

(i) Printed Pages : 2

Roll No.

(ii) Questions : 7

Sub. Code :

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Exam. Code :

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B.A./B.Sc. (General) 6th Semester

(2054)

PHYSICS

Paper-A : Condensed Matter Physics—II

Time Allowed : Three Hours]

[Maximum Marks : 44

- Note :— (i) Attempt *five* questions in all by selecting *two* questions from each of Unit-I, II and Unit—III is compulsory.
- (ii) Use of non-programmable calculator is allowed.

UNIT—I

1. (a) What is a phonon ? Derive the vibrational modes of a linear diatomic lattice. Describe the name and difference between the two branches of dispersion relation curve. 7
- (b) Estimate the Debye temperature of gold if its atomic weight is 197, the density is $1.9 \times 10^4 \text{ kg/m}^3$ and the velocity of sound in it is 2100 m/s. 2
2. (a) Explain the origin of diamagnetism in materials. Derive an expression for diamagnetic susceptibility using Langevin's theory. 7
- (b) Explain the hypothesis on which Weiss theory of ferromagnetism is based. 2

3. (a) What do you mean by polarization of a dielectric ? Derive Clausius—Mossotti relation between polarizability and dielectric constant of dielectric. 7
- (b) Distinguish between Ferrimagnetic and Ferromagnetic substances on the basis of hysteresis. 2

UNIT—II

4. (a) What are Liquid Crystals ? Describe different types of liquid crystals based on their mesophases. 7
- (b) Discuss the anisotropy in liquid crystals. 2
5. (a) What is Meissner effect ? Distinguish between Type — I and Type —II Superconductors. Discuss the role of critical magnetic field in superconductors. 7
- (b) The critical temperature, T_c for Hg with Isotopic mass 199.5 is 4.185 K. Calculate its critical temperature for one of its isotopes $_{80}\text{Hg}^{204}$. 2
6. (a) What are nanomaterials ? Describe different types of nanostructures based on their applications. 7
- (b) Discuss the advantages of Nano Technology. 2

UNIT—III

7. Attempt any four questions :—
 - (i) Define Debye T^3 law.
 - (ii) What is Curie's temperature ?
 - (iii) Define dielectric permittivity and dielectric loss.
 - (iv) What is Silsbee effect ?
 - (v) What are Cooper pairs ?
 - (vi) What are Fullerenes ?

4×2=8