



End Term (Even) Semester Examination May-June 2025

Roll no.....

Name of the Program and semester: B.Tech Semester-II

Name of the Course: Engineering Physics

Course Code: TPH201

Time: 3 hour

Maximum Marks: 100

Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

Q1.

CO1-(2X10=20 Marks)

- a. Define interference. In Newton's ring experiment, derive the expression for the diameter of dark rings when liquid of refractive index μ is introduced between the plano-convex lens and the plane glass plate.
- b. Explain Fresnel's Biprism with a diagram and prove that the fringe width increases with decrease in distance between virtual sources.
- c. Derive the expression for resultant intensity in N slits Fraunhofer diffraction. Also, deduce the intensity and position of principal maxima.

Q2.

CO-2 (2X10=20 Marks)

- a. Discuss the construction and working of the Helium-Neon laser. Give the reason why four-level lasers are superior to three-level lasers.
- b. Discuss the difference between linearly, elliptically, and circularly polarized light. Also, discuss the method to produce elliptically and circularly polarized light.
- c. (i) Discuss the method for the detection of linearly polarized light.
(ii) Define specific rotation. A sugar solution in a tube of length 20cm produces an optical rotation of 15° . If the solution is diluted to one-third of its previous concentration, find the optical rotation produced by a 30 cm long tube containing the diluted solution.

Q3.

CO-3 (2X10=20 Marks)

- a. Derive Lorentz transformation equations for space and time coordinates and show that these equations convert to the Galilean equation at very low speeds.
- b. Derive the expression for length contraction. Two photons approach each other. What is their relative velocity?
- c. Calculate the speed of the electron that has a kinetic energy of 1.02 MeV. Given that the rest mass energy of the electron is 0.51 MeV. (rest mass of electron 9.1×10^{-31} kg)

Q4.

CO-4 (2X10=20 Marks)

- a. Derive Schrodinger's time-independent and time-dependent wave equations.
- b. Discuss the Heisenberg uncertainty principle. Calculate the difference between the ground state and the first excited state for an electron in a box of length 1\AA . ($h=6.6 \times 10^{-34}$ J-sec, mass of electron $= 9.1 \times 10^{-31}$ kg)
- c. Show the Bloch sphere for state 1 and 0. Explain the Quantum Bits superposition and Entanglement principle.



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Q5.

CO-5(2X10=20 Marks)

- a. Explain the term superconductivity and discuss the electrical and magnetic properties. Also, differentiate between Type I and Type II superconductors.
- b. Derive four Maxwell's equations and write their physical significance.
- c. Explain the term Quantum confinement, also write the differences between Quantum Well, Quantum Wire, and Quantum Dot.