

**(REVISED COURSE)**

(2 Hours)

QP Code : NP-17709

[ Total Marks :60

- N.B.:**— (1) Question no.1 is compulsory.  
 (2) Attempt any three questions from Q.2 to 6  
 (3) Use suitable data wherever required.  
 (4) Figures to the right indicate full marks.

1. Solve any five from the following:— 15
  - (a) What is x-rays? Why the x-rays are preferred to study crystalline solid.
  - (b) Represent the following in a cubic unit cell (021), (123) , [121]
  - (c) Find the miller indices of a set of parallel planes which makes intercepts in the ratio 3a:4b on the x and y axes and parallel to Z-axis.
  - (d) What is Fermi level and Fermi energy? Write Fermi-Dirac distribution function.
  - (e) Explain the concept of hole in a semiconductor.
  - (f) Draw the structure of quartz crystal and explain its various axes.
  - (g) State and explain ohm's law in magnetic circuit?
  
2. (a) Describe the formation of energy band in solid? Explain how it helps to classify the solids in to conductors, insulators and semiconductors with proper diagram. 8  
 (b) Explain Dimond crystal structure with proper diagram and determine its APF? 7
  
3. (a) Derive the Bragg's law and describe the powder method to determine crystal structure of powdered specimen. 8  
 (b) The magnetic field strength of copper is  $10^6$  ampere / metre. and magnetic susceptibility is  $-0.8 \times 10^{-3}$ . Calculate magnetic flux density and magnetisation in copper. 7
  
4. (a) What is liquid crystal state of matter? Draw the diagram to describe molecular arrangement in their different phases? 5  
 (b) Mention different types of polarizability in a dielectric? Explain electronic polarizability? 5  
 (c) Calculate electron and hole concentration in intrinsic silicon at room temperature if its electrical conductivity is  $4 \times 10^{-4}$  mho/m. (mobility of electron =  $0.14 \text{ m}^2/\text{v-s}$  & mobility of hole= $0.040 \text{ m}^2/\text{v-s}$ ) 5
  
5. (a) Explain with neat diagram construction and working of solar cell. 5  
 (b) State the acoustic requirements of good auditorium. Explain how these requirements can be achieved. 5  
 (c) If the x-rays of wavelength  $1.549 \text{ \AA}$  will be reflected from crystal having spacing of  $4.255 \text{ \AA}$ , calculate the smallest glancing angle and highest order of reflection that can be observed. 5.
  
6. (a) Explain with neat diagram Hysterisis effect in ferromagnetic material. 5  
 (b) Explain piezoelectric oscillator to produce USW? 5  
 (c) Explain the formation of barrier potential in P-N Junction. 5