

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
First Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: PHT110

Course Name: ENGINEERING PHYSICS B
(2019-Scheme)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- 1 Define Q factor of a damped harmonic oscillator. Mention the factors on which it depends. (3)
- 2 List any three differences between transverse waves and longitudinal waves. (3)
- 3 Explain why straight line fringes are observed in air wedge. (3)
- 4 What are the differences between interference and diffraction? (3)
- 5 What is the physical significance of wave function? (3)
- 6 Gold is chemically reactive in their nanoscale form though it is inert in its bulk form. Give the reason. (3)
- 7 Define threshold of hearing intensity. What is its value? (3)
- 8 Explain thermal detection of ultrasonic waves. (3)
- 9 Differentiate between hologram and photograph. (3)
- 10 Write a short note on fibre optic sensors. Name any two of them. (3)

PART B

Answer one full question from each module, each question carries 14 marks

Module-I

- 11 a) A body executing damped motion is subjected to an oscillating external force. Obtain its differential equation. Find expressions for its amplitude and phase (10)
- b) Write the differential equation for mechanical and electrical oscillators. List any 3 points to compare them. (4)
- 12 a) Derive an expression for fundamental frequency of transverse vibrations in a stretched string. Hence deduce the laws of vibrations. (10)

- b) The displacement of a particle due to a sound wave is given by (4)

$$y = 3 \times 10^{-3} \cos 2\pi \left(\frac{x}{5} - 50t \right) \quad \text{where } x \text{ is measured in meters and } t \text{ in}$$

seconds. Find the amplitude, wavelength, frequency and velocity of the wave.

Module-II

- 13 a) Explain interference in thin films and derive cosine law. Obtain the conditions for minima and maxima. (10)
- b) Newton's rings are formed by the light reflected normally from a plano-convex lens and a plane glass plate with a liquid in between them. The diameter of the n^{th} dark ring is **2.24 mm** and that of $(n+15)^{\text{th}}$ dark ring is **4.81mm**. Calculate the refractive index of the liquid? (Given $\lambda = 5893 \text{ \AA}$ and radius of curvature of the lens = **90 cm**) (4)
- 14 a) What is grating element? Derive the grating equation. (8)
- b) Define resolving power and dispersive power of grating. What is Rayleigh's criterion for spectral resolution? (6)

Module-III

- 15 a) What is uncertainty principle? Explain any two applications of uncertainty principle. (10)
- b) Compare the de Broglie wavelength of an electron and a proton moving in a potential of **50kV**. Given $m_e = 9.1 \times 10^{-31} \text{ kg}$ and $m_p = 1.67 \times 10^{-27} \text{ kg}$ (4)
- 16 a) Classify nanomaterials based on quantum confinement and explain the mechanical and electrical properties. (10)
- b) Find the lowest energy of an electron moving in a one dimensional infinitely high potential well of width **1 \AA**. ($h = 6.62 \times 10^{-34} \text{ Js}$) (4)

Module-IV

- 17 a) Explain any six factors affecting the acoustics of a building and give their remedies. (9)
- b) A hall has a volume **2000m³** and its total absorption is **92.9sabine**. What will be the effect on reverberation time if the hall is full of audience and thereby increasing the absorption by another **85sabine**? (5)
- 18 a) What is ultrasonic diffractometer? State its working principle. Explain how the velocity of ultrasonic wave is determined using ultrasonic diffractometer. (10)

- b) Calculate the capacitance required to produce ultrasonic waves of frequency (4)
1MHz with an inductance of **1H**.

Module-V

- 19 a) Explain the construction and working of a Helium-Neon laser with proper (10)
schematic and energy level diagrams.
- b) Discuss any four applications of lasers. (4)
- 20 a) With a block diagram explain the working of an optical fibre communication (10)
system. Why fibre optic communication system is preferred over other types of
communication techniques? Give any two medical applications of optical
fibres.
- b) Calculate the numerical aperture, acceptance angle and the critical angle of an (4)
optical fibre. The refractive index of the core is **1.5** and that of cladding is
1.45.
