

3/5/2025 (morning)

(i) Printed Pages: 3

Roll No.

(ii) Questions : 7 Sub. Code :

1	7	5	4	4
---	---	---	---	---

Exam. Code :

0	0	0	6
---	---	---	---

B.A./B.Sc. (General) 6th Semester
(2055)

PHYSICS

Paper—A : Condensed Matter Physics—II

Time Allowed : Three Hours]

[Maximum Marks : 44

Note :—Attempt FIVE questions in all, by selecting TWO questions each from Unit-I and Unit-II. Unit-III is compulsory.

UNIT—I

1. Explain the vibrational modes of a diatomic linear lattice. Give a brief description of different branches of dispersion relation curve. 9
2. (a) Discuss the Quantum Theory of Paramagnetism and derive an expression for Susceptibility. 7
(b) What are ferrites ? How are they classified based on their magnetic properties ? Give their important applications. 2
3. (a) What presumptions underlie the Debye Model of Lattice Specific Heat ? Talk about its shortcomings and forecasts in comparison to the Einstein Model. 7

- (b) Find the value of the Debye temperature for gold. The density of gold is 19000 kgm^{-3} and velocity of sound is 2100 m/s . Take atomic mass of gold as 197. 2

UNIT—II

4. (a) Discuss the qualitative description of BCS Theory. How does it account for the super conducting state ? 7
- (b) The actual energy-gap at 0 K in Lead (Pb) is $2.37 \times 10^{-3} \text{ eV}$, what is the critical temperature according to BCS Theory ? 2
5. (a) Explain what is Meissner Effect. Discuss how London Equations are important to explain this effect. 7
- (b) Write a short note on Type-I and Type-II superconductors. 2
6. (a) What are Carbon Nano Tubes (CNTs) and how they are synthesized ? Discuss the properties and applications of CNTs. 7
- (b) What is meant by Liquid Crystals ? Give a brief note on the classification of liquid crystals. 2

UNIT—III

7. Attempt any **EIGHT** parts :
- (1) Define Debye T^3 law.
- (2) What is dielectric permittivity and dielectric loss ?
- (3) What is the cause of polarizability in dielectrics ?
- (4) Explain the diamagnetism in solids.

- (5) What is Curie Temperature ?
- (6) Differentiate between photons and phonons.
- (7) What is isotope effect in superconductors ?
- (8) What is hysteresis ?
- (9) What is the difference between Ferrimagnetism and Ferromagnetism ?
- (10) What are advantages of Nano Technology ? $8 \times 1 = 8$