Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S1 (Special Improvement) Examinations January 2021 (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		Distinguish between free oscillation and damped oscillation.	(3)
2		Define frequency, wavelength and wave velocity of a wave.	(3)
3		Write a short note on colours of thin films.	(3)
4		What is meant by the phenomenon of diffraction? Why diffraction of light is not evident in daily experience as that of sound?	(3)
5		What are matter waves? Derive the expression for de-Broglie wavelength.	(3)
6		Explain the effect of increased surface to volume ratio in nanomaterials.	(3)
7		State Faradays laws of electromagnetic induction and Lenz's law.	(3)
8		Give the physical significance of curl.	(3)
9		What is critical magnetic field? How is it related to temperature of superconductor?	(3)
10		What is a light emitting diode? Give its working principle.	(3)

PART B

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

Module-I

11	a)	Write down the differential equation of a forced harmonic oscillator and obtain its solution. Derive the expressions for amplitude and phase difference.	(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 an expression for the velocity of transverse waves in a stretched string and state the laws of transverse vibrations.	(10)

b) A piece of wire **60 cm** long and mass **1.2 g**. is stretched by a load of **3 kg**. Find the frequency of the second harmonic. (4)

Module-II

13 a) Starting from the expression of radius of nth dark ring in Newton's rings pattern, describe an experiment to determine the refractive index of a transparent liquid. (10)

b) Two optically plane glass plates of length **0.1m** are placed one over the other with a thin wire at one end, separating the two. The fringes formed with light of wavelength **589.3 nm** are of width **3mm**. Calculate radius of the wire. (4)

14 a) Derive grating equation for a plane transmission grating. Explain resolving power and dispersive power of grating with expressions. (10)

b) When a diffraction grating is used at normal incidence, it is found that the image at **30°** consists of a yellow line of wavelength **5750 Å** of the **nth** order spectrum is superimposed on a blue line of wavelength **4600 Å** of order **(n+1)**. Calculate the number of lines per unit length of grating. (4)

Module-III

15 a) State and explain uncertainty principle. Write the three forms of uncertainty relations. How this principle is used to prove the absence of electron in the nucleus? Given $\mathbf{m_e = 9.1 \times 10^{-31}\ kg;\ h = 6.625 \times 10^{-34}\ Js}$ (10)

b) For an electron in a one dimensional box of width **1Å,** calculate the first three energy levels in **electron volt**. (4)

16 a) Why do nanomaterials exhibit properties different from those of their classical counter parts? Explain the electrical and mechanical properties of nanomaterials. (10)

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

Module-IV

17 a) Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials. (10)

b) Find the relative permeability of a ferromagnetic material if a field strength of **200 A/m** produces a magnetization of **3100 A/m**. (4)

18 a) Starting from Maxwell's equations show that electromagnetic waves are existing in free space and find an expression for velocity. (10)

b) Calculate the value of Poynting's vector at the surface of the sun if the power radiated by sun is **3.8×10^{26} Watts** and its radius is **7×10^{8}m**. (4)

Module-V

19 a) Write a note on high temperature superconductors. Distinguish between Type I and Type II superconductors with appropriate diagrams and examples. (10)

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

20 a) Draw the block diagram of optical fibre communication system and explain its various functional blocks. Mention the advantages of optical fibres over conventional transmission lines. (8)

b) What are sensors? Explain the working of intensity modulated sensor. (6)

****