

A-1178

Total Pages : 3

Roll No.

MSCPH-506

M.Sc. Physics (MSCPH)

Condensed Matter Physics

Examination February, 2026

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.

A-1178

(1)

P.T.O.

1. What is a crystal structure ? Draw the crystal structure of Cesium chloride (CsCl) crystal and explain its lattice vectors, primitive vector, coordinate number, packing fraction.
2. Obtain the phonon dispersion relation in a crystal with two atom per primitive basis. How many optical and acoustic branches are possible in this type of crystal vibration ?
3. Define phonon heat capacity and find out expression for Debye T^3 law by using Debye model of heat capacity.
4. Explain Kronig-Penney model in detail and justify the origin of energy bands in solids with the help of this model.
5. Give the Weiss Theory of Paramagnetism.

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. Define reciprocal lattice vectors and write down diffraction condition in reciprocal lattice system.
2. Evaluate the Madelung constant for a line of ions of alternating sign with distance R between ions.
3. Define spin wave and magnons.
4. What is effective mass ? Find out the expression for effective mass of electron.
5. Define superconductivity, Meissner effect and types of superconductors.
6. Define plasmons, polaritons and polarons.
7. What are Schottkey and Frenkel defects ?
8. Calculate the interplaner spacing for (321) plane in a simple cubic lattice. The lattice constant is 4.2×10^{-10} m.
