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 – (3)

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.

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 $\mathbf{y=4.5\times10^{-2}\ sin\ (0.45\ x\text{-}200\ t)}$, 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)= 0.1Sin π(0.01x -2t), where displacement in meters and time in seconds. Obtain amplitude, frequency, wavelength and velocity of wave. (4)

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 A°** 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 30^0. 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 Ø=$x^2yz + 4xz^2$ 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)

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