Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION(2019 SCHEME), DECEMBER 2019

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.

1	Derive the differential equation of a damped harmonic oscillator	(3)
2	Find the equation of a progressive wave of amplitude 2cm, frequency 1 Hz and velocity 20 cm/s moving along positive x-axis.	(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 de Broglie hypothesis of matter waves? Write the equation of de Broglie wave length	(3)
6	Give three medical applications of nanotechnology.	(3)
7	What is meant by intensity of sound? Give the equation connecting intensity and amplitude.	(3)
8	What are ultrasonic waves? Mention any fourproperties of them.	(3)
9	What is an optical resonator? Explain its role in laser emission.	(3)
10	Discuss the advantages of optical fibre over conventional transmission lines.	(3)

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

Module-I

11	a)	What is amplitude resonance? Give any two examples. Derive an expression for resonant frequency. What is sharpness of resonance?	(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 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-II

13 a) Explain how Newton's rings are formed? Show that the radius of dark ring   (10)
        formed by Newton's rings is proportional to square root of the order of the
        ring.

    b) Light of wavelength **5893Å** is reflected at nearly normal incidence from a   (4)
        soap film of refractive index **1.42**. What is the least thickness of the film that
        will appear (i) dark and (ii) bright?

14 a) What is a plane transmission grating? Derive the grating equation. What is   (10)
        Rayleigh's criterion for spectral resolution?

    b) What is the highest order spectrum which may be obtained with a light of   (4)
        wavelength **650 nm** by means of a plane transmission grating having
        5000 lines per cm?

Module-III

15 a) Derive Schrodinger's time dependent equation and hence obtain time   (10)
        independent equation.

    b) Explain the absence of electron in the nucleus.   (4)

16 a) Write the significance of material at nanoscale and explain the quantum   (10)
        confinement in nanomaterials.

    b) Discuss quantum mechanical tunnelling and give two examples.   (4)

Module-IV

17 a) Explain any six factors affecting acoustics of a hall and give their remedial   (9)
        measures.

    b) An auditorium has dimensions **45m X 10m X 8m**. The average absorption   (5)
        coefficients of wall, ceiling and floor are **0.8, 0.4** and **0.5** respectively.
        Evaluate reverberation time of the hall.

18 a) What is inverse piezoelectric effect? How is ultrasonic wavesdetected using   (10)
        piezoelectric effect? What is NDT? Explain any one NDT method.

    b) Calculate the fundamental frequency of vibration of quartz crystal of   (4)
        thickness **8mm** at resonance if its Young`s modulus is
        $Y = 7.9 \times 10^{10} N/m^2$ and density $=2650 kg/m^3$.

Module-V

19 a) Explain the construction and working of a ruby laser with schematic and   (10)
        energy level diagrams.

    b)   What are Einstein's coefficients?Give their significance in lasing action.   (4)

20   a)   Explain total internal reflection. With the help of a neat diagram derive   (10)
           expression for numerical aperture of a step index fibre.

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

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