

F-E Sem I (CBGS)  
Applied Physics I

**(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 Diamond 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 Hysteresis 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  |

**Con. 9271-14.**

76