(i) **Printed Pages : 3**

(ii) **Questions : 7**

Roll No. ....

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Sub. Code : | 0 | 5 | 4 | 4 |

Exam. Code : | 0 | 0 | 0 | 6 |

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

(2053)

PHYSICS

Paper—A : Condensed Matter Physics-II

Time Allowed : Three Hours]   [Maximum Marks : 44

Note :— Attempt **five** questions in all, including Question No. 7
(Unit-III) which is compulsory and selecting **two** questions
each from Unit I-II. Use of non-programmable scientific
calculator is allowed.

UNIT—I

1.   (a)   What is meant by normal modes of vibration ? Find the
density of modes for the monoatomic linear lattice.   7

(b)   What is Debye's T^3 law ? How far is it satisfied by solids ?

2

2.   (a)   Work out an expression for the specific heat of solids following
Einstein's model. How does specific heat depend on
temperature and to what extent does this model agree with
experimental results ?   7

(b) Calculate the Debye specific heat of copper at :

    (i) 10 K and

    (ii) 300 K, given that the Debye characteristic frequency is 6.55×10^{12} Hz.   2

3.   (a) Explain the physical basis of diamagnetism and paramagnetism of materials. Describe the Weiss molecular field theory of ferromagnetism and derive the Curie-Weiss law.   7

    (b) What are ferrites ? How are they superior to magnetic metals ?   2

UNIT—II

4.   (a) Obtain Clausius-Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule from the dielectric constant measurements.   7

    (b) What are anti-ferroelectricity and piezoelectricity ?   2

5.   (a) Explain the two components model of a superconductor. Arrive at London's equations and hence deduce Meissner effect.   7

    (b) What are Liquid crystals ? Explain the terms mesophase, phase transition and birefringence in liquid crystals.   2

6.   (a) What are nanomaterials ? Write a short note on available techniques for the fabrication of the nanomaterials and their applications.   7

    (b) Distinguish between atomic clusters and nanoparticles.   2

UNIT—III

7. Attempt any **eight** of the following :

   (a) What is Curie temperature in magnetism ?

   (b) Write the significance of Bohr magneton.

   (c) Explain flux quantization in superconductors.

   (d) Discuss piezoelectric effect and piezoelectric tube.

   (e) What are Fullerenes ?

   (f) Distinguish between Type-I and Type-II superconductors.

   (g) What are hard and soft ferrites ?

   (h) Explain the term dielectric breakdown.

   (i) Define dielectric permittivity and dielectric loss.

   (j) What is Neel temperature ? $8 \times 1 = 8$