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DEC-23 0343

PH-101 (Engineering Physics)

B.Tech-1st (CBCS)

Time : 3 Hours

Max. Marks : 60

Note: Attempt five questions in all, selecting one question each from Section A, D, C and D, Section E is compulsory.

### SECTION-A

1. What are the postulates of special theory of relativity? Derive expressions for the Lorentz transformations. (10)
2. Explain the working of He-Ne LASER. What are its advantages? (10)

### SECTION-B

3. Write notes on damped, undamped and forced oscillators. Obtain the expression for the relaxation time of a damped oscillator. (10)
4. What are step index and graded index fibers? Show the propagation of an optical signal through these fibers and hence explain how the intermodal dispersion is overcome with graded index fiber. (10)

### SECTION-C

5. From the time dependent Schrodinger wave equation, deduce the time independent Schrodinger wave equation. What is the significance of this equation? (10)
6. Explain the mechanism of X-ray production. What are continuous and characteristic X-rays? (10)

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### SECTION-D

7. Derive differential and integral form of Maxwell's equations. What is significance of these equations? (10)
8. Explain superconductivity. What is the effect of magnetic field on the superconductivity? What is Meissner effect? (10)

### SECTION-E (Compulsory)

9. Write the short answers for the following questions:
  - (a) With what speed should a particle move so that its relativistic mass is four times its rest mass?
  - (b) Define population inversion.
  - (c) What is the condition for resonance in a forced oscillator?
  - (d) Find numerical aperture of an optical fiber having refractive of core as 1.7 and that of cladding material as 1.4, given that the fiber is surrounded by air.
  - (e) Define phase velocity and group velocity.
  - (f) What is the ratio of de Broglie wavelengths of a proton and that of an alpha particle, which are accelerated through the same potential difference?
  - (g) Find Poynting vector of a 100 W point source of light, at a distance 1m from it.
  - (h) Write four properties of electromagnetic waves.
  - (i) Find the uncertainty in the position of an electron moving with a velocity of  $6 \times 10^6$  m/s, known with  $0.05 \times 10^6$  m/s accuracy.
  - (j) Explain isotopic effect in superconductivity. (10×2=20)