

BT-2/J-25

42033

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) What do you mean by Bravais lattices? Describe briefly the Seven Systems of Crystals. Mention and explain with examples the types of Lattices in Cubic systems. 7
- (b) Draw the neat diagrams of NaCl, CsCl, Diamond and Zinc Blend. 8
2. (a) Write a short note on Bonding in Solids. 7
- (b) Name the various kinds of defects in Crystals and find out the concentration of Schottky defects in a crystal. 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 the group velocity is less than the phase velocity in a dispersive medium. 8

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4. (a) Using Uncertainty principle, find the radius of Bohr's orbit. 7
- (b) Derive the time independent Schrodinger wave equation and discuss its Physical significance. 8

UNIT-III

5. (a) Discuss the classical theory of free electrons. 7
- (b) Obtain an expression for Fermi energy at $T=0$ K in a good conductor and hence find the average energy of an electron. 8
6. (a) Discuss the effective mass of an electron and explain its Physical significance. 7
- (b) Distinguish between Metals, Semiconductors and Insulators on the basis of Band theory. 8

UNIT-IV

7. (a) Discuss the Conduction Mechanism and Band model for Intrinsic Semiconductors. 7
- (b) Derive an expression for charge carrier concentration in n-type semiconductors and also discuss the position of Fermi level in the same. 8
8. (a) Describe the I-V characteristics of a p-n junction diode. 7
- (b) Explain the principle, construction and working of a semiconductor laser. 8