

(i) Printed Pages : 3 Roll No.

(ii) Questions : 9 Sub. Code :

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Exam. Code :

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M.Sc. Physics 4th Semester
(2056)

CONDENSED MATTER PHYSICS-II

Paper : PHY-8043

Time Allowed : Three Hours] [Maximum Marks : 80

Note :— Attempt Five questions in all, selecting one question each from Unit I to Unit IV. Unit V is compulsory.

UNIT-I

1. (a) Describe the propagation of light in an isotropic conducting medium. 10
- (b) Explain the absorption of light in semiconductors and insulators. 6
2. (a) Describe the reflection, refraction, and transmission of light in materials. Compute the reflection, refraction, and transmission coefficients for the normal incidence of light. 10
- (b) Define photo-conductivity. Explain its significance in understanding the properties of semiconductor materials. 6

UNIT-II

3. (a) Describe the Langevin's theory of paramagnetic materials. 10
- (b) Describe Weiss theory of Ferromagnetic materials. 6

4. (a) Derive the dispersion relation for a spin wave in a one-dimensional chain of parallel spins. 10
- (b) Using the dispersion relation of spin waves derive the Bloch's $T^{3/2}$ law. 6

UNIT-III

5. (a) Describe BCS theory of superconductivity in metals. 9
- (b) Describe Meissner effect and the flux quantization in superconducting materials. 7
6. (a) Discuss the AC and DC Josephson effects in a junction of superconducting materials. 10
- (b) Write a note on the high T_c superconductors. Why BCS theory is not able to explain the high T_c superconductors? 6

UNIT-IV

7. (a) Discuss intrinsic and extrinsic point defects in crystalline solids. Derive an expression for the concentration of Schottky defects in ionic crystals. 10
- (b) Describe edge and screw dislocations in detail. Illustrate their Burger circuits and Burger vectors. 6
8. (a) Discuss the different classifications of liquid crystals and their applications. 10
- (b) What are slip-planes and slip-directions? Discuss surface imperfections. 6

UNIT-V

9. Answer any **eight** out of the following questions:

- (i) What is photoluminescence?
- (ii) What is the role of polarization in the propagation of light in an isotropic medium?
- (iii) What is skin depth of a material for electromagnetic waves?
- (iv) Differentiate between interband and intraband transitions.
- (v) Discuss the variation of critical magnetic field of a superconductor with temperature.
- (vi) Draw schematically the magnetic susceptibility as a function of temperature for different types of magnetic materials.
- (vii) What is isotope effect of superconductivity?
- (viii) Describe the variation of specific heat of a superconductor as a function of temperature.
- (ix) How is the density of a crystal affected due to the presence of Schottky defects? 8×2=16