A–0432

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MSCPH-506

Master of Science Physics (MSCPH)

Condensed Matter Physics

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Explain the concept of Millar indices. With the help of diagram, find out the Millar indices of a simple cubic crystal.

2. What is reciprocal lattice ? How do we construct a reciprocal lattice ? Give its properties.

3. What are primary bonds and secondary bonds ? Give the difference.

4. What are Dislocations ? Classify different type of dislocations. Explain edge and screw dislocations with the help of diagram.

5. Derive expression for different modes of vibrations of diatomic linear chain of atoms.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Explain amorphous and crystalline solids in detail.

2. Show that reciprocal of *fcc* is *bcc*.

3. What are Scottky and Frenkel diffect ?

4. What are phonons ? Give the properties of phonon.

5. In Debye model of heat capacity, explain the behavior of solids at low temperature and high temperature.

6. What is the value of mean energy in terms of Fermi energy at absolute zero ?

7. The semiconductor has 6×10^{19} electrons and 7×10^{20} holes/m^3. If the mobilities of electrons and holes are 0.10 m^2/ V s and 0.06 m^2/V s respectively. Calculate the conductivity of the semiconductor.

8. Obtain Clausius-Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule from dielectric measurement ?

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