Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S1 (Special Improvement) Examinations January 2021 (2019 scheme)

Course Code: PHT110

Course Name: ENGINEERING PHYSICS B

(**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 and write the conditions.	(3)
2		List two differences between longitudinal and transverse waves. Give an example for each.	(3)
3		Explain colours of thin films.	(3)
4		What is Rayleigh's criterion of spectral resolution?	(3)
5		State and explain Heisenberg's uncertainty principle.	(3)
6		What is the significance of surface to volume ratio in nanomaterials?	(3)
7		What is echelon effect? How it can be resolved?	(3)
8		What is magnetostriction effect? Give two examples for magnetostrictive materials.	(3)
9		Give any three properties of laser.	(3)
10		Write a short note on intensity modulated sensor.	(3)

PART B

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

Module-I

11	a)	Formulate the differential equation of a forced harmonic motion. Find the expressions for its amplitude and phase.	(10)
	b)	A damped oscillator of mass **2g** has a force constant **10 N/m** and damping constant**2 s^{-1}**. Find the angular frequency with and without damping.	(4)
12	a)	What is a one dimensional wave and derive the one dimensional wave equation. Define wavelength, time period, frequency and wave velocity. Also obtain expressions for them.	(10)
	b)	A string of mass **0.65 kg** is stretched between two supports **30 m** apart. If the	(4)

tension in the string is **160 N**, find the velocity of the wave in the string? How long will a pulse take to travel from one support to the other?

Module-II

13 a) With necessary theory, describe an experiment to determine the diameter of a thin wire using airwedge. (10)

b) A non-reflecting film is to be deposited on a glass surface. What would be the minimum thickness for zero reflection for a light of wavelength**550 nm**? **μ** for the film is **1.334.** (4)

14 a) Give the theory of plane transmission grating and explain intensity distribution. Also define dispersive power and resolving power of grating (10)

b) In Newton's rings experiment the diameters of the **4th** and **12th** dark rings are **0.4cm** and **0.7cm** respectively. Deduce the diameter of **20th**dark ring. (4)

Module-III

15 a) Write the Schrodinger's equation for a particle in a one dimensional potential well and obtain energy eigen values. (10)

b) Compute the de Broglie wavelength of an electron with kinetic energy **4.5 keV**. (4)

16 a) What are nanomaterials? Explain the optical, electrical and mechanical properties of nanomaterials. (10)

b) A microscope using photons is employed to locate an electron in an atom within a distance of**0.2 Å**. What is the minimum uncertainty in the momentum of the electron located in this way? (4)

Module-IV

17 a) Explain reverberation and reverberation time. What is the significance of reverberation time? Write down Sabine's formula for evaluating reverberation time and explain the terms. (10)

b) What is threshold of hearing and threshold of pain intensity? Give their values. (4)

18 a) With a neat diagram explain how the velocity of ultrasonic waves can be determined using ultrasonic diffractometer. (10)

b) Find the frequency of ultrasonic waves that can be generated by a nickel rod of length **4cm** (Young's modulus of nickel= **207GPa** and density=**8900 kg/m^3).** (4)

Module-V

19 a) Explain the terms spontaneous emission, stimulated emission, population inversion, and metastable state with respect to a laser system. (8)

b) Describe with figure the construction and reconstruction of a hologram. (6)

20 a) Develop an expression for numerical aperture of a step index fibre. Explain the fibre optic communication systemwith block diagram. (10)

b) An optic fibre has core of refractive index **1.6** and cladding of refractive index **1.58**. If this fibre is immersed in a liquid of refractive index **1.4**, evaluate numerical aperture and acceptance angle. (4)

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