

(i) Printed Pages: 3

Roll No.

(ii) Questions : 9

Sub. Code :

3	7	2	6
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Exam. Code :

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M.Sc. Physics 4th Semester
(2054)

CONDENSED MATTER PHYSICS-II

Paper : PHY-8046

Time Allowed : Three Hours]

[Maximum Marks : 80

Note :—Attempt FIVE questions in all selecting ONE question each from Units I to IV. Unit V is compulsory.

UNIT—I

1. (a) What is photo conductivity ? Show that : The response time is directly proportional to the photo conductivity for a given illumination level. 10
- (b) What are excitons ? How will you differentiate between Frankel excitons and weakly bound excitons ? 6
2. (a) How can piezo electricity and ferroelectricity be explained on the basis of optical absorption ? 8
- (b) Derive an expression for dielectric constant of a free electron Fermi gas. How will you relate the plasma mode to dielectric constant ? 8

UNIT—II

3. (a) Prove that Vanvleck paramagnetic susceptibility is independent of temperature. 8

- (b) Derive an expression for susceptibility of Pauli paramagnetism. Show your predictions graphically. 8
4. (a) On the basis of two sublattice model, deduce the expression for the susceptibility of antiferromagnetic material above and below the neel temperature. 10
- (b) Explain the Heisenberg's exchange interaction in ferromagnetism. Relate the exchange integral to the Weiss constant and Curie temperature. 6

UNIT—III

5. (a) Describe Meissner effect and distinguish between type I and type II superconductors. 8
- (b) What is the superconducting tunneling ? Explain the V-I characteristics of the d.c. Josephson effect. 8
6. (a) Derive London equations on the basis of superconductivity. Find an expression for penetration depth. 8
- (b) Give an elementary treatment of BCS theory of superconductivity. How does it explain the energy gap at 0K and isotope effect ? 8

UNIT—IV

7. (a) Discuss the various types of dislocations and importance of Burgers vector \vec{b} for them. Calculate the energy associated with it. 10
- (b) Explain briefly :
- (i) Extrinsic vacancies
 - (ii) Jump frequency of interstitial atom.
 - (iii) Colour Centre. 6

8. (a) What are surface imperfections ? Discuss stacking faults in :
 (i) FCC crystals
 (ii) LCP crystals. 8
- (b) What are the liquid crystals ? Discuss the structure and properties of Nematic liquid crystals. 8

UNIT—V

9. (a) Is there any difference among the alloying and solid solution ? 2
- (b) Write down the relation between refractive index and polarizability. 2
- (c) Is luminescence the inverse of optical absorption ? 2
- (d) What are spin waves and their quantisation ? 2
- (e) Is anisotropic energy an important tool in deciding the magnetic properties of solids ? 2
- (f) Find the ratio of nuclear and Bohr magneton. 2
- (g) What are the sources of superconductivity ? 2
- (h) What is the neel temperature ? 2