

Roll No.

78602

M. Sc. (Physics) 4th Semester

Examination – December, 2014

CONDENSED MATTER PHYSICS

Paper : XVI

Time : Three hours]

[Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *all* questions. All questions carry equal marks.

1. (a) Explain weigner-seitz primitive cell in crystal structure. $4 \times 4 = 16$
(b) What is twin boundary ?
(c) What is meant by a hole in solids ?
(d) Explain energy gap in super conductors.
2. (a) What is the difference between a unit cell and a primitive cell ? Draw the primitive cell of fcc and bcc lattices. 10

- (b) Explain diamond structure and show that it has loose packing structure. 6

OR

Discuss Ewald construction and derive Bragg's diffraction condition in terms of reciprocal lattice. 16

3. (a) Derive density of modes in three dimensions. 8
(b) Describe optical mode and acoustical mode. 8

OR

What are schottky defects and Frenkel defect? Derive an expression for density of Frenkel defect. 16

4. (a) With the help of diagrams explain the concept of extended zone scheme, reduced zone scheme and periodic zone scheme for representation of energy bands. 8

- (b) Distinguish between the metal, semiconductor and insulator on the basis of their energy band structure. Discuss the concept of negative effective mass. 8

OR

Write notes on the following :

- (a) Cyclotron resonance, 8
(b) Magnetoresistance. 8

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5. Describe Weiss theory for ferromagnetism and derive Curie-Weiss law for susceptibility. 16

OR

- (a) Describe Type-I and Type - II superconductors. 8
(b) Explain persistent currents and isotope effect. 8

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