

H-4/30/22

Roll No.

IV Semester Examination, 2022

M.Sc.

PHYSICS

Paper III

(Condensed Matter Physics-II)

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/Fill in the blanks)

1. The transition temperature of most super conducting elements lie in the range
2. Cooper pairs are formed at
3. The Clausius-Mossotti relation is
4. The Lorentz field is
5. The Einstein relationship between the diffusion constant D and mobility μ for electron is

P.T.O.

[2]

6. Donar type impurity is formed by adding impurity of valency
7. The quantum unit of a lattice vibration is a
8. In inelastic scattering the wave vector selection rule is written as

SECTION B

6×4=24

(Short Answer Type Questions)

Unit-I

1. Derive the London equation and explain the term coherence length.

Or

Explain Flux Quantization in a superconducting ring.

Unit-II

2. Explain first-order phase transition.

Or

Write normal and anomalous dispersion.

Unit-III

3. Discuss the nature of a $p-n$ junction at equilibrium. Explain how it can act as a rectifier?

Or

What do you understand by term semimetals?

H-4/30/22

Unit-IV

4. Explain lattice thermal conductivity.

Or

Discuss lattice dynamics of linear monoatomic.

SECTION C**12×4=48****(Long Answer Type Questions)****Unit-I**

1. Explain DC and AC Josephson's effect. Also write their importance.

Or

What is superconductivity ? Explain type I and type II superconductors.

Unit-II

2. Explain ferroelectric crystal and classified it.

Or

Explain polarization and depolarization field.

Unit-III

3. What are the main requirements for tunnel diode construction in regard to : (i) the semiconductor material, (ii) the impurity. Explain the current-voltage characteristic of a tunnel diode.

Or

Explain Intrinsic semiconductors in terms of :

- (i) Band model,
- (ii) Calculation of electron & hole concentration,
- (iii) Law of mass action,
- (iv) Electrical conductivity.

Unit-IV

4. Write about Ionic and covalent crystal. Calculate binding energies for Ionic crystal.

Or

How lattice vibrations are quantized ? Describe the inelastic scattering of neutrons for the experimental determination of phonon spectra.

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