

M.Sc. (Physics) First Semester Old
0135 - Solid State Physics-I Paper-III

P. Pages : 2

Time : Three Hours



GUG/W/18/2192

Max. Marks : 80

Notes : 1. All questions are compulsory.

1. Either
- a) Explain the two and three dimensional Bravais Lattices. 8
 - b) What are point groups space groups. Primitive cell & non-primitive cell in details. 8

OR

- e) What is reciprocal lattice? Derive the relationship for the primitive translation vectors of the reciprocal, lattice in terms of those direct lattice. 8
- f) Obtain Bragg's equation from Laue equation and explain principle of powder diffraction. 8

2. Either
- a) Obtain an expression for the fermi energy, total energy and density of states for a free electron gas in one dimension. 8
 - b) Obtain an expression for the thermal conductivity of metal on the basis of free electron theory. 8

OR

- e) What is Hall effect. Mention its application in the field of semiconductor. 8
- f) Derive an expression for the electron concentration in conduction band of an intrinsic semiconductor. 8

3. Either
- a) Using Bloch function in an appropriate wave function. Describe electron motion in periodic crystal potential. 8
 - b) Explain Kronig-Penney model for an electron having energy less than V_0 can tunnel the potential barrier. 8

OR

- e) Explain effect of electric field on fermi surface. 8
- f) Outline experimental methods of study fermi surface. 8

4. Either
- a) What are phonons. Explain Acoustic and optical phonons. 8
 - b) Explain the Einstein's theory of lattice specific heat. 8

OR

- e) Explain Dulong and Petit's law in lattice dynamics. 8
 - f) Obtain dispersion relation of Lattice vibration for Linear diatomic lattice. 8
5. Answer the followings:
- a) Explain symmetry elements of crystal. 4
 - b) Explain effect the temperature on mobility of charge carrier in a semiconductor. 4
 - c) Explain the effective mass of an electron. 4
 - d) What is T^3 law. Explain it. 4
