

End Term (Odd) Semester Examination December 2024

the Course and semester: B.Tech. I Semester
of the Paper: Engineering Physics
Code: TPH 101

Roll no. [REDACTED]

Maximum Marks: 100

Time: 3 hour

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.

- a. What is the interference of light? How will you determine the wavelength of light using Fresnel's biprism? (2X10=20 Marks) (CO1)
- b. Newton's rings are observed normally in reflected light of wavelength 6000 \AA . The diameter of the 10^{th} dark is 0.50 cm . Find the radius of curvature of the lens and the thickness of the film. (CO1)
- c. Define resolving power and dispersive power of a grating. Obtain expressions for these in the case of plane transmission grating. (CO1)

- a. Explain the construction and working of a He-Ne laser with essential components. (2X10=20 Marks) (CO2)
- b. Define quarter wave plate and half wave plate. Calculate the thickness of doubly refracting plane capable of producing a path difference of quarter of the wavelength between ordinary and extra ordinary rays with light of wavelength 5890 \AA . The refractive indices for ordinary and extra ordinary rays are 1.533 and 1.544 . (CO2)
- c. A glass clad fibre is made with core glass of refractive index 1.5 and the cladding is doped to give an index difference of 0.0005 . Determine (a) the cladding refractive index, (b) the critical reflection angle, (c) the critical acceptance angle (d) acceptance cone and (e) the numerical aperture. (CO2)

Q3.

- a. Define inertial and non-inertial frame of reference. Discuss the Galilean transformation equations and prove that the Newton's law of force remains invariant in all inertial frame of reference. (2X10=20 Marks) (CO3)
- b. State the postulates of special theory of relativity. Show that if (x, y, z, t) and (x', y', z', t') are the coordinates of one event in S and the corresponding event in S' -frames respectively, then the expression $(ds)^2 = dx^2 + dy^2 + dz^2 - c^2 dt^2$ is invariant under Lorentz transformation. (CO3)
- c. Give the qualitative and quantitative description of Michelson Morley experiment and illustrate its negative results. (CO3)

Q4.

- a. Discuss the Schrodinger time dependent wave equation. Discuss the physical significance of wave function Ψ . (2X10=20 Marks) (CO4)
- b. State Heisenberg's uncertainty principle and by applying uncertainty principle explain non-existence of electron in nucleus. (CO4)
- c. Discuss the application of Schrodinger wave equation for the case of the particle in a box. Compute the associated energy eigenvalue and wave function. (CO4)

Q5.

- a. What is superconductivity? Explain the distinction between Type-I and type-II superconductors. Give the main properties of a superconductor. (2X10=20 Marks) (CO5)
- b. What are Maxwell's Equations? Derive Maxwell's equation in differential form. (CO5)
- c. What is nanotechnology? Explain its significance in modern science and engineering. Briefly describe what is meant by fabrication and characterization techniques in the context of nanotechnology. (CO5)