Con. 5552 -13 **GX-10030**

(Revised Course)

(2 Hours) **[Total Marks : 60**

N.B. : (1) Question No.**1** is **compulsary.**
(2) Attempt any **three** questions from Question No. 2 to 6.
(2) Use **suitale** data wherever **required**.
(3) **Figures** to the right indicate **full** marks.

1. Solve any **five** from the following :- **15**
   (a) Define the term space lattice, unit cell and lattice parameter.
   (b) Find the interplaner spacing between the family of planes (111) in a crystal of lattice constant $3A^{o}$.
   (c) Represent the following in the cubic unit cell :-
   (1$\bar{T}$2), (002), [121]
   (d) Define drift current, diffusion current and mobility of charge carriers.
   (e) Explain the use of P-N junction as a solar cell.
   (f) State with neat diagram direct and inverse Piezoelectric effect.
   (g) What is magnetic circuit ? Explain Ohm's Law in case of magnetic circuit.

2. (a) Explain the Hall effect in metal ? Derive the formulae to determine the density and mobility of the electrons. **8**
   (b) Define ligeancy and critical radius ratio in case of ionic solid. Write the conditions for stability of ionic crystal in 3-D ? Determine critical radius ratio for ligancy 6. **7**

3. (a) Explain with neat diagram construction of Bragg's X-ray spectrometer ? Write the procedure to determine crystal structure. Calculate the maximum order of diffraction if X-rays of wavelength 0·819 A^{o} is incident on a crystal of lattice spacing 0·282 nm. **8**
   (b) Calculate the number of turns required to produce a magnetic flux of 4×10^{5} wb, if an iron rod of length 50 cm and cross sectional area 4 cm^{2} carrying an electric current 1A is in the form of ring. *(Permeability of iron is 65×10^{-4} H/m).* **7**

4. (a) What is mesomorphic state of matter ? Explain with neat diagram cholesteric phase. **5**
   (b) What is dielectric polarization and dielectric susceptibility ? Find the relation between them ? **5**

(c) The resistivity of intrinsic InSb at room termperatrue is $2 \times 10^{-4}\ \Omega$ cm. If the mobility of electron is 6 m^2/V-sec and mobility of hole is 0·2 m^2/V-sec. Calculate its instrinsic carrier dentsity. **5**

5. (a) Identify the crystal structure if its density is $9{\cdot}6 \times 10^2$ kg/m^3, lattice constant is 4·3 A° and atomic weight is 23. **5**

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

(c) Define reverberation time ? State Sabine's formula and explain the terms involved in it ? **5**

6. (a) What are soft and Hard magnetic material ? State their properties and applications. **5**

(b) What is Fermi level in semiconductor ? Show that in intrinsic semiconductor Fermi level always at the middle between the forbidden energy gap ? **5**

(c) An Ultrasonic sound wave is used to detect the position of defect in a steel bar of thickness 50 cm. If the echo times are 40 and 90 μ–sec. Locate the position of defect. **5**
