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 : 20PHT100

Course Name: Engineering Physics A

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

PART A

(Answer all questions. Each question carries 3 marks)

1. What is the effect of damping on 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. Write any 3 medical applications of nanoparticles.
7. Distinguish between magnetic induction and magnetising field.
8. What is divergence of a vector field. Explain its physical significance.
9. Give any three applications of superconductors.
10. Explain the principle of propagation of light through an Optical Fibre

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 expressions for amplitude and phase. (10)

    b) A transverse wave on a stretched string is described by y(x,t)=5 sin(25t+0.016x), where x and y are in cm and t is in second. Obtain (1) Speed (2) Amplitude and (3) Frequency of the wave. (4)

OR

12. a) Obtain an expression for fundamental frequency of transverse vibrations in a stretched string. (10)

b) A wave of wavelength 30 cm is travelling down a 300 m long wire whose mass is 15 kg. If the wire is under tension of 1000 N, what is the speed and frequency of the wave? (4)

MODULE II

13. a) With a neat diagram explain the formation of dark and bright bands in an air wedge and derive the expression to find the diameter of a thin wire (10)

b) In a Newton's rings experiment, n^{th} dark ring formed by light of wavelength 640 nm coincides with the $(n+1)^{th}$ dark ring for light of wavelength 480 nm . If the radius of curvature of the convex surface is 90 cm, find the diameter of the n^{th} dark ring for light of wavelength 640 nm (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) A grating is illuminated at normal incidence. At an angle of diffraction 60° of n^{th} order of wavelength 600 nm is superimposed on $(n+1)^{th}$ order of wavelength 480 nm. Evaluate the number of lines per meter of the grating used (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) An electron is moving in a one dimensional box of infinite height and width 10 Å . Calculate the first three permitted energy levels. (4)

OR

16. a) Explain the quantum confinement in nanomaterials. (10)

b) Explain mechanical and electrical properties of nanomaterials (4)

MODULE IV

17. a) State Gauss' law in magnetism, Ampere's circuital law, faraday's laws of electromagnetic induction and Lenz's law. Give their equations. (10)

b) The maximum value of the permeability of the material is 0.126 N/A^2. What is the relative permeability and magnetic susceptibility? (4)

OR

18. a) Derive Maxwell's equations in vacuum. (10)

b) State and explain Poynting's theorem. (4)

MODULE V

19. a) Explain the characteristics of Type I and Type II superconductors with appropriate diagrams and examples. (10)

b) Show that superconductors are perfect diamagnets by stating Meissner's effect. (4)

OR

20. a) Explain construction and working of a solar cell and draw its I-V characteristics. Mention any two applications of solar cells. (10)

b) Explain the working of intensity modulated fibre optic sensor. (4)

****