Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular and Supplementary Examination December 2022 (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 all types of damped harmonic oscillators (3)

2 List two differences between longitudinal and transverse waves and an example of each. (3)

3 Write the condition for minima in reflected light and explain the colours of thin film. (3)

4 Define dispersive power of a grating and write its equation. (3)

5 Write the normalisation condition of a wave function and give the significance of the wave function. (3)

6 Give the significance of surface area to volume ratio in nano materials. (3)

7 State and explain Faraday's laws of electromagnetic induction. (3)

8 Compare displacement current and conduction current. (3)

9 List any four applications of superconductivity. (3)

10 Why should refractive index of cladding be of lower value in comparison with refractive index of core in an optic fibre? (3)

PART B

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

MODULE 1

11 a Write down the differential equation of a forced harmonic oscillator and obtain its solution. (10)

b A transverse wave on a stretched string is described by **$y(x,t)=5\sin(25t+0.016x+\pi/2)$**, where x and y are in cm and t is in second. Obtain (1) Speed (2) Amplitude (3) Frequency and (4) Initial phase of the wave. (4)

12 a Derive the one dimensional wave equation. From the solution of the one dimensional wave equation obtain definitions for wavelength and time period. (10)

	b	A wave of wavelength ***30 cm*** is travelling down a ***300 m*** long wire whose mass is ***15 kg***. If the wire is under tension of ***1 kN***, what is the speed and frequency of the wave?	(4)

MODULE 2

13	a	With a neat diagram explain the formation of dark and bright bands in an air wedge and derive the expression to find the diameter of a thin wire.	(10)
	b	In a Newton's rings experiment, n^{th} dark ring formed by light of wavelength 640 nm coincides with the $(n+1)^{th}$ dark ring for light of wavelength 480 nm . If the radius of curvature of the convex surface is 90 cm, find the diameter of the n^{th} dark ring for light of wavelength 640 nm.	(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	A grating is illuminated at normal incidence. At an angle of diffraction 60^0 a certain order of light of wavelength 600 nm is superimposed on another one of wavelength 480 nm in the next higher order. Evaluate the number of lines per meter of the grating used.	(4)

MODULE 3

15	a	Write down Schrodinger's time dependent equation and hence derive Schrodinger's time independent equation.	(10)
	b	An electron is moving in a one dimensional box of infinite height and width $10A^0$. Calculate the first three permitted energy levels.	(4)
16	a	Mention any eight applications of nano materials.	(8)
	b	What are zero dimensional, one dimensional and two dimensional nano structures?	(6)

MODULE 4

17	a	Compare the properties of dia, para, and ferro magnetic materials.	(10)
	b	The maximum value of the permeability of the material is $0.126\ N/A^2$. What is the relative permeability and magnetic susceptibility?	(4)
18	a	Derive Maxwell's equations in differential form starting from the fundamental laws in electricity and magnetism.	(10)
	b	Derive equation of continuity.	(4)

MODULE 5

19 a Explain Meissner effect and show that superconductors are perfect diamagnets. Discuss BCS theory of superconductivity. (10)

b What is critical magnetic field? How is it related to temperature of superconductor? (4)

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 Explain the working of intensity modulated fibre optic sensor. (4)

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