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B TECH
(SEM–VIII) EVEN SEM.THEORY EXAMINATION, 2017-18
ELECTRICAL AND ELECTRONICS ENGINEERING MATERIAL

Time: 3 Hours   *Max. Marks: 100*

Note: Attempt all sections. Assume missing data suitably, if any.

SECTION – A

1. **Attempt all parts of the following:**   (10*2=20)

   (a) Distinguish between primitive cell and unit cell.

   (b) Define Miller indices of a plane.

   (c) Explain the terms space lattice and coordination number.

   (d) Show that for simple cubic system is $d_{100}:d_{110}:d_{111}::\sqrt{6}:\sqrt{3}:\sqrt{2}$

   (e) Define the terms energy band and forbidden bands.

   (f) Explain the Seebeck effect.

   (g) The lead material works as superconductor at a temperature of T_c=7.26K. If the constant characteristics of the lead material at 0K is H_0=8x10^{5}A/m. calculate the magnetic field in the lead at 5K.

   (h) Explain the Peltier effect.

   (i) What is Magneto-striction?

   (j) Explain the term Drift and continuity equation.

SECTION – B

2. **Attempt any three parts of the following:**   (3*10=30)

   (a) State and explain "Bragg's Law". X-rays with wavelength of 0.58Å are used for calculating d_{200} in nickel. The reflection angle is 9.5^0. What is the size of unit cell?

   (b) Explain the Langevin's theory of Diamagnetism **or** Para-magnetism.

   (c) Explain the working principle of a MOSFET. Discuss also the types of MOSFET and their working.

   (d) Show that the conductivity of intrinsic semiconductors are given as :

   $\sigma_i = n_i e (\mu_e + \mu_h)$, The symbols having their usual meanings.

   (e) Explain in brief the zone theory of solids.

SECTION – C

Answer all questions in this section.

3. **Attempt any one parts of the following:**   (1*10=10)

   (a) Show that the Hall coefficient is given as for semiconductor materials:

   $$R_H = -\frac{1}{ne} \quad \text{and} \quad \theta_H = \tan^{-1}(\mu_e \cdot B_z) \text{ respectively.}$$

   the symbols having their usual meanings.

   (b) What is Hall Effect? The resistivity of a doped silicon crystal is 9.23×10^{-3} Ω-m and the Hall coefficient is 3.84×10^{-4} m^{3}c^{-1}. Assuming that the conduction is by a single type of a charge carrier calculate the density and mobility of the carrier.

4. **Attempt any one parts of the following:**   (1*10=10)

   (a) Show that the resistivity of the metal is given by :

   $$\rho = \frac{m}{ne^2\tau}$$

   the symbols having their usual meanings.

   (b) Sketch the B-H loop of a ferromagnetic material.

5. **Attempt any one parts of the following:**   (1*10=10)

   (a) Explain relative permeability. Show that the relative permeability as $\mu_r = 1 + x$ Where x is the magnetic susceptibility.

   (b) A diffraction pattern of a cubic crystal of lattice parameter a=3.16Å is obtained with monochromatic X-ray beam of wavelength 1.54 Å. The first line on this pattern was observed to have θ =20.3˚.

6. **Attempt any one parts of the following:**   (1*10=10)

   (a) What are ferrites? Give some applications where ferromagnetic materials are used. Explain ferrimagnetisms.

   (b) Explain the concept of Hysteresis loss and eddy current loss in ferromagnetic material.

7. **Attempt any one parts of the following:**   (1*10=10)

   (a) Explain the superconductivity with Meissner Effect. Determine the temperature co-efficient of resistance of material used in a resistor if the resistance at 25˚C is 50Ω and at 70˚C is 57.2 Ω.

   (b) Explain thermal conductivity and obtain an expression for coefficient of thermal conductivity.