Exam. Code : 103205
Subject Code : 1361

B.A./B.Sc. 5th Semester

PHYSICS (Condensed Matter Physics)

Paper—A

Time Allowed—Three Hours] [Maximum Marks—35

Note :—There are **FIVE** sections. Section A consists of **SEVEN** short answer type questions and is compulsory. Sections B, C, D and E consist of **TWO** questions each. The candidates are required to attempt **ONE** question from each section.

SECTION—A

1. (a) Why amorphous solids are isotropic but crystals are anisotropic ? 2

   (b) Draw Brillouin zones in one dimension. 3

   (c) Define density of states and write down its expression. 2

   (d) What do you mean by effective mass of electron ? 2

   (e) Why n-type and p-type semiconductors are electrically neutral ? 2

   (f) How does the position of Fermi level vary in extrinsic semiconductors with temperature ? 2

   (g) Discuss momentum of a phonon. 2

SECTION—B

2. What is a Bravais lattice ? What are the different space lattices in the cubic system ? Discuss these space lattices. 5

OR

3. What are symmetry operations ? Prove that five fold axis of rotation is not possible in a lattice. 5

SECTION—C

4. Derive Bragg's law of crystal diffraction and give its significance. Discuss briefly the methods of crystal structure determination. 5

OR

5. What is atomic scattering factor ? Derive an expression for it and discuss its physical significance. 5

SECTION—D

6. Discuss Einstein's theory of lattice heat capacity and explain why it does not explain the correct behaviour at low temperature ? 5

OR

7. Derive dispersion relation for monoatomic linear chain. Discuss the different cases. 5

SECTION—E

8. Discuss Kronig Penney model for the energy band structure in solids. 5

OR

9. What is an intrinsic semiconductor ? Explain why the conductivity of pure semiconductor increases with temperature and why they behave as insulators at 0K ? 5