

Roll No.

1992

**B. E. 2nd Semester
Examination – December, 2009**

PHYSICS – II

Paper : Phy-102-E

Time : Three hours]

[Maximum Marks : 100

Before answering the question, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting at least two questions from each Part.

PART – A

1. (a) Explain clearly the concept of Miller indices. Deduce formula for the distance between two adjacent planes of a simple cubic lattice. 10
- (b) Show that the number of Frenkel defects in equilibrium at a given temperature is proportional to $(NN_i)^{1/2}$, where N and N_i are number of atoms and interstitials respectively. 10

2. (a) What is the difference between phase and group velocities ? Show that the group velocity associated with wave packet is equal to the velocity of relativistic or non relativistic particle. 10
- (b) Derive time independent Schrödinger equation for a non relativistic particle. 10
3. (a) Derive Richardson's thermionic emission equation. 15
- (b) Show that the probability of occupancy of electron at fermi level is 50% at all temperatures. 5
4. (a) Discuss Laue method for crystal structure determination. 10
- (b) Derive the expression for conductivity of metals on the basis of Drude-Lorentz theory. 10

PART - B

5. (a) Discuss band theory of solids and explain the formation of band. 15
- (b) Discuss effective mass of an electron and its physical significance. 5
6. (a) Derive the London equations and discuss how its solution explain Meissner effect. 15
- (b) For a given specimen of a super conductor, the critical field are 1.4×10^5 and 4.2×10^5 amp/m for 14K and 13K respectively. Calculate the transition temperature. 5

7. (a) Derive an expression for Bohr magneton. 5

(b) Show that magnetic susceptibility of diamagnetic substance is independent on temperature, on the basis of Langevin theory. 15

8. Write notes on the following :

(a) Hall effect, 10

(b) Concept of traps and its effect on photo-conductivity. 10