

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

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SECOND SEMESTER B.TECH DEGREE EXAMINATION (S), SEPT 2022****(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. What is amplitude resonance? Write a short note on sharpness of resonance.
2. Derive the one dimensional wave equation.
3. Explain antireflection coating with necessary figure and equation?
4. Differentiate interference and diffraction patterns.
5. What are matter waves? Give the significance of wave function.
6. Write any 3 applications of nanomaterials.
7. Define reverberation time. What is its significance?
8. Explain how ultrasonic waves are used in non-destructive testing.
9. What is population inversion? Why is it necessary for the operation of a laser?
10. Distinguish between step index and graded index fiber.

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

11. a) What is damped harmonic oscillator? Obtain the differential equation of motion for a damped harmonic oscillator. With suitable graph discuss in detail the under damped, critically damped and overdamped conditions. (10)
- b) Calculate the resonating frequency, relaxation time and Q-factor of the circuit containing 12 pF capacity, 17 mH inductance and 100  $\Omega$  resistance. (4)

**OR**

12. a) Derive the expression for the fundamental frequency of a transverse wave in a stretched string. State the laws of transverse vibration. (10)
- b) If the equation for a transverse wave in a stretched string is  
$$y = 20\sin 2\pi\left(\frac{x}{15} - 60t\right)$$
, in SI system. Calculate the amplitude, wavelength, frequency, time period, and velocity of the wave. (4)

**MODULE II**

13. a) Explain the formation of Newton's rings and derive the expression for the (10)

diameter of the  $n^{\text{th}}$  dark ring. Why is the center of the Newton's rings appears dark when observed in a reflected light?

- b) In an air wedge experiment interference fringes are formed using sodium light of wavelength  $6500 \text{ \AA}$ . When observed normally, 18 fringes are found in a distance of 3 cm. Calculate the angle of the wedge. (4)

**OR**

14. a) Explain the theory of plane transmission grating and describe how to determine the wavelength of light source used. Also define dispersive power and resolving power of grating. (10)
- b) Find the resolving power of a grating of length 30 cm and 6200 lines/cm in the first-order diffraction. What will be the smallest wavelength difference for a wavelength of  $3500 \text{ \AA}$ . (4)

**MODULE III**

15. a) Derive time dependent and independent Schrodinger equations. (10)
- b) Write a note on Quantum Mechanical Tunneling. (4)

**OR**

16. a) What is the importance of surface to volume ratio in nanomaterials? Explain the quantum confinement in nanomaterials. (10)
- b) Explain the electrical and optical properties of nanostructured materials. (4)

**MODULE IV**

17. a) What is threshold of hearing and threshold of pain intensity? Give their values. Describe the factors affecting architectural acoustics and their remedies. (10)
- b) For an auditorium the area of interior surface is  $1759 \text{ m}^2$ . Find the volume of the auditorium if the reverberation time is 3.5 s and average absorption coefficient of interior surface is 0.95 Sabine (4)

**OR**

18. a) Draw the circuit diagram of a magnetostriction oscillator and explain its working. (10)
- b) Find the natural frequency of 78 mm length of pure iron with density  $2.75 \times 10^3 \text{ kg/m}^3$  and  $Y = 115 \times 10^9 \text{ N/m}^2$ . (4)

**MODULE V**

19. a) With a neat diagram, explain the working of a Ruby laser. Draw the energy level diagram showing the transitions. (10)
- b) What is a hologram? Explain with suitable diagrams how a hologram is recorded. (4)

**OR**

20. a) Derive the expression for numerical aperture in a step index fiber. Explain the working of (i) Intensity modulated and (ii) Phase modulated sensor. (10)
- b) Calculate numerical aperture, acceptance angle and critical angle of a fibre (4)

having refractive indices of core and cladding is 1.50 and 1.45 respectively.

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