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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (R,S), MAY 2024
COMMON TO CS, EC, EE, ER & EV
(2020 SCHEME)

Course Code :   **20PHT100**

Course Name: **Engineering Physics A**

Max. Marks :   **100**   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Draw the frequency response curve of a forced harmonic oscillator and explain the sharpness of resonance.

2. What will be the change in frequency of the vibrating string if its length is reduced to half of its original length.

3. Central spot of Newton's Ring is appeared as dark. Why?

4. Distinguish between Fresnel and Fraunhofer diffraction.

5. Explain the natural line broadening of spectral lines.

6. List any three applications of nanotechnology.

7. What is relative permeability? Give its relation with magnetic susceptibility.

8. Explain the physical significance of divergence of a vector field.

9. What are high temperature superconductors.

10. Distinguish between step index and graded index fibers.

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

MODULE I

11. a) Write down the differential equation and solution of forced harmonic oscillator. Derive the expression for amplitude and phase of a forced harmonic oscillator.   (10)

b) The frequency of a tuning fork is 200Hz and its quality factor is 95000. Find the relaxation time and damping constant. (4)

OR

12. a) Frame one dimensional wave equation for a plane wave propagating along the x-axis with a velocity 'v'. Derive its solution. (10)

    b) A transverse wave on a stretched string is described by
Y = 4sin(16t+0.016x) where x is in meter and t is in second. Obtain a) wave number, k b) wavelength c) frequency and d) speed. (4)

MODULE II

13.

    a) How will you deduce the expression for diameter of a thin wire using air wedge experiment. (10)

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

OR

14. a) What is plane transmission grating? Derive grating equation and the expression for maximum number of orders available with a plane transmission grating. (10)

    b) A diffraction grating used at normal incidence gives a green line (5400 Å) in n^{th} order superimposed on the violet line (4050 Å) of $(n+1)^{th}$ order. If the angle of diffraction is 30°, how many lines /cm are there on the grating. (4)

MODULE III

15. a) State and explain 3 Heisenberg's uncertainty relations. Explain the reason for absence of electrons inside the nucleus. (10)

    b) Calculate the separation between two lowest energy levels of an electron in a one-dimensional box of width 5 Å. Mass of electron is $9.1×10^{-31}$ Kg (4)

OR

16. a) Explain Quantum Confinement. Classify nanomaterials on the basis of quantum confinement. (10)

    b) Briefly explain the optical and mechanical properties of nanomaterials. (4)

MODULE IV

17. a) Compare the properties of dia, para and ferromagnetic materials. (10)

    b) State and Prove Ampere's Circuital law. (4)

OR

18. a) Starting from the basic laws of electricity and magnetism, derive Maxwell's Equations. (10)

     b) Distinguish between conduction current and displacement current. (4)

MODULE V

19. a) What is superconductivity? Distinguish between type I and type II superconductors. (10)

     b) Write any 4 applications of superconductors. (4)

OR

20. a) What are optical fibers and why are they used in communication? With a block diagram explain fiber optic communication system. (10)

     b) Numerical aperture of an optical fiber is 0.295 and refractive index of core is 1.54. Calculate refractive index of cladding and acceptance angle. (4)

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