

Roll No. ....

Total Pages : 03

BT-2/M-18

32027

APPLIED PHYSICS-II

AS-102N

Time : Three Hours]

[Maximum Marks : 75

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

### Unit I

1. (a) Name various types of bonds in solids and give one example of each. 10
- (b) Construct Wigner-Seitz primitive cell. 5
2. (a) Discuss in brief crystal structure of sodium chloride and cesium chloride. 8
- (b) What are Miller Indices ? For a simple cubic lattice, find the ratio of spacing of (110) and (111) planes. 7

## Unit II

3. (a) What do you mean by phase velocity and group velocity ? Derive the relation between phase velocity and group velocity. 10
- (b) What is the physical significance of wave function  $\psi$  ? 5
4. (a) State Uncertainty Principle and discuss its various applications. 7
- (b) Discuss the shortcomings of the classical physics and derive and Planck's radiation law. 8

## Unit III

5. (a) What is Hall Effect ? Mention applications of Hall Effect. 7
- (b) What is meant by Fermi Energy ? Calculate its values for free electron gas at 0 K. 8
6. (a) What is Wiedemann-Franz Law. ? Explain the thermal conductivity of metals. 7
- (b) Prove that for a completely filled band, the number of effective electrons vanishes. 8

## Unit IV

7. (a) What are Superconductors ? List the general features of superconducting materials and explain. 8
- (b) Discuss various applications of nanomaterials. 7
8. (a) Explain sol-gel method for synthesis of nanomaterials with its advantages and disadvantages. 7
- (b) Derive the London equation with reference to superconductivity. 8

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Total Pages : 02

BT-2/M-18

32028

APPLIED CHEMISTRY

AS-103N

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. Log table should be provided as per requirement.

### Unit I

1. (a) Drive an expression for the entropy change for a mixing of ideal gases. 10  
(b) Show that in the mixing of two ideal gases, the maximum entropy increase results when  $X_1 = X_2 = 0.5$ . 5
  
2. (a) Discuss the phase rule diagram of Na-K system. 10  
(b) What do you mean by the chemical potential ?  
How will you calculate it ? 5

## Unit II

3. (a) Discuss the temporary and permanent hardness of water. Give the detail of determination by EDTA method. 10  
(b) Write a note on electro-dialysis. 5
4. Write notes on the following : 8,7  
(a) Supercritical fluid system  
(b) Derivatized and immobilized solvent materials.

## Unit III

5. Explain the mechanism of the following types of corrosion : 3×5=15  
(a) Pitting corrosion  
(b) Stress corrosion  
(c) Water line corrosion.
6. Write the mechanism of thin layer lubrication and the classification of lubricants. 15

## Unit IV

7. Give the brief discussion of nano crystals and clusters. Discuss the properties of nano materials. 15
8. Explain the raw materials, manufacture and analysis of Portland cement. 15

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Total Pages : 03

BT-2/M-18

32029

MANUFACTURING TECHNOLOGY AND  
PROCESSES  
ME-101N

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question from each Unit.

Unit I

1. (a) What is Manufacturing ? Explain the various manufacturing processes used to manufacture a product. 10
- (b) Discuss first aid. How is it important for industrial safety ? 5
  
2. Explain the composition, properties and applications of the following materials : 15
  - (a) Mild steel
  - (b) Cast Iron
  - (c) High speed steel.

## Unit II

3. (a) Define Core. Explain the core making and core assembly. 7
- (b) Define moulding sand and its composition. Also discuss the method of sand preparation. 8
4. Discuss the basic steps casting process. Explain the various casting defects with causes and remedies. 15

## Unit III

5. (a) Define the principle of hot working processes. Explain the wire drawing process. 8
- (b) Differentiate between the rolling and extrusion. 7
6. Explain the following sheet metal operations : 15
  - (a) Blanking
  - (b) Forming
  - (c) Bending and Joining.

## Unit IV

7. (a) Discuss the principle of resistance welding. Explain the stitch and spot welding in resistance welding.

8

- (b) Differentiate between the TIG and MIG welding with their applications. 7
8. (a) What is Metal Cutting ? Explain the significance of coolants in machining. 7
- (b) Define tool wear. Explain the different parameters responsible for the tool wear. How it affects the tool life ? 8



Roll No. ....

Total Pages : 04

BT-2/M-18

32030

APPLIED MATHEMATICS-II

AS-104-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) Solve the equation  $x^4 - 8x^3 + 21x^2 - 20x + 5 = 0$  given that the sum of two of the roots is equal to the sum of the other two. 7.5

(b) Solve the equation : 7.5

$$8x^5 - 22x^4 - 55x^3 + 55x^2 + 22x - 8 = 0$$

2. (a) State and prove the relation between beta and gamma functions. 7.5

(b) Using the method of differentiation under the integral sign, evaluate : 7.5

$$\int_0^{\pi} \frac{\log(1 + a \cos x)}{\cos x} dx = \pi \sin^{-1} a$$

## Unit II

3. (a) Solve :

(i)  $L(t \sin at)$

(ii)  $L^{-1}\left(\frac{5s+3}{(s-1)(s^2+2s+5)}\right)$

3+4.5

(b) Only state the following properties of the Laplace transform :

7.5

(i) First shifting property

(ii) Multiplication property

(iii) Division property

(iv) Derivative property

(v) Integral property.

4. (a) State and prove the Convolution theorem and evaluate :

7.5

$$L^{-1}\left(\frac{1}{(s^2+1)(s^2+25)}\right)$$

(b) Using Laplace transform, solve the simultaneous equations  $\frac{dx}{dt} + 5x - 2y = t$ ,  $\frac{dy}{dt} + 2x + y = 0$ , given that  $x(0) = y(0) = 0$ .

7.5

### Unit III

5. (a) Solve the differential equation : 7.5

$$(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$$

- (b) Find the orthogonal trajectories of the family of curves : 7.5

$$r = 2a(\cos\theta + \sin\theta)$$

6. (a) By variation of parameter, find the particular integral of equation : 7.5

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \sin(e^x)$$

- (b) Solve the differential equation : 7.5

$$(D^2 - 1)y = x \sin n$$

### Unit IV

7. (a) Find the directional derivative of

$$\phi = 5x^2y - 5y^2z + \frac{5}{2}z^2x, \text{ at the point } P(1, 1, 1) \text{ in}$$

$$\text{the direction of } \frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1} \quad 7.5$$

- (b) Give the geometrical interpretation of Divergence of a vector field. 7.5

8. (a) Evaluate by Green's theorem

$$\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy$$

where  $C$  is the boundary of the region bounded  
 $x=0, y=0, x+y=1$ . 7.5

- (b) Using Gauss divergence theorem, evaluate : 7.5

$$\iint_S \vec{F} \cdot \hat{n} \, ds$$

where  $\vec{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$  and

$S$  is the surface of the cube bounded by the planes  
 $x=0, x=a, y=0, y=b, z=0, z=c$ .

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Total Pages : 02

BT-2/M-18

32031

TECHNICAL COMMUNICATION

HS-101N

Time : Three Hours]

[Maximum Marks : 75

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

Unit I

1. What is Effective Communication ? What are the common barriers in effective communication ? 5,10
2. Define communication. Suggest ways to overcome barriers in interpersonal communication. 5,10

Unit II

3. Is there a difference between listening and hearing ? Explain with relevant examples and also list the common barriers in listening. 5,10
4. What is technical writing style ? Discuss the essential features of good technical writing with suitable examples. 5,10

### Unit III

5. Describe the significance of job interviews today. Discuss the kinds of questions that may be asked during an interview. Describe in brief the strategies to deal with loaded and open questions. 3,6,6
6. Write short notes on any *two* topics given :
- (a) Nature and importance of group discussion
  - (b) Selection group discussion
  - (c) Leadership functions in group discussions.

### Unit IV

7. Assume that you are Saurabh Mehta. You have a bachelor's degree in production engineering from IIT Madras. Since then you have been working as a production engineer at Haldia Steel Limited, Haldia. You are a dynamic professional with excellent communication, interpersonal and negotiation skills. You are proficient in MS-DOS, Windows etc. Write a covering letter along with a resume to apply for the position of Senior Production Engineer at Bharati Steel Limited, Mumbai. 7,8
8. Write an article on any *one* of the topics given :
- (a) Deep Web
  - (b) The Future of Electric Vehicles
  - (c) Solar Energy : Issues and Challenges.

Roll No. ....

Total Pages : 03

BT-2/M-18

32032

FUNDAMENTALS OF BIOTECHNOLOGY

BT-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 ultra structure of plant cell. 7
- (b) Mitochondria and chloroplast are semiautonomous organelles. Comment. 5
- (c) Define the following terms : Nucleolus, Nucleosome. 3
2. (a) Classify the proteins on the basis of their structure. 7
- (b) Write in details about various type of DNA. 5
- (c) Define the following terms :  
Hormone, Enzyme. 3

## Unit II

3. (a) Mitosis results in producing two cells which are similar to each other. What would be the consequences if each of the following irregularities occurs during mitosis ? 7
- (i) Nuclear membrane fails to disintegrate
  - (ii) Duplication of DNA does not occur
  - (iii) Cytokinesis does not occur.
- (b) Differentiate between events of mitosis and meiosis. 5
- (c) Define the following terms : 3  
Mutation, Blood group.
4. (a) Enumerate about the bacterial pathogenicity. 7
- (b) Write a note on role of immune system in health and disease. 5
- (c) Define following terms : 3  
Bactriophage and Retroviruses

## Unit III

5. (a) What is genetic engineering ? At the present level of advancement of biotechnology, what are the main techniques of genetic engineering ? 7
- (b) Write a note on restriction endonucleases ? How do these enzymes participate in recombinant DNA technology ? 5
- (c) Define the following terms Vector, Marker genes. 3



6. (a) What are transgenic animals ? Write in brief about transgenic mammals. 7
- (b) Elaborate about the significance of transgenic plants by taking suitable examples. 5
- (c) Comment on genetically modified organisms (GMOs). 3

#### Unit IV

7. (a) Describe the scope of biotechnology in medicine and environment. 7
- (b) Discuss about various ethical issues related to biotechnology. 5
- (c) Define Bioinformatics and Biosensor. 3
8. (a) Enumerate role of biology in nanotechnology by taking suitable examples. 7
- (b) Discuss about role of biology in micro-electromechanical systems. 5
- (c) Define following terms related to bioinformatics : genebank and databases. 3

Roll No. ....

Total Pages : 03

BT-2/M-18

32033

ENGINEERING DRAWING AND GRAPHICS

ME-105-N

Group I

Time : Three Hours]

[Maximum Marks : 75

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

**Unit I**

1. A line AB is inclined at  $30^\circ$  to VP has its ends 20 mm and 50 mm above HP. The length of the front view is 65 mm and its VT is 10 mm above HP. Determine the true length of the AB, its inclination with HP and its HT. 15

2. Draw the projections of the following Points on a common reference line, taking a gap of 20 mm between two consecutive vertical projectors : 15

(a) Point A 50 mm above H.P. and 30 mm in front of V.P.

(b) Point B 55 mm above H.P. and 35 mm behind V.P.

(c) Point C 65 mm H.P. and in V.P.

(d) Point D 25 mm below H.P. and 20 mm behind V.P.

## Unit II

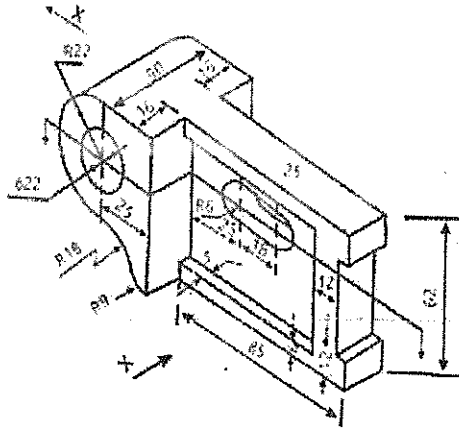
3. A hexagonal plate of side 30 mm is resting on one of its sides on VP and inclined at  $45^\circ$  to HP. Its surface is inclined at  $35^\circ$  to VP. Draw its projections. 15
4. A hexagonal pyramid of base side 30 mm and axis length 60 mm is resting on HP on one of its base corners with its axis inclined at  $35^\circ$  to VP and parallel to HP. Draw its projections when the base side containing the resting corner are equally inclined to HP. 15

## Unit III

5. A pentagonal pyramid of base side 30 mm and axis length 50 mm lies on one of its triangular faces on HP and with its axis parallel to VP. It is cut by a horizontal section plane whose VT passes through the centre of the base the pyramide. Draw the sectional plan. 15
6. A hexagonal prism of base side 30 mm and axis length 65 mm is resting on HP on its base with two of its vertical faces perpendicular to VP. It is cut by a plane inclined at  $50^\circ$  to HP and perpendicular to VP and meets the axis of prism at a distance 10 mm from the top end. Draw the development of lateral surface of the prism. 15

## Unit IV

7. Draw the front view, top view and right side view of the following object : 15



8. Describe the use of the following commands in AUTOCAD using suitable examples : 15
- (a) Circle
  - (b) Ellipse
  - (c) Trim
  - (d) Offset
  - (e) Arc.

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Total Pages : 03

BT-2/M-18

32034

ENGINEERING DRAWING AND GRAPHICS

(Even)

ME-105N

Time : Three Hours]

[Maximum Marks : 75

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

### Unit I

1. Draw the projections of the following points on a common reference line : 15
  - (a) Point P 30 mm above HP and 20 mm in front of VP
  - (b) Point Q 40 mm above HP and 25 mm behind VP
  - (c) Point R 28 mm below HP and 45 mm behind VP
  - (d) Point S 32 mm below HP and 20 mm in front of VP
  - (e) Point H 34 mm above HP and in VP.
  
2. One end of the line PQ of True length 60 mm is 30 mm above HP and 25 mm in front of VP. Line is inclined at  $40^\circ$  to HP and  $30^\circ$  to VP. Draw its projections and located its traces. 15

## Unit II

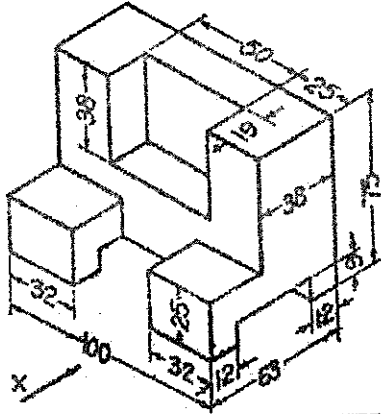
3. A Pentagonal plate of 30 mm side is inclined at  $40^\circ$  to HP and perpendicular to V.P. Draw its projections if one edge of the plate is inclined at  $30^\circ$  to V.P. 15
4. Draw the projections of Pentagonal pyramid of base side 30 mm long and height 55 mm long. The pyramid is resting on one base side on HP with its Axis parallel to VP and inclined at  $40^\circ$  to HP. 15

## Unit III

5. A pentagonal pyramid of height 60 mm and base side 30 mm long is resting on its base in HP with one base side inclined at  $30^\circ$  to VP. A section plane perpendicular to VP and inclined at  $40^\circ$  to H.P. bisects through the axis of the solid. Draw the true and apparent section of the truncated solid. 15
6. A pentagonal pyramid of base side 30 mm, axis length 55 mm is resting on its base in HP with one base side parallel to VP. A cutting plane perpendicular to VP and inclined to HP cuts through the solid, bisecting the axis. Draw the development of the truncated solids. 15

## Unit IV

7. Draw the front view, top view and right side view of the following object : 15



8. Describe the applications of the following AUTOCAD commands : 15
- (a) Fillet
  - (b) Offset
  - (c) Chamfer
  - (d) Trim
  - (e) Mirror.

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Total Pages : 02

BT-2/M-18

32035

BASIC OF ELECTRONICS ENGG.

ECE-101N

(Opt. I)

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions out of eight questions selecting at least *one* question from each Unit.

### Unit I

1. (a) Explain the working and applications of Zener diode.  
7½
- (b) Explain the working and applications of photodiode.  
7½
2. (a) What is Rectifier ? Explain the working of Halfwave and Full-wave Rectifier. 10
- (b) Discuss the parameters of Half Wave Rectifier. 5

### Unit II

3. (a) Discuss the characteristics of Common Base Circuit.  
7½



- (b) Write the comparison of different characteristics in CE, CB and CC configurations. 7½
4. (a) What are advantages of Negative feedback in Amplifier ? 7½
- (b) What is an Oscillator ? Explain the Barkhausen criterion for Oscillations. 7½

### Unit III

5. Explain the following :
- (a) Voltage follower using OPAMP 7½
- (b) Integrator and Differentiator using OPAMP. 7½
6. Define the following terms :
- (a) PSRR 3
- (b) CMRR 3
- (c) Slew Rate 3
- (d) Gain-Bandwidth Product 3
- (e) Input Bias Current. 3

### Unit IV

7. Explain the characteristics, operation and applications of UJT. 15
8. Explain the characteristics, operation and applications of TRIAC. 15

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Total Pages : 04

BT-2/M-18

32036

ELECTRICAL TECHNOLOGY

FUNDAMENTALS

EE-101N

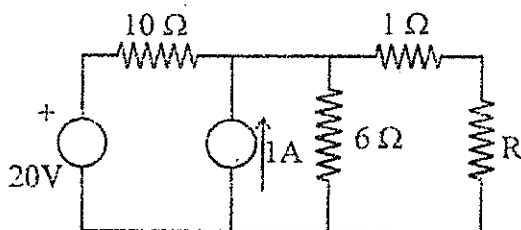
Time : Three Hours]

[Maximum Marks : 75

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

Unit I

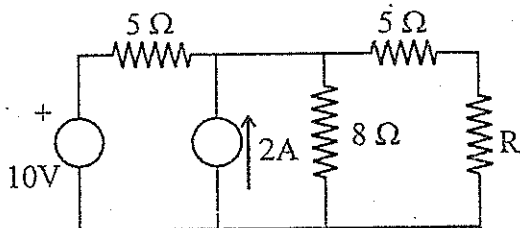
1. (a) For the ckt. shown below, find Thevenin's equivalent w.r.t. the load resistance R. 10



- (b) Define the following with giving example of each : 5

- (i) Linear Circuit Element
- (ii) Bilateral circuit element
- (iii) Passive Circuit Element
- (iv) Active Circuit Element
- (v) Distributed Circuit Element.

2. (a) For the ckt. shown below, find the Norton's equivalent w.r.t. the load resistance R. 10



- (b) 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 dissipated. 5

### Unit II

3. (a) Explain AC input steady state response of series RL ckt. with expressions of current, impedance and draw power triangle and waveforms of input voltage, current and instantaneous power on simultaneous time scale. 10
- (b) An inductor of 1 mH and a capacitor of 10  $\mu$ F when connected in series to an a.c. source have numerically equal reactances. Find the angular frequency  $\omega$  (in radians per seconds) of the a.c. source. 3

4. (a) Explain concept of generation of alternating emf (dynamo). 10
- (b) An ac voltage wave ( $v = V_m \sin \theta$ , where  $\theta = \omega t$ ) is made half-wave and full-wave rectified. Determine their average and r.m.s. values for complete cycle for both cases. 5

### Unit III

5. (a) Three equal resistances are first connected in star, then in delta to the same 3-phase supply. Find out the ratios of corresponding : 10
- (i) Line voltage
  - (ii) Phase voltages
  - (iii) Phase currents
  - (iv) Line currents
  - (v) Power dissipated.
- (b) Establish relation between line current and phase current in a 3 phase delta connected balanced power system. 5
6. Explain the following :
- (a) Ideal transformer with phase diagram 5
  - (b) Transformer at no load with phasor diagram 5
  - (c) Concept of eddy current loss and remedy to reduce it in the core 5

#### Unit IV .

7. Explain principle, construction and working of DC generator with suitable sketches and explaining commutator action. 15
8. Explain general working of a 3-phase induction motor along with explanation regarding production of rotating flux produced from 3-phase pulsating flux with suitable sketches. 15

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Total Pages : 04

BT-2/M-18

32001

MATHEMATICS-II

MATH-102-E (Group I) (Opt. I)

Common for All Branches

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) Using Gauss Jordan method, find the inverse of the following matrix : **10**

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$$

- (b) Test for the consistency and solve : **10**

$$2x - 3y + 7z = 5$$

$$3x + y - 3z = 13$$

$$2x + 19y - 47z = 32$$

2. (a) Using Cayley-Hamilton theorem, find the inverse of : 10

$$\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$$

- (b) Show that the following matrix is unitary : 10

$$\frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$$

### Unit II

3. (a) Solve : 10

$$(y \log y) dx + (x - \log y) dy = 0$$

- (b) Find the orthogonal trajectory of the cardioids : 10

$$r = a(1 - \cos \theta)$$

4. (a) Solve by method of variation of parameters : 10

$$\frac{d^2 y}{dx^2} + y = x \sin x$$

- (b) Solve the differential equations : 10

$$\frac{dx}{dt} - 7x + y = 0; \quad \frac{dy}{dt} - 2x - 5y = 0$$

### Unit III

5. (a) Find the Laplace transforms of : 5+5

(i)  $\sin 2t \cos 3t$

(ii)  $f(t) = |t-2| + |t+1|; t \geq 0$

(b) Find the inverse transform of the function : 10

$$f(s) = \frac{4s+5}{(s-1)^2(s+2)}$$

6. (a) State and prove the convolution theorem of Laplace transform. 10

(b) Solve the differential equation by the transform method : 10

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t, y(0) = 0 \text{ and } \left(\frac{dy}{dt}\right)_{t=0} = 0$$

### Unit IV

7. (a) Solve the PDE : 10

$$(z-y)p + (x-z)q = y-x$$

(b) Using Charpit's method, solve : 10

$$2z + p^2 + qy + 2y^2 = 0$$



8. (a) Solve the following equations by the method of separation of variables : 10

$$\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$$

given that  $u(0, y) = 8e^{-3y}$ .

- (b) A bar 100 cm long, with insulated sides, has its ends kept at  $0^\circ\text{C}$  and  $100^\circ\text{C}$  until steady state conditions prevail. The two ends are then suddenly insulated and kept so. Find the temperature distribution. 10

Roll No. ....

Total Pages : 02

BT-2/M-18

32002

PHYSICS-II

PHY-102E

Time : Three Hours]

[Maximum Marks : 100

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

### Unit I

1. (a) Explain different types of crystal bonding. 10
- (b) What do you mean by Miller Indices ? Explain with proper example how to determine Miller Indices. 5
- (c) Draw Cesium Chloride Structure. 5
  
2. (a) What are Schottky and Frenkel defects ? Derive the necessary relation to show that Schottky defect ion ionic crystal depends on temperature. 15
- (b) Write note on X-ray diffraction. 5

### Unit II

3. (a) Derive an expression for time dependent Schrödinger wave equation. 10
- (b) Write a note on discovery of Planck's constant. 10

4. (a) Obtain an expression for density of states. 10  
(b) Discuss classical free electron theory of metal. 10

### Unit III

5. (a) Construct two dimensional Brillouin zones. 10  
(b) Write a note on origin of energy bands. 10
6. (a) What do you understand by the concept of effective mass and holes ? 10  
(b) What is Hall Effect ? Give an elementary theory of Hall effect. Mention applications of Hall effect. 10

### Unit IV

7. (a) What is Photoconductivity ? Discuss simple model of a photoconductors. 10  
(b) Discuss London equations with reference to superconductivity. 10
8. (a) Derive an expression for diamagnetic susceptibility on the basis of Langevin theory and show it is independent of temperature. 10  
(b) Explain photovoltaic cells and their characteristics. 10

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Total Pages : 04

BT-2/M-18

32006

ELEMENTS OF ELECTRONICS  
ENGINEERING  
EL-101-E

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, with at least *one* question  
from each Unit. Q. No. 1 is compulsory.

1. Attempt all questions. All questions carry equal marks. 15×1=15

- (i) Differentiate between clippers and clampers.
- (ii) Why Si and Ge are not used for making LEDs ?
- (iii) What is the use of filters in rectifiers ?
- (iv) What is Pinch-off voltage in JFET ?
- (v) What is the relation between  $\mu$ ,  $g_m$  and  $r_d$  ?
- (vi) What is the difference between enhancement and depletion MOSFET ?
- (vii) What is latching and holding current in SCR ?
- (viii) How TRIAC is better than SCR ?
- (ix) Explain the differences between Active and Passive electronic components.

- (x) Draw the equivalent model of Op-Amp 741.

### Unit I

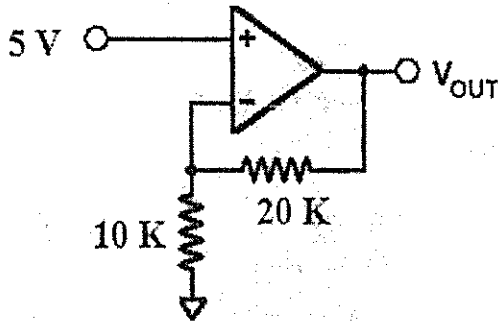
2. Explain the VI characteristics of  $p-n$  diode in forward and reverse bias with necessary diagrams. 15
3. What is the significance of zener diode ? What are its various applications ? How can it be used as a voltage regulator ? 15

### Unit II

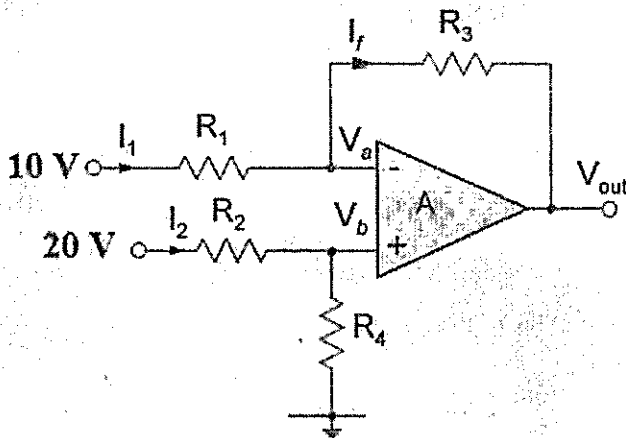
4. Explain the input and output characteristics of Common Emitter BJT configuration. Hence, explain the significance of cut-off, active, saturation and breakdown regions. 15
5. Derive the relation between  $\alpha$ ,  $\beta$  and  $\gamma$  parameters of BJT. What are their range of values ? 15

### Unit III

6. Explain the non-inverting configuration of Op-Amp. Calculate the output of the following Op-Amp Circuit : 15



7. How Op-Amp can be used as a subtractor ? Find the values of all the resistors to get an output voltage of  $10\text{ V}$  in the following circuits : 15



## Unit IV

8. What is SCR ? Explain the working and operation of SCR. What are its various applications ? 15
9. How UJT is different from BJT ? Explain the working and operation of UJT. How can you say that UJT exhibits negative resistance and what is its significance ? 15

Roll No. ....

Total Pages : 03

BT-2/M-18

32008

ENGINEERING GRAPHICS AND DRAWING

ME-105-E

Time : Three Hours]

[Maximum Marks : 100

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

**Unit I**

1. Describe various types of scales and lines used in Engineering Drawing. Differentiate between First and Third angle systems of Projections. 20
  
2. Draw the projections of the following points on a common reference line taking a gap of 25 mm between two consecutive projectors : 20
  - (a) Point E 15 mm above H.P. and 20 mm in front of V.P.
  - (b) Point F 20 mm above H.P. and 28 mm behind V.P.
  - (c) Point G 30 mm H.P. and in V.P.
  - (d) Point H 25 mm below H.P. and 40 mm behind V.P.



## Unit II

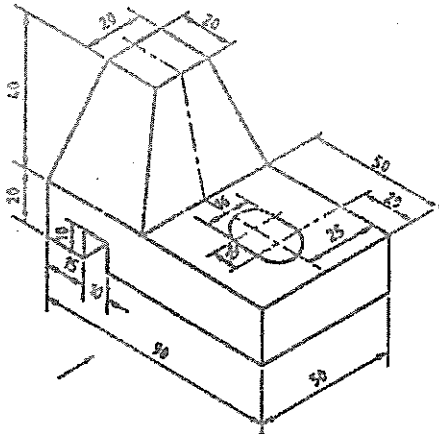
3. The top view of a straight line AB 72 mm long measures 62.5 mm while length of its front view is 50 mm. Its end A is in the VP and 12 mm above the H.P. Draw the projections of the straight line, and determine its inclination with HP and VP. 20
4. A Hexagonal lamina of 40 mm side is resting on one of its corners in the HP. Its plane is inclined at an angle of  $30^\circ$  to HP and perpendicular to V.P. Draw its projections. 20

## Unit III

5. A Pentagonal prism, side of base 25 mm and axis 50 mm, is resting on one of its base edges on the horizontal plane with its axis inclined at  $45^\circ$  to HP. Draw its projections. 20
6. A Pentagonal pyramid of 30 mm base edges and 50 mm height is resting on its base with an edge of base parallel to VP. The pyramid is cut by a section plane intersecting the axis at 30 mm above base, the plane being inclined at  $30^\circ$  to HP. Develop the lateral surface of the truncated prism. 20

Unit IV

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



8. Draw three orthographic views of hexagonal nut and square nut. 20

Roll No. ....

Total Pages : 03

BT-2/M-18

32009

ENGINEERING GRAPHICS AND DRAWING  
ME-105E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Assume any missing data.

**Unit I**

1. (a) What do you mean by scale ? Construct a Diagonal scale of RF = 3 : 200 showing metres, decimetres and centimetres. The scale should measure up to 6 metres. Show a distance of 4.56 metres. 10
- (b) Differentiate first and third angle systems of orthographic projections. 10
2. (a) Point A is 20 mm above HP and in the 1st quadrant. Its shortest distances from the XY line is 40 mm. Draw the projections determine its distance from VP. 8

- (b) Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors. Name the quarants in which they lie. 12
- (i) E -30 mm below HP and 25 mm behind VP
  - (ii) F -35 mm below HP 30 mm in front of VP
  - (iii) G -on HP and 30 mm in front of VP.
  - (iv) H - on HP and 35 mm behind VP.

### Unit II

3. The front view of a line AB of length 70 mm is inclined  $30^\circ$  to the reference line and measures 45 mm. The end A is 20 mm above HP and 25 mm in front of VP. Draw the projection of line and find the inclinations with HP and VP. 20
4. The top view of a plate, the surface of which is perpendicular to the V.P. and inclined at  $60^\circ$  to the H.P. is a circle of 60 mm diameter. Draw its view. 20

### Unit III

5. A hexagonal Prism (Base edge 30 mm and lateral edge 70 mm) is resting on one of its lateral edge such that the axis is inclined at  $50^\circ$  with VP. Draw the projection of solid. 20

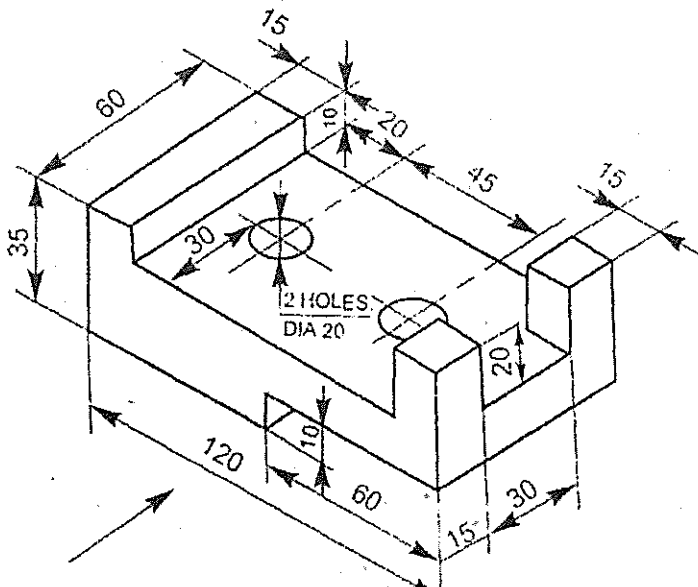
6. A cylinder, with a 66 mm base diameter and 84 mm axis length, has its base in H.P. A square hole of 36 mm side is punched centrally having its sides equally inclined with H.P. Draw the development of lateral surface of cylinder.

20

#### Unit IV

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

20



8. Draw full size three views in orthographic projection of a 30 mm diameter hexagonal bolt, 100 mm long, fitted with a hexagonal nut.

20

Roll No. ....

Total Pages : 03

BT-2/M-18

32010

MANUFACTURING PROCESSES

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 is a manufacturing process ? Give a detailed classification of manufacturing processes. **10**
- (b) Discuss causes and common sources of Industrial accidents. **10**
2. Write detailed notes on general properties and applications of the following engineering materials : **10×2**
  - (a) Mild Steel
  - (b) High Speed Steel.

Unit II

3. (a) Define the terms "Pattern" and "Mould". Briefly discuss types of patterns. **10**

- (b) What is the composition of moulding sand? Describe the relevant properties imparted by the various constituents to the mould. 10
4. (a) Write a detailed note on "Core Sands" and "Core Making". 8
- (b) Draw a neat sketch of Cupola furnace and discuss its salient features for melting of materials. 12

### Unit III

5. (a) Distinguish between cold and hot working of metals. Briefly explain sheet metal operations. 10
- (b) What is Forging? Explain its principle of working and give some industrial applications. 10
6. Write notes on the following :
- (a) Principle of hot Rolling 8
- (b) Types of Plant Layout and their advantages. 12

### Unit IV

7. (a) Give specifications and uses of the following machine tools : 8
- (i) Lathe
- (ii) Planer and Shaper.

- (b) Draw neat sketches of a single point cutting tool to represent various angles. 12
8. Write detailed notes on the following welding processes :
- (a) Oxy-Acetylene Welding 8
- (b) TIG and MIG Welding. 12



Roll No. ....

Total Pages : 03

BT-2/M-18  
CHEMISTRY  
CH-101E

32011

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) State and explain the second law of thermodynamics.  
(b) Derive the Gibbs-Helmoltz equation.  
(c) Calculate the increase in entropy when 3.4l of oxygen is mixed with 12.4l of hydrogen at standard condition of temperature and pressure. 7,8,5
  
2. (a) State Gibb's phase rule. Also give its importance.  
(b) Draw and explain the phase diagrams for the following system :
  - (i) Two component eutectic system
  - (ii) Two component system with incongruent melting point. 5,15

## Unit II

3. Write short notes on the following : 6,7,7
- (a) Reverse osmosis
  - (b) Zeolite softness
  - (c) Scale and sludge formation.
4. (a) How do you estimate the temporary features of water by complexometric method ?
- (b) What is Flocculation ? Explain what happens when alum is add to water for its purification.
- (c) Chemically treated water containing  $\text{NH}_4\text{HCO}_3$  was boiled for 5 min to remove ammonia. The alkalinity was found to change as :  $A_{\text{ph}}$  from 0 to 0.3 mg equiv./l and  $A_{\text{mo}}$  from 1.1 to 0.8 mg equiv/l. Find the amount of ammonia that distilled off. 7,7,6

## Unit III

5. (a) What do you understand by the term Corrosion ? Write briefly about the primary factors that effect the rate of corrosion. 7
- (b) Write short notes on the following : 13
- (i) Water-line corrosion
  - (ii) Pitting corrosion.

6. Explain the following : 7,7,6
- (a) Flash and fire points
  - (b) Addition for lubricants
  - (c) Cathodic protection for controlling corrosion.

#### Unit IV

7. (a) How are polymers classified as the basis of mechanism of polymerisation ? Cite suitable examples.
- (b) What are Composite Materials ? Write the importance and applications of different types of composites.
- (c) Give synthesis of the following polymers with their uses : 7,7,6
- (i) Buna-S
  - (ii) Silicane rubber.
8. Explain briefly the the following : 7,7,6
- (a) Flame Photometric Analysis
  - (b) Thermogravimetric Analysis (TGA)
  - (c) Conductometric Titrations.

Roll No. ....

Total Pages : 03

BT-2/M-18

32012

ELECTRICAL TECHNOLOGY

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 and D.

**Section A**

1. (a) When a resistor R is connected to a current source, it consumes a power of 27W. When the same R is connected a voltage source having the same magnitude (SI units) as the current source, the power absorbed by R is 3 W. Find the magnitude of the current source and R. 10

(b) Draw neatly the waveforms on simultaneous time scale : 10

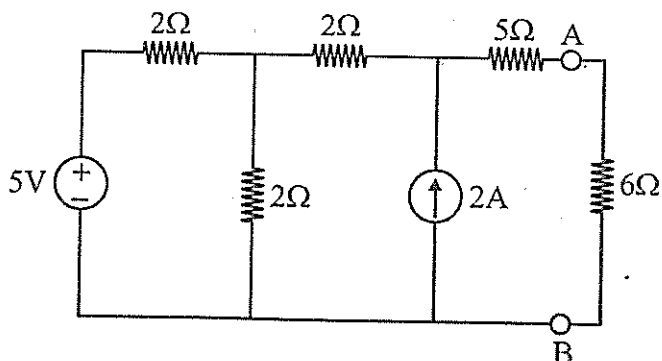
$V_1 = V_m \sin \omega t$ ,  $V_2 = V_m (\sin \omega t - 120^\circ)$ ,  $V_3 = V_m (\sin \omega t - 240^\circ)$  in volts.

2. (a) The voltage phasor for circuit is  $50\angle -75^\circ \text{ V}$  and the current phasor is  $5\angle -30^\circ \text{ A}$ . The magnitudes of voltage and currents are shown in rms. Find the active power of the circuit with units. **5**
- (b) The voltage applied to an ac circuit is  $100\sqrt{2}\sin(100\pi t)$  volts and the circuit draw a current of  $10\sqrt{2}\cos(100\pi t + 3\pi/2)$  ampere. Taking voltage as the reference phasor, find the phasor representation (polar form) of the current in ampere. **5**
- (c) Explain in detail the theory of sinusoidal frequency response of series RLC circuit including resonance, with neat diagrams. **10**

### Section B

3. (a) Explain verification of superposition theorem by writing all procedural steps taking a linear resistive DC circuit having one voltage and one current source. **15**
- (b) Convert star connected set of three equal resistance R into delta. **5**

4. Find Thevenin's equivalent of the given circuit w.r.t. resistor of  $6\Omega$ . 20



### Section C

5. Explain in detail the two wattmeter method of power measurement for delta connected purely resistive load with suitable steps containing equations, circuit and phasor diagram. 20
6. (a) Explain open and short circuit tests in a single phase transformer with the help of neat sketches and their uses. 15
- (b) Explain an ideal transformer's phasor diagram. 5

### Section D

7. Explain, how is a 3-phase pulsating magnetic flux equivalent to single bipolar revolving flux with the help of neat sketches. 20
8. Explain principle, general construction and working of DC generator with suitable sketches. 20

Roll No. ....

Total Pages : 03

BT-2/M-18

32013

FUNDAMENTAL OF COMPUTER AND  
PROGRAMMING IN C  
CSE101E

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) Discuss the classifications of the computer systems. 10
- (b) Explain the secondary memory in details. 10
  
2. (a) Differentiate between Unix and Windows Operating System. Why operating system is important for computer system ? 10
- (b) Solve the following : 10
  - (i)  $(AC2F)_{16} - (5BD)_{16}$  using (r-1) complement
  - (ii)  $(7653)_8 = (?)_{16}$

## Unit II

3. (a) What is Algorithm ? Write an algorithm to search an element from an array. **10**
- (b) Write notes on the following :
- (i) Debugger                      (ii) Interpreter
- (iii) Linker                        (iv) Assembler. **10**
4. (a) Differentiate between : **10**
- (i) Internet and Intranet
- (ii) http and ftp
- (iii) Star and tree topology.
- (b) What do you understand by flowchart ? Draw flowchart for sorting of array. **10**

## Unit III

5. (a) Define the storage classes in C with example. **10**
- (b) What is recursion ? Write a program to find the Fibonacci series using recursion. **10**
6. (a) How array can be passed to a function ? Explain with suitable example. **10**
- (b) Explain the use of break, continue and goto statement in C with suitable examples. **10**



## Unit IV

7. (a) Explain the use of structure within structure with suitable example. **10**
- (b) Write a program to handle a file in C language. **10**
8. (a) Explain the following with syntax : **10**
- (i) fread
  - (ii) fwrite
  - (iii) fgetc
  - (iv) fopen
  - (v) fputs.
- (b) Write a program to concatenate two strings without using string functions. **10**