

Exam. Code : 103205
Subject Code : 1338

B.A./B.Sc. 5th Semester
PHYSICS
Paper—A
(Condensed Matter Physics)

Time Allowed—3 Hours] [Maximum Marks—35

Note :—There are **FOUR** Sections (A to D). Attempt **FIVE** questions, selecting at least **ONE** question from each section. The fifth question may be attempted from any section.

SECTION—A

- (a) Explain the various symmetry elements of a crystal. Prove that five-fold symmetry is not possible in crystals. 5

(b) Draw a cubic unit cell indicating the [110] Miller plane in it. 2
- (a) Explain the structure of diamond in detail and determine its packing fraction. 5

(b) Distinguish between primitive and non-primitive unit cell. 2

SECTION—B

3. (a) Explain the Laue's theory of X-ray diffraction and derive the Bragg's law from it. 5
(b) Explain the terms reciprocal lattice and k-space. 2
4. (a) Derive an expression for geometric structure factor and explain the absence of (100) plane in a bcc lattice. 6
(b) What is a Brillouin zone ? 1

SECTION—C

5. (a) What are phonons ? Explain the inelastic scattering of phonons by photons. 6
(b) State the Dulong and Petit's law. 1
6. Discuss the Debye's theory of specific heat of solids. What are its limitations ? 7

SECTION—D

7. Discuss the free electron theory of metals. How does it explain the lattice heat capacity of metals ? 7
8. (a) Explain in detail the findings and applications of the Kronig-Penny model. 5
(b) Distinguish between intrinsic and extrinsic semiconductors. 2