

Lib

Theory (2 Hours)

Physics

[Total Marks : 75]

- N. B. : (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from Q. No. 2 to 7.
 (3) Assume **suitable** data and symbols if **required**.
 (4) Figures to **right** indicate **full** marks.

1. Attempt any **five** :— 15
- Draw the following planes and directions in cubic cell. (101), (100), [111]
 - Define superconductivity and explain critical magnetic field.
 - Explain measurement of frequency of a.c. signal using CRO.
 - Explain cavitation effect and give its two applications.
 - Define mobility of charge carrier and state its S.I. unit.
 - What are liquid crystals ? State its different phases.
2. (a) Explain atomic arrangement in diamond structure and calculate. 10
 Total number of atoms per unit cell (n)
 Atomic radius (r)
 Co-ordination number (CN)
 Atomic packing factor (APF)
 Packing efficiency (PE)
 Void space and density
 Also write the materials exhibiting diamond structure.
- (b) The critical field of niobium is 1×10^5 A/m at 8°k and 2×10^5 A/m at 0°k. Calculate 5
 critical temperature of the element.
3. (a) Explain formation of energy bands in solid and classify the solids on the basis 10
 of energy band diagram.
 A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5$ wb/m². If current of 200A is set up in the strip, calculate Hall Voltage that appears across the strip. (Given : $R_H = 6 \times 10^{-7}$ m³/C)
- (b) Molybdenum has a BCC structure. Its density is 1.02×10^4 kg/m³ and its atomic 5
 weight is 95.94. Determine the radius of molybdenum atom.
4. (a) Derive Bragg's law. Explain Bragg's Spectrometer and its use to analyze crystal 10
 structure.
- (b) Two ships are anchored at some distance from each other. An ultrasonic signal 5
 is sent by two routes through water and air. The difference between times at which the signals reach the other ship is 2 seconds. If velocity of sound in air and water is 348 m/s and 1392 m/s respectively, find distance between the ships.
5. (a) Explain the structure of naturally occurring quartz crystal. 10
 With neat circuit diagram explain production of Ultrasonic waves by Piezo-electric oscillator.
- (b) A classroom has dimensions $20 \times 15 \times 5$ m³. The reverberation time is 3.5 sec. 5
 Calculate the total absorption of surface and average absorption.

6. (a) What are Lissajous figures ? Explain how they are used to measure unknown frequency. 10

An electron travels with a velocity of $2.5 \times 10^6 \text{ m/s}$ in a uniform magnetic field strength of $0.94 \times 10^{-4} \text{ wb/m}^2$, such that velocity vector makes an angle of 30° with the field direction. Determine the distance covered along the magnetic field direction in its one revolution.

- (b) Distinguish between Type-I and Type-II superconductors. 5

7. (a) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved. 10

- (b) If P.D. across an X-ray tube is 25kV and filament current is 10mA. Calculate number of electrons striking the target per second and velocity of electrons striking the target. 5
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