Exam. Code : 209002
Subject Code : 4888

M.Sc. Physics 2nd Semester

CONDENSED MATTER PHYSICS-I

Paper: Phy-455

Time Allowed—2 Hours] [Maximum Marks—100

Note :— There are **eight** questions of equal marks. Candidates are required to attempt any **four** questions.

1. Derive an expression for the specific heat of solids on the basis of Debye model. How does the Debye model differ from the Einstein model ? Discuss the variation of Debye specific heat with temperature.
2. (i) Define stress and strain. Express both stress and strain as tensors and explain the physical meaning of each component with suitable diagrams.
   (ii) The Debye temperature for diamond is 2230 K. Calculate its molar heat capacity at 10 K.
3. What are color centers ? How they are produced ? Explain F-center and V-center. What is the opposite of F center?
4. What are the types of dislocations and how the propagation of dislocations set up stress fields in crystals ? Derive expression for dislocation energy.

5. State and derive Boltzmann transport equation. Also, explain its physical significance.
6. What is activation energy ? Derive the expression of activation energy required for formation of defects in ionic crystals.
7. Discuss orientational polarizability and obtain its expression.
8. (i) Explain the Dipole theory of Ferroelectricity in detail.
   (ii) What is ferroelectricity ? Name two ferroelectric materials and their applications.