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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (Regular), JULY 2022
(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. Compare electrical and mechanical oscillator
2. Find the equation of a wave of amplitude 3 cm, time period 0.5 s and velocity 210 cm/s moving along X- axis.
3. What will happen to the diameter of Newton's rings when a liquid of refractive index μ is introduced in between the lens and glass plate.
4. Define dispersive power of a grating. What are the factors affecting the dispersive power of a grating?
5. Explain why does the frequency of light emitted by an atom have a finite width.
6. Explain the mechanical and optical properties of nano materials.
7. State Gauss's law for magnetism and Ampere's circuital law.
8. Distinguish conduction current and displacement current.
9. State and prove Meissner effect.
10. With suitable diagram, explain the working of an LED .

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

MODULE I

11. a) Derive the differential equation of a damped harmonic oscillator and deduce its solution. Discuss the 3 possible cases with its displacement – time graph   (10)

     b) In case of a forced harmonic oscillator, the amplitude of vibrations increases from 0.05mm at very low frequency to a value 7.5mm at the frequency of 220Hz. Find Q- factor, damping constant and relaxation time.   (4)

OR

12. a) Frame the one dimensional wave equation and hence derive the solution of one dimensional wave equation.   (10)

     b) A wave of wavelength 0.50m is travelling down a 300m long wire whose total mass is 15Kg. if the wire is under tension of 800 N what is the velocity and   (4)

frequency of the wave.

MODULE II

13. a) Why Newton's rings are circular. Derive the expression for the diameter of the nth dark ring with necessary diagram. (10)

  b) Two optically plane glass plates of length 10 cm are placed one above the other. A thin foil of thickness 0.01 mm is introduced between the plates at one end to form an air wedge. If the light used has a wavelength 5900Å , find the separation between consecutive bright fringes. (4)

OR

14. a) Explain a plane transmission grating. Define the grating element and explain the formation of central maximum in the diffraction pattern. Derive the grating equation. (10)

  b) Differentiate interference and diffraction. (4)

MODULE III

15. a) Assuming the time independent Schrodinger equation, discuss the solution for particle in a one dimensional potential well of infinite height and obtain the energy eigen values. (10)

  b) Explain quantum mechanical tunneling. (4)

OR

16. a) How the surface to volume ratio affect the properties of nanomaterials. Classify and explain different types of nano structures. (10)

  b) Mention any four applications of Nanomaterials. (4)

MODULE IV

17. a) What is a magnetizing field? Classify magnetic materials on the basis of their behavior in magnetizing field ? (10)

  b) Calculate the magnetic susceptibility of a paramagnetic substance at 600K, if its susceptibility at 200K is 3.756×10^{-4}. (4)

OR

18. a) Starting from basic laws of electricity and magnetism, deduce Maxwell's equations in vacuum. (10)

  b) State Poynting theorem and explain Poynting vector. (4)

MODULE V

19. a) Differentiate Type I and Type II superconductors with examples. What is high temperature superconductors. Give any two examples. (10)

  b) Write any four applications of superconductivity. (4)

OR

20. a) Explain how light is propagated in a step index fiber ? Define and derive numerical aperture of a step index fiber   (10)

    b) Explain working of a solar cell with its I – V characteristics.   (4)

****