

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  $3.7 \times 10^{-3}$ . 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?

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- (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  $2.18 \text{ gm/cm}^3$ . 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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