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B.TECH.

THEORY EXAMINATION (SEM–IV) 2016-17 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIAL

Time : 3 Hours

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

1. Explain the following:

- (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:

- (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 ($\lambda = 1.539$ Å) at an angle of 22.5°.
- (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:

- **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 $9.23 \times 10^{-3} \Omega$ -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°C is 50 Ω and at 70°C is 57.2 Ω .

 $10 \ge 2 = 20$

Max. Marks : 100

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 $2 \ge 15 = 30$



 $5 \ge 10 = 50$