53 (IE 303) EEMD

2021

ELECTRICAL ENGINEERING MATERIALS AND DEVICES

Paper : IE 303

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What is a unit cell? What are the different types of lattice structures? 7

(b) Draw the planes represented by—

(i) ⟨ 010 ⟩

(ii) ⟨ 111 ⟩

(iii) ⟨ 101 ⟩ 2×3=6

Contd.

(c) What are crystal imperfections? Explains various types of crystal imperfections. 7

2. (a) What are dielectric constant and dielectric strength? 4

(b) Derive the expression for dielectric constant of a monoatomic gas. 6

(c) What is polarization? Explain different types of polarization. 10

3. (a) What is dipolar relaxation? 4

(b) Explain the frequency dependence of ionic polarization. 6

(c) Explain the internal fields in solids and liquids. 10

4. (a) What are the different types of magnetic materials? Define each. 10

(b) What are hard and soft ferromagnets? 5

(c) Explain the concept of magnetostriction. 5

5. *(a)* Explain the electron gas model of a metal. 5

(b) Define mean free path and mean free time. 5

(c) State and explain Hall effect in semiconductor. 10

6. *(a)* What are drift and diffusion current? 4

(b) Derive the Einstein relation for diffusion. 6

(c) Explain the Czochralski method of wafer preparation. 10

7. Write short notes on : 10×2=20

(i) Piezoelectricity

(ii) Superconductivity.