Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S,FE) Examinations May 2026 (2019 Scheme)

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 Marks

1		Give the differential equation for simple harmonic oscillator and write down its solution	(3)
2		Distinguish between a transverse wave and a longitudinal wave. Give one examples of transverse and longitudinal waves.	(3)
3		Explain the features of a coherent beam.	(3)
4		Write any three differences between interference and diffraction	(3)
5		Write a short note on wave particle duality	(3)
6		Explain quantum dots?	(3)
7		Explain Faraday's law of electromagnetic induction	(3)
8		Define displacement current.	(3)
9		What are the high temperature superconductors?	(3)
10		How intensity modulated and phase modulated photonic sensors differ?	(3)

PART B

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

MODULE 1

11	(a)	With necessary theory explain a forced harmonic oscillator. Formulate its differential equation and obtain its solution. Explain the three conditions with a graph.	(10)
	(b)	A damped harmonic oscillator of mass 1 gram and force constant 9.8 N/m has a damping factor of 2 s^{-1}. Calculate its angular frequency with and without damping	(4)
12	(a)	Derive one dimensional wave equation for transverse vibration of a stretched string and discuss its solution.	(10)
	(b)	A string when stretched by loading a mass of 9 kg gives a note of frequency 256 Hz. Calculate the mass to be loaded on the string to produce a frequency of	(4)

512 Hz?

MODULE 2

13 (a) Explain the theory of formation of Newton's rings with the help of necessary diagrams. Explain the experimental procedure for the measurement of wavelength of a light source by newtons ring method . (10)

(b) A thin wire of 60 micrometre diameter is placed in an air wedge arrangement between two optically flat glass slides at a distance of 3.6 cm from their joining point. Calculate the separation between two adjacent dark bands? Given that sodium vapour lamp of wavelength 589 nm is used. (4)

14 (a) What is a diffraction grating and how it is constructed? Derive the grating equation. How wavelength of a light source can be measured using a grating? (10)

(b) A plane transmission grating has 5400 lines per cm. Find the angular separation between two wavelengths 405 nm and 436 nm in the first order. (4)

MODULE 3

15 (a) Derive the normalised wave function and energy eigen values of particle in a one-dimensional box (10)

(b) Prove quantum mechanically that, electrons cannot be exist in atomic nuclei. (4)

16 (a) Explain quantum confinement of nanomaterials in, one dimension, two dimension and three dimensions. Write any two examples and applications each of these materials. (10)

(b) A gold cube of 1 cm in side is divided in to cubes of side length 1 nm. Calculate the change in surface area and surface area to volume ratios (4)

MODULE 4

17 (a) Define magnetic permeability and susceptibility of materials and obtain the relation between them. Explain how magnetic material are classified? (10)

(b) State and prove Ampere's circuital theorem. (4)

18 (a) Explain the concepts of gradient, divergence and curl with their physical significance. (8)

(b) Starting from Maxwell's equations derive the expression for the velocity of electromagnetic waves in free space. (6)

MODULE 5

19 (a) Explain Meissner effect and distinguish between Type I and Type II superconductors (9)

(b) Explain BCS theory of super conductors (5)

20 (a) Write a detailed note on the principle, working and characteristics of a of a photodiode (8) (7)

(b) Explain the significance of numerical aperture of optical fibre and derive the equation for the numerical aperture of a step index fibre. (7)

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