

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION (Regular), DECEMBER 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 the effect of damping on frequency and time period of an oscillator?
2. Give the comparison between transverse and longitudinal waves with one example for each.
3. When a medium of $\mu \neq 1$ is introduced in the Newton's ring set up, what happens to the diameter of interference pattern? Explain it with the help of relevant equation.
4. Define dispersive power of a grating.
5. State Heisenberg's Uncertainty principle and write the three uncertainty relations.
6. Explain the optical properties of nanomaterials.
7. Relate Reverberation time with total absorption.
8. List any three medical applications of ultrasonic waves.
9. What is population inversion? How can it be achieved in Ruby laser?
10. What is the physical meaning of Numerical Aperture?

PART B

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

MODULE I

11. a) Set up the differential equation for a forced harmonic oscillator and derive the amplitude of oscillation. (10)
b) The frequency of a tuning fork is 250 Hz and its Q – factor is 4×10^4 . Find the relaxation time (τ) and damping constant (λ). (4)

OR

12. a) Obtain an expression for fundamental frequency of transverse vibrations in a stretched string. (10)
b) A piece of wire 50 cm long is stretched by a load of 2.5 Kg and has a mass of 1.44 g. Find the frequency of the second harmonic. (4)

MODULE II

13. a) Explain the formation of interference fringes using air wedge and derive the expression for bandwidth. How is it used to determine the diameter of a thin wire? (10)
- b) Light of wavelength 5893 \AA is reflected at normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that will appear (i) dark and (ii) bright? (4)

OR

14. a) What is grating element? Derive the grating equation in terms of grating element. Also explain resolving power of grating. (10)
- b) What is the higher order spectrum which may be obtained with a light of wavelength 5500 \AA using a plane transmission grating having 4500 lines per cm. (4)

MODULE III

15. a) Derive an expression for energy eigen values and normalised wave function for a particle in a box of width a . (10)
- b) Calculate the de-Broglie wavelength of electron whose kinetic energy is 10 KeV (4)

OR

16. a) Write a note on quantum confinement and based on this explain nanosheet, nanowire and quantum dot. (10)
- b) Mention any 4 applications of Nanotechnology. (4)

MODULE IV

17. a) What are ultrasonic waves? Write the principle of production of ultrasonic waves by magnetostriction effect. With the help of a neat circuit diagram explain the working of a magnetostriction oscillator. (10)
- b) Given that the velocity of ultrasonic waves in sea water is equal to 1440 m/s . Find the depth of the sea if ultrasonic pulses reflected from the seabed is received 0.33 sec after sending the ultrasonic waves. (4)

OR

18. a) Give an account of the factors affecting the acoustics of a hall and it's remedial measures. (10)
- b) The dimensions of an auditorium are $60\text{m} \times 15\text{m} \times 10\text{m}$ and it's interior surfaces have an average absorption coefficient of 0.25. Find the reverberation time of the auditorium. (4)

MODULE V

19. a) "Lasing medium with metastable state, optical resonator and pumping mechanism are the essential requirements of a LASER" How it is satisfied in He-Ne LASER? Explain it's working with the help of a neat energy level diagram. (10)
- b) Distinguish Holography and Photography. (4)

OR

20. a) With a block diagram explain the fibre optic communication system in detail. (10)
- b) A fibre cable has an acceptance angle of 30° and a core of refractive index 1.4, calculate the refractive index of the cladding. (4)
