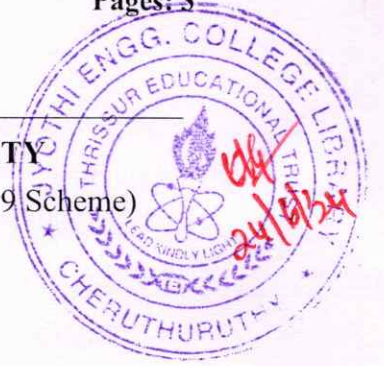


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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

**Course Code: PHT 100****Course Name: ENGINEERING PHYSICS A
(2019 -Scheme)**

Max. Marks: 100

Duration: 3 Hours

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

Marks

- | | | |
|----|---|-----|
| 1 | What would be fundamental frequency of transverse vibration of stretched string for following –
When length of string is reduced by one-half of its initial value.
When tensional force applied is increased by twice of its initial value. | (3) |
| 2 | What is meant by Simple Harmonic motion. Give equation for SHM. | (3) |
| 3 | What is meant by interference of light? State conditions for two beams to interfere. | (3) |
| 4 | What are antireflection coatings? | (3) |
| 5 | Discuss significance of surface to volume ratio. | (3) |
| 6 | State Heisenberg's uncertainty principle with appropriate mathematical equations. | (3) |
| 7 | Explain concept of curl of vector and its significance. | (3) |
| 8 | Explain concept of divergence of vector and its significance. | (3) |
| 9 | State any three applications of superconductivity. | (3) |
| 10 | List any two medical applications of optical fibre. | (3) |

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

- | | | |
|----|--|------|
| 11 | a) Formulate differential equation for damped harmonic oscillator and obtain its solution. Discuss the condition for over damped oscillations. Plot graph for Displacement as function of time for this oscillation. | (10) |
| | b) The Displacement of a wave is represented by $y=4.5 \times 10^{-2} \sin (0.45 x-200 t)$, where x is measured in meters and t in seconds. Deduce amplitude, time period, velocity and wavelength. | (4) |

- 12 a) Derive fundamental and third harmonic frequency of transverse vibration of stretched string with suitable diagram. State three laws of vibration. (10)
- b) Equation of progressive wave propagation through medium
 $u(x,t) = 0.1 \sin \pi(0.01x - 2t)$, where displacement in meters and time in seconds. (4)
Obtain amplitude, frequency, wavelength and velocity of wave.

MODULE 2

- 13 a) Explain principle of superposition of waves. Derive the conditions for constructive and destructive interference of reflected light from a thin film. (10)
- b) In Newton's ring experiment, the diameter of 5th dark ring due to wavelength 5020 \AA in air is 0.2 cm . Find radius of curvature of lens. (4)
- 14 a) Explain the construction of a diffraction grating and derive grating equation. (10)
- b) A grating of 8333 lines/cm is illuminated and the first order spectrum is obtained at an angle 30° . Evaluate wavelength of light used. (4)

MODULE 3

- 15 a) Derive Schrodinger time dependent wave equation and deduce its time independent form with respect to particle exhibiting dual nature. (10)
- b) An electron is confined to a potential well of width 50 nm. Calculate the minimum uncertainty in velocity. (4)
- 16 a) Explain optical, mechanical and electrical properties of nanomaterials. (10)
- b) State and explain any four applications of Nanotechnology. (4)

MODULE 4

- 17 a) Starting from the field equations in free space derive the velocity of electromagnetic waves in free space. (10)
- b) Calculate Magnetisation (M) for a material with relative permeability 3.1 and magnetising field 900 A/m. (4)
- 18 a) State Ampere's Circuital law and derive mathematical expression for the same. Further analyse inconsistency of this law. (10)
- b) Find gradient of $\phi = x^2yz + 4xz^2$ at (1,1,1). (4)

MODULE 5

- 19 a) Explain Meissner effect. How type I and type II superconductors are different in terms diamagnetic property. (10)
- b) Explain concept of BCS theory associated with superconductivity. (4)
- 20 a) Point out the difference between step index and graded index fibres. Derive Numerical aperture associated with a step index fibre. (10)
- b) An optical fibre has numerical aperture of 0.321 and refractive index of cladding is 1.654. Determine the core refractive index. (4)
