

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SECOND SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023****(2020 SCHEME)****Course Code : 20PHT110****Course Name: Engineering Physics B****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Explain resonance in oscillating system with an example.
2. Deduce the wavelength, velocity and frequency of the wave represented by  $y = A \cos(kx - \omega t)$ .
3. Why does a soap bubble show beautiful colours, when illuminated by white light?
4. List three differences between interference and diffraction fringes.
5. Estimate the energy in eV of a Helium atom having a de-Broglie wavelength of 0.1 nm (Mass of Helium atom =  $6.6 \times 10^{-27}$  kg).
6. Write any 3 applications of nanotechnology?
7. Define absorption coefficient and reverberation time. Write the relation which connects these two.
8. What are ultrasonic waves? Mention two of its applications.
9. What are the main components of a laser? Draw a schematic diagram showing the components of a laser.
10. Explain the working of intensity modulated fibre optic sensor.

**PART B*****(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Derive the differential equation of damped harmonic oscillator and deduce its solution. Using graph discuss the possible cases. ( 10 )  
b) An oscillator has mass 10 gram, force constant 0.49 N/m and damping constant ( $\lambda$ )  $10^{-3}$  Ns/m. Calculate Q-factor? ( 4 )

**OR**

12. a) Discuss transverse vibration in stretched string and obtain ( 10 )

expression for fundamental frequency of vibration.

- b) Compare Transverse and Longitudinal waves with one example each. ( 4 )

**MODULE II**

13. a) Explain the formation of Newton's Rings. With a neat diagram explain how Newton's Ring's arrangement can be used to determine the diameter of the  $n$ th dark ring. ( 10 )
- b) Newton's rings are observed normally in reflected light of wavelength  $5.9 \times 10^{-5} \text{ cm}$ . The diameter of the 10<sup>th</sup> dark ring is 0.50 cm. Find the radius of curvature of the lens. ( 4 )

**OR**

14. a) Compare two types of diffraction? What is a diffraction grating? With the help of a diagram derive grating equation. ( 10 )
- b) Explain dispersive and resolving power of a grating. ( 4 )

**MODULE III**

15. a) Use Schrodinger's wave equation to derive energy eigen values of a particle which is trapped in a box of width  $a$ . Also, find the normalised wave function. ( 10 )
- b) How does Heisenberg's uncertainty principle help us to decide whether electron can exist inside the nucleus or not? ( 4 )

**OR**

16. a) How the mechanical properties are changed due to nano sized reduction of the materials? Explain three kinds of confined structures that are defined depending on the dimension of confinement. ( 10 )
- b) Explain surface to volume ratio of nano materials? ( 4 )

**MODULE IV**

17. a) Write short notes on intensity of sound with special reference to threshold hearing intensity and threshold pain intensity. Discuss any six factors affecting the acoustics of buildings and give their remedies. ( 10 )
- b) A classroom has dimensions  $20 \times 15 \times 15 \text{ m}^3$ . The reverberation time is 3.5 s. Calculate the total absorption of its surfaces and the average absorption coefficient. ( 4 )

**OR**

18. a) Define Magnetostriction effect. Draw a circuit diagram of a magnetostriction oscillator and explain its working. ( 10 )
- b) An ultrasonic source of 0.07 MHz sends down a pulse towards the sea bed, which returns after 0.65 s. The velocity of sound in sea water is 1700 m/s. Calculate the depth of the sea and the wavelength of the pulse. ( 4 )

**MODULE V**

19. a) Explain the recording and reading of a hologram. Write any three differences between holography and photography. ( 10 )
- b) Distinguish between spontaneous and stimulated emission. ( 4 )

**OR**

20. a) What is the principle behind the propagation of light through optical fibre? What is numerical aperture? Derive an expression for numerical aperture. ( 10 )
- b) Distinguish step index and graded index fibres with fibre profiles. ( 4 )

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