1992

PHYSICS–II

Paper–PHY-102-E

Time allowed : 3 hours]   *[Maximum marks : 100*

Note : *Students have to attempt **five** questions in total selecting at least **two** questions from each part.*

Part–A

1. (a) Derive an expression for concentration of Schottky defects.   10

   (b) The mean energy required to create a Schottky defect in a crystal is 1.4 eV. Calculate the ratio of number of Schottky defects at 27°C and 327°C in 1 gram of crystal.   10

2. (a) Distinguish between ionic and covalent crystals; with examples. Obtain an expression for the binding energy in ionic crystals.   15

   (b) An electron is in a box 0.1 nm across, which is the order of magnitude of atomic dimensions. Find its permitted energies.   5

3. Calculate the expectation value of E and E^2 for the normalized wave function

$$\psi(x) = \left(\frac{2}{L}\right)^{1/2} \sin\left(\frac{\pi x}{L}\right)$$

in region $0 < x < L$ and $\psi(x) = 0$ for $x > L$ and $x < 0$. Where, E is the energy of the particle.   20

4. Derive an expression for Fermi-Dirac distribution function and Fermi energy at absolute zero.   20

Part–B

5. Define Hall-Effect and derive expressions for Hall coefficient, Hall mobility and Hall angle. Discuss the main applications of Hall-Effect using experimental determination of Hall coefficient.   20

6. What are extrinsic semiconductors ? Derive an expression for the carrier concentration in N-type and P-type semiconductors.   20

7. (a) What are traps ? Derive an expression for the effect of traps on photo conductivity of insulators.   10

1992

(b) What are photo conductive cells ? Describe in detail the construction working, characteristics and uses of photo conductive cells. 10

8. What do you mean by ferromagnetic domains ? Give an account of Weiss theory of ferromagnetism and show from the plot of Langevin's function, spontaneous magnetization exists below the Curie temperature and vanishes above the Curie temperature. 20