B.Sc. Semester-V Examination, 2022-23

PHYSICS [Honours]

Course ID : 52412 **Course Code : SH/PHS/502/C-12**

Course Title : Solid State Physics

Time : 1 Hour 15 Minutes Full Marks : 25

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

UNIT–I

1. Answer any **five** of the following questions: 1×5=5

a) The interplaner distance of (110) planes in a BCC crystal is 2.03Å. What is the lattice parameter of the crystal?

b) All metals are opaque to light of all wavelengths and have high luster. Explain.

c) What are the basic drawbacks of Einstein model of specific heat?

d) Distinguish between a metal, semiconductor and insulator on the basis of their energy band structure.

e) What is Piezoelectricity?

f) Why zeroth order diffraction is not considered in X-ray diffraction?

g) Distinguish between acoustic and optical phonons.

h) Explain the term "Hysteresis and Energy Loss".

UNIT–II

2. Answer any **two** of the following questions: 5×2=10

a) Explain the origin of diamagnetism in the material. Obtain an expression for diamagnetic susceptibility using Langevin's theory. 1+4=5

b) Explain Dulong and Petit's law for the specific heat of a solid. Does it obey the experimental result? 4+1=5

c) What is Bragg diffraction condition? Explain it in terms of reciprocal lattice. 3+2=5

d) Differentiate between type-I and type-II superconductors. Penetration depth of Hg at 3.5K is 750Å. Estimate the penetration depth at 0K. 3+2=5

UNIT–III

3. Answer any **one** of the following questions: $10\times1=10$

a) What is ionic polarizability? On what factor does it depend? NaCl crystal has a dielectric constant $\varepsilon_r = 5.6$ and refractive index $n = 1.5$. Calculate the percentage contribution of the ionic polarizability. Mention some applications of dielectric materials. 1+2+5+2=10

b) What is spontaneous magnetization? What is exchange field? Describe Weiss theory of ferromagnetism. Define Hall coefficient of a material. 2+2+5+1=10

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