

- 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 the **right** indicate **full marks**.

1. Attempt any **five** :—
 - (a) Describe phase measurement by using CRO. 3
 - (b) Draw following planes in Cubic Unit Cell $(\bar{1} 1 \bar{1}) (1 0 \bar{1}) (\bar{1} 0 1)$ 3
 - (c) Describe working of liquid Crystal display. 3
 - (d) State applications of Hall effect. 3
 - (e) State applications of Super Conductivity. 3
 - (f) Explain Industrial applications of x-rays. 3

 2. (a) A loudspeaker emits energy in all directions at the rate of 1.5 J/sec. What is the intensity level in dB at a distance of 20 m ?
 (Standard intensity level of sound = 10^{-12} w/m²). 5
 (b) What are Crystal imperfections ? How they are formed ? What is their Significance ? 10

 3. (a) State Sabines formula. Explain the terms involved in it. How Sabines formula can be made applicable to acoustics of auditorium ? 5
 (b) Show that the ratio of Hall electric field E_H to the electric field E which is responsible for the Current in n-type Semiconductor water kept in a Uniform magnetic field B is given by— 10
- $$\frac{E_H}{E} = \frac{B}{nep}$$
4. (a) Sodium is a BCC Crystal. It's density is 9.6×10^2 kg/m³ and atomic weight is 23. Calculate the lattice Constant for Sodium Crystal. 5
 (b) What is Super Conductivity ? Describe Type-I and Type -II Super conductors and prove that Super Conductors are perfect diamagnetic. 10

 5. (a) What is fermi energy and fermi-dirac distribution function ? Show that in intrinsic Semiconductors fermi level lies midway between Conduction band and valance band. 10
 (b) Estimate the number of Frankel defects per mm³ in Silver chloride if energy of formation of Frankel defects is 1.5 ev at 700°k. The molecular weight of AgCl is 0.143 kg/mol and Specific density is 5.56. 5

 6. (a) How ultrasonic waves are produced ?
 Illustrate any two applications of Ultrasonics. 10
 (b) Explain the concept of Electrostatic focussing in electron optics. 5

 7. Write short notes on any **three** :— 15
 - (a) Miller indices
 - (b) C.R.O.
 - (c) X-rays in Crystallography
 - (d) Conduction in Semiconductor diode.