

(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
(2055)

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 Units I-IV. Unit-V is compulsory.

UNIT—I

1. (a) Describe the propagation of light in an isotropic conducting medium. 10
- (b) Explain the physical meaning of real and imaginary parts of a dielectric function. 6
2. (a) Discuss the absorption processes in the materials. Explain the effect of optical absorption on the piezoelectricity in materials. 10
- (b) What is photo-conductivity ? Explain its significance in understanding the properties of semiconductor materials. 6

UNIT—II

3. (a) Derive a relation for the magnetic susceptibility of paramagnetic materials using quantum theory. 10
- (b) What are Ferrites ? Discuss the role of their structure in their magnetic properties. 6

4. (a) Derive the dispersion relation for a spin wave in one dimensional chain of parallel spins. 10
- (b) Using the dispersion relation of spin waves derive the Bloch's law. 6

UNIT—III

5. (a) Describe the main features of BCS theory of superconductivity in metals. 9
- (b) Describe the transition between normal and superconducting states in terms of entropy using the thermodynamics. 7
6. (a) Discuss in detail 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 Frankel 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) How reflectivity is related to the dielectric function ?
- (iii) Distinguish between anti-ferromagnetic and ferrimagnetic materials.
- (iv) What is skin depth of a material for electromagnetic waves ?
- (v) Discuss the variation of critical field of a superconductor varies with temperature.
- (vi) What is Meissner effect of superconductors ?
- (vii) Differentiate between interband and intraband transitions.
- (viii) How density of the crystal is affected due to Schottky defects?
- (ix) Draw schematically the magnetic susceptibility as a function of temperature for different types of magnetic materials.

8×2=16