CONDENSED MATTER PHYSICS-I

Paper-A
Semester-V

Time Allowed : 3 Hours]   [Maximum Marks : 30

Note : The candidates are required to attempt two questions each from Sections A and B carrying 5 marks each and five questions from Section C consisting of 7 short answer type questions carrying 2 marks each.

SECTION-A

1. What are Miller indices? Derive a formula for the distance between two adjacent planes of simple cubic lattice.   5
2. Calculate the density of copper in its fcc structure. Given: radius of a Cu atom-1.278A and atomic weight of Cu=63.54.   5
3. (a) Describe the NaCl structure giving its special features.
    (b) Describe the Diamond structure giving its main features.   5
4. Explain, why is a five-fold symmetry of Crystals are note possible.   5

SECTION-B

5. (a) Derive Bragg's law of crystal diffraction $2d \sin\theta = n\lambda$
    (b) Discuss briefly the methods of Crystal structure determination.   5
6. Find the Brillouin zone in case of
    (a) Simple cubic
    (b) Body centered cubic lattices.   5
7. Name the different experimental methods of X-ray diffraction by Crystals. Discuss a method in detail structure analysis.   5
8. Explain Atomic scattering factor with mathematical expression.   5

SECTION-C

9. Attempt any five :
    (a) Explain Winger Seitz cell?
    (b) What are the considerations in deriving Laue equations?

(c) What is the significance of a Brillouin Zone?
(d) What is a Atomic scattering factor?
(e) What is meant by axis of symmetry?
(f) What is a Crystal?
(g) Why are Crystal used for X-ray diffraction?   5x2=10