T0121 / T1865   APPLIED PHYSICS I.

F.E.(SEM I)(ALL BRANCHES) (CBSGS)

Q. P. Code: 27427

Time: 2 hours

Marks: 60

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 $20 \times 15 \times 15 m^3$, 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 ^{o} 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 2×10^{-4} Ω.cm. If the mobility of electron is 6 m^2/ V- sec , and that of holes is 0.2 m^2/ V- 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.
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(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]

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