Condensed Matter Physcis - I Semester - VI

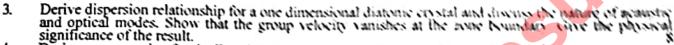
Time Allowed: Three Hours

Note: - The candidates are required to attempt two questions each from Section A and B carrying 8 marks each, and the entire Section C consisting of 8 short answer type questions carrying I marks each.

Section - A

1. What are assumptions made in Debye Theory? Discuss Debye's model of specific heat of solids. What are its success and failure?

What do you mean by lattice vibrations? Discuss inelastic scattering of photon by phonon.



4. Derive an expression for the Fermi energy of a free electron gas in three dimensions

Section-B Discuss Kroneg Penny model for the energy band structure of solids and show it explain the forbidden 5. bands

6. (a) What do you mean by Fermi Level? Discuss the variation of the Fermi level with temperature fly an n-type semiconductor. **(b)** 

For a semiconductor of band gap 1.5 eV, calculate the wavelength of radiation emitted when an electron jumps from conduction band to valence band

Discuss BCS theory of semiconductor and describe on experimental evidence for the existence of band 7.

gap.

Explain the difference between type I and type II superconductors using Measurer effect. Prove that the Meissner effect and disappearance of resistivity in superconductors are mutually consistent.

Section-C 8

9.

What is superconductivity?

(i) (ii) Lead in a superconducting state has critical temperature of 6.0K at zero magnetic field and critical field H<sub>1</sub>(0) = 0.064 mAm<sup>-1</sup> at 0K.

Fermi gas

Effective mass of electron

Block theorem

Give two limitations of free electron gas.

What is Einstein temperature?

Difference between elastic vibrations and e.m. waves.

8-1-8