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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular Examination December 2024 (2024 Scheme)

Course Code: GZPHT121

Course Name: PHYSICS FOR PHYSICAL SCIENCE / LIFE SCIENCE

Max. Marks: 60

Duration: 2 hours 30 minutes

**PART A**

*(Answer all questions. Each question carries 3 marks)*

		CO	Marks
1	Explain stimulated emission process with the help of an energy level diagram.	CO1	(3)
2	Why metastable state is necessary for laser emission.	CO1	(3)
3	What are the conditions required for two light beams to interference.	CO2	(3)
4	Distinguish between Fresnel diffraction and Fraunhofer diffraction.	CO2	(3)
5	Explain with a diagram the phenomenon of quantum mechanical tunnelling.	CO3	(3)
6	Discuss the significance of a wave function.	CO3	(3)
7	How reverberation differ from echo in acoustics.	CO4	(3)
8	Distinguish between longitudinal and transverse waves with one example each.	CO4	(3)

**PART B**

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

**Module -1**

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|----|--|-----|-----|
| 9  | a) With schematic and energy level diagrams, discuss the construction and working of a Ruby laser.   | CO1 | (6) |
|    | b) Explain the three components required for a laser system.   | CO1 | (3) |
| 10 | a) Discuss the principle of propagation of light through an optic fiber. How a step index fiber differ from a graded index fiber. Explain wave propagation through each of them. | CO1 | (6) |
|    | b) With the help of a block diagram explain the main components of a fiber optic communication system.   | CO1 | (3) |

Module -2

- 11 a) Explain the formation and nature of interference fringes in wedge shaped thin films. Discuss how air wedge is used to measure wavelength of a thin wire. CO2 (6)
- b) Light of wavelength 600 nm falls on an air wedge of length 7cm. if interference bands formed has a width 0.01 mm calculate the diameter of the wire separating the glass plates. CO2 (3)
- 12 a) Discuss how a plane transmission grating works. With necessary figure derive grating equation. CO2 (6)
- b) Light of wavelength 550 nm falls on a plane transmission grating and the third order principal maxima is obtained at an angle  $30^\circ$  from the normal. Evaluate the number of lines per meter of the grating. CO2 (3)

Module -3

- 13 a) State Uncertainty principle for two pair of conjugate variables. Show that electrons cannot be confined within nucleus. CO3 (6)
- b) Evaluate uncertainty in velocity of an electron trapped in a box of width 0.5 nm. CO3 (3)
- Given mass of electron is  $9.1 \times 10^{-31}$  kg, Plank's constant is  $6.63 \times 10^{-34}$  Js
- 14 a) Derive time dependent Schrodinger equation from plane wave equation. CO3 (6)
- b) Explain normalization condition and write down its mathematical form. CO3 (3)

Module -4

- 15 a) Formulate differential equation for a transverse wave on a stretched string and obtain the expression for fundamental frequency of the wave. CO4 (6)
- b) A string of guitar 50 cm long and has a mass 0.05gm, kept under a tension 256N. What will be the fundamental frequency of the wave through it. CO4 (3)
- 16 a) Explain reverberation time. Point out its significance in designing the acoustics of an auditorium. Write down Sabine's formula and explain different terms. CO4 (6)
- b) The dimension of an auditorium is 30m X 20m X 15m. If the interior surfaces have an average absorption coefficient 0.3, evaluate reverberation time. CO4 (3)

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