



**SECTION-B**

- 2 a) Deduce Maxwell equation using Gauss Law in electrostatics. (5)  
 b) In free space,  $E(x, t) = 80 \cos (wt - \beta x) a_y$  V/m. Find the average power crossing a circular area of radius 8m in plane  $x = \text{constant}$ . (3)
- 3 a) What is Magnetostriction effect. How can we exploit it to produce ultrasonic waves? (4)  
 b) Differentiate between Dia, Para and Ferro magnetic materials by taking suitable examples. (4)
- 4 a) A beam of X-rays,  $\lambda = 0.745 \text{ \AA}$  is incident on a crystal at a grazing angle of  $7^\circ 42'$  when first order Bragg's reflection occurs. Calculate the glancing angle for 4<sup>th</sup> order reflection. (4)  
 b) Derive Bragg's law of diffraction of X-rays by crystals. (4)
- 5 a) Draw energy level diagram and discuss working of CO<sub>2</sub> Laser. (5)  
 b) What is the concept of population inversion? (3)

**SECTION-C**

- 6 a) Find the core radius necessary for single mode operation at 700 nm in step index fibre with  $n_1=1.50$  and  $n_2=1.48$ . Also find the Numerical Aperture and maximum acceptance angle. (4)  
 b) Discuss important applications of optical fibres. (4)
- 7 a) Give a brief account of Michelson Morley experiment and discuss its importance in reference to special theory of relativity. (6)  
 b) What are main postulates of special theory of relativity? (2)
- 8 a) Compute the de-Broglie wavelength of a proton whose kinetic energy is double the rest energy of an electron. Mass of proton is 1800 times that of the electron. (4)  
 b) What do you mean by eigen values and eigen functions? (4)
- 9 a) "*The properties of a material get modified at nano scale!*" Comment and justify your answer. (4)  
 b) How can we synthesize a nano material using ball milling? Can you suggest some better method for synthesizing nanomaterial? (4)