

PHYSICS-II
(PHY-102, May-06)

Note: Attempt five questions in all selecting at least one question from each unit.

UNIT-I

1. (a) What are Bravais space lattices? Discuss the details of all crystal systems and Bravais lattices.
(b) For a simple cubic lattice calculate
 $d_{100} : d_{110} : d_{111}$
(c) Draw the following planes
 $(110) (\bar{1}\bar{1}\bar{1}) (\bar{1}\bar{1}0)$
2. (a) Discuss in detail experimental X-ray diffraction methods for determining crystal structure.
(b) Discuss briefly various 'point defects' in solids. Why are they called so?

UNIT-II

3. (a) Prove that wave group associated with a moving particle travels with the same velocity as that of the particle.
(b) Differentiate between Ψ and $|\Psi^2|$
4. (a) What is meant by Fermi energy? Calculate its value for free electron gas at OK and mention its significance.
(b) Use the Fermi distribution function to obtain the value of $F(E)$ for $E-E_1 = 0.01$ e V at 200 K.

UNIT-III

5. (a) Discuss the motion of electron in a periodic field of a crystal. Show that effective mass of an electron in a crystal is inversely proportional to the second derivative of the E-K curve. Under what conditions the effective mass of an electron can become +ve, -ve and infinity?
6. (a) Prove that at absolute zero all the states above Fermi level E_F are empty when the temperature is raised above absolute zero.
(b) Distinguish between metals, semiconductors and insulators on the basis of band theory and show that the effective number of free electrons in a completely filled band vanishes.

UNIT-IV

7. (a) Define atomic magnetic moment and discuss orbital diamagnetism.
(b) Derive London's equation with reference to super conductivity.
8. (a) Explain a photovoltaic cell and give its characteristics. What is 'Fill factor'?
(b) What is the effect of traps on photoconductivity? Explain.