

**B.TECH.**  
**THEORY EXAMINATION (SEM-IV) 2016-17**  
**ELECTRICAL AND ELECTRONICS ENGINEERING MATERIAL**

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

**SECTION – A**

1. **Explain the following:** **10 x 2 = 20**
- (a) What do you mean by co-ordination number ?
  - (b) Find the miller indices for a plane when the intercepts along the axes are 2a, 3b and 2c.
  - (c) What is the difference between crystalline and non-crystalline material?
  - (d) Explain seebeck effect.
  - (e) What is superconductivity? Name some super-conducting material.
  - (f) Differentiate between drift and diffusion current.
  - (g) What happen when a p-n junction is biased in forward direction?
  - (h) Why does a pure semiconductor behave like an insulator at absolute zero?
  - (i) Give relationship between relative permeability and magnetic susceptibility.
  - (j) Draw hysteresis curve for a ferromagnetic material.

**SECTION – B**

2. **Attempt any five of the following questions:** **5 x 10 = 50**
- (a) Define the following: (i) Unit cell (ii) Space lattice (iii) Atomic packing factor
  - (b) Explain Bragg's law. How Bragg's equation can be used to determine the lattice parameters. Determine the interplanar distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube ( $\lambda = 1.539\text{\AA}$ ) at an angle of  $22.5^\circ$ .
  - (c) Explain the "Meissner Effect". Also explain Type-I and II superconductors with examples.
  - (d) Derive an expression for heat developed in a current carrying conductor. Also explain the factors responsible for it.
  - (e) Explain in detail p-n junction diode and its VI characteristics.
  - (f) Distinguish between insulator, conductors and semiconductor on the basis of band theory. Give the electrical characteristics of n-type and p-type semiconductors.
  - (g) How do you classify the material as dia, para or ferromagnetic? Explain ferromagnetism in detail.
  - (h) What is magnetostriction? How many types are possible?

**SECTION – C**

**Attempt any two of the following questions:** **2 x 15 = 30**

- 3 Determine the atomic packing factor of the following:
- (i) Simple cubic crystal
  - (ii) Body centered cubic crystal
  - (iii) Face centered cubic crystal.
- 4 What is Hall Effect in semiconductor? The resistivity of doped silicon crystal is  $9.23 \times 10^{-3} \Omega\text{-m}$  and hall coefficient is  $3.84 \times 10^{-4} \text{m}^3\text{C}^{-1}$ . Assuming that the conduction is by a single type of a charge carrier calculate the density and mobility of carrier.
- 5
- (i) Distinguish between soft and hard magnetic materials. Discuss and explain typical B-H curve for soft magnetic material.
  - (ii) Determine the temperature coefficient of resistance of material used in a resistor if the resistance at  $25^\circ\text{C}$  is  $50 \Omega$  and at  $70^\circ\text{C}$  is  $57.2 \Omega$ .