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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S, FE) S2 (S, FE) Examination December 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	Set up the differential equation for a particle executing damped oscillations under the action of an external periodic force.	(3)
2	Show that the function $y=(x+vt)^2$ is a solution to one dimensional wave equation.	(3)
3	Extremely thin film viewed in white light appear dark. Why?	(3)
4	Briefly explain the term resolving power of an optical instrument and also write the expression for resolving power of grating.	(3)
5	Using Heisenberg uncertainty principle, show that electron is not existed inside the nucleus	(3)
6	What are nano materials? Why do these materials exhibit properties different from those of bulk materials?	(3)
7	State and explain Ampere's circuital law.	(3)
8	Compare the displacement current and conduction current.	(3)
9	How does the resistivity of a super conductor depend on temperature?	(3)
10	What do you mean by numerical aperture and acceptance angle in optic fibres?	(3)

PART B

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

MODULE 1

11	a)	Obtain the differential equation of a damped harmonic oscillator and deduce the solution for the under damped condition. Show the graphical variations of displacement w.r.t to time.	(10)
	b)	For a damped oscillator, the mass of the block is 100g. Force constant is 10N/m and damping constant is 10g/s. Examine whether the motion is oscillatory or not?	(4)

12 a) What are harmonic waves? Derive the one-dimensional wave equation and obtain its solutions. (10)

b) A wave of wavelength 0.30m is travelling down a 300m long wire whose total mass is 15Kg. If the wire is under a tension of 1000N, what is the velocity and frequency of the wave? (4)

MODULE 2

13 a) Derive the cosine law and obtain the conditions of brightness and darkness for a thin film in reflected system. (10)

b) An air wedge is formed with two glass plates, each of length 4cm, and a thin wire. The wavelength of light used is 589nm. If 200 fringes are formed from one end to the other of the glass plate, find the radius of the wire. (4)

14 a) Explain the theory and construction of a plane transmission grating and how would you use it to determine the wavelength of light? (10)

b) A parallel beam of monochromatic light is allowed to be incident normally on a plane grating having 4400 lines/cm and a second order spectral line is observed to be deviated through 30^0. Calculate the wavelength of the spectral line. (4)

MODULE 3

15 a) Obtain the time dependent Schrodinger equation from the wave equation and hence deduce the time independent Schrodinger equation. (10)

b) Find the lowest energy of an electron moving in one dimension, in an infinitely high potential box of width $2A^0$, given mass of the electron $=9.11 \times 10^{-31}$ Kg and Planck's constant, $h= 6.63 \times 10^{-34}$ Js. (4)

16 a) Write a short note on quantum confinement. Explain the terms (a) nano sheets (b)nano wire and (c) quantum dots with wave function, energy and diagrams of each. (10)

b) Mention any four applications of nano technology. (4)

MODULE 4

17 a) Distinguish between diamagnetic and paramagnetic materials with two examples for each. (10)

b) A magnetic material has a magnetisation of 3300 A/m and flux density $0.0044 Wb/m^2$. Calculate the magnetizing field and the relative permeability of the material. (4)

18 a) Derive the free space electromagnetic wave equations and show that the velocity of the electromagnetic wave is $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$. How did Maxwell show that light is electromagnetic in nature? (10)

b) Calculate the value of Poynting vector for a 60W bulb at a distance of 0.5m from it. (4)

MODULE 5

19 a) Explain Meissner effect and show that super conductors are perfect diamagnetic materials. (5)

b) Discuss BCS theory of superconductivity. (5)

c) Write a short note on high temperature super conductors. (4)

20 a) Discuss the fibre optic communication system with the help of a block diagram. (8)

b) Discuss briefly the industrial medical and technological applications of optical fibre. (6)

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