M.Sc.(Physics) CBCS Pattern Semester-IV

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

P. Pages : 1 **GUG/W/23/11413**

Time : Three Hours * 6 4 1 4 * Max. Marks : 80

Either:

1. a) State and prove Bloch theorem. **8**

b) Discuss briefly Kronig – Penney model for energy band structure of solids. **8**

OR

e) Explain the quantum theory of paramagnetic materials. **8**

f) What is effective mass of electron? Explain. **8**

Either:

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

b) Explain Einstein and Debye models. **8**

OR

e) Give the theory of one dimensional monoatomic linear lattice vibrations & obtain expression for angular frequency of vibration. **8**

f) Explain Dulong Petit's law. **8**

Either:

3. a) Obtain an expression for energy of an electron moving in three dimensional potential well. **8**

b) Discuss fermi-level and carrier concentration in semiconductors. **8**

OR

e) Explain the term quantum state and degeneracy in the suitable examples. **8**

f) Explain Hall effect in conductors and semiconductors. **8**

Either:

4. a) Explain tunnelling DC and AC Josephson effect in detail. **8**

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

OR

e) Discuss BCS theory of superconductor. **8**

f) Explain type I & II superconductors. **8**

5. All questions are compulsory.

a) Discuss Pauli Paramagnetic susceptibility. **4**

b) What are acoustic and optical phonons? **4**

c) Explain Seebeck effect. **4**

d) Explain high temperature superconductor. **4**

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