

FACULTY OF SCIENCE**M.Sc. I – Semester (CBCS) Examination, December 2016****Subject: Physics & Applied Electronics****Paper – IV****General Solid State Physics****Time: 3 Hours****Max.Marks: 80****Note: Answer all questions from Part – A and Part – B.****Each question carries 4 marks in Part-A and 12 marks in Part-B.****PART – A (8x4 = 32 Marks)****[Short Answer Type]**

- 1 What are miller indices? How are they determined?
- 2 What are symmetry operations? Explain the meaning of a “n-fold rotation axis” and “n-fold screw axes”.
- 3 What is lattice thermal conductivity? Explain.
- 4 What is meant by phonon mean free path? Explain.
- 5 Briefly explain failures of free electron theory of metals.
- 6 State and explain Bloch theorem.
- 7 State and explain Fick's laws of diffusion.
- 8 What are colour centers? How are they produced?

PART – B (4x12 = 48 Marks)**[Essay Answer Type]**

- 9 a) Describe Laue method of X-ray diffraction. Discuss how it is useful in evaluating crystal structure.
OR
b) Describe various types of lattices and mention their distinguishing features.
c) Obtain an expression for lattice constant 'a' of a cubic crystal.
- 10 a) On the basis of Einstein's theory obtain an expression for the specific heat capacity of a solid, and discuss the variation of specific heat capacity with temperature.
OR
b) Derive the dispersion relation for one dimensional diatomic lattice vibrations.
- 11 a) How band theory of solid lead to the classification of solids into conductors, semiconductors and insulators.
OR
b) What is Hall effect? Give an elementary theory of Hall effect. Explain how Hall coefficients help one to determine the mobility of electrons in metals.
- 12 a) What are imperfections? Derive an expression for the concentration of Frenkel defects in ionic crystals.
OR
b) With neat diagram discuss in detail the crystal growth experimental techniques from melts.
