

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Describe the arrangement of atoms in a hexagonal close packed (hcp) structure. (4)
(ii) Determine the c/a ratio and packing factor for an ideal hcp structure. (12)
- OR**
- (b) (i) Describe Bridgman method of growing single crystals. What are the advantages and limitations of this method? (8)
(ii) Derive an expression for inter planar spacing 'd' between (hkl) planes of a cubic structure. (8)
12. (a) (i) Derive an expression for the depression produced at the free end of a cantilever due to the load. (12)
(ii) Give reasons why the cross-section of girders are I-shaped and made of steel. (4)
- OR**
- (b) (i) Describe Lee's disc method to determine the thermal conductivity of bad conductors. (12)
(ii) A copper rod of length 50 cm and cross-sectional area $6 \times 10^{-2} \text{ cm}^2$ is connected in series with an iron rod of same area of cross-section and length 25 cm. One end of copper is immersed in boiling water. The far end of the iron rod is in an ice bath of 0°C . Find the rate of transfer of heat from boiling water to ice bath. (Thermal conductivity of copper and iron are $401 \text{ Wm}^{-1} \text{ K}^{-1}$ and $80 \text{ Wm}^{-1} \text{ K}^{-1}$ respectively). (4)
13. (a) (i) What is Compton effect? Derive an expression for the wavelength of the scattered photon. (12)
(ii) What is the momentum and de Broglie wavelength of an electron accelerated through a potential difference of 56 V. (4)
- OR**
- (b) (i) Describe the construction and working of scanning electron microscope. (12)
(ii) Compare scanning electron microscope with transmission electron microscope. (4)
14. (a) Discuss the important factors that affect the acoustics of an auditorium and methods to maintain good acoustics. (16)
- OR**
- (b) Explain the working of ultrasonic flaw detector with a block diagram. Explain the different modes of scanning. (16)
15. (a) (i) Explain the principle of LASER. (4)
(ii) Describe the construction and explain the working principle of CO_2 laser with energy level diagram. (12)
- OR**
- (b) (i) Explain the principle of propagation of light through optical fibre. (4)
(ii) Derive an expression for acceptance angle and Numerical aperture. (12)