temperature is 15°C. Find the stress in each material when the temperature of the whole assembly is raised to 55°C. Both the alloy $E_s$ = 200 GPa, $E_{AL}$ = $EAL = \frac{E_s}{3}$ and steel bars have the same length. $\alpha_s = 1.2 \times 10^{-5}/°C$, $\alpha_{AL} = 2.3 \times 10^{-5}/°C$. [9]

(*b*) A steel bar 40 mm × 40 mm in section, 3 m long is subjected to an axial pull of 128 kN. Taking E = 200 GPa, calculate the elongation in the length of the bar. Also calculate the amount of energy stored. [8]

**3.** (*a*) At a point in a stressed body the principal stresses are 100 MPa (Tensile) and 60 MPa (compressive). Determine the normal and shear stresses on a plane inclined at 50° to the axis of major principal stress. Also calculate the maximum shear stress at the point. [9]

(*b*) Write the assumptions in the theory of torsion. Write also the torsion formula and explain each term. [8]

*Or*

**4.** (*a*) Derive the expression for the stresses on an oblique plain of a rectangular element when it is subjected to direct stresses in two mutually perpendicular directions. [9]

(*b*) A solid steel shaft 100 mm in diameter transmits 136 kW at 150 rpm. Calculate the torque on the shaft, the angle of twist in a length of 600 mm and the maximum shear stress developed in the shaft. Take G = 80 GPa. [8]

**5.** (*a*) Write the assumptions *f* in Lame's theory for thick walled pressure vessels.

A spherical vessel of 150 mm internal diameter is subjected to an interval fluid pressure of 20 N/mm$^2$. If the permissible tensile stress is 100 N/mm$^2$, find the thickness of the shell. [8]

(*b*) A thin spherical shell 1400 mm in diameter is subjected to an internal pressure of 1.8 N/mm$^2$. If the permissible stress in the plate material is 140 N/mm$^2$ and joint efficiency is 75%, find the minimum thickness. [8]

*Or*

6. (*a*) For a thick cylinder derive the expression for hoop stress and radial stress developed in the wall of the cylinder when subjected to an internal fluid pressure. [8]

(*b*) Derive the expressions for longitudinal stress, circumferential stress and maximum shear stress developed in a thin cylinder when subjected to an internal pressure. [8]

## SECTION II

7. (*a*) A cantilever 1.5 m long is loaded with a udl of 2 kN/m over a length of 1 m from the free end. It also carries a point load of 3 kN at 0.25 m from the free end. Draw the SFD and BMD for the beam. [9]

(*b*) Derive the flexure formula for pure bending in a beam. [8]

*Or*

8. (*a*) A simply supported beam of span 6 m is loaded by a gradually varying load of 1 kN/m from left support to 2 kN/m to the right support. Draw the SFD and BMD for the beam showing all important values. [9]

(*b*) A timber beam of depth 300 mm and symmetrical section is simply supported over a span of 10 m. What udl per metre (including self weight) can it carry if the maximum permissible stress is 7.5 $N/mm^2$ ? MI of the section = $4.5 \times 10^8$ $mm^4$. [8]

**9.** (*a*) For a beam having a circular cross-section which is subjected to a shear force, show that the maximum shear stress developed in the section is 33% more than the average shear stress. [9]

(*b*) What is effective length for a column ? Explain. What is the effective length for columns with different end condition (standard) ? [8]

*Or*

**10.** (*a*) A T-section of a beam is subjected to a shear force of 25 kN. Its flange is 100 mm × 12 mm and web is 12 mm × 88 mm; with overall depth as 100 mm. Draw the shear stress distribution diagram for the section. [9]

(*b*) A hollow cyclindrical cast iron column is 6 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 100 kN with a factor of safety of 4. Take internal diameter as 0.7 times the external diameter. Also $f_c$ = 550 N/mm$^2$ and $\alpha = \frac{1}{1600}$ in Rankine's formula. [8]

**11.** (*a*) With the help of proper sketches, derive the expression for th extreme fibre stresses developed in a short member subjected to a eccentric compressive loading (eccentricity is about one axis only). the cross-section of the short member is rectangular. [8]

(*b*) A beam is simply supported at the ends with a concentrated load acting at the centre. Determine the deflection under the load. [8]

*Or*

**12.** (*a*) A hollow circular shaft having inside diameter half the outside diameter is subjected to a torque of 40 kNm and a bending moment of 30 kNm simultaneously. If the maximum allowable shear stress in the shaft is 80 MPa, find the diameter of the shaft. [8]

(*b*) A beam of 6 m span and EI = 40,000 kNm$^2$ is subjected to a clockwise couple of 300 kNm at 4 m from the left end. Find the deffection at the point of application of the couple. [8]

Total No. of Questions—**12**]  [Total No. of Printed Pages—**4+1**

| Seat No. | |
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# [4957]-226

## S.E. (Polymer/Petroleum Petrochemical) (Second Sem.) EXAMINATION, 2016

## ENGINEERING CHEMISTRY-II

## (2008 PATTERN)

**Time : Three Hours**  **Maximum Marks : 50**

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

(*ii*) Answer *three* questions from Section I and *three* questions from Section II.

(*iii*) Answer to the two Sections should be writen in separate-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right side indicate full marks.

(*vi*) 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 Haworth's projection formula for the following :

(*i*) Cellulose

(*ii*) Sucrose

(*iii*) B-D(+) glucose. [6]

(*b*) Give classification of carbohydrates. [6]

(*c*) Explain four factors affecting enzyme activity. [4]

P.T.O.

*Or*

2. (*a*) Give a brief account of primary and secondary structure of proteins. [6]

   (*b*) Starting from glucose how will you prepare : [6]

   (*i*) Gluconic acid

   (*ii*) Sorbitol.

   (*c*) Explain D, L configuration of glucose. [4]

3. (*a*) Give any *two* methods for synthesis of : [6]

   (*i*) Alcohols

   (*ii*) Acid chlorides.

   (*b*) Give two methods to convert ketone into alkane. [6]

   (*c*) Write a short note on Williamson's synthesis of ether. [4]

*Or*

4. (*a*) Explain synthesis of esters from : [6]

   (*i*) Acids

   (*ii*) Diazomethane

   (*b*) Give any *two* methods for synthesis of aldehyde. [6]

   (*c*) Give Gabrial's phthalimide synthesis of amines. [4]

5. (*a*) Explain following terms with suitable example. [6]

   (*i*) Auxochrome

   (*ii*) Hyperchromic shift

   (*iii*) Hypsochromic shift

(*b*) Discuss the principle and application of U.V. spectroscopy. [6]

(*c*) How will you identify presence of following functional groups of I.R. Spectroscopy : [6]

(*i*) Aldehyde

(*ii*) Ketone

(*iii*) Caboxyl

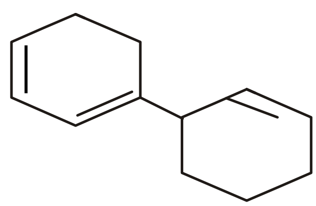
*Or*

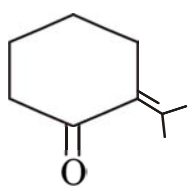
**6.** (*a*) How many signals are expected in NMR spectra of following compounds ? Justify your answer. [6]

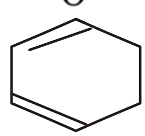
(*i*) Ethylmethyl ether

(*ii*) Ethanol

(*b*) Find the $\lambda_{max}$ for following compounds : [6]

(*i*) 

(*ii*) 

(*iii*) 

(*c*) Explain the principle of I.R. spectroscopy. [6]

## SECTION II

**7.** (*a*) Draw molecular orbital diagram for oxygen molecule. Explain magnetic behaviour of the oxygen molecule using this diagram. [6]

(*b*) What is meant by hybridization ? Explain it for ammonia molecule. [6]

(*c*) Write electronic configuration of chromium atom and write quantum numbers for last electron of chromium. [4]

*Or*

**8.** (*a*) Give postulated of VBT. Explain structure of water molecule on the basis of VBT. [6]

(*b*) What are quantum number ? Give their significance. [6]

(*c*) Explain Hund's rule and Pauli's exclusion with proper examples. [4]

**9.** (*a*) What is meant by transition element ? Explain why they show variable oxidation states ? [6]

(*b*) What is meant by CFSE ? Calculate it for following complex ions. Which ion is suitable ? [6]

(*i*) $[CO(CN)_6]^{3-}$

(*ii*) $[COF_6]^{3-}$

(*c*) With the help of proper example explain : [4]

(*i*) Ligand

(*ii*) Co-ordination number.

*Or*

**10.** (*a*) On the basis of VBT, explain tetrahedral structure of $[NiCl_4]^{2-}$ [6]

(*b*) Draw different '*d*' orbitals. What is differences between d2sp3 and $sp^3d^2$ hydbridised octahedral complexes. [6]

(*c*) Find C.N., E.A.N. of the metal ion for the following complexes. [4]

(*i*) $[Fe(CO)_5]$

(*ii*) $[CO(NH_3)_4Cl_2$

**11.** (*a*) What is chromatograph ? Explain column chromatography. [6]

(*b*) Write a short note on gas chromatography. [7]

(*c*) Give two principles of chromatography. [5]

*Or*

**12.** (*a*) Give experimental setup for TLC. Give application of TLC. [6]

(*b*) Give principle and working of atomic absorption spectroscopy. [7]

(*c*) Ist ionisation potential of an element in period increases with increases in atomic number. Explain. Given : [5]

| **Symbol** | **Atomic Number** |
|---|---|
| Sc | 21 |
| Ti | 22 |
| Cr | 24 |
| Fe | 26 |
| Co | 27 |
| Ni | 28 |
| Cu | 29 |

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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# [4957]-227

## S.E. (Petroleum/Petrochemical/Polymer Engineering) (II Sem.) EXAMINATION, 2016

## HEAT TRANSFER

## (2008 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer to the *two* sections should be written in separate books.

(*ii*) Draw neat diagrams wherever necessary.

(*iii*) Numbers to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of logarithmic table, electronic pocket calculators is allowed.

## SECTION-I

**1.** (*a*) Derive the necessary expression for Heat flow rate, Fin Efficiency from an Infinitely long fin. [6]

(*b*) Define the terms Heat and Thermal Conductivity. [4]

(*c*) Explain the following : [8]

(*i*) Fourier's Law of Heat Conduction,

(*ii*) Newton's Law of cooling,

(*iii*) Stefan-Boltzmann Law of Radiation.

*Or*

2. (*a*) Derive the necessary expression for the heat conduction through a composite cylindrical pipe made up of five layers of different materials. [10]

(*b*) Which of the following arrangement will give higher heat transfer rate ? [8]

Case *i*) 6-fins of 10 cm length

Case *ii*) 10-fins of 5 cm length.

Pin fins with insulated ends are provided to increase the heat transfer rate from a hot surface. Thermal Conductivity $k_{\text{(fin material)}}$ = 300 w/m ºC, h = 30 W/$m^2$ ºC, cross section area of fin = 2 $cm^2$, Perimeter of fin = 4 cm, Fin Base temperature = 330 ºC and surrounding temperature = 40 ºC.

**3.** (*a*) Discuss any three law of Radiation. [8]

(*b*) Discuss the term Intensity of Radiation and Total Emissive Power. Prove that the total Emissive Power of diffuse surface in qual to $\pi$ times its Intensity of Radiation. [10]

Calculate the rate of heat loss from 6 m long horizontal steam pipe, 60 mm O.D. at 170 ºC and the temperature of air is 25 ºC. Take emissivity = 0.85, heat transfer coefficient for heat loss by Natural convection h = 1.64 $(\Delta T)^{0.25}$ W/$m^2$ ºC.

*Or*

4. (*a*) Discuss the term Emissive power and emissivity. Explain in detail Radiation Heat exchange between two Black Bodies. [12]

(*b*) Explain the term Shape Factor. [6]

**5.** (*a*) Explain the following Dimensionless Numbers with their importance [10] (*i*) Reynolds Number.

(*ii*) Prandtl Number

(*iii*) Nusselt Number

(*iv*) Rayleigh Number

(*v*) Grashof Number

(*b*) Discuss with one example Method of Dimensional Analysis. [6]

*Or*

6. (*a*) A hot plate 1m × 1.5m is maintained at 300 ºC. air at 20 ºC blows over the plate. If the convective heat transfer coefficient is 20 w/m$^2$ ºC, calculate the rate of heat transfer. [8]

(*b*) Write a note on heat transfer by Natural Convection. Differentiate between Natural Convection Vs Forced Convection. [8]

## SECTION-II

7. (*a*) Calculate the overall heat transfer coefficient depending on inside as well as outside area of the tube. Alcohol flowing in inner steel pipe of a double pipe exchanger is cooled with water flowing in the jacket. Inner diameter of inner steel pipe is 25 mm and 2 mm thick. The thermal conductivity of steel is 45 W/m ºC. Film Coefficient of alcohol is 1200 W/m$^2$ ºC and that of water is 1800 W/m2 ºC. The inside and outside fouling factors are 5000 W/m$^2$ ºC and 3000 W/m$^2$ ºC respectively. [12]

(*b*) Discuss the followings : [6]

Heat Exchanger Effectiveness and Number of Transer Units (NTU).

*Or*

8. (*a*) Derive the expression for Logarithmic Mean Temperature Difference for Counter current type of Heat Exchanger. [12]

   (*b*) Discuss the following : [6]

   (*i*) Temperature Ratio,

   (*ii*) Capacity Ratio,

   (*iii*) Heat Exchanger Effectiveness.

9. (*a*) Write a note on Film and Drop wise Condensation. [8]

   (*b*) Discuss with neat diagram following terms : Nucleate Boiling, Film Boiling, Critical heat flux point. [8]

*Or*

10. (*a*) Discuss the following : Pool Boiling, Forced Convection Boiling, Sub-cooled Boiling and Saturated Boiling. [8]

    (*b*) Discuss the effects of the presence of non condensable gases on condensation. [8]

11. (*a*) Discuss in detail with neat diagrams the following : [16]

    (*i*) Short tube evaporator.

    (*ii*) Long tube vertical evaporator.

*Or*

12. (*a*) Explain Material balance and energy balance for single effect evaporator with block diagram. [8]

    (*b*) Discuss is detail Multiple Effect Evaporators. [8]

Total No. of Questions—**3**] [Total No. of Printed Pages—**3**

| Seat No. | |
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**[4957]-229**

**S.E. (POLY/PETRO/PETROCHEMICAL ENGINEERING)**
**(Second Semester) EXAMINATION, 2016**
**ELEMENTS OF SOCIAL SCIENCE**
**(2008 COURSE)**

**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.

## SECTION I

**1.** (*a*) Explain Law of Demand with exceptions. [8]

(*b*) Scarcity of resources is the root cause of Economic Problem. Explain. [8]

*Or*

(*a*) State and explain different types of markets. [8]

(*b*) Explain the merits and demerits of Mixed Economics. [8]

**2.** (*a*) Explain the different factors of production. [8]

(*b*) Explain the functions of Money. [8]

*Or*

(*a*) Government plays a vital role in Economic Development. Explain. [8]

(*b*) Explain merits and demerits of specialization and division of labour. [8]

**3.** Write short notes on : [18]

(*a*) 5 year plans of Economic Development.

(*b*) Vision of India 2020

(*c*) LPG model for Economic Development

*Or*

(*a*) Industrial policy of India.

(*b*) Rationing of Prices

(*c*) Law of Diminishing Return

## SECTION II

**4.** (*a*) Discuss the Socio economic impact of Globalization on Indian Society in detail. [10]

(*b*) Explain the importance of Study of Civilizations. [6]

*Or*

Explain in brief :

(*a*) Cultural Diversity of India [8]

(*b*) Modern families in India. [8]

**5.** (*a*) Explain the importance of "Census of India." [8]

(*b*) Technology leads to Social Change. Explain. [8]

*Or*

(*a*) Sustainable Consumption and Sustainable Development go hand in hand. Explain. [8]

(*b*) The entire world is in grief of Religious Fundamentalism. Comment. [8]

**6.** Write short notes on the following : [18]

(*a*) IT Revolution in India

(*b*) Indian Philosophy

(*c*) Communalism

*Or*

(*a*) Environment and Ecology

(*b*) Social Reformers and Reforms

(*c*) Caste System in India

Total No. of Questions—**12**]　　　　[Total No. of Printed Pages—**8+1**

| Seat No. | |
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# [4957]-231

## S.E. (Biotechnology) (First Semester) EXAMINATION, 2016

## APPLIED CHEMISTRY

## (2008 PATTERN)

**Time : Three Hours**　　　　**Maximum Marks : 100**

***N.B.* :—** (*i*) Answer only *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 table or electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) What is Carbonium ion ? Discuss its geometry, stability order with one preparation method. [6]

(*b*) Draw the resonance structures of : [6]

(*i*) Aniline

(*ii*) Toluene

(*iii*) Nitrobenzene.

P.T.O.

(*c*) Justify the following (*two* marks each) : [6]

(*i*) Pyrrole is weaker base than Pyridine.

(*ii*) Guanidine is a strongest base

(*iii*) Phenol is more acidic than alcohol.

*Or*

**2.** (*a*) Explain in brief about Hyperconjugation and Tautomerism with suitable example. [6]

(*b*) Explain inductive effect and steric effect with suitable examples. [6]

(*c*) Classify the following compounds as Aromatic, Non-aromatic and Antiaromatic : [6]

(*i*) Naphthalene

(*ii*) Cyclopentadienyl cation

(*iii*) Cyclohexane

(*iv*) Furan

(*v*) Tropylium ion

(*vi*) Cyclooctatetraene.

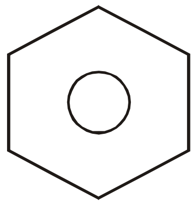
**3.** (*a*) Explain the effect of the following factors on $S_N2$ reaction :

(*i*) Nature of nucleophile and substrate

(*ii*) Nature of leaving group

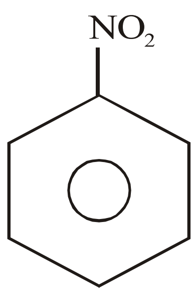
(*iii*) Nature of solvent.

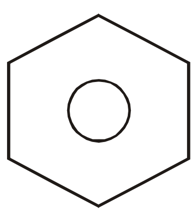
(*b*) Predict the product : [6]

(*i*)  $+ \ CH_3Cl \xrightarrow{\text{Anhydrous } AlCl_3} ?$

(*ii*) $\underset{\substack{| \\ Br}}{CH_3-CH}-CH_2-CH_3 \xrightarrow{\text{alc.KOH}} ?$

(*iii*) $(CH_3)_3\ C - Br + \underset{(aq.)}{KOH} \longrightarrow ?$

(*iv*)  $+ \underset{(Conc)}{HNO_3} \xrightarrow[H_2SO_4]{Conc} ?$

(*v*)  $+ \ CH_3COCl \xrightarrow[AlCl_3]{\text{Anhydrous}} ?$

(*vi*) $CH_3-CH = CH_2 \xrightarrow[H_2O_2]{HBr} ?$

(*c*) Write Beckmann rearrangement with its mechanism. [4]

*Or*

4. (*a*) Explain E1-mechanism with suitable example. [6]

(*b*) What is the action of $CH_3MgBr$ on Formaldehyde, Acetaldehyde and Acetone followed by hydrolysis ? [6]

(*c*) Write mechanism of Claisen ester condensation reaction with suitable example. [4]

5. (*a*) Define optical isomerism and explain the optical activity of the compound containing two dissimilar asymmetric carbon atoms. [6]

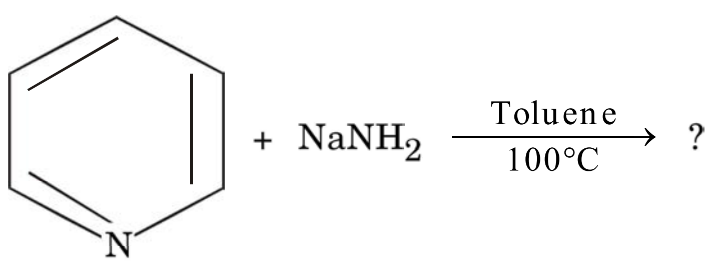
(*b*) Define the following with suitable example : [6]

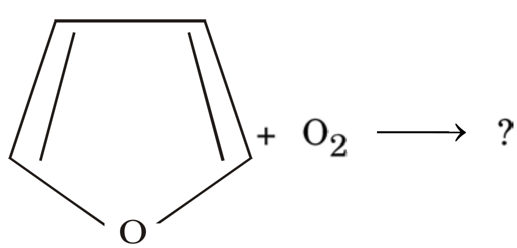
(*i*) Enantiomer

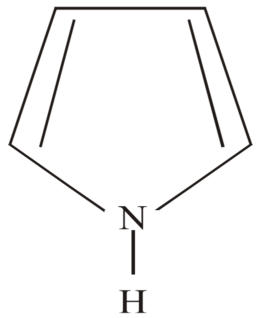
(*ii*) Racemic mixture

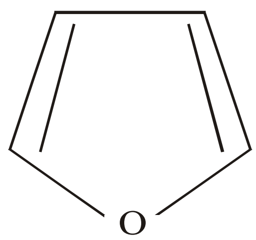
(*iii*) Functional isomerism.

(*c*) Predict the product (*one* mark each) : [4]

(*i*)



(*ii*)


(*iii*)  $\xrightarrow[\Delta]{CHCl_3,\ NaOH}$ ?

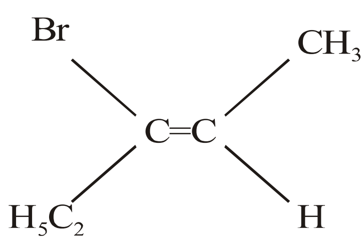
(*iv*)  + $NH_3$ $\xrightarrow[\Delta]{Al_2O_3}$ ?

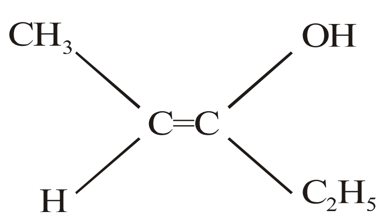
*Or*

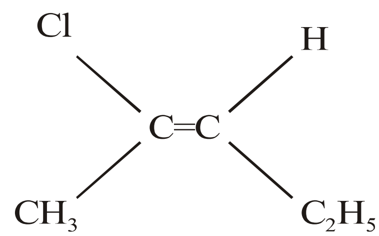
**6.** (*a*) Explain conformations of Butane with energy profile diagram. [6]

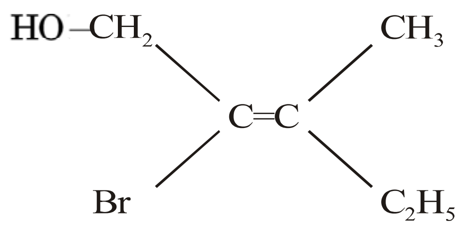
(*b*) Write Skraup synthesis of Quinoline. [6]

(*c*) Assign E or Z configuration of the following (*one* mark each) : [4]

(*i*) 


(*ii*) 

(iii) 

(iv) 

## SECTION II

**7.** (a) Define viscosity. Derive Poiseuille equation to determine viscosity coefficient of a liquid flowing through a tube. [6]

(b) Derive Bragg's equation for studying internal structure of solid crystals. [6]

(c) (i) The time required to flow through Ostwald's viscometer is 1.52 minutes for water and for same volume of organic liquid having density 0.8 g/cc is 2.25 minutes. Find the viscosity of liquid relative to that of water. (Viscosity coefficient of water is 1.002 centipoise). [3]

(ii) Find the interplanar distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube ($\lambda = 1.539\ A^0$) at an angle of $22.5^0$. [3]

*Or*

**8.** (*a*) Explain the concept of Parachor to calculate surface tension of liquid. [6]

(*b*) Define surface tension and explain drop number method by use of stalagmometer to measure surface tension of liquid. [6]

(*c*) (*i*) At 298 °K, surface tension of Ethanol in contact with its vapour is $2.189 \times 10^{-2}$ $Nm^{-1}$ and its density is 0.740 g/cc. How far up the liquid will rise in a tube of internal radius of 0.1 mm. (g : 980 $gm/sec^2$). [6]

(*ii*) Calculate the angles at which first, second and third order reflections are obtained from planes 500 pm apart, using X-rays of wavelengths 100 pm. [3]

**9.** (*a*) Explain in brief RMS, Average and Most Probable velocities and their interrelation. [6]

(*b*) What is mean free path ? Derive an expression for measurement of collision diameter. [6]

(*c*) Calculate collision diameter of $CO_2$, if at 20°C the coefficient of viscosity of $CO_2$ is $1.48 \times 10^{-5}$ Kg $m^{-1}$ $s^{-1}$. [4]

*Or*

**10.** (*a*) Derive kinetic gas equation. [6]

(*b*) Derive van der Waals' equation to explain the deviation of real gases from ideal gas behaviour. ]6[

(*c*) Calculate RMS velocity of $CO_2$ at 27°C. (At Wt. of C = 12 and O = 16). [4]

**11.** (*a*) Show that elevation in boiling point is Colligative property. How will you find out molecular weight of solute by using elevation in boiling point ? [6]

(*b*) Define Van't Hoff's factor. How are Van't Hoff's factor and degree of dissociation related with each other ? [6]

(*c*) A solution of 0.278 g of an organic susbstance in 55.6 g of acetone had its boiling point raised by 0.272°C. Find the molecular weight of that compound if Kb for 1000 gm of solvent is 1.72. [4]

*Or*

**12.** (*a*) Define osmosis and osmotic pressure. Explain Berkeley and Hartley method to determine osmotic pressure of dilute solutions. [6]

(*b*) Define : [6]

(*i*) Molarity

(*ii*) Molality

(*iii*) Mole fraction

(*iv*) Normality

(*v*) Ideal solution

(*vi*) Colligative property.

(*c*) Calculate the osmotic pressure of 3.5% solution of sucrose at 27°C. Find the strength of urea solution which is isotonic with solution. [4]

Total No. of Questions—**12**]  [Total No. of Printed Pages—**4+1**

| Seat No. | |
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# [4957]-232

## S.E. (Biotechnology) (I Sem.) EXAMINATION, 2016

## FLUID FLOW AND UNIT OPERATIONS

## (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*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Write a note on "Effect of temperature on viscosity of Liquids and Gases". [6]

(*b*) What is meant by transition length and fully developed flow ? [6]

(*c*) Water is flowing through a tapering pipe having diameters 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 lit/sec. The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/$m^2$. [6]

*Or*

2. (*a*) Water flows through pipe AB 1.2 m in diameter at 3 m/s and then passes through a pipe BC which is 1.5 m in diameter. At C, the pipe branches into two pipes CD and CE. Branch CD is 0.8 m in diameter and carries 1/3 of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the following from the above data : [8]

   (*i*) Discharge in pipe AB

   (*ii*) Velocity in pipe BC

   (*iii*) Diameter in pipe CE

   (*b*) Derive the Bernoulli's equation without friction. State the assumptions made. [10]

3. (*a*) Derive the Hagen Poiseuille equation for laminar flow in circular pipes. [8]

   (*b*) Why energy loss does takes place due to sudden expansion and contraction in the flow path ? Give the expressions for head loss in the above cases. [4]

   (*c*) Short horizontal pipe carrying water is enlarged from 10 cm to 20 cm diameter. If the flow through pipe is 1360 kg/min, determine loss of head due to sudden enlargement. [4]

*Or*

4. (*a*) Write a note on different factors which affect friction in fluid flow. [5]

(*b*) Define roughness. Classify the different types of surfaces based on roughness. [6]

(*c*) An oil of viscosity 0.1 Pa.s and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and length 300 m. The rate of fluid flow through pipe is 3.5 lit/sec. Find pressure drop in a length of 300 m. [5]

5. (*a*) What are the standard design considerations for the agitated vessel system ? [5]

(*b*) A disc turbine with a six flat blades is installed centrally in a vertical baffled tank 2 m in diameter. The turbine is 0.5 m in diameter and is positioned 0.5 m above the bottom of the tank. The liquid being agitated has a viscosity and density of 12 cp nad 1500 kg/$m^3$ respectively. The speed of the turbine is 100 r.p.m. What power will be required ? (Np = 5.8 for disc turbine) [5]

(*c*) What is power curve ? How is it used for determination of power consumption in an agitated vessel ? [6]

*Or*

6. (*a*) What is Cavitations and NPSH in pumping technology ? [6]

(*b*) Describe the following equipments : [10]

(*i*) Banbury Mixer

(*ii*) Pug Mill

## SECTION II

**7.** (*a*) What is Kynch's theory of sedimentation ? List the various assumptions made for this theory. [8]

(*b*) Explain the $\Delta$P versus velocity graph for a fluidized bed system. Mark the different regions on the graph. [8]

*Or*

**8.** (*a*) Explain Principle, construction and Working of hydrocyclone. [6]

(*b*) Write notes on : [10]

(*i*) Aggregative fluidization

(*ii*) Filter media and filter aids.

**9.** (*a*) Write notes on the following : [16]

(*i*) Formation of spouted beds

(*ii*) Applications of fluidized bed system

(*iii*) Rotary drum filter

(*iv*) Minimum fluidization velocity

*Or*

**10.** (*a*) What is meant by constant rate and constant pressure filtration ? Give expressions for calculation pressure drop in both the cases. [8]

(*b*) Explain the different types of fluidization commonly observed. Which type is more perferable in practice ? [8]

**11.** (*a*) A certain crusher accepts a feed of rock having volume surface mean diameter of 0.75 inches and discharges a product of diameter 0.2 inches. The power required to crush 15 tons/hr is 12 hp. What should be the power consumption if the capacity is reduced to 10 tons/hr and the volume surface mean diameter of the product to 0.15 inches ? Use Rittinger's law. [6]

(*b*) Differentiate between : [6]

(*i*) Ideal and actual screens

(*ii*) Closed and Open circuit grinding

(*c*) Describe methods of screen analysis. [6]

**12.** (*a*) It is required to crush 250 tons/hr of ore. The range of the feed size is such that 80% of the feed passes through an opening of 2.5 inch. The product is such that 80% of it passes through an opening of 0.125 inch. Estimate the power consumption per ton of feed.

Take $K_b = 4.784$. [6]

(*b*) What is meant by screen effectiveness ? What are the factors which reduce the screen effectiveness ? [6]

(*c*) Explain different Crushing laws. [6]

Total No. of Questions—**12**]    [Total No. of Printed Pages—**3**

| Seat No. | |
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# [4957]-233

**S.E. (Biotechnology) (First Semester)**

**EXAMINATION, 2016**

**MICROBIOLOGY**

**(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**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*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.** Describe the structure and the important cellular features of a eukaryotic cell. [18]

*Or*

**2.** Describe :

(*a*) For what contributions are Hooke, Beijerinck, and Ehrlich remembered in microbiology. [9]

(*b*) The Five Kingdom System of Classification. [9]

P.T.O.

**3.** Explain the methods used for measurement of cell numbers. [16]

*Or*

**4.** Draw a neat labeled diagram for :

(*i*) An autoclave [8]

(*ii*) Neubauer chamber. [8]

**5.** Answer the following :

(*i*) Distinguish between an enriched media and an enrichment media. [8]

(*ii*) Compare between the pour plate and spread plate techniques. [8]

*Or*

**6.** Answer :

(*i*) Explain the growth requirements of microorganisms. [8]

(*ii*) Explain the 3 major categories of microbes based on their temperature preference. [8]

## SECTION II

**7.** Answer the following :

(*a*) What are the important features of viruses. [9]

(*b*) Describe the use of embryonated egg for virus cultivation. [9]

*Or*

**8.** Answer the following :

(*a*) Chemical agents do not have equal levels of disinfection. Justify. [9]

(*b*) Write a note on Bacterial resistance to antibiotics. [9]

**9.** Answer the following :

(*a*) Enumeration of the microbes in air. [8]

(*b*) Differentiate between food infection and food intoxication. [8]

*Or*

**10.** Define Rabies, with respect to its causative agent, pathogenesis, laboratory diagnosis and treatment. [16]

**11.** Explain the use of chemicals which can be used for preservation of food. [16]

*Or*

**12.** Answer the following :

(*a*) Describe the preventive methods for an AIDS infection. [8]

(*b*) Explain the terms :

(*i*) Symbiosis [4]

(*ii*) Antibiosis. [4]

| Seat No. | |
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**[4957]-234**

**S.E. (Biotechnology) (I Sem.) EXAMINATION, 2016**

**BIOCHEMISTRY—I**

**(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**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*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.** Write short notes on : [18]

(*a*) Buffering system in human beings

(*b*) Second by-pass reaction in gluconeogenesis.

*Or*

**2.** Derive Handerson-Hasselbalch equation. What will be the pH of a mixture of 5 ml of 0.1 M/lit sodium acetate and 4 ml of 0.1 mol/lit acetic acid ? How is the pH changed on adding 1 ml of 0.1 mol/lit HCl to the above mixture ? [18]

3. Describe in detail about synthesis of starch with special prominence on the role of nucleoside diphosphate sugar. [16]

*Or*

4. Draw a neat diagram for : [16]

(*a*) ETC

(*b*) TCA cycle.

5. Describe in detail about : [16]

(*a*) Transamination and deamination

(*b*) Defects in Urea cycle.

*Or*

6. Write short notes on : [16]

(*a*) Size exclusion chromatography

(*b*) Digestion and absorption of lipids.

## SECTION II

7. Answer the following : [18]

(*a*) Describe in detail about acidosis and ketosis.

(*b*) Classification of lipids with suitable example of each.

*Or*

8. Answer the following : [18]

(*a*) Write down in detail about β-oxidation of fatty acid. Draw the structures of intermediate product.

(*b*) Elongation of saturated fatty acids in mitochondria.

**9.** Write short notes on : [16]

(*a*) Purines and pyrimidines

(*b*) Nucleoside and nucleotide.

*Or*

**10.** Describe in detail about synthesis o purines. Draw the structures of intermediate. [16]

**11.** Give the detail account about sources, recommended dietary allowance and deficiences of any two water soluble vitamins. [16]

*Or*

**12.** Answer the following : [16]

(*a*) Describe in detail about functions and deficiencies of vitamin E and K.

(*b*) Differentiate between osteomalacia and osteoporosis.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

| Seat No. | |
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# [4957]-235

## S.E. (Biotechnology) (II Sem.) EXAMINATION, 2016

## 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**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*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.** Describe in detail about primary and secondary of protein. [18]

*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*) Isozymes

(*b*) Covalent modification of enzyme.

*Or*

**4.** Describe the following terms with suitable example (8 marks each) : [16]

(*a*) Multienzyme complex

(*b*) Allosteric enzyme.

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

(1) Describe the role of pyridoxal phosphate in any *one* enzyme catalyzed reaction.

(2) Explain in detail about role of biotin in enzyme catalyzed reactions.

## SECTION II

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

(1) Pituitary gland

(2) Serpentine receptor.

*Or*

**8.** 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 gucose.

9. Describe in detail about (8 marks each) : [16]

(1) Kinesin

(2) Action potential.

*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 : [16]

(1) Water electrolyte balance

(2) Enzyme tests used for monitoring liver disease.

*Or*

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

Total No. of Questions—**12**]    [Total No. of Printed Pages—**4+2**

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# [4957]-236

## S.E. (Biotechnology) (Second Semester) EXAMINATION, 2016

## MATERIAL BALANCE AND STOICHIOMETRY

## (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*) By titration, it was found that a sample of water contains hardness equivalent to 500 mg/L (ppm) $CaCO_3$. Assuming that the water contains temporary hardness in 60% $Ca(HCO_3)_2$ form, and 40% $Mg(HCO_3)_2$ form. Find the concentrations of both in water. [8]

(*b*) What is gram equivalent mass ? Calculate the 1 gram equivalent of :

(*a*) Cu and

(*b*) $H_3PO_4$. [8]

*Or*

**2.** Mango leaves from Punjab region were dried and subjected to extraction with supercritical $CO_2$ at 200 bar and 333 K (60°C). Dry leaves are analysed to contain 0.46% $\alpha$-tocopherol and 0.01% $\beta$-carotene. Extract is found to contain 15.5% $\alpha$-tocopherol and 0.41% $\beta$-carotene. All percentages are by mass. If $\beta$-carotene content of the leached residue is nil, calculate :

(*a*) Mass of extract phase per kg dry leaves, and

(*b*) % recovery of $\alpha$-tocopherol. [16]

**3.** The analysis of a sample yields 4.6% moisture, 13.7% tannin, 8.4% soluble non-tannin organic matter and the rest lignin. In order to extract tannin out of the sample, a counter-current extraction process is employed. The residue from the extraction process is analysed and found to contain 0.92% tannin and 0.65% solute non-tannin organic matter on a dry basis. Find the percentage of tannin recovered on the basis of the original tannin present in the bark. All analyses are given on mass basis. [16]

*Or*

**4.** A 100 kg mixture of 27.8% acetone (A) and 72.2% of chloroform (B) by mass is to be batch extracted with a mixed solvent at 298

K (25°C). The mixed solvent of an unknown composition is known to contain water (S1) and acetic acid (S2). The mixture of the original mixture and the mixed solvent is shaken well, allowed to attain equilibrium, and separated into two layers. The compositions of the two layers are given below. Find :

(*a*) the quantities of the two layers,

(*b*) the mass-ratio of the mixed solvent to the original mixture and

(*c*) the composition of the mixed solvent (mass basis). [16]

**Composition**

| **Layer** | **A** | **B** | **S1** | **S2** |
|---|---|---|---|---|
| Upper Layer | 7.5 | 3.5 | 57.4 | 31.6 |
| Lower Layer | 20.3 | 67.3 | 2.8 | 9.6 |

**5.** An absorption tower packed with tellerette packing is used to absorb $CO_2$ in an aqueous monoethanol amine (MEA) solution. The volumetric flow rate of the incoming dry gas mixture is 1000 $m^3$/hr at 318 K (45°C) and 101.3 kPa. The gas mixture contains 4.5 mol% $CO_2$. A 3.2 M MEA solution is introduced at the top of the tower at the rate of 0.625 lit/sec. Dissolved $CO_2$ concentration of the entering solution is 0.166 kmol per kmol of MEA. Find the concentration of dissolved $CO_2$ in the solution leaving the tower. (Specific volume at 45°C and 101.3 kPa is 26.107 $m^3$/kmol). [18]

*Or*

6. The gaseous reaction A = 2B + C takes place isothermally in a constant pressure reactor starting with a mixture of 75% A and 25% inert by volume. In a specified time, the volume doubles. Calculate the % conversion achieved.

   Add a note on recycling operations. [18]

## SECTION II

7. Toluene ($C_7H_8$) is heated from 290 K (70°C) to 350 K (77°C) at the rate of 0.25 kg/sec. Calculate the heat requried to be added to toluene using the following constituents (Data on molar basis) : [16]

| | Ref A | Ref B |
|---|---|---|
| $a$ | 1.8083 | –56.3627 |
| $b \times 10^3$ | 812.223 | 1768.423 |
| $c \times 10^6$ | –1512.67 | –5192.623 |
| $d \times 10^9$ | 1630.01 | 5497.39 |

*Or*

8. (*a*) In the production of sulphuric acid from anhydrite, the gypsum is roasted with clay to obtain sulphur dioxide and cement clinker. The reaction proceeds as follows : [8]

$$3CaSO_{4(S)} + SiO_{2(S)} = 3CaO.SiO_{2(g)} + 3SO_{2(g)} + 3/2O_{2(2)}$$

Calculate the heat of reaction at 298.15K(25°C)

Table : Thermodynamic Data :

| **Component** | **Phase** | **$\Delta H^\circ_f$ at 298.15 K (25°C) kJ/mol** |
|---|---|---|
| $CaSO_4$ | Solid | –1432.7 |
| $SiO_2$ | Solid (amorphous) | –903.5 |
| $3CaO.SiO_2$ | Solid (clinker) | –2879.0 |
| $SO_2$ | Gas | –296.81 |
| $O_2$ | Gas | 0.0 |

(*b*) Calculate the standard heat of reaction at 298.15K (25°C) when gaseous ammonia is dissolved in water to form 3% by mass of its solution for the regeneration of weak anion exchanger of a water treatment plant. [8]

**9.** An absorption tower packed with tellerette packing is used to absorb $CO_2$ in an aqueous monoethanol amine (MEA) solution. The volumetric flow rate of the incoming dry gas mixture is 1000 $m^3$/hr at 318 K (45°C) and 101.3 kPa. The gas mixture contains 4.5 mol% $CO_2$. A 3.2 M MEA solution is introduced at the top of the tower at the rate of 0.625 lit/sec. Dissolved $CO_2$ concentration of the entering solution is 0.166 kmol per kmol of MEA. Find the concentration of dissolved $CO_2$ in the solution leaving the tower. (Specific volume at 45°C and 101.3 kPa is 26.107 $m^3$/kmol). [16]

*Or*

**10.** A common salt solution contains 24% NaCl and 76% $H_2O$. To recover 80% of the dissolved salt, it is proposed to evaporate a part of water and then to carry out crystallisation at a temperature of 20°C. At 20°C, the solubility of NaCl in $H_2O$ is 36 g per 100 g $H_2O$. Calculate the weight of $H_2O$ evaporated/1000 kg original solution. [16]

**11.** (*a*) How coal can be classified ? What is ultimate analysis of coal ? Explain it in detail. [9]

(*b*) What is ultimate analysis of coal ? Explain it in detail. [9]

*Or*

**12.** What is net calorific value and gross calorific value ? [18]

An oil sample is found to contain 77.0% C, 22.7% $H_2$, and 0.3% S (by mass). Its GCV at 298.15 K is measured to be 45,071 kJ/kg oil. Calculate its NCV at 298.15 K. Latent heat of $H_2O$ vapour = 2442.5 kJ/kg water.

Total No. of Questions—**12**]

[Total No. of Printed Pages—**3**

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# [4957]-237

## S.E. (Biotechnology) (Second Semester) EXAMINATION, 2016
## CELL BIOLOGY AND TISSUE CULTURE
## (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**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. **10**, Q. **11** *or* Q. No. **12**.

(*ii*) Neat diagrams must be drawn whenever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Answer to the two secetions should be written in separate answer-books.

## SECTION I

**1.** Describe the cellular features of an eukaryotic cell. [18]

*Or*

**2.** Answer the following : [18]

(*a*) Why can mitochondria be considered the "power plants" of aerobic cells ?

(*b*) What are chloroplasts ? What is the main function of chloroplasts ?

**3.** Explain how organelles maintain their position in the cytosol. [16]

*Or*

**4.** Draw neat labelled diagrams for : [16]

(1) Structure of the Golgi apparatus

(2) Eukaryotic nucleus.

5. Answer the following : [16]

(1) What is the difference between the smooth and rough endoplasmic reticulum ?

(2) Where, in the cell, can ribosomes be found ? What is the main biological function of ribosomes ?

*Or*

6. Answer the following : [16]

(1) What are the three types of protein filaments that make up the cytoskeleton ?

(2) Explain, Membranes play a central role in both the structure and function of all cells.

## SECTION II

7. Answer the following : [18]

(1) Define Mitosis. Which protein filaments are responsible for attaching to chromosomal centromeres and pulling apart DNA during mitosis.

(2) What is the difference between mitosis and meiosis in terms of their biological function ?

*Or*

8. Answer the following : [18]

(1) What are the *two* types of transport process occur across the membrane.

(2) Write a note on cell signaling.

9. Answer the following : [16]

(1) Describe the cell division cycle is a series of events that take place in a ell.

(2) Explain the important role of crossing over.

*Or*

**10.** Explain the process and significance of meiosis. [16]

**11.** Write two important features of animals cell culture. Differentiate between primary and secondary cell cultures. [16]

*Or*

**12.** Answer the following : [16]

(1) What are the two methods used for isolation of single plant cells ?

(2) Explain :

(*i*) Organ culture

(*ii*) Role of serum in culturing animals cells.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

| Seat No. | |
|---|---|

# [4957]-238

**S.E. (Biotechnology) (Second Semester) EXAMINATION, 2016**

**THERMODYNAMICS**

**(2008 Pattern)**

**Time : Three Hours** **Maximum Marks : 100**

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

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

(*iii*) Neat diagrams should be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

## Section I

**1.** (*a*) What is first law of thermodynamics ? Explain the mathematical statement of first law. [8]

(*b*) Draw a neat labelled Carnot's cycle. Explain in brief the Carnot's theorems. [10]

*Or*

**2.** (*a*) Explain the following terms using suitable examples : [10]

(*i*) Reversible processes

(*ii*) Irreversible processes

(*iii*) Path functions

(*iv*) Intensive properties

(*v*) Surrounding.

(*b*) What is second law of thermodynamics ? Add a note on the concept of entropy. [8]

**3.** (*a*) Derive an expression that gives the effect of temperature on standard heat of reaction. An industrially important water gas shift reaction is given by [12]

$$CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$$

Determine the standard enthalpy change of this reaction at 298.15 K from the following standard enthalpy change of combustion data :

$$CO(g) + \tfrac{1}{2} O_2(g) \rightarrow CO_2(g); \ \Delta H_c^{o} = -283.18 \text{ kJ}$$

$$H_2(g) + \tfrac{1}{2} O_2(g) \rightarrow H_2O \ (l); \ \Delta H_c^{o} = -286.03 \text{ kJ}$$

$$H_2O \ (l) \rightarrow H_2O(g); \ \Delta H^{o} = 43.966 \text{ kJ}$$

(*b*) Define standard heat of reaction. Explain standard heat of combustion using formula. [4]

*Or*

**4.** State and explain Hess's law for heat of reactions. Explain in brief the temperature dependence of heat of reaction with derivation. [16]

## Section II

**5.** Write a note on fundamental property relations. Explain the use of pneumonic diagram for obtaining fundamental property relations. [16]

*Or*

**6.** What are excess properties ? How is excess property change of mixing and excess volume change of mixing calculated ? [16]

**7.** Explain in brief boiling point curve. [16]

*Or*

**8.** (*a*) Write a note on the nature of equilibrium. [8]

(*b*) What are the criteria of vapour-liquid equilibrium ? Explain in detail. [8]

**9.** (*a*) How is equilibrium constant related to composition ? Derive an expression for the same. [9]

(*b*) Write a note effect of temperature on equilibrium constant. [9]

*Or*

**10.** (*a*) Derive phase rule and Duhem's theorem for reacting systems. [9]

(*b*) Derive the relationship between the mole fraction of components taking part in the reaction and the extent of reaction. [9]

**11.** How can themodynamics be applied to biological systems ? Explain in brief. [16]

*Or*

**12.** (*a*) What is the concept of Gibb's free energy for bio-changes ? Explain with applications. [8]

(*b*) How do energy transformations occur in bio-systems ? Explain in the perspective of thermodynamics. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**2**

| Seat No. | |
|---|---|

# [4957]-239

## S.E. (Biotechnology) (Second Semester) EXAMINATION, 2016

## GENETICS AND MOLECULAR BIOLOGY

## (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 side indicate full marks.

### Section I

**1.** (*a*) Explain DNA packaging stages with their importance and scale of packaging. [8]

(*b*) Describe "Linkage Theory". [8]

*Or*

**2.** Describe the following *two* model systems : [16]

(*i*) Drosophila

(*ii*) Zebra Fish

**3.** Write short notes on : [16]

(*i*) B DNA

(*ii*) Z DNA

P.T.O.

*Or*

4. What is melting temperature ? Write in detail about effect of UV absorption on Denaturation of DNA. [16]

5. Discuss the process of Eukaryotic DNA Replication in detail. [18]

*Or*

6. Write short notes on : [9+9]
   (*i*) Replication in prokaryotes
   (*ii*) Point Mutations and their types.

## Section II

7. (*a*) Write a note on RNA Enzymes. [8]
   (*b*) Explain the 'Post-transcriptional modifications' in detail. [8]

*Or*

8. Write short notes on : [16]
   (*a*) Splicing
   (*b*) Reverse Transcriptase.

9. Describe the process of transcription in eukaryotes in detail. [16]

*Or*

10. What is a concept of 'Operon' ? Explain with *one* example. [16]

11. (*a*) Write a note on genetic code and explain wobble hypothesis in detail. [9]
    (*b*) What are oncogenes ? How are they responsible to cause cancer ? Explain the mechanism. [9]

*Or*

12. Explain in detail the process of protein biosynthesis in detail. [18]