Code No: 09A1BS02 **R09** **Set No. 2**

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) What is statistical mechanics? Write notes on Bose-Einstein statistics.
   (b) Write notes on black body radiation.
   (c) Calculate the energies that can be possessed by a particle of mass 8.50×10^{-31}kg which is placed in an infinite potential box of width 10^{-9}cm. [6+5+4]

2. (a) What is the meaning of nanotechnology? Explain.
   (b) Describe the processes of "sol-gel" and "precipitation" in the fabrication of nano- structures.
   (c) Write the applications of nanotechnology in Electronic Industry. [4+7+4]

3. (a) Write notes on volume defects in crystals.
   (b) What is Burger's vector? What is Burger's circuit? Explain.
   (c) If the average energy required to create a Frenkel defect in an ionic crystal is 1.35 eV, calculate the ratio of Frenkel defects at 25^0C and 350^0C. [5+6+4]

4. (a) Discuss the band theory of solids and explain the formation of bands and concept of holes.
   (b) What is effective mass of an electron? Derive an expression for the effective mass of an electron. [9+6]

5. (a) Explain the formation and properties of an ionic crystal, with a suitable example.
   (b) Derive an expression for the cohesive energy of an ionic crystal. [7+8]

6. (a) What is Meissner effect? Explain, in detail.
   (b) Distinguish a super-conductor and a normal metal, both maintained at same temperature.
   (c) Write notes on magnetic levitation. [5+5+5]

7. (a) Explain the characteristics of a laser beam.
   (b) Describe the construction of He-Ne laser and discuss with relevant ELD, the working of He-Ne laser.
   (c) What are the differences between a laser diode and an LED? [4+7+4]

8. (a) Derive an expression for carrier concentration of p-type semiconductors.
   (b) Explain Hall effect and its importance.
   (c) For a semiconductor, the Hall coefficient is -6.85 $\times$ 10^{-5} m^3/coulomb, and electrical conductivity is 250 $m^{-1}\Omega^{-1}$. Calculate the density and mobility of the charge carriers. [7+4+4]

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