This question paper contains 4 printed pages.]

Your Roll No. .....

8473 **A**

B.Tech. (EE)/I

Paper III–EEE/EEC–103 : ELECTRICAL ENGINEERING MATERIALS

(Parts A & B)

Time : 3 *Hours* *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer Parts A and B on separate answer sheets.

Assume missing data suitably, if any.

PART–A

Question No. 1 *is compulsory. Attempt any* ***two*** *questions from the remaining questions.*

Assume missing data suitably, if any.

1. Attempt any ***three*** questions. $5 \times 3 = 15$

   (a) What are Miller indices ? Explain. A plane makes an intercepts of $1, \frac{1}{2}, \infty$ on x, y and z axes respectively. Find the Miller indices of this plane and represent this plane clearly by drawing a neat diagram.

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(b) Define : (i) drift velocity, (ii) mobility, and (iii) current density. The acceptor level in a p- type semiconductor lies 57 meV above the valence band. Calculate the maximum wavelength of light which can create a hole.

(c) Why Fermi-Dirac distribution is applicable to metals? Draw Fermi-Dirac distribution. Versus energy curves at different temperatures and mention its important features and hence define Fermi energy.

(d) Why the metals are good conductors? Discuss in the context of free electron theory? What is the effect of (i) impurities and (ii) temperature increase on the metallic conduction.

2. (a) Discuss how X-ray diffraction can be used for the study of crystal structure obtaining Bragg's law. 6

(b) A beam of X-rays of wavelength 1.54Å is incident at certain planes of a silicon crystal. As the angle of incidence is increased from zero, a strong interference maximum is seen at 34.5°. Calculate the interplanar separation. Will you observe other interference maxima at higher incidence angles? 4

3. (a) Differentiate between different types of magnetic materials. 5

(b) What are ferrites ? Why ferromagnetic materials are not good choice for high frequency applications. Why ferrites are preferred for high frequency applications. 5

4. (a) Define polarization and polarizability. Name and briefly discuss various types of polarizations. 6

(b) What are piezoelectric and ferroelectric materials? Explain and mention few applications of both materials. 4

PART–B

Question No. **1** *is compulsory.*

Attempt any ***two*** *Questions from the remaining .*

1. Attempt any ***five*** Questions from the following : $3 \times 5 = 15$

(a) What do you understand by the term Co-polymer? Define Block and Graft Co-polymers.

(b) Write the names and structures of the monomers used for the preparation of Bakelite.

(c) State Faraday's Laws.

(d) What is electroplating ? Why it is done?

(e) Draw a well labelled diagram of Dry Cell. Write its electrode reactions.

(f) What are Fuel Cells? Discuss its applications.

2. (a) Explain cationic mechanism of chain polymerization. 5

(b) Mention the preparation, properties and uses of PVC. 5

3. (a) Explain the methods employed to clean the surface of metal to be electroplated. 6

(b) Explain the process of either gold or Nickel Plating. 4

4. (a) What are components of a battery? What are their functions ? 6

(b) Discuss the principles of fuel cell. In what way fuel cell is different from galvanic cell. 4

5. (a) Explain the construction of lead storage battery. Write the discharging and charging reactions. 6

(b) Define the Throwing Power of electroplating bath solution. 2

(c) Differentiate between addition and condensation polymerization. 2