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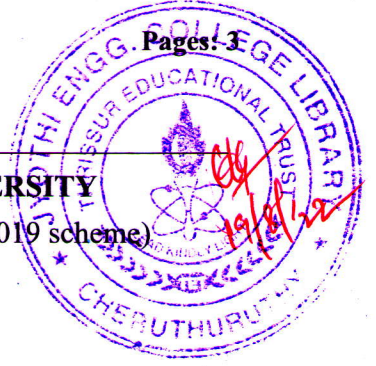
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Second Semester B.Tech Degree Examination June 2022 (2019 scheme)



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

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|----|----------------------------------------------------------------------------------------------------------------------------------|-----|
| 1 | Distinguish between free oscillation and damped oscillation. | (3) |
| 2 | What will happen to fundamental frequency when length of string reduced to one third of original length kept under same tension? | (3) |
| 3 | Why thin transparent films appear to be beautifully coloured under sunlight? | (3) |
| 4 | Write any three difference between Fresnel and Fraunhofer diffraction? | (3) |
| 5 | Give the physical significance of the wave function. | (3) |
| 6 | What are the reasons for the change of properties of materials at nano sizes? | (3) |
| 7 | Distinguish between musical sound and noise? | (3) |
| 8 | Mention the properties of ultrasonic waves and list its significant industrial and medical applications? | (3) |
| 9 | What do you mean by pumping in lasers? List any three pumping methods used. | (3) |
| 10 | Draw a properly labelled block diagram of a fibre optic communication system. | (3) |

PART B

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

MODULE 1

- 11 (a) Write the differential equation of a forced harmonic oscillator and find its solution. Derive an expression for amplitude and phase difference. (10)
- (b) A simple harmonic wave is represented by $y=8\sin 2\pi(t/0.05 - 0.05x)$. Find wavelength, wavevector, amplitude and velocity of wave. Also find displacement of particle **40cm** from the origin and **2s** after the start of motion. (x,y in cm and t in second). (4)

- 12 (a) Derive an expression for the velocity of transverse waves in a stretched string and state the laws of transverse vibrations. (10)
- (b) The amplitude of an undamped harmonic oscillator reduces to **1/10 th** of its initial value after **100** oscillations. Its time period is **1.15 s**. Find the damping constant and relaxation time. (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) Newton's rings are observed by source emitting light of wavelength $\lambda_1=3000\text{\AA}$ and $\lambda_2=2500\text{\AA}$. It is found that n^{th} dark ring due to λ_1 coincides with $(n+1)^{\text{th}}$ dark ring due to λ_2 . If the radius of curvature of lens is **90cm**, calculate the diameter of n^{th} dark ring of λ_1 . (4)
- 14 (a) Explain the construction of a grating and derive grating equation. (10)
- (b) A plane transmission grating of length **6cm** has **5000lines/cm**. Find the resolving power of grating and the smallest wavelength difference that can be resolved for light of wavelength **5000\AA** in the second order. (4)

MODULE 3

- 15 (a) Apply Schrodinger equation to derive the energy values and normalised wave functions for a particle confined to an infinite potential box of width L. (10)
- (b) Explain the phenomenon of quantum mechanical tunnelling with any two examples. (4)
- 16 (a) Write a note on quantum confinement and based on this explain nano sheets, nano wire and quantum dots. (10)
- (b) Write any four applications of nanotechnology in medical field. (4)

MODULE 4

- 17 (a) What is Piezo electric effect? Explain with a circuit diagram the generation of ultrasonics using a piezo electric oscillator. (10)
- (b) A quartz crystal of thickness **1mm** is vibrating at resonance. Calculate the fundamental frequency, given Youngs modulus= $7.9 \times 10^{10} \text{N/m}^2$ and density= 2650Kg/m^3 . (4)

- 18 (a) Explain the terms i) Decibel ii) Sabine's formula iii) reverberation iv) reverberation time v) echo. (10)
- (b) A cinema hall has a volume of 20000m^3 . It is required to have a reverberation time of 4s. What should be the total absorption of the hall? (4)

MODULE 5

- 19 (a) With properly labelled diagrams, explain the construction and working of He-Ne Laser. (10)
- (b) Calculate the acceptance angle and critical angle for a step index fibre whose refractive indices are 1.5 (core) and 1.45 (cladding). The launching medium is air. (4)
- 20 (a) What do you mean by acceptance angle and acceptance cone of an optical fibre? Obtain the expression for the acceptance angle of an optic fibre. (10)
- (b) Distinguish between spontaneous and stimulated emissions. (4)
