M.Sc. S.Y. (Physics) (CBCS Pattern) Sem-IV

PSCPHYT14 - Paper-XIV (Core-XII) : Solid State Physics

P. Pages : 1 **GUG/W/22/11413**

Time : Three Hours * 0 5 1 1 * Max. Marks : 80

Either :

1. a) What is the concept of effective mass? What information does one obtain about the effective mass of electrons moving in a periodic potential? What is the significance of negative effective mass? **8**

b) What do you mean by tight binding approximation? **8**

OR

e) Discuss briefly quantum theory of paramagnetic materials. **8**

f) Obtain an expression for paramagnetic susceptibility of free electrons on the basis of classical law. Discuss its inadequacy and show how Pauli modified it. **8**

Either :

2. a) Explain general theory of harmonic approximation. **8**

b) Obtain the vibrational spectrum of a linear diatomic lattice. **8**

OR

e) Explain Dulong and Petit's Law. **8**

f) Describe Debye's T^3 law of specific heat of solids. **8**

Either :

3. a) Explain electrons moving in three dimensional potential well. **8**

b) Obtain an expression for the thermal conductivity of a metal on the basis of free electron theory. **8**

OR

e) Give the theory of Hall effect in semiconductors. **8**

f) Explain electrical conductivity of semiconductors. **8**

Either :

4. a) Explain Meissner effect. **8**

b) Discuss Ginzberg – Landau theory of microscopic quantum interference. **8**

OR

e) Derive the London equation. **8**

f) Discuss d.c. and a.c. Josephson's effect. **8**

5. Answer all the followings

a) Discuss the construction of Brillouin zones. **4**

b) Discuss Born procedure. **4**

c) Discuss Seebeck effect. **4**

d) Explain coherence length and isotope effect. **4**

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