Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S, FE) S2 (S, FE) Examination December 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	Mention three cases of damping. Draw their displacement –time graphs.	(3)
2	State the laws of transverse vibration of a stretched string.	(3)
3	Write down the expression for the radius of nth dark ring in Newton's ring. Explain with reason what happens to the radius when air is replaced by a liquid of refractive index μ?	(3)
4	What is Rayleigh's criterion of spectral resolution?	(3)
5	What is de Broglie hypothesis of matter waves? Write the equation of de Broglie wave length	(3)
6	Define zero,one and two dimensional nanomaterials.	(3)
7	Define threshold of hearing intensity. What is its value?	(3)
8	Mention the properties of ultrasonic waves and list its significant industrial and medical applications?	(3)
9	What are the difference between holography and photography?	(3)
10	Draw the block diagram of fibre optic communication system.	(3)

PART B

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

MODULE 1

11	a) Write down differential equation of a damped harmonic oscillator and obtain its solution. Show that, in underdamping condition, amplitude is an exponentially decaying quantity.	(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) Derive an expression for the velocity of transverse waves in a stretched string (10)

b) A wave of wavelength 30cm is travelling through a 300m long wire whose mass is 15kg. If the wire is under tension of 1kN, compute the speed and frequency of the wave. (4)

MODULE 2

13 a) Explain air wedge arrangement with neat diagram, deduce the expression for band width of air wedge arrangement and hence the diameter of thin wire using this setup. (10)

b) Light of wavelength 5893Å is reflected at nearly normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that will appear (i) dark and (ii) bright? (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) What is the highest order spectrum which may be obtained with a light of wavelength 650 nm by means of a plane transmission grating having 5000 lines per cm? (4)

MODULE 3

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

b) Calculate the de-Broglie wavelength of electron whose kinetic energy is 10keV. (4)

16 a) What is quantum confinement in nanotechnology? Explain nanosheet, nanorod and quantum dot. (9)

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

MODULE 4

17 a) Explain reverberation and reverberation time? What is the significance of Reverberation time? Explain the factors affecting the acoustics of a building and their corrective measures. (10)

b) A hall has dimensions of **25mX20mX8m**. The reverberation time is 4s.Determine the average absorption coefficient of the surfaces. (4)

18 a) What is meant by piezoelectric effect? Give two example for piezoelectric crystals. Explain the production of ultrasonic waves using piezoelectric oscillator. (10)

b) Given that the velocity of ultrasonic waves in sea water is equal to 1440m/s. Find the depth of a submerged submarine if an ultrasonic pulses reflected from the submarine is received 0.52 s after sending ultrasonic waves. (4)

MODULE 5

19 a) With a neat diagram explain the construction and working of He-Ne laser (10)

b) With diagram explain the process of recording a hologram. (4)

20 a) What is numerical aperture and acceptance angle of optic fibre cable? How are they related? Derive an expression for numerical aperture of an optical fibre cable in terms of refractive indices of core and cladding. (10)

b) An optic fibre has an acceptance angle of 45^0 . If the refractive index of core is 1.57, calculate numerical aperture and refractive index of cladding. (4)

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