বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020
(Under CBCS Pattern)
Semester - III
Subject: PHYSICS
Paper: GE3T & GE3P
(Solid State Physics)

Full Marks : 60
Time : 3 Hours

Candiates are required to give their answer in their own words as far as practicable.
The figures in the margin indicate full marks.

Group - A

THEORY (Marks : 40)

Answer any ***two*** from the following questions : 2×20

1. (a) (i) What do you understand by Unit cell ?

(ii) Show that in a cubic crystal the spacing between consecutive parallel planes of Miller indices (hkl) is given by $d_{hkl} = a/\left(h^2 + k^2 + l^2\right)^{1/2}$.

(iii) A plane intercepts at a, $2b$, c in a simple cubic unit cell. Claculate the Miller indices of the plane. 2+5+3

(b) Establish the specific heat capacity of a solid $C_v = 3R$ at high temperature. 10

2. (a) Explain p-type semiconductor using band diagram. Give an example of n-type semiconductor. 6

(b) What is Amorphous and Crystalline Materials ? Give a corresponding example. 7

(c) Discuss B-H curve for ferromagnetic materials. 7

3. (a) Establish the Clausius-Mossotti equation. 7

(b) Give the assumptions of classical theory of lattice specific heat. Draw a graph C_v (specific heat of solid) vs. temperature in high temperature range. 7

(c) How we distinguish between type I and type II Superconductors ? 6

4. Answer any ***five*** from the following : 5×4=20

(a) What are Lattice Vibrations.

(b) Explain the Hall coefficient.

(c) Draw PE hysteresis loop.

(d) Draw a graph of electric susceptibility of ferroelectric material with example.

(e) Graphically represent the Curie-Weiss Law. Where is it applicable ?

(f) Write the value of band gap energy of Conductor, Semiconductor and insulator in eV unit ?

(g) Write the Bragg's law on X-ray diffraction with diagram.

(h) What do you meant by phonon ?

Group - B

PRACTICAL (Marks : 20)

Answer any ***one*** from the following questions : 1×20

1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method).

   (a) Write down the working formula.

   (b) Describe how susceptibilility of the paramagnetic solution could be measured.

2. To measure the Magnetic susceptibility of Solids

   Discuss the theoretical formula and methodology to determine the magnetic susceptibility of solid paramagnetic smaple.

3. To study the BH curve of iron using a Solenoid and determine the energy loss.

   (a) Describe the B-H curve and discuss how experimentally you could trace a B-H curve on a CRO screen with diagram.

   (b) Write down the formula of determination of energy loss of a BH loop.

4. To determine the Hall coefficient of a semiconductor sample.

   (a) Write down the working formula of Hall coefficient measurement.

   (b) Describe different apparatus which are used for determination of Hall coefficient and discuss how you could determine the Hall coefficient of semiconductor sample.

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