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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2022

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. Compare electrical oscillator with a mechanical oscillator.
2. Distinguish between transverse and longitudinal waves with examples.
3. What are antireflection coatings? Give the expression for the thickness.
4. Distinguish between Fresnel and Fraunhofer diffraction.
5. What is quantum mechanical tunneling? Give two examples.
6. Explain the electrical and optical properties of nanostructured materials.
7. What is meant by reverberation time? Write the Sabine's formula and explain the terms.
8. What is NDT? Describe the pulse echo method.
9. What is an optical resonator? Explain its role in laser emission.
10. Draw a neat and labeled block diagram of fiber optic communication system.

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

MODULE I

11. a) Set up the equation of motion for a damped harmonic oscillator. What are the conditions for overdamped, critically damped and under damped cases. Represent graphically. (10)

    b) Calculate the resonating frequency, relaxation time and Q-factor of the circuit containing 4 μF capacity, 5 mH inductance and 0.9 ohm resistance. (4)

OR

12. a) Derive an expression for the fundamental frequency of a transverse wave in a stretched string. (10)

    b) A wave of wavelegth 60 cm is travelling through a 150 m long wire whose mass is 25 kg. If the wire is under tension of 2 kN, compute the speed and frequency of the wave. (4)

MODULE II

13. a) Derive the expression for the diameter of the nth dark ring in Newton's ring interference pattern. Why the central fringe is dark? (10)

b) A monochromatic light of wavelength 5893 Å is incident normally on a soap film of μ = 1.42. What is the least thickness of the film that will appear dark by reflection? (4)

OR

14. a) Give the theory of plane transmission grating and explain how you use it to determine the wavelength of light. Also define dispersive power and resolving power of grating. (10)

b) How many orders will be visible if the wavelength of incident radiation is 4000 Å and the number of lines on the grating is 2500 per cm? (4)

MODULE III

15. a) Assuming one dimensional time independent Schrodinger wave equation for a particle in a one-dimensional potential box, obtain the energy Eigen values and the normalized wave function. (10)

b) An electron is confined to one dimensional potential box of length 3 Å. Calculate the difference in energies corresponding to the lowest two energy levels in eV. (Given 1 eV = 1.6×10^{-19} J, m_e=9.1 x 10^{-31}kg) (4)

OR

16. a) What is the importance of surface to volume ratio in nanomaterials? Explain the quantum confinement in zero, one and two dimensional nanomaterials. (10)

b) Describe briefly any four applications of nanotechnology. (4)

MODULE IV

17. a) What are the characteristics of musical sound. Explain any seven factors affecting acoustics of a hall and give their remedial measures. (10)

b) An auditorium has dimensions 45 m × 10 m × 8 m. The average absorption coefficients of wall, ceiling and floor are 0.8, 0.4 and 0.5 respectively. Evaluate reverberation time of the hall. (4)

OR

18. a) Draw the circuit diagram of a magnetostriction oscillator and explain its working. (10)

b) Find the natural frequency of 40 mm length of pure iron with density 2.75×10^3 kg/m^3 and Y = 115×10^9 N/m^2. (4)

MODULE V

19. a) Discuss the construction and working of a ruby laser. (10)

b) What is the difference between holography and photography? (4)

OR

20. a) Distinguish between step index and graded index fiber. Derive the expression for numerical aperture in a step index fiber. (10)

b) A ray of light enters from air to fiber. The fiber has refractive index of core = 1.5 and that of cladding = 1.48. Calculate the critical angle, numerical aperture and acceptance angle. (4)

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