

- Note : 1. Question No. 1 is compulsory
2. Attempt any three from remaining questions.
 3. Assume suitable data wherever necessary.
 4. Figures to the right indicate full marks.

Q.1 Solve any five from the following

[15]

- (a) Draw (121), (200), [121]
- (b) Write values of atomic radius for SC, BCC, FCC in terms of lattice constant 'a'
- (c) Why soft magnetic materials are used in core of transformers?
- (d) Explain magnetostriction effect.
- (e) Draw a neat labeled diagram to show variation of Fermi level with respect to temperature in n type semiconductor.
- (f) For a class room of $20 \times 15 \times 15 \text{ m}^3$, the reverberation time is 3.5 sec. Calculate the total absorption of sound.
- (g) Write a relation between polarization and dielectric susceptibility and the relation between dielectric susceptibility and dielectric constant.

Q.2 (a) Draw the unit cell of HCP. Derive the number of atoms / unit cell, atomic radius and APF. [8]

(b) Define Hall effect and explain its significance. With neat diagram derive the expression for the Hall voltage and Hall coefficient. [7]

Q.3 (a) Draw hysteresis loop for a ferromagnetic material. Prove that in a ferromagnetic material, the power loss/ unit volume in a hysteresis cycle is equal to the area under the loop. [4+4]

A solenoid with 500 turns carrying current 5 Amp is 0.5 m long. Calculate (i) MMF (ii) total flux. Consider area of cross section 0.0004 m^2 and air as the medium.

(b) Explain with neat circuit diagram the working of piezo electric Oscillator for generation of ultrasound. [7]

Q.4 (a) An ultra-sonic beam of wavelength 1 cm is sent from a ship and returns from sea bed after 2 seconds. If the salinity of the water is 29 gm/lit at 30°C calculate the depth of sea bed and the frequency of beam. [5]

(b) Draw the diagram representing molecular arrangement of different of different phases for the liquid crystal. State any two applications of liquid crystal. [5]

(c) The resistivity of intrinsic semiconductor is $2 \times 10^{-4} \Omega \cdot \text{cm}$. If the mobility of electron is $6 \text{ m}^2/\text{V} \cdot \text{sec}$, and that of holes is $0.2 \text{ m}^2/\text{V} \cdot \text{sec}$, calculate its carrier density. [5]

Q.5 (a) Derive critical radius ratio for ligancy 8. [5]

(b) The volume of a room is 600 m^3 . The wall area of the room is 220 m^2 , sound absorption coefficient for wall is 0.03, for ceiling is 0.8 and for and for floor is 0.06. Calculate the average sound absorption coefficient and the reverberation time. [5]

(c) An element of crystal has density 8570 kg/m^3 . Packing efficiency 68%. determine mass of one atom if the nearest neighbor distance is 2.86 Angstrom. [5]

Q.6 (a) Explain Ohm's law for magnetic circuit. Write at least 2 points as its comparison with electrical circuit. [5]

(b) Explain the principle and working of solar cell. [5]

(c) Derive Bragg's law for x ray diffraction. What data about the crystal structure can be obtained from x ray diffraction pattern? [5]
