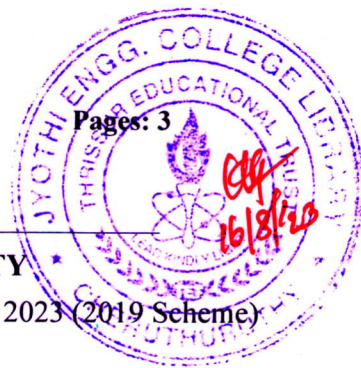


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester B.Tech Degree Regular and Supplementary Examination June 2023 (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 | What is amplitude resonance? How is the effect of damping related to sharpness of resonance? | (3) |
| 2 | Differentiate longitudinal waves from transverse waves. | (3) |
| 3 | Write down the expression for the radius of n^{th} 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 meant by optical path? Give the relation between geometrical path and optical path. | (3) |
| 5 | What do you mean by quantum confinement in nanomaterials? | (3) |
| 6 | Define nanotechnology. Write any 4 applications of nanomaterials. | (3) |
| 7 | List and explain three characteristics of musical sound. | (3) |
| 8 | What is sonar? Write an application of sonar. | (3) |
| 9 | Write the difference between step index fibre and graded index fibre. | (3) |
| 10 | How is a hologram recorded? | (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 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) |

- 12 a) Derive an expression for the fundamental frequency of transverse waves in a stretched string. Also state the laws of vibrations of a stretched string. (10)
- b) The frequency of a tuning fork is **300 Hz** and its Q factor is 5×10^4 . Find the relaxation time. Also calculate the time after which its energy becomes $(1/10)^{\text{th}}$ of its initial undamped value. (4)

MODULE 2

- 13 a) Explain with the help of figure, how air wedge can be used to determine the diameter of a thin wire. What will be the nature of the fringe pattern if monochromatic source is replaced by white light? (10)
- b) A plane grating just resolves two lines in the second order. Calculate the grating element, if $d\lambda = 1 \text{ \AA}$, $\lambda = 6000 \text{ \AA}$ and the width of grating is **2cm**. (4)
- 14 a) Derive grating equation for a plane transmission grating. Explain the resolving and dispersive powers of a transmission grating with their equations. (10)
- b) Light of wavelength **5893 \AA** 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 as dark? (4)

MODULE 3

- 15 a) Write down the Schrodinger equation for a particle in a one-dimensional infinite potential well. Also derive the equation for wave function and energy for a particle in a 1-D Box. (10)
- b) Calculate the de-Broglie wavelength of electron whose kinetic energy is **10keV**. (4)
- 16 a) State Heisenberg's uncertainty principle. Write its mathematical form with different pairs of variables. With the help of it, explain the absence of electrons inside the nucleus of an atom. (10)
- b) Define surface to volume ratio of nano materials. How surface to volume ratio of nano material is related to the size of the particle. (4)

MODULE 4

- 17 a) Write any five factors affecting acoustics of a hall. How is it remedied? (10)
- b) A quartz crystal of thickness **0.05m** is vibrating at resonance. Find the fundamental frequency. Young's modulus of quartz = $8 \times 10^{10} \text{ N/m}^2$ Density of quartz = $2.65 \times 10^3 \text{ Kg/m}^3$. (4)
- 18 a) With a neat circuit diagram explain the principle and working of magnetostriction oscillator. (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)

MODULE 5

- 19 a) Explain with suitable diagrams, the principle, construction and working of Helium Neon laser. (10)
- b) What is the difference between spontaneous emission and stimulated emission? (4)
- 20 a) With a block diagram, explain the working of an optical fibre communication system. Write any three advantages of optical fibre communication? (8)
- b) Write a note on an intensity modulated and phase modulated fibre optic sensor. (6)
