G-3/387/22

Roll No. .....

III Semester Examination, January 2022

M.Sc.

PHYSICS

Paper III

(Condensed Matter Physics-I)

Time : 3 Hours] [Max. Marks : 80

Note : *All questions are compulsory. Question Paper comprises of 3 Sections. Section A is objective type/multiple choice questions with no internal choice. Section B is short answer type with internal choice. Section C is long answer type with internal choice.*

SECTION A **1×8=8**

(Objective Type Questions)

Fill in the blanks :

1. The number of possible types of Brovice lattice in two dimension is ..... .

2. Unit cell is defined as ..... .

3. A vacancy is the simplest ..... defect in a crystal.

4. The direct lattice is the ..... of its own reciprocal lattice.

5. The velocity of $\bar{e}$ in periodic potential is ..... .

6. Formula for Hall coefficient is ..... .

7. The value of magnetic susceptibility for diamagnetic material is ..... .

8. The spin of magnon is ..... .

SECTION B **6×4=24**

(Short Answer Type Questions)

Unit-I

1. Explain three dimensional Bravice lattice.

Or

What are Miller indices ? Draw neat diagram to indicate Miller indices in a simple cubic crystal.

Unit-II

2. Explain plastic deformation.

Or

Differentiate edge and screw dislocation with suitable diagram.

Unit-III

3. What is Hall effect ? Explain it.

Or

Classify the materials on the basis of band theory.

Unit-IV

4. Discuss Weiss theory of ferromagnetism.

Or

State and prove Curie Weiss law.

SECTION C **12×4=48**

(Long Answer Type Questions)

Unit-I

1. Describe the face centered cubic and hexagonal close packed structure. Prove that the close packing of atoms in the hcp structure demands on axial ratio $\frac{c}{a} = \sqrt{\frac{8}{3}}$.

Or

Discuss Ewald construction and derive Bragg's diffraction condition in terms of the reciprocal lattice.

Unit-II

2. What are colour centers ? How are they produced ? What are experimental facts on F-center's and how are they explained ?

Or

Explain Frenkel defects. Show that the number of Frankel defects in equilibrium at a given

temperature is proportional to $(NNi)^{1/2}$, where N be the number of atoms and Ni be the interstitial atoms.

Unit-III

3. What is Fermi surface ? Explain de Haas Von Alfen effect.

Or

Explain Tight Bonding approximation for calculating band structure.

Unit-IV

4. What do you mean by exchange interaction ? Find out expression for Heisenberg exchange interaction.

Or

Discuss Langevin theory for paramagnetic gases in detail.

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