

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree (S, FE) Examination June 2024 (2019 Scheme)

**Course Code: PHT 110****Course Name: ENGINEERING PHYSICS B
(2019 -Scheme)**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks*

- | | | Marks |
|----|--|-------|
| 1 | Write down the features of Q factor of an oscillator. | (3) |
| 2 | Define wavelength, frequency and wave velocity of a wave. | (3) |
| 3 | Find the minimum thickness of antireflection coating wave (magnesium fluoride of refractive index 1.42) to be deposited on glass plate of refractive index 1.5, for light of wavelength 500nm. | (3) |
| 4 | Distinguish between Fresnel and fraunhoffer diffraction | (3) |
| 5 | What are the conditions of a well behaved wave function? | (3) |
| 6 | Explain the effect of increased surface to volume ratio in nanomaterial's | (3) |
| 7 | Write down the significance of reverberation time | (3) |
| 8 | Write any three properties of ultrasonic waves. | (3) |
| 9 | What are the difference between spontaneous and stimulated emission | (3) |
| 10 | Distinguish between step index and graded index fibres | (3) |

PART B*Answer one full question from each module, each question carries 14 marks.***MODULE 1**

- 11 (a) Formulate the differential equation of a forced harmonic motion and find the expression for its amplitude and phase (10)
- (b) A transverse wave on a stretched string is described by (4)
- $$y(x, t) = 4\sin(10t - 0.021x + \frac{\pi}{3})$$
- Where x and y are in cm and t in seconds
find 1.amplitude 2.wavelegth 3.frequency 4.speed
- 12 (a) Derive an expression for fundamental frequency of transverse vibration in a stretched string. (10)
- (b) A string when stretched by a weight of 2 kg gives a note of frequency 112Hz.what weight will produce a frequency twice the above frequency? (4)

MODULE 2

- 13 (a) Explain how newton's rings are formed. Derive the expression to find wavelength of incident monochromatic light. (10)
- (b) Sodium light (589.9nm) strikes a film of oil on water at an angle 30° . The 8th dark band is seen. Compute the thickness of oil film if the refractive index of the oil is 1.44 (4)
- 14 (a) What is diffraction? Derive grating equation. What is meant by dispersive power of grating? (10)
- (b) A plane grating just resolves two lines in the second order. Calculate the total number of lines on the grating if $d\lambda = 0.1\text{nm}$ & $\lambda = 500\text{nm}$ (4)

MODULE 3

- 15 (a) Derive time dependent Schrodinger's equation and hence obtain time independent equation (10)
- (b) Calculate the voltage that must be supplied to an electron microscope to produce an electron of wavelength 4.5\AA (4)
- 16 (a) Write a note on (9)
- i. Nano sheet
 - ii. Nanowire
 - iii. Quantum dot
- (b) Write any five applications of nanomaterials. (5)

MODULE 4

- 17 (a) Explain the terms absorption coefficient and reverberation time and discuss the factors that affecting the acoustics of a hall and give their remedies. (9)
- (b) An auditorium has dimension of $35 \times 15 \times 6$. The average absorption coefficient of wall, ceiling and floor are 0.03, 0.36, and 0.26 respectively. Evaluate reverberation time of the hall (5)
- 18 (a) With a neat circuit diagram explain the principle and working of piezoelectric oscillator. (10)
- (b) An ultrasonic source of 0.09MHz sends down a pulse towards the sea bed which return after 0.55s. The velocity of sound in water is 1800m/s. Calculate the depth of the sea. (4)

MODULE 5

- 19 (a) With a neat diagram, explain the construction and working of He-Ne laser. (10)
(b) Give any four application of holographic technique. (4)
- 20 (a) With a block diagram explain the working of an optical fibre communication system and mention any three advantages of optical fibres. (10)
(b) The numerical aperture of the optical fibre is 0.295 and refractive index of core is 1.54. calculate the refractive index of cladding and acceptance angle (4)
