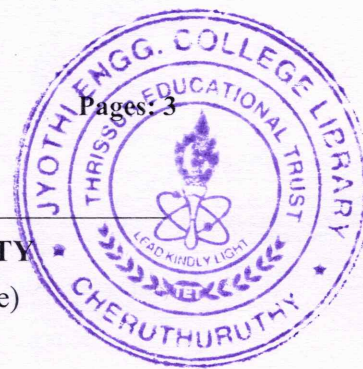


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S1 (S,FE) S2 (S,FE) Exam May 2025 (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 | Draw the displacement-time curves for over damped, critically damped, and under damped oscillators. | (3) |
| 2 | Write down the one dimensional wave equation and its solution. Explain the parameters in it. | (3) |
| 3 | What is meant by antireflection coating? Name any two instruments where it is highly essential. | (3) |
| 4 | Give any three differences between Fresnel and Fraunhofer classes of diffraction. | (3) |
| 5 | What are matter waves? Write the expression of de-Broglie wavelength. | (3) |
| 6 | Describe the significance of large surface area to volume ratio of nano materials. | (3) |
| 7 | State and explain Ampere's circuital law. | (3) |
| 8 | Define curl of a vector function. Establish its physical significance. | (3) |
| 9 | Discuss BCS theory of superconductivity. | (3) |
| 10 | What is a photo diode? Name any two types. | (3) |

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

- | | | |
|----|--|------|
| 11 | a. Obtain the differential equation of a forced harmonic oscillator. Derive the expressions for amplitude and phase difference. | (10) |
| | b. In the case of a forced harmonic oscillator, the amplitude of vibrations increases from 0.05mm at very low frequencies to a value 7.5mm at the frequency 210Hz . Find Q- factor, relaxation time and damping constant. | (4) |
| 12 | a. Derive an expression for the velocity of transverse waves in a stretched string and state the laws of transverse vibrations. | (10) |
| | b. A piece of wire 60cm long and mass 1.2g . is stretched by a load of 3kg . Find the frequency of the second harmonic. | (4) |

MODULE 2

- 13 a. Show that the radii of different dark rings in Newton's rings are proportional to square root of integers. Explain with necessary theory, how the refractive index of the given liquid is determined using Newton's rings arrangement. (10)
- b. Two optically plane glass plates of length **0.1m** are placed one over the other with a thin wire at one end, separating the two. The fringes formed with light of wavelength **589.3nm** are of width **3mm**. Calculate radius of the wire. (4)
- 14 a. What is a grating? Derive the grating equation. Explain how we can find the wavelength of monochromatic light using grating. (10)
- b. What is the highest order of spectrum which may be seen with a light of wavelength **650nm** by means of a grating having **5000 lines per cm**? (4)

MODULE 3

- 15 a. Starting from the wave equation derive Schrodinger's time dependent equation and hence deduce Schrodinger's time independent equation. (10)
- b. For an electron in a one dimensional box of width **1A⁰**, calculate the first three energy levels in electron volt. (4)
- 16 a. Explain Quantum confinement in nanomaterials. Based on these, explain nano sheet, nano wire and quantum dot. (10)
- b. Write any four applications of nanomaterials in the medical field. (4)

MODULE 4

- 17 a. Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials. Write two examples for each of them. (10)
- b. Find the relative permeability of a ferromagnetic material if a field strength of **200A/m** produces a magnetization of **3100A/m**. (4)
- 18 a. Starting from Maxwell's equations show that velocity of electromagnetic waves in free space is $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$ (10)
- b. Compare displacement current and conduction current. (4)

MODULE 5

- 19 a. Distinguish between Type I and Type II superconductors with appropriate graphs and examples. Mention any three applications of superconductivity. (10)
- b. Calculate the numerical aperture and acceptance angle of a fiber with a core index of **1.54** and a cladding index of **1.50** when the fibre is inside water of (4)

refractive index 1.33

- 20 a. Describe fibre optic communication system with a block diagram. List four (10)
advantages of fibre optic communication.
- b. Distinguish between Step index and Graded index fibre. (4)
