

**SEMICONDUCTOR PHYSICS**

Paper-BS-115-A

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) Explain the lattice translation vector and symmetry operations in a crystal. 7
- (b) What do you mean by point defects in solids? Derive an expression for concentration of Frenkel defects in a crystal. 8
2. (a) Explain hcp structure. Calculate its packing fraction. 7
- (b) Explain two-dimensional and three-dimensional Bravais lattice. 8

**UNIT-II**

3. (a) What are De-Broglie waves? What is the relation between De-Broglie group velocity associated with the wave packet and velocity of the particle. 8
- (b) Derive Schrodinger time independent equation for matter waves. Give physical significance of the wave function. 7

4. (a) Explain the non existence of electron in nucleus using Heisenberg's uncertainty principle. 8

(b) Explain the concept of wave particle duality with examples. 7

### UNIT-III

5. (a) Based on band theory of solids distinguish between metals, insulators and semiconductor. 8

(b) Explain the electrical conductivity in metals using classical free electron theory. 7

6. (a) Write short notes on the following : 8

(i) Fermi Energy.

(ii) Brillion zone.

(b) Explain Hall effect and its applications. 7

### UNIT-IV

7. (a) Explain the working and characteristics of Bipolar Junction Transistor. 8

(b) What do you mean by extrinsic semiconductor? Derive an expression for carrier concentration in extrinsic semiconductor. 7

(a) Describe the formation of p-n junction. Discuss its current voltage characteristics. 8

(b) Explain the construction and working of semiconductor laser. 7



#### UNIT-IV

7. Explain the process of glycolysis.

15

8. Write notes on the following :

(a) BIOMEMS

(B) Biosensors.

15