

B.TECH.
(SEM I) THEORY EXAMINATION 2022-23
ENGINEERING PHYSICS-I

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- (a) What are inertial and non-inertial frames of reference? Is an earth inertial frame or non-inertial?
- (b) If one photon has a speed c in one reference frame, can it be at rest in some other frame of reference? Explain.
- (c) What are the main conclusions of Davision and Germer experiment?
- (d) What are the applications of uncertainty principle.
- (e) Explain why a thick film shows no color in reflected white light.
- (f) Two independent sources could not produce interference, why?
- (g) What do you mean by polarization of light?
- (h) Why population inversion is necessary for laser action?
- (i) Why modal dispersion is negligible in single mode fiber?
- (j) What is the basic difference between holography and photography?

SECTION B**2. Attempt any three of the following: 10 x 3=30**

- (a) What is length contraction? Derive the necessary expression for it. Show that $x^2+y^2+z^2- c^2t^2$ is invariant under Lorentz transformation.
- (b) What is de-Broglie hypothesis? Find the least energy of an electron moving in one dimension in an infinitely high potential box of width 1×10^{-10} m. (Mass of electron is 9.1×10^{-31} kg and $h = 6.63 \times 10^{-34}$ J-s).
- (c) Newton's rings are observed normally in reflected light of wavelength 6000 \AA . The diameter of the 10th dark ring is 0.50cm. Find the radius of curvature of lens and thickness of the film.
- (d) An optical fiber of length 150 m has input power of $10 \mu\text{W}$ and output power of $9 \mu\text{W}$. Compute loss in dB/Km.
- (e) Find the ratio of populations of the two states in the He-Ne laser that produces light of wavelength 6328 \AA at 27°C . ($k = 8.61 \times 10^{-5} \text{ eV/k}$).

SECTION C

3. Attempt any *one* part of the following: 10x1=10

- (a) Describe Michelson Morley experiment and explain significance of its negative result.
- (b) State the velocity addition theorem and deduce an expression for the variation of mass with velocity.

4. Attempt any *one* part of the following: 10x1=10

- (a) What are the conditions and limitations, a wave function must obey? Derive time independent Schrodinger equation.
- (b) A particle, with zero potential energy, is in motion along a line $x = 0$ and $x = a$. At points for which $x < 0$ and $x > a$, the potential energy is infinite. The wave function for the particle in the n^{th} state is given by $\Psi_n = A \sin \frac{n\pi x}{a}$. Obtain the expression for normalized wave function.

5. Attempt any *one* part of the following: 10x1=10

- (a) Explain and describe the formation of Newton's rings in reflected light. Prove that in reflected light the diameters of dark rings are proportional to the square roots of natural numbers.
- (b) Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the relative intensities of successive maximum are nearly $1:4/9\pi^2:4/25\pi^2:4/49\pi^2$.

6. Attempt any *one* part of the following: 10x1=10

- (a) Describe the construction and working of Nicol prism.
- (b) What is holography? Discuss the construction and reconstruction of image on a hologram with the help of neat diagram.

7. Attempt any *one* part of the following: 10x1=10

- (a) Draw a neat diagram of He-Ne laser and describe its method of working? How is it superior to a Ruby laser?
- (b) What are superconductors? Explain their classifications as type-I and type-II superconductors.