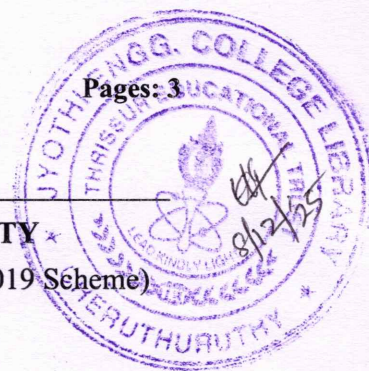Reg No.:_____       Name:_____

## APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S1 (S,FE) S2 (S,FE) Degree Examination December 2025 (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

| | | |
|---|---|---|
| 1 | List any six points to compare electrical oscillator with a mechanical oscillator. | (3) |
| 2 | Distinguish between transverse wave and longitudinal waves with examples. | (3) |
| 3 | What is the relation between phase difference and path difference. | (3) |
| 4 | Why are Newtons rings circular and centre of the ring system is dark? | (3) |
| 5 | What are matter waves? Derive the expression for de-Broglie wavelength. | (3) |
| 6 | How does the high surface area to volume ratio change the properties of nano materials? | (3) |
| 7 | Differentiate reverberation and echo. | (3) |
| 8 | Define Absorption coefficient , sound absorption and give their relation. | (3) |
| 9 | Explain the roles of (i) Reference wave and (ii) Object wave in holography. | (3) |
| 10 | Can a laser produce more than one wavelength? Justify your answer. | (3) |

## PART B

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

### MODULE 1

11 (a) Derive the differential equation of a damped harmonic oscillator and find its solution. Explain the time displacement curve of over damped, critically damped and under damped cases. (10)

    (b) The equation of transverse wave vibration of a stretched string is given by $\psi=5\sin 5\pi(x/50 -t/0.02)$ where x and $\psi$ are in cm and t in s. Find the frequency and wavelength, wavevector, amplitude and velocity. (4)

12 (a) Derive the expression for frequency of transverse vibrations in a stretched string. Write expression for second harmonic frequency. (10)

(b) A rope of mass **0.55Kg** is stretched between two supports **30 m** apart. If (4) the tension in the rope is **150N**. What time will a pulse take to travel from one support to the other?

## MODULE 2

13 (a) Explain interference in thin films and derive Cosine law. (10)

(b) Newtons rings are observed with two different medium between glass surface. The rings have diameters in the ratio **10:7**.Find the ratio of refractive indices of (4) the two media.

14 (a). What do you mean by resolving power and dispersive power of an optical (10) instrument? Explain Rayleigh's criterion for limit of resolution. Obtain the expression for resolving power and dispersive power of grating.

(b) A plane grating just resolves two lines in the $2^{nd}$ order. Calculate the grating (4) element if $\lambda$=**5500Å** and d$\lambda$ =**1Å** and the length of ruled surface is **2cm**.

## MODULE 3

15 (a) What are the essential requisites for a well behaved wave function for a given (4) system?

(b) Deduce the time independent Schrodinger equation from time dependent (10) equation.

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

(b) Distinguish between zero-, one- and two-dimensional nano materials. (5)

## MODULE 4

17 (a) Briefly explain two methods for the detection of ultrasonic waves. List any four (10) medical applications of ultrasonic waves.

(b) Explain inverse piezoelectric effect . (4)

18 (a) What are the characteristics of a musical sound? Explain the factors affecting (10) acoustics of a building and list their remedies.

(b) The dimension of auditorium is **80x20x10** and its average absorption coefficient (4) **is 0.32**.Find the reverberation time of auditorium.

## MODULE 5

19 (a) With properly labelled diagram, explain the construction and working of Ruby (10) Laser.

(b) The numerical aperture of a step index fibre of core diameter 100 $\mu$m is **0.26**. If the refractive index of the core is **1.5**, find (i)the refractive index of the cladding and (ii) acceptance angle (4)

20 (a) Explain the kinds of interaction between light and matter and obtain Einstein's relations. (10)

(b) Compare graded index fibre with step index fibre. (4)

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