LJ-10090

(OLD COURSE)

(2 Hours) [**Total Marks** : **75**

N. B. : (1) Question No. **1** is **compulsory**.

(2) Attempt any **four** questions from question. No. **2 to 7**.

(3) Use **suitable** data wherever **necessary**.

(4) **Figures** to the **right** indicate **full** marks.

(5) **Illustrate** your answer with **sketches** wherever **necessary**.

1. Attempt any **five** from the following:– 15

   (a) Calculate the lattice parameter of FCC lattice with molecular weight 60·2 and density 6250 kg/m^3.

   (b) State direct and inverse piezo-electric effect.

   (c) Explain how crystal acts as 3-D diffraction grating for the incident X-rays ?

   (d) What is fermi energy ? Explain the variation of fermi level with temperature in metal ?

   (e) Write the difference between type-I & type-II superconductors ?

   (f) State and explain Sabine's formula.

   (g) Represent the following in cubic unit cell (120), (321) [101].

2. (a) State and explain Hall effect. Derive an expression for Hall voltage. Give its applications. 8

   (b) Calculate the distance between two adjacent atoms of NaCl crystal of FCC structure, which has density 2·818 gm/cm^3 and atomic weight of Na = 23 and Cl = 35·5. 7

3. (a) Explain the construction and working of CRT with neat labeled diagram. 8

   (b) Superconducting tin has critical temperature of 3·7 K at magnetic field and a critical field of 0·0306 tesla. Find the critical field at 2K. 7

4. (a) Explain different phases of Liquid crystals. 5

   (b) What are extrinsic semiconductors ? Explain variation of fermi level with impurity concentration with energy level diagram. 5

   (c) The volume of room is 1500 m^3. The wall area of room is 260 m^2, the floor area is 140 m^2, an ceiling area is 140 m^2. The sound absorption coefficient for the wall is 0·03, for ceiling is 0·8 and for the floor is 0·06. Calculate the absorption coefficient and reverberation time. 5

5. (a) Explain NaCl structure. 5

   (b) Explain the formation of depletion region in un-biased P-N junction diode. 5

   (c) Certain piezo-electric crystal of thickness 4 mm produces ultrasonic waves of frequency 400 kHz. Calculate the thickness of this crystal to produce ultrasonic frequency of 500 kHz. 5

6. (a) X-Rays are diffracted in the first order from (110) plane of calcite crystal with lattice constant 3·03A° at a glancing angle 9·6°. Calculate wavelength of X-rays. 5

   (b) Explain SQUIDS ? 5

   (c) Explain cavitation effect and echo sounding in case of ultrasonics. 5

7. (a) What is imperfection ? Explain point imperfections ? 5

   (b) Calculate the increase in the acoustic intensity level in dB. When the sound is doubbled. 5

   (c) Write short note on Miller Indices of atomic plane. 5

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