Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester B.Tech Degree (R,S) Examination May 2024 (2019 Scheme)

Course Code: PHT 110

Course Name: ENGINEERING PHYSICS B

(2019 -Scheme)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks Marks

1	Define quality factor and relaxation time of a damped harmonic oscillator. What are the factors affects the quality factor?	(3)
2	List two differences between longitudinal and transverse waves. Give one example for each.	(3)
3	How will you test the planeness of a surface using air wedge?	(3)
4	Distinguish between Fresnel and Fraunhofer classes of diffraction.	(3)
5	What is quantum mechanical tunnelling? Name two electronic devices based on this phenomena.	(3)
6	Gold is chemically reactive in its nano scale form, but it is inert in its bulk form. Explain.	(3)
7	Distinguish between musical sound and noise.	(3)
8	What is SONAR? Write any one application of SONAR.	(3)
9	Differentiate between spontaneous emission and stimulated emission.	(3)
10	Explain the working of phase modulated fibre optic sensor	(3)

PART B

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

MODULE 1

11	a) Formulate the differential equation of a forced harmonic motion. Find the expressions for its amplitude and phase.	(10)
	b) In the case of a forced harmonic oscillator, the amplitude of vibrations increases from 0.05 mm at very low frequencies to a value 7.5mm at the frequency 210Hz. Find Q- factor, damping constant and relaxation time.	(4)

12 a) Obtain an expression for fundamental frequency of transverse vibrations in a stretched string. (10)

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

MODULE 2

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

b) A wedge air film is enclosed between glass plate separated at one edge by a wire of 60 μm diameter at a distance of 0.15m from the edge. Calculate the fringe width. The wavelength of light used is 600 nm. (4)

14 a) Explain Rayleigh's criterion for spectral resolution. Discuss the theory of diffraction at a plane transmission grating. Derive the condition for diffraction maxima (the grating equation). (10)

b) A grating has 6000 lines/cm. Find the angular separation of the two yellow lines of mercury of wavelengths 577 nm and 579.1 nm in the second order. (4)

MODULE 3

15 a) What is uncertainty principle? Explain any two applications of uncertainty principle. (10)

b) An electron is confined to a one-dimensional box of side 4.5 Å. Obtain the first two eigen values of the electron in eV. (4)

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

b) Briefly explain any five applications of nanotechnology. (5)

MODULE 4

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

b) A hall has a volume of $7500m^3$. What should be the total absorption in the hall, if a reverberation time of 2.3s is to be maintained? (4)

18 a) With a neat circuit diagram explain the principle and working of magnetostriction oscillator. (10)

b) A quartz crystal of thickness 0.05m is vibrating at resonance. Find the fundamental frequency. Young's modulus of quartz = $8x10^{10}N/m^2$, density of quartz = $2.65x10^3Kg/m^3$. (4)

MODULE 5

19	a) Explain the construction and working of a ruby laser with schematic and energy level diagrams.	(10)
	b) Explain the reconstruction of a hologram	(4)
20	a) With a block diagram explain the working of an optical fibre communication system. Why fibre optic communication system is preferred over other types of communication techniques? Give any three applications of optical fibres.	(10)
	b) Calculate the numerical aperture, acceptance angle of an optical fibre. The refractive index of the core is 1.5 and that of cladding is 1.45.	(4)

****