

Time : 2 Hours

Marks : 60

1. Question number 1 is compulsory
2. Attempt any three from question number 2 to 6
3. Assume suitable data with justification
4. Figures to the right indicate maximum marks.



Q.1. Solve any five from the following

[15]

- (a) Justify use of X- rays in the study of crystals.
- (b) Draw the following [231], (213), (102)
- (c) Derive APF for FCC
- (d) Describe Magnetostriction effect.
- (e) The resistivity of Cu is 1.72×10^{-8} Ohm- m. Calculate the mobility of electrons in Cu. Given that number of electrons per unit volume is $10.41 \times 10^{28} \text{ m}^{-3}$.
- (f) What is cavitation?

Q.2 (a) What is Fermi level? Show that it is located at the centre of forbidden energy gap. Find the resistivity of Cu assuming that each atom contributes one free electron .Consider density = 8.96 gm/ cubic cm, Atomic weight =63.5, mobility of electron = $43.3 \text{ cm}^2/\text{V-sec}$ [8]

(b) Calculate APF for HCP structure [7]

Q.3 (a) Derive Bragg's law and using it calculate the smallest glancing angle at which X-rays of 1.549 Angstrom will be reflected from a crystal having spacing of 4.255 Angstrom. [8]

(b) A metal ring having cross section 5 cm^2 and diameter of 20 cm has a coil of 200 turns wound over it. Determine the current required to produce flux of 4 milli weber. Consider the metal with relative permeability as 380. [7]

Q.4 (a) Explain with neat diagram different phases of liquid crystal. State any two applications of liquid crystals. [5]

(b) Explain in detail "electronic polarization" [5]

(c) Define the term "mobility" Write any formula to obtain it. Write its unit. [5]

Q.5 (a) Explain the principle of solar cell. What are main features of its construction? [5]

(b) What are the conditions of good acoustics? Give some methods to design a hall with good acoustics. [5]

- (c) Derive critical radius ratio for ligancy 6. [5]
- Q.6 (a) Explain how to produce ultrasonic waves with the help of piezo electric effect. [5]
- (b) What is Hall effect? How to find carrier concentration using it in semiconductors? [5]
- (c) Calculate reverberation time for an empty hall of size $21 \times 16 \times 10 \text{ m}^3$ with absorption coefficient 0.106 [5]

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