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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(2019 SCHEME), DECEMBER 2019

Course Code: PHT100

Course Name: ENGINEERING PHYSICS A

(2019-Scheme)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

1	List any six points to compare electrical oscillator with a mechanical oscillator.	(3)
2	Distinguish between transverse and longitudinal waves. Give one example for each.	(3)
3	When a medium of $\mu \neq 1$ is introduced in the Newton's ring set up, what happens to the diameter of interference pattern? Explain it with the help of relevant equation.	(3)
4	Give 3 differences between interference and diffraction.	(3)
5	State Heisenberg's Uncertainty principle and write the three uncertainty relations .	(3)
6	Explain the optical properties of nanomaterials.	(3)
7	Distinguish between magnetic induction and magnetising field.	(3)
8	Derive the equation of continuity for time varying fields.	(3)
9	Show that superconductors are perfect diamagnets.	(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-I

11	a)	Set up the differential equation for a forced harmonic oscillator and solve it.	(10)
	b)	A transverse wave on a stretched string is described by **$y(x,t)=2\sin(20t+0.021x+\pi/6)$** where **x** and **y** are in cm and **t** is in second. Obtain (1)Amplitude (2)Initial phase (3)speed (4)frequency	(4)
12	a)	Derive an expression for the fundamental frequency of a transverse wave in a stretched string.	(10)
	b)	A sitar wire is under tension of **40 N** and length of the bridge is **80cm**. A **10m**	(4)

sample of that wire has mass **1.2g**. Find the speed and fundamental frequency of transverse wave on the wire.

Module-II

13 a) With necessary diagram, write the formation of interference pattern in an air wedge and derive an expression for the diameter of a thin wire. (10)

b) A monochromatic light of wavelength **5893 Å** is incident normally on a soap film of $\mu = 1.42$. What is the least thickness of the film that will appear dark by reflection ? (4)

14 a) Derive the grating equation and describe an experiment to determine the wavelength of light. Define resolving power of a grating with expression. (10)

b) A grating has **6000 lines/cm**. Find angular separation between two wavelengths **577nm** and **579 nm** in the second order. (4)

Module-III

15 a) Derive an expression for energy eigen values and normalised wave function for a particle in a box of width L. (10)

b) Calculate the separation between the two lowest energy levels of an electron in a one dimensional box of width **4Å** in joules. Given $m_e = 9.1 \times 10^{-31}$ kg; $h = 6.625 \times 10^{-34}$ Js (4)

16 a) Write a note on quantum confinement and based on this explain nano sheets, nano wire and quantum dots. (10)

b) Mention any four applications of nanotechnology. (4)

Module-IV

17 a) State Gauss' law in magnetism, Ampere's circuital law, faraday's laws of electromagnetic induction and Lenz's law. Give their equations. (10)

b) A magnetising field of **1800 A/m** produces a magnetic flux of 3×10^{-5} **Wb** in an iron bar of cross – sectional area **0.2 cm^2**. Calculate the permeability. (4)

18 a) Starting from Maxwell's equations derive the expression for the velocity of electromagnetic waves in vacuum. (10)

b) State and explain Poynting's theorem. (4)

Module-V

19 a) Explain the characteristics of Type I and Type II superconductors with appropriate diagrams and examples. (7)

b) Discuss BCS theory of superconductivity. Give any four applications of (7)

superconductivity.

20 a) Explain construction and working of a solar cell and draw its I-V characteristics. Mention any two applications of solar cells. (10)

b) The numerical aperture of an optic fibre **is 0.295** and refractive index of core is **1.54**. Calculate refractive index of cladding and acceptance angle. (4)

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