## BT-I/D-21     **41045**

# SEMICONDUCTOR PHYSICS
## BS-115A

Time : Three Hours]     [Maximum Marks : 75

**Note** : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

### Unit I

1. (a) Explain various types of crystal system with example.     **7**

 (b) What is Frenkel Defect ? Derive the expression to show that Frenkel defect in ionic cyrstal depends on temperature.     **8**

2. (a) Discuss the nature of bonds in Na and water.     **7**

 (b) Explain two-dimensional and three-dimensional Bravais lattice.     **8**

### Unit II

3. (a) Why there is need and origin of quantum mechanics and also explain its basic postulates.     **7**

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(b) Derive the expression for Schrödinger time independent wave equation for a free particle. **8**

4. (a) Explain group velocity and phase velocity. Derive the expression for group velocity with which a wave packet travel. **8**

(b) Explain the non-existence of electron in nucleus using Heisenberg's Uncertainty Principle. **7**

## Unit III

5. (a) Explain Kronig-Penney model for the motion of an electron in a periodic potential. **7**

(b) Discuss briefly the following :
   (i) E-K diagram
   (ii) Density of states. **4×2=8**

6. (a) Obtain the expression for thermal conductivity in metals and hence prove Wiedmann-Franz law. **8**

(b) Based on band theory of solids distinguish between metals, insulators and semiconductor. **7**

## Unit IV

7. (a) What do you mean by extrinsic semiconductor ? Derive an expression for carrier concentration in extrinsic semiconductor. **8**

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(b) Describe the formation of p-n junction. Discuss its current voltage characteristic. **7**

**8.** (a) Discuss in detail metal semiconductor junction. **7**

(b) Explain the working and characteristics of Field Effect Transistor (FET). **8**

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