DS-544

Roll No. .....
500 -/-/15/20

January 2018

M. Sc. IIIrd Semester Examination

PHYSICS

First Paper : Condensed Matter Physics – I

Time 3 Hours] [Max. Marks : Regular 85 / Private 100
[Min. Marks : Regular 28 / Private 33

Note : This question paper is meant for all Regular and Private students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. (a) Explain crystal systems in three dimension.
   (b) Show that five fold rotation axis is not compatible with a lattice.

   OR

   Determine the interplanar spacing between two adjacent planes of Miller indices(h, k, l) in a cubic lattice.

2. (a) Explain reciprocal lattice. Describe its geometrical construction.
   (b) Describe Bragg's law of X-ray diffraction.

   OR

   (a) Discuss Ewaldi construction for X-ray diffraction.
   (b) Describe Brillouin Zone.

3. (a) Explain elastic constants of a cubic crystal.
   (b) Derive an expression for elastic energy density.

   OR

   (a) Obtain an expression for elastic waves in [100] direction of a cubic crystal.
   (b) Write short note on experimental determination of elastic constants.

4. Consider a monoatomic chain of atoms. Obtain the dispersion relation. Sketch and explain the dispersive behaviour.

   OR

   (a) Obtain dispersion relation of a linear diatomic lattice.
   (b) Describe the inelastic scattering of neutrons to probe the phonon structure of solids.

5. Explain thermal expansion and thermal conductivity. Obtain an expression for them.

   OR

   Write short notes on any two of the following :
   (a) de Hass Van Alfen effect
   (b) Cyclotron Resonance
   (c) Magnetoresistance
   (d) Gruneisen Constant.