Code No: 09A1BS02 **R09** **Set No. 3**

I B.Tech Regular Examinations,June 2010
ENGINEERING PHYSICS
Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, BT, AME, ICE, E.COMP.E, MMT, ETM, EIE, CSE, ECE, EEE

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain Fermi-Dirac distribution function. Illustrate the effect of temperature on the distribution.
   (b) Derive an expression for density of states of an atom. [8+7]

2. (a) Derive the expressions for:
      i. Acceptance angle and
      ii. Numerical aperture of an optical fiber.
   (b) Describe the different types of fibers by giving the refractive index profiles and propagation details. [8+7]

3. (a) What are Brillouin zones? Explain using E-K diagram.
   (b) Define effective mass of an electron. Explain its physical significance.
   (c) What is a hole? List out the properties of a hole. [5+5+5]

4. (a) Write notes on 'point defects' in crystals..
   (b) Derive the expression for the density of Frenkel defects in a metallic crystal.
   (c) What is Burgers vector? Explain. [5+5+5]

5. (a) Describe the different methods of acoustic quieting.
   (b) Describe various method to achieve soundproofing. [7+8]

6. (a) Explain the terms:
      i. Magnetic induction,
      ii. Magnetic susceptibility,
      iii. Permeability of a medium and
      iv. Intensity of magnetization.
   (b) What are hard and soft magnetic materials? Give their characteristic properties and applications.
   (c) A paramagnetic material has a magnetic field intensity of 10^4 amp/m. If the susceptibility of the material at room temperature is 3.7×10^{-3}. Calculate the magnetization and flux density of the material. [6+5+4]

7. (a) What do you understand by Miller indices of a crystal plane?

(b) Show that in a cubic crystal the spacing (d) between consecutive parallel planes of Miller indices (h k l) is given by $d = a\ (h^2 + k^2 + l^2)^{-1/2}$.

(c) NaCl crystals have FCC structure. The density of NaCl is 2.18 gm/cm^2. Calculate the distance between two adjacent atoms. (Molecular weight of NaCl = 58.5). [4+7+4]

8. (a) Derive an expression for density of electrons in intrinsic semiconductors.

(b) Explain the variation of Fermi level with temperature in the case of p-type semiconductors.

(c) If the effective mass of holes in a semiconductor is 5 times that of electrons, at what temperature would the Fermi level be shifted by 15% from the middle of the forbidden energy gap? [Given that the energy gap for the semiconductor is 1.20 eV]. [7+4+4]

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