Reg No.: _____ Name: _____

Jyothi Engineering College(Autonomous)

B. Tech Degree S1 (S) Examination, June 2026 (2025 Scheme)

25PHT103 - PHYSICS FOR PHYSICAL SCIENCE AND LIFE SCIENCE

Total Mark: 60 **Total Time: 2hrs 30 min**

CO MARK

PART A

(Answer All Questions. Each question carries 3 marks)

1. How does a semiconductor laser differ from other lasers? CO1 (3)
2. What would be the consequence if the cladding of an optical fiber had a higher refractive index than the core? CO1 (3)
3. Define resolving power and dispersive power of a grating. CO2 (3)
4. Why does the central fringe of Newton's ring appear dark? CO2 (3)
5. What are matter waves? Write the expression of de-Broglie wavelength. CO3 (3)
6. What do you understand by the wave function Ψ of a moving particle? CO3 (3)
7. Explain reverberation time and its significance in acoustics? CO4 (3)
8. What is piezoelectric effect? Write any two medical applications of ultrasonic waves. CO4 (3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9. What is numerical aperture and acceptance angle of optic fibre cable? How are they related? Derive an expression for numerical aperture of an optical fibre cable in terms of refractive indices of core and cladding. CO1 (9)

OR

10. Discuss with suitable diagrams the principle, construction and working of CO_2 laser. CO1 (9)

Module - 2

11. a) Explain with necessary theory, how the refractive index of the given liquid is determined using Newton's rings arrangement. CO2 (5)

    b) Light of wavelength $5893A^0$ is reflected at nearly normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that will appear as dark? CO2 (4)

OR

12. a) Explain how we can find the wavelength of monochromatic light using grating equation. CO2 (5)

    b) Light of wavelength 550 nm falls on a plane transmission grating and the third order principal maxima is obtained at an angle 300 from the normal. Evaluate the number of lines per meter of the grating. CO2 (4)

Module - 3

13. a) Obtain the time independent Schrodinger equation from time dependent Schrodinger equation. CO3 (5)

b) An electron is confined to a potential well of width 10nm. Calculate the minimum uncertainty in its velocity. Mass of electron is $9.1 \times 10^{-31} kg$. CO3 (4)

OR

14. a) In the context of a particle encountering a potential barrier, explain quantum mechanical tunneling and analyze how the wave functions in each region contribute to this phenomenon. CO3 (5)

b) An electron is confined in an infinite square well of width $2.5 \times 10^{-10} m$. Evaluate lowest energy electron in eV. (Given mass of electron = $9.11 \times 10^{-31} kg$, Plank's constant = $6.63 \times 10^{-34} Js$.) CO3 (4)

Module - 4

15. a) Discuss the propagation of a transverse wave along a stretched string and derive the expression for velocity of wave. CO4 (5)

b) A quartz crystal of **2mm** is vibrating at resonance. Calculate the fundamental frequency of vibration, if Young`s modulus of quartz is $8.5 \times 10^{10} N/m^2$ and density $3000 kg/m^3$. CO4 (4)

OR

16. a) Explain any five factors affecting the acoustics of a building and how they can be controlled. CO4 (5)

b) A cinema hall has a volume of $8000 m^3$. What should be the total absorption in the hall so that the reverberation time is made to 2 seconds. CO4 (4)

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