

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 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. Starting from the differential equation, write any 3 analogies between a mechanical and electrical oscillator.
2. State the three laws of transverse vibration.
3. How do you test for the optical planeness of a surface using air wedge arrangement.
4. Distinguish interference and diffraction.
5. What is Heisenberg's Uncertainty Principle. Write the three-uncertainty relations.
6. Explain the importance of surface to volume ratio in nanostructured materials.
7. Define reverberation time. What is its significance?
8. Explain NDT of materials using ultrasonics.
9. What is spontaneous absorption, spontaneous emission and stimulated emission.
10. Differentiate step index and graded index fiber?

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

11. a) Derive the differential equation of a forced harmonic oscillator and obtain the equation of amplitude of the oscillator. (10)
- b) A tuning fork has a tuning frequency of 556 Hz and its Q – factor is 9×10^5 . Find the relaxation time (τ) and damping constant (λ). (4)

OR

12. a) Differentiate between transverse and longitudinal waves with one example. Derive an expression for the velocity of a (10)

transverse wave in a stretched string.

- b) The equation for a transverse wave in a stretched string is given (4)
 $y = 48\sin\left(\frac{x}{55} - 85t\right)$, in SI system. Calculate the amplitude, wavelength, frequency, velocity, and time period of the wave.

MODULE II

13. a) Derive the cosine law and obtain the condition for constructive (10)
and destructive interference in thin films in a reflected system.
- b) Light of wavelength 556 nm is reflected at normal incidence from (4)
a soap film of refractive index 1.41. What is the least thickness
of the film that will appear (i) dark and (ii) bright?

OR

14. a) Define resolving power of a grating. What is Rayleigh Criteria for (10)
the limit of resolution What is a plane transmission grating?
Derive the grating equation.
- b) Monochromatic light of wavelength 550 nm is diffracted by a (4)
grating of 3500 lines per cm. Show whether the 10th order is
possible

MODULE III

15. a) Write the Schrodinger equation for a particle trapped in a one- (10)
dimensional box of width 'a' and solve it to obtain the energy
eigen values. Obtain the normalized wave function.
- b) Compute the first three permitted energy values for an electron (4)
in a box of width 4 Å

OR

16. a) Write a note on quantum confinement and based on this (10)
explain nanosheet, nanowire and quantum dot.
- b) Why do nanomaterial exhibit properties different from their bulk (4)
counterpart.

MODULE IV

17. a) Give an account of acoustical properties of halls. Discuss the (10)
the remedies.
- b) A cinema hall has a volume of 6525 m³. It is required to have a (4)
reverberation time of 1.67 sec. What should be the total
absorption in the hall.

OR

18. a) What are ultrasonic waves? With the help of a neat circuit (10)
diagram explain the working of a magnetostriction oscillator.

- b) Given that the velocity of ultrasonic waves in sea water is 1440 m/s. Find the depth of the submerged submarine if an ultrasonic pulse is received 0.33 sec after sending out under water. (4)

MODULE V

19. a) With a neat figure and energy level diagram explain the construction and working of He-Ne laser (10)
- b) Explain the recording and reconstruction of a hologram (4)

OR

20. a) Obtain the expression for numerical aperture of an optic fibre in terms of refractive indices of core and cladding. Mention any four advantages of optic communication system over conventional communication system. (10)
- b) Calculate the numerical aperture, acceptance angle of a fibre having core refractive index 1.467 and cladding refractive index 1.452. (4)

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