Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester B.Tech Degree Examination June 2022 (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		Comment the statement "smaller the damping, larger will be the relaxation time and greater the quality factor".	(3)
2		State the laws of vibrations of a stretched string.	(3)
3		Explain the formation of different colours in thin films with example.	(3)
4		What is diffraction? Compare diffraction pattern with interference pattern.	(3)
5		Write the expression for energy of a particle trapped in one dimensional box and find the energy of first excited state.	(3)
6		What is meant by quantum dot and quantum wire?	(3)
7		State Ampere's circuital theorem. Give its mathematical statement.	(3)
8		Define Divergence of a vector function. Give its physical significance.	(3)
9		Write a note on high temperature superconductors with two examples.	(3)
10		Explain the working of a solar cell.	(3)

PART B

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

MODULE 1

11	a)	Discuss the conditions of over damped, critically damped and under damped cases of a damped harmonic oscillator by writing down the differential equation and its solution. With the help of displacement - time graph show that how damping affects the amplitude of the oscillator.	(10)
	b)	Show that LCR circuit acts as an electrical analogue of mechanical oscillator.	(4)
12	a)	Considering the transverse vibrations of a stretched string derive the one dimensional wave equation and show that velocity of the wave v=$\sqrt{T/m}$.	(10)

b) The displacement of a wave is represented by y = $\mathbf{0.25x10^{-3}\ Sin(0.025x - 500t)}$, where x is measured in metres and t in secs. Deduce amplitude, time period, velocity and wavelength? (4)

MODULE 2

13 a) Explain the construction and band formation in Newton's ring apparatus. Derive an equation to find the wavelength of incident monochromatic light. (10)

b) What is an antireflection coating? Find the minimum thickness of antireflection coating (magnesium fluoride of refractive index **1.42**) to be deposited on a glass plate of refractive index**1.5**, for light of wave length **5800Å**. (4)

14 a) Explain resolving power of a grating? Explain the formation of spectra by a plane transmission grating by deriving grating equation. (10)

b) Consider a plane transmission grating having **6000** lines/cm. Find the angular separation between first and second order maxima when a light of wavelength **5500Å** incident normally on it. (4)

MODULE 3

15 a) Derive time dependent Schrodinger equation for a particle moving in a potential V(x). Hence derive time independent Schrodinger equation. (10)

b) State and explain Heisenberg's uncertainty principle. Explain natural line broadening mechanism on the basis of this principle. (4)

16 a) What are nanomaterials? Discuss the mechanical, optical and electrical properties of nano materials. (8)

b) Give any six applications of nanomaterials. (6)

MODULE 4

17 a) Explain the terms (i)Magnetization (ii)Magnetic permeability (iii)Relative permeability and (iv) Susceptibility. Derive the relation between magnetic susceptibility and relative permeability. (10)

b) The magnetic flux through a closed circuit with resistance **2.5Ω** varies with time obeying the equation $\mathbf{\phi = 5t^2 + 2t + 6}$. What will be the induced emf and current in it at time = **5** seconds. (4)

18 a) Starting from the field equations in free space, derive the velocity of electromagnetic waves in free space. How did Maxwell show that light is electromagnetic in nature? (10)

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

MODULE 5

19 a) What is critical temperature and critical field? Write the relation between these two. Explain the conductivity of super conductors using BCS theory. (10)

b) State and explain Meissner effect. Show that superconductors are perfect diamagnets. (4)

20 a) Describe fibre optic communication system with a block diagram. List four advantages of fibre optic communication. (10)

b) The numerical aperture of an optic fibre is **0.38**. If the difference in the refractive indices of the material of its core and the cladding is **0.05**, calculate the refractive index of material of the core. (4)

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