FE - SEM I - CBSGS - AP-I

24.12.14

(REVISED COURSE) **QP Code : 11958**

(2 Hours) **[Total Marks : 60**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attmept any **three** questions from Question No. **2** to **6**.
(3) Use **suitable data** wherever **required**.
(4) **Figures** to the **right** indicate the **full** marks.

1. Attempt any **five** of the following :— 15
   (a) Identify the type of lattice and number of atoms per unit cell for CsCl and $BaTiO_3$ (above 120°C) crystal structure.
   (b) Fermi Energy for Silver is 5·5 eV. Find out the energy for which the probability of occupancy at 300 K is 0·9.
   (c) Explain the formation of depletion region in an unbiased p-n junction.
   (d) Write three distinct differences between ionic and orientational polarization.
   (e) Draw the variation of permeability against external magnetic field for a paramagnetic and ferromagnetic material (below Curie temperature).
   (f) Mention only one solution for each of the following acoustical problems in a hall (i) echo (ii) dead spot and (iii) inadequate loudness.
   (g) What is piezoelectric effect ? Why ferro-electrics are preferred than quartz for the production of ultrasonic waves ? 2+

2. (a) What is effective mass ? Why the effective mass of holes is more than the effective mass of electrons ? 2+
   Draw the diagrams only (fully labelled and self explanatory) to show the variation of Fermi energy with (i) temperature and (ii) impurity concentration at high level, for an n-type semiconductor. 2+
   (b) Define space lattice and basis. A metal crystallizes with a density of 2·7 gm/cc and has a packing fraction of 0·74. Determine the mass of one atom if the nearest neighbour distance is 2·86Å. 1+1+

3. (a) Explain the variation in magnetic induction with magnetic field for a ferromagnetic material, using the domain theory and with the help of a graph. A magnetic field of 1800 Amp/m produces a magentic flux of 3×10^{-4} Wb in an iron bar of cross-sectional area 0·2 cm^2. Calculate the susceptibility and the permeability. 3+
   (b) How the variation in glancing angle is achieved while determining the crystal structure using (i) rotating crystal method and (ii) powder method ? 3+
   Calculate Bragg angle if (200) planes of a BCC crystal with lattice parameter 2·814Å give second order reflection with X-rays of wavelength 0·71Å.

[TURN OVER