Exam. Code : 209003
Subject Code : 8116

M.Sc. Physics 3rd Semester (Old Sylb. 2019)

CONDENSED MATTER PHYSICS-I

Paper : PHY-503

Time Allowed—3 Hours] [Maximum Marks—100

Note :—Attempt **FIVE** questions in all, selecting at least **ONE** question from each section. The **fifth** question may be attempted from any section. All questions carry equal marks.

SECTION–A

1. (a) Derive an expression for specific heat of a linear continuous chain of atoms according to Debye's theory. Also discuss high and low temperature limits. 15

   (b) Define elastic compliance and stiffness constants and write them in tensor notations. 5

2. (a) Explain the characteristics of stress-strain relations in a cubic crystal. Also obtain an expression for elastic energy density in a cubic crystal. 15

   (b) Why Einstein theory of lattice heat capacity is not able to give correct behaviour at low temperature ? 5

SECTION–B

3. (a) Explain the phenomenon of dislocation multiplication and slips. 10

   (b) What is a grain boundary ? Explain the burger model of low angle grain boundary. 10

4. (a) Distinguish between the formation of F-center and V-center. 5

   (b) Calculate the equilibrium concentration of Schottky defect and find the order of its magnitude. 15

SECTION–C

5. (a) State and derive Weidemann-Franz law. 10

   (b) Define hydration energy of ions and formulate an expression for it. 10

6. (a) Describe Sommerfeld theory of electrical conductivity of metals. 10

   (b) Give the physical significance of Boltzmann equation. 10

SECTION–D

7. (a) Discuss dipolar polarisation in atoms and obtain an expression for it. 10

   (b) Explain the dipole theory of ferroelectricity. 10

8. Explain frequency dependence of different types of polarisabilities. 20