

(i) Printed Pages : 3 Roll No. ....

(ii) Questions : 7 Sub. Code : 

1	7	5	4	4
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Exam. Code : 

0	0	0	6
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B.A./B.Sc. (General) 6<sup>th</sup> Semester

(2056)

## 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 and II. Use of non-programmable calculator or log-table is allowed.

### UNIT—I

1. (a) Derive the dispersion relation of vibrational modes for a monoatomic linear lattice. 6
- (b) Discuss optical and acoustic modes of vibrations in a diatomic linear lattice. 3
2. (a) Describe Dulong-Pettit's law of specific heat and its failure to describe the temperature dependence of specific heat of solids. 4
- (b) Derive the relation of the specific heat of solids in the Einstein model. 5

3. (a) Describe the Langevin's classical theory of diamagnetism. 6  
(b) Describe the Domain and Domain-wall of a ferromagnetic material. 3

### UNIT-II

4. (a) Derive Clausius-Mosotti relation of atomic polarizability. 5  
(b) Describe the different types of liquid crystals. 4
5. (a) Derive the London's equations of a superconducting state of matter. 7  
(b) What is Meissner effect? Distinguish between Type I and Type II superconductors. 2
6. (a) Discuss main features of BCS theory of superconductivity. 6  
(b) Discuss the techniques for the fabrication of nanomaterials. 3

### UNIT-III

7. Attempt any **eight** questions :  $8 \times 1 = 8$
- (i) What is Debye's  $T^3$  law of specific heat of solids?
- (ii) What is Curie-Weiss law of magnetism?
- (iii) Why is the magnetic susceptibility of a diamagnetic material negative?
- (iv) What are soft and hard ferrites?
- (v) Describe the isotope effect of superconductors.

- (vi) Describe Cooper pair.
- (vii) Define piezoelectric effect. Write its uses in daily life.
- (viii) What is anti-ferromagnetism?
- (ix) What do you mean by a nanomaterial?