Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular and Supplementary Examination December 2020 (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	List any six points to compare mechanical and electrical oscillators.	(3)
2	Derive one dimensional wave equation	(3)
3	Explain the principle and working of antireflection coatings.	(3)
4	Distinguish between Fresnel and Fraunhofer classes of diffraction.	(3)
5	Listany two characteristics of matter waves. Find the expression for de Broglie wavelength.	(3)
6	Define zero,one and two dimensional nanomaterials.	(3)
7	How echo is different from reverberation?	(3)
8	Write a note on SONAR. Give any two uses of it.	(3)
9	Define metastable state and population inversion.	(3)
10	Differentiate between step index and graded index fibre.	(3)

PART B

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

Module-I

11	a)	Frame the differential equation of a damped harmonic motion and obtain its solution. Mention the different cases.	(10)
	b)	The frequency of a tuning fork is **300Hz**. If its Q- factor is **$5X\ 10^4$**, find the time after which its energy becomes **$(1/10)^{th}$** of its initial value.	(4)
12	a)	Discuss the propagation of a transverse wave along a stretched string and derive the expression for frequency.	(10)
	b)	A uniform steel wire has length **10m** and mass **2 kg**. Find the Tension in the string if the speed of transverse wave on the wire is **340m/s**.	(4)

Module-II

13 a) Explain the formation of Newton's rings. Obtain the expression for finding the wavelength of light. (10)

b) An air wedge is formed using two optically plane glass strips of length **15cm**. A spacer of thickness **0.015 mm** is introduced at one end. If the light used is of wavelength **5893Å**, find the separation between consecutive bright fringes. (4)

14 a) What is grating? Give the theory of plane transmission grating. How can it be used to find the wavelength of light? (10)

b) A plane transmission grating has **6000 lines/cm**. It is used to obtain a spectrum of light from sodium lamp in **second** order. Calculate the angular separation between two sodium lines of wavelength**5890 Å**and **5896 Å.** (4)

Module-III

15 a) Starting from a plane wave equation,obtain Schrodinger's time dependent equation, by using de Broglie's formula and Einstein's relation for photon energy. (9)

b) Using position - momentum uncertainty relation show that electrons cannot exist in the nucleus. (5)

16 a) Explain the mechanical, electrical and optical properties of nanomaterials. (9)

b) Mention any five applications of nanotechnology. (5)

Module-IV

17 a) Explain the terms absorption coefficient and reverberation time. What is thesignificance of reverberation time? Discuss the factors on which the reverberation time depends and write the Sabine's formula. (10)

b) A hall has dimensions of **25m×20m×8m**. The reverberation time is **4s**.Determine the average absorption coefficient of the surfaces. (4)

18 a) What is meant by magnetostriction effect?Give two examples for magnetostrictive materials. Explain the production of ultrasonic waves by magnetostriction method. Mention any two medical applications of ultrasonic waves. (10)

b) A quartz crystal of **2mm** is vibrating at resonance. Calculate the fundamental frequency of vibration, if Young`s modulus of quartz is **$8.5X10^{10}$ N/m^2** and density**$3000Kg/m^3$.** (4)

Module-V

19	a)	Explain construction and working of Ruby laser.	(10)
	b)	Describe the recording of hologram	(4)
20	a)	Define numerical aperture of an optical fibre. With a neat diagram derive an expression for numerical aperture of a step index fibre.	(10)
	b)	The sum of refractive indices of core and cladding is **2.9** and difference is **0.03**. Determine numerical aperture and acceptance angle of optical fibre.	(4)

****