

SECTION-B

2. a) Applying Maxwell's equations, obtain the continuity conditions for electric and magnetic fields at the interface of two media. (4)
b) Derive the equation of electromagnetic waves propagating in the conducting medium. (4)
3. a) Discuss the origin of diamagnetism on the basis of atomic structure. (4)
b) What are ferrite materials? Discuss their atomic origin and give certain applications of ferrites. (4)
4. a) Discuss the principle and working of CO₂ laser. (5)
b) Why is the output of ruby laser spiked? Give the wavelength of output radiation. (3)
5. a) Discuss various attenuations and losses of signal in optical fibers. (5)
b) Discuss some applications of optical fibers used as sensors. (3)

SECTION-C

6. a) Show that the quantity $E^2 - p^2c^2$ is a Lorentz invariant for a relativistic particle. (6)
b) Why was concept of ether introduced and what properties were assigned to it? (2)
7. a) Discuss various processes through which x-rays suffer attenuation in its intensity while propagating through a medium. (4)
b) What is Bragg's law and derive its expression for diffraction of x-rays? What are limitations of this law in determination of crystal structure? (4)
8. a) Discuss using Heisenberg's uncertainty principle that electrons cannot be the constituents of a nucleus. (2)
b) A particle of mass m is trapped in one dimensional harmonic oscillator potential well. Using steady state Schrodinger's equation, obtain wave functions and quantized energies for this particle. (6)
9. a) Give a brief account of superconductivity while throwing light on magnetic and thermodynamic properties. (4)
b) Write down London's equations and give their physical significance. (4)