Dec-24-0059 NEP

PHY-111 [Applied Physics (Group-A)]

B.Tech-1st CBCS/NEP

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, select one question each from section A, B, C, D. Section E (Question-9) is compulsory.

Section-A

1. Explain the postulates of Einstein's Special Theory of Relativity. Discuss how these postulates lead to the concepts of time dilation, length contraction and the relativity of simultaneity. Provide examples to illustrate these effects.   (12)

2. Discuss the working principle of Helium-Neon (He-Ne) lasers. Explain the energy-level transitions involved, the role of different gases in the lasing process and the characteristics of the laser beam produced.   (12)

Section-B

3. Derive the differential equation for damped harmonic motion and solve it for the case of underdamping. Discuss the physical significance of each parameter involved.   (12)

4. Differentiate between step index and graded index fibers. Discuss their structure, mode of light propagation, and applications.   (12)

Section-C

5. State and derive the time-dependent Schrodinger equation. Explain the physical significance of the wave function $\psi(x,t)$ $\psi(x,t)$ and how it evolves over time. (12)

6. Explain the Bremsstrahlung effect and describe the conditions under which it occurs. Discuss its significance in X-ray production and how it relates to the energy of the incoming electrons. (12)

Section-D

7. State and explain the Poynting theorem. Derive the integral form of the theorem and discuss its implications for the conservation of energy in electromagnetic fields. (12)

8. Define the Meissner effect and describe its significance in the study of superconductors. Explain the experimental observations that demonstrate this phenomenon. (12)

Section-E (Compulsory)

9. (a) What do you mean by Lorentz transformation?

   (b) Define resonance.

   (c) Explain wave function.

   (d) State isotropic dielectric medium.

   (e) Define numerical aperture.

   (f) Discuss about soft X-Rays. (6×2=12)