Your Roll No.

B.Tech. (EE) / I

J

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.

1. Attempt any five questions:

 $3 \times 5 = 15$

- (a) What are ferrites? Discuss their uses.
- (b) Name the seven crystal systems. Mention the nature of the unit cell for each of them.
- (c) What are Miller indices? Find the Miller indices of a plane making intercepts of 2, 3 and 1 units along x, y and z axes respectively.

- (d) Differentiate between dielectrics and insulators.

 Name two sub-class of dielectric materials.
- (e) Define:
 - (i) Drift velocity,
 - (ii) Mobility
 - (iii) Current density.

Obtain their SI units.

- (f) What are piezoelectric and ferroelectric materials? Briefly explain their applications.
- 2. (a) Name different types of bondings in solids and briefly discuss the characteristics of each. 5
 - (b) Explain how X-ray diffraction is useful for crystal analysis. Hence obtain Bragg's law.
- 3. (a) Derive the expression for the electrical conductivity of a metal. How is it affected by temperature and alloying?
 - (b) Differentiate between intrinsic and extrinsic semiconductors. Why are semiconductors made extrinsic?
- 4. (a) Differentiate between paramagnetic, ferromagnetic, antiferromagnetic and ferrimagnetic

- materials. Mention the differences between hard and soft magnetic materials.
- (b) What do you mean by polarization of materials?
 Name different types of polarization and briefly discuss them.

PART B

Question No. 5 is compulsory. Attempt any two questions from the remaining questions.

- 5. Answer any five questions from the following: $3 \times 5 = 15$
 - (i) Explain the term tacticity in polymers.
 - (ii) Discuss vulcanisation of rubber.
 - (iii) Comment on good and poor throwing power. State the factors affecting throwing power.
 - (iv) Explain the ways by which metal ion concentration is maintained in electrolyte.
 - (v) Draw a well labelled diagram of dry cell. Write the electrode reactions taking place in it.
 - (vi) What is fuel cell? How is electrical energy is produced from it?
- 6. (i) Write preparation, properties and uses of any two of the following:
 - (a) Polystyrene

		(b) Nylon 6,6					
		(c) Styrene-Butadiene rubber.				3×2	=6
	(ii)		lain hanis	free-radical m.	addition	polymerizati	ion 4
7.	7. (i) Write brief notes on any two of the following						
		(a)	(a) Purpose of Electroplating				
		(b)	(b) Current density.				
	(c) Chemical cleanliness.						4
	(ii)) Describe the electroplating of:					
		(a)	Zinc				
		(b)	Copp	рег.	•		6
8.	(i)	What are batteries? Give their classification wit suitable examples.					ith 4
	(ii)	Write the advantages and uses of alkaline batte					у.
							3
(iii) Discuss the electrode reactions in mercury						nercury cell.	3