Roll No. .....

Total Pages : 2

BT–1/D-24

41045

SEMICONDUCTOR PHYSICS

Paper–BS–115A

Time allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Describe the seven systems of crystals with suitable diagrams. 7

   (b) Describe the Hexagonal Closed Packed (HCP) structure. Calculate c/a ratio for an ideal HCP structure. 8

2. (a) Discuss the various types of bonding in solids. 7

   (b) What is meant by point defects in crystal lattice? Derive an expression for the concentration of Schottky defects. 8

UNIT–II

3. (a) What are de–Broglie waves? Show that the de–Broglie wavelength of a particle of momentum p is h/p. 7

   (b) Prove that group velocity is less that the phase velocity in a dispersive medium. 8

4. (a) Using uncertainty principle, prove that electrons cannot exist inside the nucleus. 7

(b) Develop the time–independent Schrödinger wave equation and discuss its physical significance. 8

UNIT–III

5. (a) Explain the Fermi-Dirac distribution function. Plot this function for various temperatures including 0K. 7

(b) What is meant by Fermi energy? Calculate its value for free electron gas at 0K. 8

6. (a) Distinguish between metals, semiconductors and insulators on the basis of band theory of solids. 7

(b) What is Hall effect? Give the elementary theory of Hall effect. Mention the applications of Hall effect. 8

UNIT–IV

7. (a) Distinguish between intrinsic and extrinsic semiconductor. Discuss the theory of intrinsic conductivity of a semiconductor. 7

(b) Derive an expression for carrier concentration of an intrinsic semiconductor. 8

8. (a) Explain with diagrams the forward and reverse biasing of a p-n junction. What is meant by avalanche breakdown? 7

(b) Explain the construction and working of a Bipolar Junction Transistor (BJT). Discuss the role of the base, collector and emitter regions. 8