

28/12/11

FE Sem-I (R)

Applied Physics-I

AGJ 2nd half (t) 41

Con. 5957-11.

MP-2446

(2 Hours)

[Total Marks : 75

- N.B. :** (1) Question No. 1 is compulsory.
(2) Attempt any four questions from the remaining questions.
(3) Assume suitable data and symbols if required.
(4) Figures to the right indicate the full marks.

Q.1 Answer any five questions:

- Draw the following planes (121), (100), (111) (3)
- State any three applications of superconductivity (3)
- How Lissajous figures are used to determine phase difference? (3)
- What are ultrasonic waves? State magnetostriction effect. (3)
- State Sabine's formula. (3)
- Calculate atomic packing factor for FCC crystal structure? (3)
- Show the position of Fermi level in intrinsic semiconductor, p-type semiconductor and n-type semiconductor. (3)

- Q.2
- Explain Diamond crystal structure with proper diagram. Calculate the number of atoms per unit cell, atomic radius and atomic packing factor for diamond unit cell. (8)
 - What is cavitation effect? Find the natural frequency of vibration of quartz plate of thickness 2 mm. Given: Young's modulus for quartz is $8 \times 10^{10} \text{ N/m}^2$ and density 2650 Kg/m^3 . Calculate the change in thickness required if the same plate is to be used to produce ultrasonic waves of 3 MHz. (7)

- Q.3
- Explain reverberation and reverberation time. Explain various methods for design of good acoustics. (8)
 - What are lattice parameters? Aluminium has density 2.7 gm/cm^3 . It has atomic weight 27 and lattice parameter is 4.05 \AA . Determine the type of crystal structure followed by Aluminium and calculate the atomic radius. Given Avogadro's number $N_A = 6.023 \times 10^{23} / \text{gm mole}$. (7)

- Q.4
- What is superconductivity and critical temperature? Describe type I and type II superconductor. (8)
 - Define mobility of charge carrier. Find resistivity of germanium at $300 \text{ }^\circ\text{K}$. Given density of carriers is $2.5 \times 10^{19} / \text{m}^3$. Mobility of electron is $0.39 \text{ m}^2/\text{V-Sec}$ and mobility of hole is $0.19 \text{ m}^2/\text{V-Sec}$. Charge of electron is $1.6 \times 10^{19} \text{ C}$. (7)

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- Q.5 a) State Hall effect and what is the significance of hall effect?
n-type Ge sample has donor concentration 10^{21} atoms /m³. What hall voltage would you expect if current 1×10^{-3} A and if 0.5 T magnetic field is applied across 2 mm thick sample. (8)
- b) What is piezoelectric effect? Explain with neat labeled diagram the construction and working of Piezoelectric oscillator. (7)
- Q.6 a) State and explain terms in Bragg's law of X-ray diffraction. Calculate the glancing angle on cube (100) of rock salt having lattice constant 2.814 \AA^0 corresponding to first order diffraction maximum for X-rays of wavelength 1.541 \AA^0 . (8)
- b) Explain construction and working of CRO. (7)
- Q.7 Solve/explain any three:
- a) A class room has dimension $20 \times 15 \times 10 \text{ m}^3$, the reverberation time is 3 sec. Calculate total absorption of its surfaces and average absorption coefficient. (5)
- b) Liquid crystal and different phases of liquid crystal (5)
- c) Point defects in crystal (5)
- d) Meissner effect (5)