

Roll No. ....

Total Pages : 2

**BT-I/D-17**

**31014**

**APPLIED PHYSICS-I**

**Paper : AS-101 N**

Time : Three Hours]

[Maximum Marks : 75

- ( **Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

### UNIT-I

1. (a) Explain with theory the construction and working of Michelson's interferometer. 10
- (b) If red light source is replaced by violet light then what will be the change in width of principal maxima of Plane Transmission Diffraction grating. 5
2. (a) What is the difference between Fresnel and Fraunhofer diffraction ? 8
- (b) Explain the effect of placing a thin film in the path of one of the interfering beams of Fresnel's bi-prism. 7

### UNIT-II

3. (a) Explain the construction and working of Nicol prism. What are its limitations as a polarizer. 10
- (b) Describe various applications of laser. 5

4. (a) Define Specific rotation. Describe the construction and working of Laurents half shade polarimeter. 8
- (b) Explain the construction and working of semiconductor laser. 7

### UNIT-III

5. (a) Explain step index single mode optical fiber with its applications. 7
- (b) What are ultrasonic waves? How can you determine the velocity of ultrasonic waves? 8
6. (a) Explain with the help of a block diagram how optical fiber communication system works. 7
- (b) Discuss the magnetostrictive effect method of production of ultrasonic waves. 8

### UNIT-IV

7. (a) State the postulates of special theory of relativity and prove the energy momentum relation  $E^2 = p^2 c^2 + m_0^2 c^4$  where  $p$  is the relativistic mass. 7
- (b) Describe the Michelson-Morley experiment and discuss its results. 8
8. (a) Explain how nuclear radiations interact with matter. 5
- (b) Describe the construction and working of Geiger Muller counter and explain how quenching is achieved. 10

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Total Pages : 3

**BT-I/D-17**

**31015**

**APPLIED CHEMISTRY**

Paper : AS-103 N

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

**UNIT-I**

1. (a) Calculate the change in entropy when 2 mol of ideal gas  
(i) Undergoes a change from  $-5^{\circ}\text{C}$  temperature and 3 atm pressure to  $-10^{\circ}\text{C}$  temperature and 1.5 atm pressure, given that  $C_v = 1.5 R$ .  
(ii) Expands isothermally to 5 times its initial volume. (5)
- (b) Derive the Clapeyron and Clausius-Clapeyron equation and discuss its significance. (10)
2. (a) State Gibb's phase rule. Discuss the application of phase rule to the sulphur system. Draw a labelled self-explanatory diagram for this. (12)
- (b) Define triple point. What is triple point of water system? (3)

## UNIT-II

3. (a) One gram of  $\text{CaCO}_3$  was dissolved in dilute  $\text{HCl}$ , and the solution diluted to 1 L. Then 100 ml of this solution required 90 ml of EDTA solution. Also, 100 ml of the water sample contain 36 ml of same EDTA solution. The water sample (100 ml) on boiling was titrated against 18 ml of EDTA solution. Calculate the total and permanent hardness. (9)
- (b) What is caustic embrittlement? What are its causes and effects? (3)
- (c) Discuss the concept of "reverse osmosis" and its one application in daily life. (3)
4. (a) Discuss the concept of atom economy by taking examples from addition reaction, elimination reaction, substitution reaction and rearrangement reactions. (5)
- (b) What is the need of green chemistry? How the use of ionic solvent can fulfill this need? Discuss by taking suitable example of ionic solvents. (4)
- (c) Discuss the salient feature of twelve principles of green chemistry. (6)

## UNIT-III

5. (a) Discuss the importance of cathodic protection in controlling corrosion. (6)
- (b) What is corrosion? How the properties of any metal can influence the rate of corrosion. (9)

6. (a) What are additives? Discuss their importance for lubricants. (6)
- (b) Define the following terms with reference to the lubricating oil:
- (i) Mechanical stability.
  - (ii) Corrosion stability.
  - (iii) Precipitation Number. (9)

#### UNIT-IV

7. (a) Explain :
- (i) Soundness of Cement
  - (ii) Heat of Hydration of Cement. (3)
- (b) Name the raw material used in the preparation of Portland cement. Discuss the details of manufacturing of Portland cement with diagram. (12)
8. (a) How are carbon nanotubes classified? Discuss important methods of their synthesis. (9)
- (b) Discuss the applications of nanomaterials in
- (i) Catalysis and
  - (ii) Medicine. (6)
-

Roll No. ....

Total Pages : 2

**BT-1/D-17**

**31016**

**MANUFACTURING TECHNOLOGY AND PROCESSES**

Paper–ME-101N

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

**UNIT–I**

1. (a) Define manufacturing process. Explain the various classifications of manufacturing processes. 10  
(b) Discuss the various principles of safety at workplace. 5
2. Explain the composition, properties and applications of the following materials:
  - (a) Medium carbon steel
  - (b) High carbon steel
  - (c) High speed steel. 15

**UNIT–II**

3. (a) Explain the pattern allowance. Discuss the different type of pattern allowances. 7  
(b) Describe the gating system in sand casting with a neat diagram. 8

4. What is casting? Explain the various casting defects with causes and remedies. 15

### UNIT-III

5. (a) What is rolling? Explain the different types of rolling. 8  
(b) Differentiate between the forging and extrusion. 7
6. Explain the following sheet metal operations:  
(a) Shearing.  
(b) Piercing.  
(c) Punching. 15

### UNIT-IV

7. (a) Discuss the principle of electric arc welding. Explain the reverse and straight polarity in arc welding. 8  
(b) Describe the seam and spot resistance welding with their applications. 7
8. (a) What is chip? Explain the different types of chip with their causes of formation. 7  
(b) Explain the working of drilling machine with constructional features and different operations. 8

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Total Pages : 3

BT-1/D-17

31017

APPLIED MATHEMATICS-I

Paper : AS-105(N)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Using Gauss-Jordan method, find the rank of the matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}. \quad 7\frac{1}{2}$$

- (b) Find the values of  $\alpha$  and  $\beta$  for which the equations  $x + 2y + 3z = 4$ ;  $x + 3y + 4z = 5$ ;  $x + 3y + \alpha z = \beta$  have (i) no solution, (ii) a unique solution, and (iii) an infinite number of solutions.  $7\frac{1}{2}$

2. (a) Find the eigen values and eigen vectors of the matrix

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}. \quad 7\frac{1}{2}$$

- (b) Reduce the quadratic form

$$x^2 + 2xy - 4xz + 6yz - 5y^2 + 4z^2$$

into canonical form; also find the matrix of transformation.  $7\frac{1}{2}$



## UNIT-II

3. (a) If  $y = e^{a \sin^{-1} x}$ , prove that

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + a^2)y_n = 0,$$

hence find the value of  $y_n$  when  $x = 0$ . 7½

- (b) Find the Taylor's series expansion for  $\log \cos x$  about the point  $\pi/3$ . 7½

4. (a) Find the asymptote of the curve

$$r = a(\sec \theta + \cos \theta). \quad \text{7½}$$

- (b) Trace the curve  $y^2(2a - x) = x^3$  giving all its features in detail. 7½

## UNIT-III

5. (a) If  $u = f(r)$ , where  $r = \sqrt{x^2 + y^2 + z^2}$ ; show that

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = f''(r) + \frac{2}{r} f'(r). \quad \text{7½}$$

- (b) If  $u = \tan^{-1} \left( \frac{x^3 + y^3}{x - y} \right)$ ; prove that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u, \text{ and}$$

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 2 \cos 3u \sin u. \quad \text{7½}$$

6. (a) If  $u = f(x, y)$  and  $x = r \cos \theta$ ,  $y = r \sin \theta$ , prove that

$$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 = \left(\frac{\partial u}{\partial r}\right)^2 + \frac{1}{r^2} \left(\frac{\partial u}{\partial \theta}\right)^2. \quad 7\frac{1}{2}$$

#### UNIT-IV

7. (a) Find the area of the surface generated by revolving the curve  $y = \sqrt{4 - x^2}$ ,  $-1 \leq x \leq 1$  about the  $x$ -axis.  $7\frac{1}{2}$

- (b) Change the order of integration and solve

$$\int_{-a}^a \int_0^{\sqrt{a^2 - y^2}} y^2 dx dy. \quad 7\frac{1}{2}$$

8. (a) Find the volume of the cylinder  $x^2 + y^2 = a^2$  above the  $xy$ -plane cut by the plane  $x + y + z = a$ .  $7\frac{1}{2}$

- (b) Change into polar co-ordinates and solve the integral

$$\int_0^a \int_0^{\sqrt{a^2 - x^2}} (x^2 + y^2) dy dx. \quad 7\frac{1}{2}$$

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Total Pages : 2

**BT-I/D-17**

**31018**

**TECHNICAL COMMUNICATION**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all selecting at least *one* question from each unit.

**UNIT-I**

1. Discuss in detail various types of Communication. 15
2. Write a note on the process of communication. 15

**UNIT-II**

3. How to achieve confidence, clarity and fluency in communication ? Discuss in detail. 15
4. What do you know about SQ3R reading technique ? 15

**UNIT-III**

5. Do you know how to exchange opinions and suggestions in a group discussion ? Discuss. 15
6. Write a note on the nature and importance of Group discussion. 15

## UNIT-IV

7. Draft an application for the post in a large Public limited company. 15
  8. Discuss the types of technical articles. 15
-

Roll No. ....

Total Pages : 2

BT-1/D-17

31019

FUNDAMENTALS OF BIOTECHNOLOGY

Paper : BT-101N

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. Draw the diagram of Mitochondria and Chloroplast and explain the structure and function of these Organelles. (15)
2. (a) Explain different structures and form of DNA. How it differs from RNA ?  
(b) Differentiate between plant and animal cell. (5,10)

UNIT-II

3. Explain the process of Meiosis and write its significance. (15)
4. (a) What are the morphological features for characterization of fungi ? How are they beneficial or harmful for humans ?  
(b) Write the steps involved in transcription in Prokaryotes. (10,5)

### UNIT-III

5. Write a note on different types of vectors used in recombinant DNA technology. What other tools are used in genetic engineering ? (15)
6. What do you mean by Transgenics ? Write the tools and methods for producing transgenic animals. (15)

### UNIT-IV

7. Write in detail various applications of biotechnology in agriculture. (15)
  8. Define forensic science. What role does biotechnology play in this field ? (15)
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Roll No. ....

Total Pages : 3

**BT-I/D-17**

**31020**

**ENGG. DRAWING GRAPHICS (ODD)**

Paper : ME-105(N)

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all selecting at least *one* question from each unit.

### UNIT-I

1. A point A is 50 mm above the H.P. and 20 mm in front of the V.P. Another point B is 20 mm below the H.P. and 40 mm behind the V.P. The distance between the projectors is 75 mm. Draw the projections of the points.

List various types of lines and give their gradation.

(10+5=15)

2. A line AB has its end A 15 mm away from the H.P. and 55 mm away from the V.P., end B 45 mm from the H.P. and 10 mm from the V.P. The line lies in a profile plane. Draw the projections of the line if it lies in first quadrant.

15

### UNIT-II

3. A rectangular hexagonal lamina of 25 mm side, rests on H.P. at  $45^\circ$  and the side on which it rests, inclined at  $30^\circ$  to the V.P. Draw its projections.

15

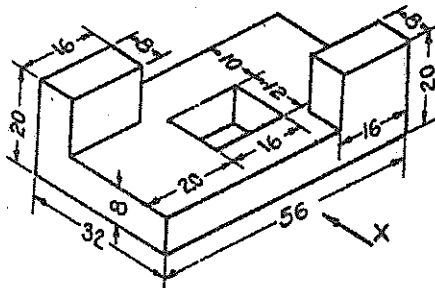
4. A right regular pentagonal pyramid, side of base 20 mm and height 45 mm rests on a corner of its base on H.P. such that its axis is inclined at  $45^\circ$  to the H.P. and is parallel to the V.P. Draw its projections. 15

### UNIT-III

5. A triangular prism side of base 45 mm and length of axis 75 mm is lying on one of its rectangular faces in H.P. Its axis is parallel to both H.P. and V.P. It is cut by a sectional plane parallel to and at a distance of 22 mm from the H.P. Draw its front view and sectional top view. 15
6. A right rectangular pentagonal pyramid, edge of base 30 mm and height 75 mm resting on its base on H.P. is cut by a section plane inclined to H.P. at  $45^\circ$  and meeting the axis at a distance of 18 mm from its top end. Develop the frustum of the prism. 15

### UNIT-IV

7. Looking in the direction of the arrow, draw the front view, right side view and top view of block given in figure below : 15





8. Write steps to draw a pentagon of edge 18 units and having one of its corners at (40, 15). With suitable examples explain the following transformations :

(a) Moving an object.

(b) Rotation of an object.

15

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Total Pages : 3

**BT-I/D-17**

**31021**

**ENGINEERING DRAWING AND GRAPHICS (EVEN)**

Paper : ME-105(N)

Opt. (I)

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

### UNIT-I

1. A point P is 20 mm below H.P. and 30 mm behind V.P. and another point Q is 25 mm above H.P. and 35 mm in front of V.P. Draw its projection by taking the distance between the end projectors to be 50 mm. Also find the length of the line joining their plans and elevations. 15
2. A line AB 75 mm long has its end A in both H.P. and V.P. The line is kept inclined at  $45^\circ$  to H.P. and  $30^\circ$  to V.P. Draw its projections. 15

### UNIT-II

3. A rectangular plate of side  $50 \times 25$  mm is resting on its shorter side on H.P. and inclined at  $30^\circ$  to V.P. Its surface is inclined at  $60^\circ$  to H.P. Draw its projections. 15
4. A square prism of base side 30 mm and axis length 60 mm is resting on H.P. on one of its longer edges with a face containing the resting edge inclined at  $30^\circ$  to H.P. Draw its projections when the axis is parallel to both H.P. and V.P. 15

### UNIT-III

5. A cone of base diameter 50 mm and axis length 75 mm is resting on H.P. on its base. It is cut by a plane perpendicular to both H.P. and V.P. and is 10 mm to the left of the axis. Draw its top view, front view and true shape of its section.

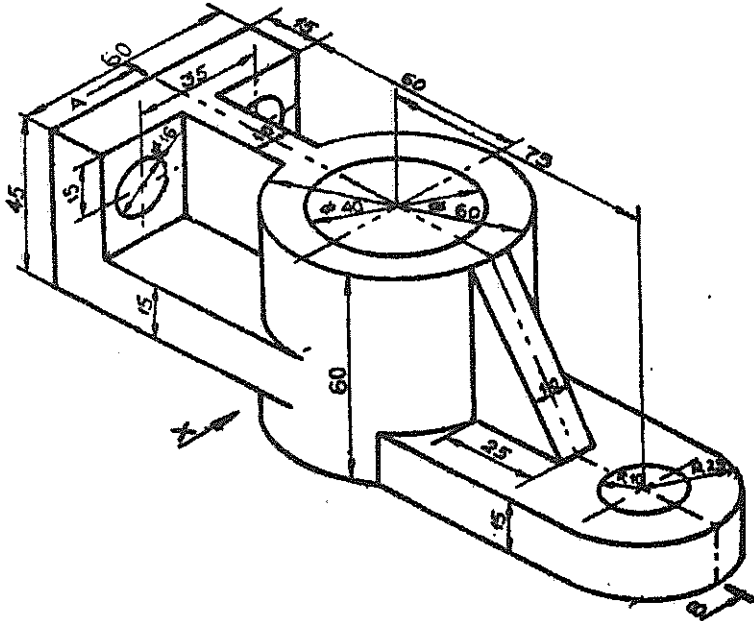
15

6. Draw the development of the lower portion of a cylinder of diameter 50 mm and axis 70 mm when sectioned by a plane inclined at  $40^\circ$  to H.P. and perpendicular to V.P. and bisecting the axis.

15

### UNIT-IV

7. Draw the orthographic views of the solid shown below :15



8. (a) Define Editing of a drawing. How do you classify EDIT commands? State any *five* significant EDIT commands.

7

(b) State the difference between the *Window* option and *Crossing* option. State the prompt sequence for Add selection option.

8

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Roll No. ....

Total Pages : 3

**BT-1/D-17**

**31022**

**BASICS OF ELECTRONIC ENGG.**

Paper : ECE-101(N)

Opt. (ii)

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

**UNIT-I**

1. (a) How zener diode is different from normal p-n diode ?  
What are its applications? 7
- (b) Explain how zener diode can be used as a voltage regulator. 8

OR

2. (a) What is the use of Rectifiers? What are the various types of rectifiers ? 7
- (b) Explain the working of the full-wave bridge rectifier with necessary diagrams and waveforms. 8

**UNIT-II**

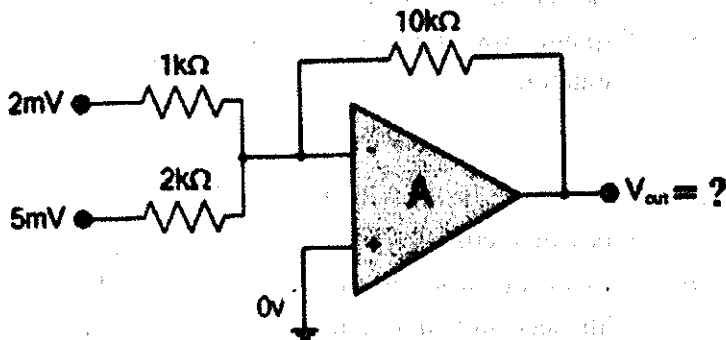
3. (a) Differentiate between Negative and Positive feedback. 7
- (b) What are the advantages of using negative feedback in amplifiers ? 8

OR

4. (a) Why Common Emitter (CE) is mostly used for making amplifiers ? 7
- (b) Explain the input and output VI characteristics of BJT CE configuration showing various regions of operation. 8

### UNIT-III

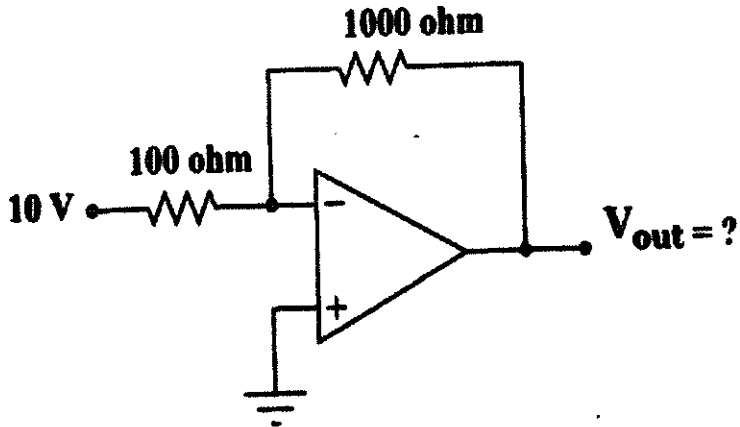
5. (a) Prove that the output of the inverting Adder using Op-amp is  $V_o = -R_f(V_1/R_1 + V_2/R_2)$ . 8
- (b) Find the output of the adder circuit given in the following circuit : 7



OR

6. (a) Derive the output equations of the Inverting and non-inverting op-amp circuits. 8

- (b) Calculate the output of the following inverting op-amp circuit : 7



#### UNIT-IV

7. (a) Explain how UJT is different from BJT in operation and structure. 7
- (b) Describe the operation of UJT with its VI characteristics. What are its applications ? 8

OR

8. (a) What is TRIAC? How is it different from SCR? 7
- (b) Describe the operation and characteristics of TRIAC. What are its applications ? 8
-

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Total Pages : 6

BT-I/D-17

31023

ELECTRICAL TECHNOLOGY FUNDAMENTALS

Paper : EE-101 (N)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions, selecting at least *one* question from each unit.

UNIT-I

1. (a) Find current in 2 ohm resistance in the following fig. 1 using Loop analysis method :

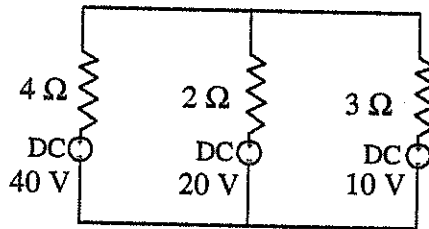


Fig. 1.

7

- (b) State and explain Kirchoff's law. What are the limitations and applications of Kirchoff's law in circuit theory ?

4

- (c) What do you mean by Apparent power, Active power and Reactive power?

4



2. (a) How Norton's Theorem is equivalent to Thevenin's Theorem? Also write the limitations of Thevenin's Theorem and find the voltage across load resistance  $R_L$  using Thevenin's Theorem when load resistance is  $2k\Omega$ .

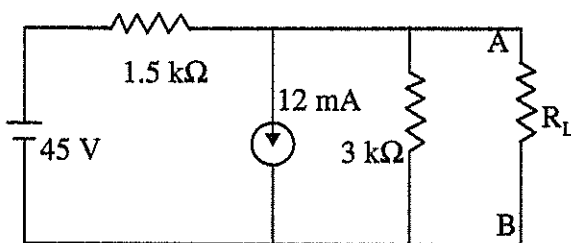


Fig. 2.

7

- (b) Define Bilateral & Unilateral elements with example.

3

- (c) Determine the effective resistance between the terminals A-B in the network of Fig. 3. below.

5

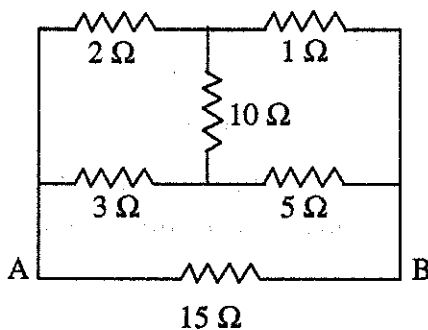


Fig. 3.

## UNIT-II

3. (a) Find average and r.m.s., values of the voltage waveform shown in Fig. 4. 6

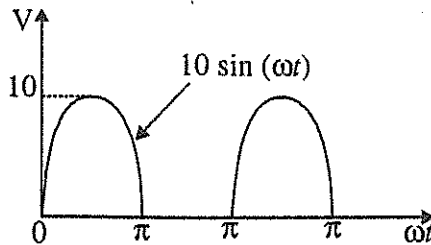


Fig. 4.

- (b) Define RMS value & Average value. What will be the RMS value of voltage for  $V = 4/6 \sin \omega t$  waveform? 5
- (c) A series circuit has  $R = 10 \Omega$ ,  $L = 0.02 \text{ H}$ , and  $C = 3 \mu\text{F}$ . Calculate Q-factor of the circuit. 4
4. (a) Explain resonance in a series RLC circuit with the help of impedance vs. frequency diagram, and derive the expression for resonant frequency. Write the properties of series resonance circuit. 7
- (b) Derive the expression of resonance frequency of parallel RLC circuit in series-parallel circuit A & B are in series with C. The impedances are  $Z_A = 4 + j_3 \Omega$ ,  $Z_B = 4 - j5\Omega$  and  $Z_C = 2 + j8 \Omega$ . If the current  $I_C = 25 + j0$ , calculate : (i) branch voltage; (ii) branch currents; (iii) total power; and (iv) phasor diagram. 8

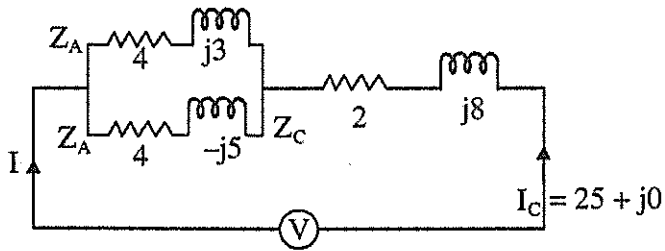


Fig. 5.

### UNIT-III

5. (a) In the two-wattmeter method of power measurement in a three-phase circuit, the readings of the wattmeters are 2000 W and 500 W. What is the total power and power factor of the load ? 6
- (b) Derive relation between line and phase values in delta connected three-phase balance system. A three-phase voltage source has a phase voltage of 120 V and supplies star connected load having impedance of  $24 + j36 \Omega$  per phase. Calculate (i) line voltage; (ii) line current; and (iii) total three-phase power supplied to the load. 6
- (c) Explain Single phase auto transformer, and give its *two* applications. 3

6. (a) A 1-phase 250/500 V transformer gave the following results :

Open circuit test : 250 V, 1 A, 80 W (LV side)

Short circuit test : 20 V, 12 A, 100 W (HV side).

Calculate the equivalent circuit parameters and show them on an equivalent circuit. 8

- (b) Define the following with respect to a magnetic circuit :

(i) Magneto motive force; (ii) Flux; (iii) Reluctance; (iv) Flux density; and (v) Magnetic field intensity. 4

- (c) Explain why the hysteresis loss and eddy current loss occur in a transformer. Explain how these losses can be reduced in a transformer. 3

#### UNIT-IV

7. (a) A 120 V DC shunt motor having an armature circuit resistance of  $0.2 \Omega$  and field circuit resistance of  $60 \Omega$ , draws a line current of 40 A with full load. The brush voltage drop is 3 volt and rated full load speed is 1800 rpm. Calculate :

(i) The speed at half load, and

(ii) The speed at 125% of full load. 8

- (b) Derive the expression for generated e.m.f. in DC machine. Explain the term back e.m.f. when applied to DC motor. Briefly explain what role back e.m.f. play in the starting and running of the motor. 7

8. (a) Draw the slip vs. torque characteristics of the three phase induction motor and indicate (i) Stable operating region; and (ii) Induction generator operating region. 6
- (b) Discuss the use of damper winding for starting a synchronous motor. 5
- (c) Why is the synchronous motor not self-starting? Explain the advantages and disadvantages alongwith applications of synchronous motor. 4
-

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Total Pages : 3

**BT-I/D-17**

**31024**

**INTRODUCTION TO COMPUTER-PROGRAMMING**

**Paper : CSE-101 (N)**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

**UNIT-I**

1. (a) Why a line printer is preferred over a dot matrix printer ?  
If you have an image to be printed, which out of these two will you use, and why ? 5
- (b) Define the following terms :
  - (i) Linker.
  - (ii) Loader.
  - (iii) Debugger. (3×2=6)
- (c) How is data stored on hard disk ? Explain its process in detail. 4
2. (a) Differentiate between Algorithm and Flow charts. What symbols are used to draw flow chart. What are the limitations of using flow charts ? Draw a flow chart to find the sum of digits of a given integer number. 10
- (b) What are the advantages and limitations of assembly language over High level languages ? 5

## UNIT-II

3. (a) Explain all formatted and unformatted input and output functions of C-language with their general syntax and examples. 8
- (b) Write a program in C-language using While loop that sums the series given as
- $$1 + x + x^2 + x^3 + x^4 + \dots + x^n. \quad 7$$
4. (a) Differentiate between While and Do-while loop giving a suitable example. 5
- (b) What do you understand by identifiers and keywords. How Keywords differ from Reserve words. Explain. 5
- (c) Explain the Operator precedence and Associativity with example. 5

## UNIT-III

5. (a) How an array is passed to a function in C-language ? Write a function which accepts an array as an argument, and find the average of its elements. 7
- (b) Write a program to search the location of a given element in an array using Binary search method. 8
6. (a) What are the parameter passing techniques ? Explain them with example. 8
- (b) Write a program that accepts two strings at the runtime and accepts the first 10 characters of first string at the end of second string. 7

## UNIT-IV

7. (a) How structure differ from an array and union ? Write a program in C-language which reads and displays the name, age, designation, date of retirement and salary of an employee using structure. 8
- (b) Write a program in C-language using pointers to read an array of integers and prints its element in the reverse order. 7
8. (a) Define Pointers. Explain the features of using pointers. Also explain the use of (\*) indirection operator giving a suitable example. 5
- (b) What are the primary advantages of using a data file. What are the *three* general methods of file access ? What operations are performed on files ? Also write a program to copy one existing file to another named file. 10
-



Roll No. ....

Total Pages : 3

**BT-I/D-17**  
**MATHEMATICS-I**  
**Paper : Math-101(E)**

**31001**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all selecting at least *one* question from each unit.

**UNIT-I**

1. (a) Using Taylor's series, compute the value of  $\sin 31^\circ$  to four decimal places. 10

(b) Find the radius of curvature of the curve  $\sqrt{x} + \sqrt{y} = 1$  at  $\left(\frac{1}{4}, \frac{1}{4}\right)$ . 10

2. (a) Find the asymptotes of the curve  $6x^2 + xy - 2y^2 + x + 2y + 1 = 0$ . 10

(b) Trace the curve  $y = (x - 2)(x + 1)^2$ . 10

**UNIT-II**

3. (a) If  $u = \log(x^3 + y^3 + z^3 - 3xyz)$ , show that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x + y + z}$ . 10

- (b) If  $z = f(x, y)$  and  $x = e^u + e^{-v}$ ,  $y = e^{-u} - e^v$ , prove that

$$\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y}. \quad 10$$

4. (a) If  $u = x \phi(y/x) + \psi(y/x)$ , prove that

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 0. \quad 10$$

- (b) Examine for extreme values

$$f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2. \quad 10$$

### UNIT-III

5. (a) Evaluate  $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2 - y^2}} x \, dx \, dy$  by changing the order of integration. 10

- (b) Evaluate  $\int_0^{\log 2} \int_0^x \int_0^{x+\log y} e^{x+y+z} \, dz \, dy \, dx$ . 10

6. (a) Show that the volume of the solid obtained by the revolution of the curve  $a^2 y^2 = x^2(a^2 - x^2)$  about the  $x$ -axis is  $\frac{4a^3}{15}$ . 10

- (b) Derive the relation between Beta and Gamma functions. 10

## UNIT-IV

7. (a) Find the values of  $\lambda$  and  $\mu$  such that the surfaces  
 $\lambda x^2 - \mu yz = (\lambda + 2)x$  and  $4x^2y + z^3 = 4$ ,  
may intersect orthogonally at the point  $(1, -1, 2)$ . 10

(b) Define divergence of a vector point function, and  
discuss its physical significance. 10

8. (a) Evaluate  $\iint_S \vec{F} \cdot \vec{n} \, dS$  where  $\vec{F} = 18z \hat{i} - 12y \hat{j} + 3y \hat{k}$  and

S is the surface of the plane  $2x + 3y + 6z = 12$ , in the  
first octant. 10

(b) Use divergence theorem to evaluate  $\iiint_S \vec{F} \cdot d\vec{S}$  where

$\vec{F} = x^3 \hat{i} + y^3 \hat{j} + z^3 \hat{k}$  and S is the surface of the sphere  
 $x^2 + y^2 + z^2 = a^2$ . 10

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Roll No. ....

Total Pages : 2

**BT-I/D-17**  
**PHYSICS-I**  
Paper : Phy-101E

**31002**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

### UNIT-I

1. (a) What are Newton's rings? Explain the formation of Newton rings by reflected light and derive expression for diameter of  $n$ th dark ring. 12
- (b) A thin film of a material ( $\mu = 1.45$ ), is introduced in one of the arms of Michelson interferometer which causes a shift of 6.5 fringes. Calculate thickness of the thin film. ( $\lambda = 5890 \text{ \AA}$ ). 8
2. (a) Explain the construction and theory of a plane diffraction grating and explain the formation of spectra by it. 10
- (b) What do you understand by Polarization of light? Explain double refraction. 10

### UNIT-II

3. (a) What are Einstein's coefficients? Derive relation between them. 12
- (b) Explain population inversion. How it can be achieved? 8

4. (a) What are optical fibers ? Describe single mode and multi-mode fibers. 12
- (b) Calculate numerical aperture and acceptance angle of optical fiber with  $\mu_{\text{clad}} = 1.5$  and  $\mu_{\text{core}} = 1.6$ . 8

### UNIT-III

5. (a) Define dipole moment. Derive an expression for the energy density of electric field established in a dielectric medium. 10
- (b) Explain D, E and P vectors and obtain relation among them. 10
6. (a) State and explain Gauss law. 8
- (b) Write down Maxwell's equations and explain their significance. 12

### UNIT-IV

7. (a) State and prove the law of equivalence of mass and energy. 12
- (b) A particle of rest mass  $M_0$  is moving with a speed of  $C/\sqrt{2}$ , where C is the speed of light. Calculate its relativistic mass at this speed. 8
8. (a) Describe construction and working of a Nuclear Reactor. 10
- (b) Write notes on nuclear fission and fusion. 10

Roll No. ....

Total Pages : 2

**BT-I/D-17**

**31003**

**INTRODUCTION TO BIOTECHNOLOGY**

Paper : BT-101(E)

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

**UNIT-I**

1. (a) Differentiate between Prokaryotes and Eukaryotes. 10  
(b) Write the characteristic features of living organisms. How is DNA structurally different from RNA ? 10
2. (a) Classify different types of Carbohydrates. 10  
(b) What will be the effect of Temperature and pH change on enzyme activity ?

**UNIT-II**

3. Explain the different stages of meiosis of cell division. Also write about its significance. 20
4. (a) How can bacteria be harmful and beneficial for human life ? 10  
(b) Write about the different morphological characters of bacteria. 10

### UNIT-III

5. What are Vectors and why are they called as Cloning vehicles ?  
Explain *two* vectors alongwith their constructs. 10
6. (a) What are Transgenic animals ? How do they contribute  
in the improvement of animal traits ? 10
- (b) Why are Restriction enzymes called as nature's pinking  
shears ? Write about different restriction enzymes. 10

### UNIT-IV

7. Explain the different applications of Biotechnology in  
Agriculture and Medicine. 20
8. Write about the different applications of Biotechnology in  
Industry and Environment. 20
-

Roll No. ....

Total Pages : 5

**BT-I/D-17**

**31004**

**COMMUNICATION SKILLS IN ENGLISH**

**Paper : HUM-101 E**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt all questions.

**UNIT-I**

1. Correct the following sentences: (any 10)
  - (a) I am afraid I speak English very bad.
  - (b) The cooker puts too much salt in the food.
  - (c) I will be happy to pay the costs of the postage.
  - (d) The medicine proved to be very efficient.
  - (e) The nature of mankind is very complicated.
  - (f) The glass fell of the table.
  - (g) The road was not large enough for two cars.
  - (h) A friend of you phoned and wants you to call her.
  - (i) I don't agree to them by many reasons.
  - (j) We have reserved the hall for the evening.
  - (k) In the afternoon we went for shopping. (10×1=10)
  
2. Change the voice of the following sentences:
  - (a) She blew the candles.
  - (b) No was donating food for some reason.



- (c) I bought a new diamond ring.
- (d) The news was disclosed by him.
- (e) I can move this heavy box.
- (f) They played really well.
- (g) I was called to face an interview by Sports Club.
- (h) Money is generally assumed to bring happiness.
- (i) The axe was thrown away by woodcutter angrily.
- (j) What do you call him? (10×1=10)

### UNIT-II

3. (a) Use the following idioms and phrasal verbs in your sentences: (any 5)

- 1. ask out
- 2. break down
- 3. chip in
- 4. fall out
- 5. sort out
- 6. show off. (10×1=10)

- (b) Fill in the blanks with appropriate words:

- 1. Rahul has been sitting ..... for the past two months, (ideal/idle).
- 2. The books were ..... tied. (loosely/loose)
- 3. The Principal inaugurated the seminar by ..... the ceremonial lamp.

(lightening/lighting)

4. I decided to call her in the ..... (knight/night)

5. The girl works ..... in the house.

(diligently/diligent)

(5×1=5)

4. (a) Give one word substitution for the following:

1. Killing of the king.

2. One who is fond of collecting stamps.

3. One who knows many languages.

4. A list of books.

5. One who cannot be corrected. (5×1=5)

(b) Make one word with the following suffixes and prefixes:

an ....., bene....., com....., ad .....,  
neo ....., pan..... ss, ..... ed, ..... ian,  
..... al. (5)

### UNIT-III

5. (a) Transcribe the following words phonetically (any 5):

Cake, ship, grass, have, his, treasure, dial . (5×1=5)

(b) Mark stress on the following words:

photograph, produce, examinee, bacteria, education.

(5×1=5)

6. (a) Mark Intonation in the following sentences:

1. Get out!

2. Sit down please.

3. Call me on Monday.

4. It is not raining, is it?
5. Open the door. (5×1=5)
- (b) Make weak form of the underlined words:
1. Give me a cup of tea.
  2. I am going to market.
  3. They are going away.
  4. Black and white is outdated.
  5. They are not ready to pay.

#### UNIT-IV

7. (a) Develop an outline of a presentation on "Genetic Engineering".

OR

Develop an outline of a presentation on "Global Warming". 10

- (b) Write a slogan and supporting text on Rain Water Harvesting.

OR

Write a slogan and supporting text on Educating the Girl Child. 10

#### UNIT-V

8. (a) Write an e-mail on behalf of Sports Officer for purchasing sports equipments for basket ball team of your Institute. 10

OR

Write an e-mail on behalf of Medical Officer for informing Faculty, Staff and students regarding free eye check up in your Institute.

- (b) Write a newspaper report on 'Handicraft Fest' for charity held in your Institute.
-

Roll No. ....

Total Pages : 3

**BT-I/D-17**

**31006**

**ELEMENTS OF ELECTRONICS ENGINEERING**

Paper : EL-101E

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *five* questions in all, selecting *one* question from each unit. Question No. 1 is compulsory.

**Compulsory Question**

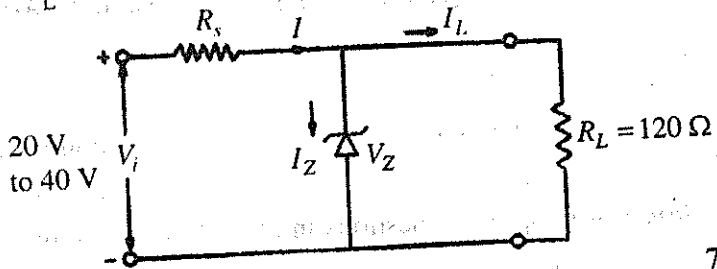
1. Answer the following in brief :

- (a) What is an inductor ? What is its units and give its some applications ? 3
- (b) Explain why the conductivity of Germanium is more than that of Silicon at room temperature ? 3
- (c) Why the Q-point in a voltage amplifier is selected in the middle of the active region ? 3
- (d) Compare the CB and CE configuration of BJT in context to input and output resistance. 3
- (e) Define the transfer characteristics of an Op-amplifier. 3

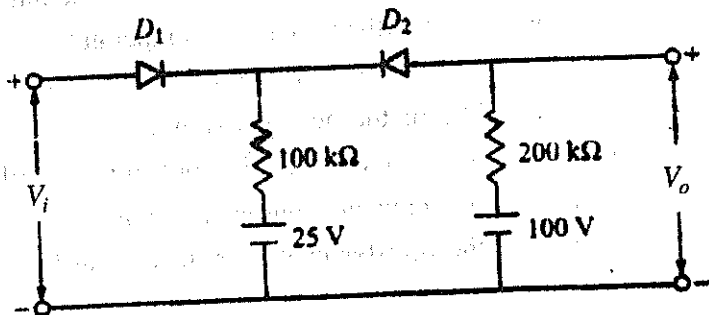
**UNIT-I**

- 2. (a) Explain the working of Zener diode under all biasing conditions. 8

- (b) The Zener diode regulator shown in Fig. below has a fixed voltage drop of 12 V across Zener as long as  $I_Z$  is between 20 mA and 200 mA. Find  $R_{in}$  so that  $V_L$  remains 12 V and  $V_{dc}$  varies from 15 V to 19.5 V ?



3. (a) Explain the working and characteristics of LED ? 8  
 (b) The input voltage  $V_i$  to two level clipper shown in Fig below varies linearly from 0 to 150 V. Sketch and determine the output voltage  $V_o$  to the same time scale as input voltage. Assume ideal diodes.



## UNIT-II

4. (a) Explain the input-output characteristics of common base BJT configuration. 8  
 (b) Explain Miller's Theorem in detail. 7

5. (a) Explain the operation of RC coupled oscillator in detail. 8  
(b) Explain the emitter feedback biasing in BJT. 7

### UNIT-III

6. (a) Explain the working of a differential amplifier. 7  
(b) Explain the following characteristics of an OP-Amp :  
(i) Input impedance  
(ii) Out Impedance  
(iii) Virtual ground  
(iv) CMRR. 8
7. Explain the working of the following in context to Op-Amp :  
(a) Transducer ? 7  
(b) Differentiator ? 8

### UNIT-IV

8. (a) Explain the working of p-channel MOSFET and draw its characteristics. 8  
(b) Explain the working of CRO with diagram. 7
9. Write a short note on the followings :  
(a) UJT.  
(b) SCR. (8+7=15)
-

Roll No. ....

Total Pages : 3

**BT-I/D-17**

**31008**

**ENGINEERING GRAPHICS AND DRAWING (ODD)**

Paper : ME-105(E)

Group-I

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

### UNIT-I

1. Draw the projections of following points on a common reference line, taking a gap of 25 mm between the two consecutive vertical projectors :
  - (i) Point A 15 mm above H.P. and 32 mm in front of V.P.
  - (ii) Point B 40 mm above H.P. and 25 mm behind V.P.
  - (iii) Point C 20 mm H.P. and in V.P.
  - (iv) Point D 30 mm below H.P. and 40 mm behind V.P.
  - (v) Point E 40 mm in front of V.P. and in H.P. 20
2. Construct a diagonal scale 1/50, showing metres, decimetres and centimetres, to measure upto 5 metres. Mark a length 4.75 m on it. 20

### UNIT-II

3. A line measuring 75 mm long has one of its ends 50 mm in front of V.P. and 15 mm above H.P. The top view of the line is 50 mm long. Draw and measure the front view. The other end is 15 mm in front of V.P. and is above H.P. 20



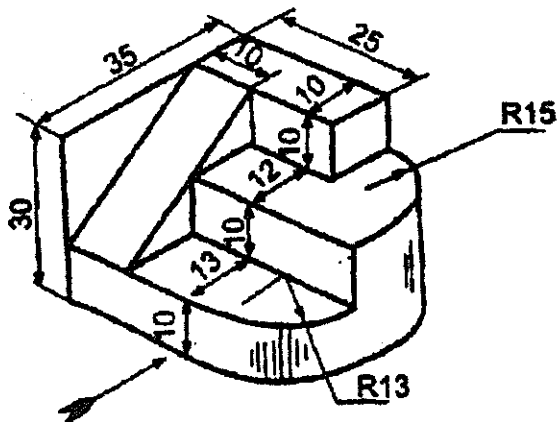
4. Draw the projections of a regular hexagon of 25 mm side, having one of its sides in the H.P. and inclined at  $60^\circ$  to the V.P. and its surface making an angle of  $45^\circ$  with the H.P. 20

### UNIT-III

5. A pentagonal prism with side of base 25 mm and axis 50 mm long lies on one of its faces on H.P., such that its axis is inclined at  $45^\circ$  to V.P. Draw the projections. 20
6. Draw the development of the lateral surface of the frustum of the square pyramid of side of base 30 mm and axis 40 mm, resting on H.P. with one of the base edges parallel to V.P. It is cut by a horizontal cutting plane at a height of 20 mm. 20

### UNIT-IV

7. Draw the front view, top view and right side view of the following object : 20



8. Draw the profiles of following screw threads :

- (a) Knuckle thread.
  - (b) Isometric thread.
  - (c) Buttress thread.
  - (d) Acme thread.
- 

20

Roll No. ....

Total Pages : 3

**BT-1/D-17**

**31010**

**MANUFACTURING PROCESS**

**Paper--ME-103E**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit.

**UNIT-I**

1. (a) What points should be considered for selecting a manufacturing process? 10
- (b) What is safety? Why is it necessary and how it pays? List the common safety measures required to be taken in welding shop. 10
2. (a) State the ranges of compositions for low, medium and high carbon steel. Give *two* applications for each range. 9
- (b) What is steel? How is it different from Cast Iron? Differentiate based on compositions and application. 6
- (c) State the reason why White Cast Iron is more brittle than Gray Cast Iron. 5

## UNIT-II

3. (a) Describe the procedure of green sand preparation in a small batch foundry. 7
- (b) Describe the operation of Cupola furnace for melting cast iron with neat sketch. 9
- (c) Describe the allowances given on pattern for shaking and distortion using neat sketches. 4
4. (a) What are the common commonly used types of Gates? Explain the reasons of their choice. 8
- (b) Differentiate the following casting defects with reference to causes and methods of prevention:
- (i) Cold shut and misrun.
- (ii) Blow holes and Pin hole porosity. 8
- (c) Clearly differentiate the following types of sands: Moulding Sand, Backing sand, Facing sand. 4

## UNIT-III

5. (a) What is Hot working? State the advantages and disadvantages of Hot working process. 10
- (b) Discuss the concept of forging. Explain the steps involved in drop forging with neat sketch. 10
6. (a) Write a short notes on the following: 10
- (i) Cold Bending
- (ii) Stretch forming

- (b) What do you mean by Layout? Explain the Product and Process Layout with their advantages, disadvantages and applications. 10

#### UNIT-IV

7. (a) Discuss about different operations that can be performed on Lathe machine. 8
- (b) Discuss the desirable characteristics of coolants. 4
- (c) Write a short notes on any *two* types of chips along with their formations. 8
8. (a) Explain with the help of neat sketch the principle of resistance welding. Also describe the working of any three resistance welding techniques. 10
- (b) Explain in detail about TIG welding process with the help of neat diagram. What are the merits and demerits? Write its applications. 10
-

Roll No. ....

Total Pages : 3

**BT-I/D-17**  
**CHEMISTRY**  
Paper : CH-101 E

**31011**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

### UNIT-I

1. (a) Derive Gibb's Helmholtz equation.  
(b) Explain the term entropy. Discuss entropy change for an ideal gas.  
(c) Define second law of thermodynamics and give its limitation. (7+7+6=20)
2. (a) Draw a labelled phase diagram of water and interpret the findings from melting curve in it.  
(b) Derive Gibb's phase rule equation.  
(c) With the help of a suitable example, discuss eutectic system. (7+7+6=20)

### UNIT-II

3. (a) Discuss the types of impurities of water.  
(b) What do you understand by hardness of water? Give its units.  
(c) Discuss the methods used for prevention of sludge. (8+6+6=20)

31011/4,500/KD/1162

[P.T.O.]

4. (a) Differentiate between the process of sedimentation and coagulation.
- (b) Discuss the process of disinfection.
- (c) Describe the process of electro dialysis. Write down its application. (10+5+5=20)

### UNIT-III

5. Write notes on the following:
- (a) Dry and wet corrosion.
- (b) Galvanic corrosion.
- (c) Concentration cell. (8+6+6=20)
6. (a) Discuss the electrochemical theory of corrosion.
- (b) What do you understand by Stress corrosion?
- (c) Describe the Mechanism of lubrication. (7+7+6=20)

### UNIT-IV

7. (a) Discuss different types of polymerization with examples.
- (b) Discuss the method of preparation, properties and technical applications of the following:
- (i) PVC
- (ii) PE. \_\_\_\_\_ (6+14=20)

3. (a) What are conductometric titrations ?
- (b) Discuss the types of curves obtained when a strong acid is titrated with a strong base.
- (c) Discuss the principle and applications of DTA.

(6+6+8=20)

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## ELECTRICAL TECHNOLOGY

Paper : EE-101 E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt exactly *five* questions by selecting at least *one* question from each of the four sections A,B,C & D.

## SECTION-A

1. (a) An ac wave ( $v = V_m \sin \theta$ , where  $\theta = \omega t$ .) is made half wave and full wave rectified. Find out their average and r.m.s. values for complete and half cycle in each case. 12

- (b) Given (all in volts) :

$$V_1 = 10 \sin \omega t,$$

$$V_2 = 10 \cos (\omega t + 225^\circ),$$

$$V_3 = 10 \cos(\omega t - 225^\circ),$$

$$\text{Find } V = V_1 + V_2 + V_3. \quad 8$$

2. (a) Three resistors 12 ohm, 18 ohm and 36 ohm are connected in parallel. This parallel circuit is connected in series with a resistor 'R'. The whole circuit is connected to supply of 60 Volt and it is found that power developed in 12 ohm resistor is 48 W. Find the value of R and total power. 8

- (b) Differentiate among the following ckt. elements by giving examples (i) Linear-non linear, (ii) lumped-distributed, (iii) active-passive, (iv) unilateral-bilateral.

12

## SECTION-B

3. (a) Explain in detail the maximum power transfer theorem with proper mathematical treatment. 15
- (b) Convert delta connected set of three equal resistors R into star. 5
4. Explain in detail the theory of sinusoidal frequency response of series RLC ckt. including series resonance, with neat diagrams & voltage current and power waveforms on simultaneous time scale. 20

## SECTION-C

5. Explain in detail the two wattmeter method of power measurement for star connected purely resistive load with suitable steps containing equations, ckt. & phasor diagram. 20
6. Draw and explain in detail the phasor diagram of an actual transformer having inductive load (RL series) with suitable steps containing equations and ckt. diagram.

## SECTION-D

7. Explain in detail the construction and working of a C C Generator with suitable sketches. 20
8. Explain principle, general construction and working of synchronous motor with suitable sketches. 20

Roll No. ....

Total Pages : 3

BT-1/D-17

31013

FUNDAMENTALS OF COMPUTER  
AND PROGRAMMING IN C  
Paper-CSE-101 E

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *five* questions in all by selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (i) What is an operating system ? What is its need ? What are the types of an operating system ? Explain the following operating system :
  - (a) UNIX/Linux.
  - (b) Window operating system. 10
- (ii) What is difference between Primary and Secondary memory ? What are auxiliary storage devices ? Explain them in brief. 10
  
2. (i) Differentiate impact and non-impact printers. 5
- (ii) Perform the following conversions :
  - (a)  $(98765)_{10} = (?)_{16}$
  - (b)  $(5674)_8 = (?)_{10}$
  - (c)  $(100100101110)_2 = (?)_{16}$
  - (d)  $(89CD)_{16} = (?)_2$
  - (e)  $(987654)_{10} = (?)_8$
  - (f)  $(AIE2)_{16} = (?)_{10}$ . (6×2.5=15)

## UNIT-II

3. (i) Differentiate the following :
- (a) Linker, Loader and Debugger.
  - (b) Assembler, Compiler and Interpreter. (2×5=10)
- (ii) Differentiate algorithm and flow-charts. What symbols are used in flow-charts. Draw a flow-chart to find area of circle. 10
4. (i) What are the advantages and limitations of using machine language, assembly language and high level languages. 10
- (ii) What is internet ? How it works. What are the major features and applications of using internet. 10

## UNIT-III

5. (i) Explain the structure of a program in C-Language by giving a suitable example. 10
- (ii) What do you understand by identifiers and keywords. How keywords differ from reserved words ? 5
- (iii) Explain the operator precedence chart with example. 5
6. (i) Compare the use of if-else statement with that of ternary operator. 5
- (ii) Explain the usefulness of default statement in switch case statement with example. 5
- (iii) Differentiate local and global variables. Write a program using switch case statement to display a menu that offers five options: read three numbers, calculate total, calculate average, display the smallest number and display the largest number. 10

#### UNIT-IV

7. (i) What is a string ? How to declare a string ? How it differ from character array. Write a program to copy  $n$  characters of a string from the  $m$ th position in another string. 10
- (ii) Explain how strings are represented in main memory ? How are strings read from the standard input device ? Explain the different functions used to perform string input operations. Give example. 10
8. (i) Differentiate structure and union. Explain the utility of typed keyword in structures. Write a program to find smallest number an array by using structure. 10
- (ii) Differentiate a text file and a binary file. Explain the different modes in which a file can be opened in C program. Explain the following with example :
- (a) fopen()
  - (b) ferror()
  - (c) fclose(). 10
-