

Roll No. ....

Total Pages : 03

**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 crystal 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**

- (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