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

SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

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

FIRST SEMESTER B.TECH DEGREE EXAMINATION(R), MARCH-APRIL 2021

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 and mechanical oscillators.
2. Write down the one-dimensional wave equation. What is its three-dimensional equivalent?
3. Write the working of an anti-reflection coating.
4. What is Rayleigh's criterion for limit of resolution? Define resolving power of a grating.
5. What is the physical significance of a wavefunction? Write the normalization condition.
6. Explain the effect of surface to volume ratio of nanomaterials.
7. Distinguish between Intensity and loudness of sound. Mention its units.
8. Define Piezoelectric effect and Magnetostriction effect.
9. Explain the role of Population Inversion and Metastable state in laser action.
10. Explain the principle of light propagation in optical fibre. Mention any two applications of optical fibre.

PART B

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

MODULE I

11. a) Frame the differential equation of a damped harmonic oscillator and obtain its solution. Discuss the different cases of damping. (10)

    b) The string of violin 36 cm long and has a mass of 0.2 gm. With what tension it must be stretched to tune 1000 Hz? (4)

OR

12. a) Considering the transverse vibrations in a stretched string, derive the differential equation and velocity of one-dimensional wave. (10)

    b) The transverse wave on a string is described by (4)
    $y(x,t)= 2.5 \sin 2\pi(0.005x+10t)$, where x and y in cm, t in sec
    Find (i) wave number (ii) frequency (iii) wavelength (iv) velocity

MODULE II

13. a) With necessary diagram, explain how an interference pattern is formed in an air wedge and derive an expression for finding the diameter of a thin wire. (10)

    b) The diameters of 10^{th} and 20^{th} Newton's rings are formed with a plano convex lens and an optically plane glass plate are 0.415 cm and 0.616 cm respectively. If the wavelength of the interfering light is 5893 Å, find the radius of curvature of the lens. (4)

OR

14. a) Explain the diffraction due to a plane transmission grating and obtain the grating equation. Also explain Dispersive power of a grating. (10)

b) At what angle will 650 nm light produces a second order maximum when incident normally on a grating whose slits are 1.2×10^{-3} cm apart? (4)

MODULE III

15. a) Starting from de-Broglie and photon energy equation, formulate time dependent Schrodinger equation. (10)

b) Calculate the de- Broglie wavelength of an electron of kinetic energy 4.5 eV. (4)

OR

16. a) Write a short note on quantum confinement, and explain nanosheet, nanorod and quantum dot. (10)

b) Explain the absence of electrons inside the nucleus using uncertainty principle. (4)

MODULE IV

17. a) Give an account of the factors affecting the acoustics of a hall and its remedial measures. (10)

b) A hall has a volume 13000 m^3 and reverberation time 1.5 sec. If 300 cushioned chairs are placed in the hall, what will be the new reverberation time of the hall? The absorption of each chair is 1 Sabine. (4)

OR

18. a) Briefly describe the determination of velocity of ultrasonics in a liquid using Ultrasonic Diffractometer. (10)

b) An ultrasonic detector receives an echo from a specimen. The time difference between the transmitted pulse and the reflected pulse is 5 μs. The velocity of ultrasonic wave through the specimen is 5000 m/s. Calculate the thickness of the specimen. (4)

MODULE V

19. a) With a neat figure and energy level diagram, explain the construction and working of a He- Ne laser. (10)

b) Distinguish between holography and photography. (4)

OR

20. a) Differentiate Step Index Fibres and Graded Index Fibres. Briefly explain the working of Intensity Modulated and Phase Modulated Sensors. (10)

b) Calculate the Numerical Aperture of a Step Index Fibre with n_1=1.5 and n_2=1.48. Calculate acceptance and critical angles. (4)

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