

## CONDENSED MATTER PHYSICS - I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt two questions each from Section A and B carrying 8 marks each. Section C is compulsory consisting of 8 short answer type questions carrying 1 mark each. Use of non-programmable calculator is allowed.

### Section - A

1. (a) Explain the indexing system for crystal planes. 5  
(b) Draw the [110] and [111] planes of simple cubic crystal. 3
2. Discuss the structure of diamond by drawing its sketch and show that it has a loose packing. 8
3. Define space lattice, unit cell and primitive cell. Discuss Bravais lattice in two dimensions. 8
4. What is meant by the packing of spheres in the crystals ? Explain hexagonal closed packed structure. 8

### Section - B

5. Write the structure factor of bcc crystal and account for missing reflection for sodium crystal. 8
6. What is K-space ? Find Bragg's diffraction condition in terms of reciprocal lattice. 8
7. What do you mean by Brillouin zones ? Explain. Derive expression for bcc lattice. 8
8. Derive Laue's equations. How Bragg's law can be deduced from them ? 8

### Section - C

#### (Compulsory Question)

9. Give answer in brief :
  - (a) Find packing fraction of scc lattice.
  - (b) Can a unit cell be primitive ? Explain.
  - (c) What are point groups ?
  - (d) In diamond crystal, what is the number of nearest neighbours ?
  - (e) How is reciprocal lattice constructed ?
  - (g) Why [100] reflection is absent in bcc lattice ?
  - (h) What is coordination number of hcp structure ?

8×1=8