[Total No. of (i) Printed Pages 4 (ii) Questions 7]

Sub Code : 0544 (1048) **Exam Code :** 0006

Exam : B.A./B.Sc. (General), 6th Semester

Subject : Physics

Paper : Paper-A : Condensed Matter Physics-II

Time : 3 Hours ***Maximum Marks : 44***

Note: (i) Attempt **five** questions in all by selecting **two** questions from **each** of **Unit I, II** and **III** is compulsory.

(ii) Use of non programmeble calculater is allowed.

UNIT-I

1. (a) Obtain an expression for the dispersion relation in case of mono-atomic linear chain of atoms. 2.5

(b) Find the value of the Debye temp. for gold. The density of gold is 19000 Kgm^{-3} and velocity of sound is 2100m/sec. Take atomic mass of gold is 197. 1.5

2. Give an account of the Langevin's theory of paramagnetism. 4

P.T.O.

3. (a) Explain the Curic law for paramagnetism. Derive this law using quantum theory. 2

(b) Debye temp. for Kcl and Nacl have been found to be 23.0 k and 281k. The lattice heat capacity for Nacl is 0.016 J $mole^{-1}$ k^{-1} at 5k temp. Find the heat capacity at 5K. and 2k for Kcl. Assume that Nacl and Kcl have some lattice structure. 2

UNIT-II

4. (a) Discuss Meisner effect. How does it help in classifying different types of Super Conductors ? 2

(b) Super Conductivity is a low temperature phenomenon. Explain. 2

5. (a) Discuss various types of microscopic techniques involved in the fabrication and study of the nanomaterials. 2.5

(b) Give a few applications of nenotechnology. 1.5

6. (a) Give a brief description of piezoelectric materials. What is the cause of piezoelectricity ? List some of their important applications. 2.5

(b) Helium gas consists of non polar atoms having an electric suceptibility, of 6.98×10^{-25}. Find the dipole moment induced in the atom and atomic polarisability, if the gas is subjected to an electric field of 10^4 v/m at N.T.P. 1.5

UNIT - III

7. Attempt any **six.** 6×1=6

(i) When the material is considered as nanomaterial ?

(ii) What is Silsbee effect ?

(iii) Why at ok the alignment of molecules in polar diclectric is perfect.

(iv) What are the soft and hard ferriter

(v) How does the magnetic susceptibility of anti ferromagnetic materials charges with temperature.

(vi) Define a Brillouin zone in case of one dimensional linear lattice.

(vii) What is Dulong and Petit's law.