

BT-2/M-15

8202

PHYSICS-II

(2005 Onwards)

Paper-Phy-102 (E)

Time Allowed : 3 Hours] [Maximum Marks : 100

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

UNIT-I

1. (a) Explain Miller indices of a Plane. Draw a simple cube and show (111) and (110) Plane in it. 10
- (b) Calculate the interplaner distance between successive (211) Planes in a cubic lattice in which the cube edge $a = 3$ A.U. Prove the relation used. 10
2. (a) Distinguish between four types of Interatomic bindings. 10
- (b) Describe briefly Lane method for crystal structure determination. 10

UNIT-II

3. Derive both the time independent and time dependent Schrödinger wave equation for matter waves. Give the physical interpretation of Wave function. 20
4. (a) Explain the quantum theory of free electrons in metals. Drive an expression for the Fermi energy at 0°K. 12
- (b) Explain Fermi-Dirak distribution curve. 8

UNIT-III

5. (a) Show that for an electron in a crystal $\hbar \frac{dk}{dt}$ equals to force acting on it. Use this result to derive the expression for the effective mass of the electron. 8
- (b) Discuss Hall effect in Semiconductors assuming only one type of charge carriers. Discuss its applications. 12
6. (a) Show that the effective number of free electrons in a filled band is zero and hence differentiate between Metal, Semiconductors and Insulators. 12
- (b) What are Brillouin zones? Discuss briefly. 8

UNIT-IV

7. Explain the phenomenon of Photoconductivity. Discuss its variation with intensity of Illumination and bring out the effect of traps. 20
8. Write notes on any **two** of the following :
- (i) Langevin's equation for diamagnetic Susceptibility.
 - (ii) London equation.
 - (iii) Photovoltaic cells. 10+10