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## 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)

Ma	x. M	Tarks: 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	(3)
		oscillators and write the conditions.	
2		List two differences between longitudinal and transverse waves. Give an	(3)
		example for each.	
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	(3)
		materials.	
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	(10)
11	a)	Formulate the differential equation of a forced harmonic motion. Find the	(10)
		expressions for its amplitude and phase.	
	b)	A damped oscillator of mass $2g$ has a force constant $10 \text{ N/m}$ and damping	(4)
		constant $2 s^{-1}$ . Find the angular frequency with and without damping.	
12	a)	What is a one dimensional wave and derive the one dimensional wave	(10)
		equation. Define wavelength, time period, frequency and wave velocity. Also	
		obtain expressions for them.	

b) A string of mass **0.65 kg** is stretched between two supports **30 m** apart. If the (4)

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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 (10) thin wire using airwedge.
  - b) A non-reflecting film is to be deposited on a glass surface. What would be the (4) minimum thickness for zero reflection for a light of wavelength550 nm? μ for the film is 1.334.
- 14 a) Give the theory of plane transmission grating and explain intensity distribution. (10)Also define dispersive power and resolving power of grating
  - b) In Newton's rings experiment the diameters of the 4<sup>th</sup> and 12<sup>th</sup> dark rings are (4)
    0.4cm and 0.7cm respectively. Deduce the diameter of 20<sup>th</sup> dark ring.

## Module-III

- 15 a) Write the Schrodinger's equation for a particle in a one dimensional potential (10) well and obtain energy eigen values.
  - 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 (10) properties of nanomaterials.
  - b) A microscope using photons is employed to locate an electron in an atom (4) within a distance of 0.2 Å. What is the minimum uncertainty in the momentum of the electron located in this way?

## Module-IV

- 17 a) Explain reverberation and reverberation time. What is the significance of (10) reverberation time? Write down Sabine's formula for evaluating reverberation time and explain the terms.
  - 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 (10) determined using ultrasonic diffractometer.
  - b) Find the frequency of ultrasonic waves that can be generated by a nickel rod of (4) length 4cm (Young's modulus of nickel= 207GPa and density=8900 kg/m<sup>3</sup>).

## Module-V

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

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- 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 (10) fibre optic communication system with block diagram.
  - b) An optic fibre has core of refractive index 1.6 and cladding of refractive index (4)
    1.58. If this fibre is immersed in a liquid of refractive index 1.4, evaluate numerical aperture and acceptance angle.

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