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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S,FE) Examinations May 2026 (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		What do you mean by quality factor of an oscillator? Write the expression of Q-factor in terms of relaxation time.	(3)
2		State laws of vibrations in a stretched string.	(3)
3		Extremely thin films viewed in white light appear dark. Why?	(3)
4		Define diffraction of light. What is the condition for diffraction?	(3)
5		What is meant by wave function? Give its physical significance.	(3)
6		What is the significance of surface to volume ratio in nanomaterials?	(3)
7		Define intensity of sound waves. Distinguish between threshold of hearing and threshold pain intensities.	(3)
8		What is meant by NDT? How ultrasonic waves are used for it?	(3)
9		Distinguish between spontaneous and stimulated emissions.	(3)
10		Draw a block diagram of optic communication system and explain its parts	(3)

PART B

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

MODULE 1

11	(a)	Derive the differential equation of a damped harmonic oscillator and obtain its solution. Mention the conditions of over damped, critically damped and under damped cases of a harmonic oscillator and represent these conditions graphically.	(10)
	(b)	For a forced harmonic oscillator, the amplitude of oscillation increases from 0.03mm at a very low driving frequency to 4 mm at frequency 100 Hz. Find Q factor, damping constant and relaxation time.	(4)
12	(a)	Derive the differential equation for the propagation of a one-dimensional wave	(10)

in a stretched string and deduce expression for the velocity and frequency of transverse wave.

(b) A transverse wave on a stretched string is described by Y= 4.0 sin (25t+0.016x), where x and Y are in expressed in cm and t is in second. Find amplitude, wavelength, frequency and speed of the wave. (4)

MODULE 2

13 (a) How an air wedge arrangement can be constructed? Explain the formation of interference pattern by air wedge. Obtain an expression for fringe width in a wedge-shaped air film. (10)

(b) A parallel beam of light of wavelength 5890 Å is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is 60^0. Calculate the smallest thickness of the glass plate which will appear dark by reflection. (4)

14 (a) What is plane transmission grating? Derive the grating equation. How spectrum of white light can be formed by a grating? (10)

(b) A parallel beam of light falls normally on a grating with 6000 lines per cm. The first order principal maximum is formed at 15^0. Calculate wavelength of light used. (4)

MODULE 3

15 (a) Formulate Schrodinger's time dependent equation. (10)

(b) Calculate the de-Broglie wavelength of an electron moving with a kinetic energy of 100 eV. (4)

16 (a) What is quantum confinement in nanotechnology? Compare zero dimensional, one dimensional and two dimensional nanosystems. (10)

(b) Explain the electrical and mechanical properties of nanomaterials. (4)

MODULE 4

17 (a) Explain any five factors affecting the acoustics of a building and give their remedies. (10)

(b) A cinema hall has a volume of 10000 m^3. It is required to have a reverberation time of 2 seconds. What should be the total absorption of the hall? (4)

18 (a) With a neat diagram explain how ultrasonic waves are produced by piezoelectric oscillators. (10)

(b) A nickel rod of length 10cm is used in a magnetostriction oscillator. Calculate

the frequency of ultrasonic waves generated. Young's modulus of nickel is 210×10^9 N/m^2 and density of nickel is 8900 kg/m^3. (4)

MODULE 5

19 (a) Explain the principle and working of Ruby Laser with the help of a (10)

(b) Describe the recording of hologram. (4)

20 (a) What is numerical aperture of an optic fibre cable? Derive an expression for numerical aperture of an optic fibre cable. (10)

(b) An optic fibre has an acceptance angle of 30^0. If the refractive index of core is 1.4, calculate numerical aperture and refractive index of cladding. (4)

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