Model Question Paper

RegNo:

Name:

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

FIRST SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2021

100906/PH900B ENGINEERING PHYSICS-A

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

PART A

(Answer **all** questions, **each** question carries 3 marks)

1. Compare electrical and mechanical oscillators
2. Distinguish between longitudinal and transverse waves
3. Write a short note on antireflection coating.
4. Diffraction of light is not as evident in daily experience as that of sound waves. Give reason.
5. State and explain Heisenberg's Uncertainty principle. With the help of it explain natural line broadening
6. Explain surface to volume ratio of nanomaterial
7. State Faraday's laws of electromagnetic induction.
8. Compare displacement current and conduction current
9. List four important applications of superconductors.
10. Give the working principle of LED.

PART B

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

Module –I

11. (a) Derive the differential equation of damped harmonic oscillator and deduce its solution. Discuss the cases of over damped, critically damped and under damped cases.

    (b)The frequency of a tuning fork is 500 Hz and its Q factor is 7×10^4. Find the relaxation time. Also calculate the time after which its energy becomes 1/10 of its initial undamped value.

12. (a) Derive an expression for the velocity of propagation of a transverse wave in a stretched string. Deduce laws of transverse vibrations.

    (b) The equation of transverse vibration of a stretched string is given by y =0.00327 sin(72.1x-2.72t) m, in which the numerical constants are in S.I units. Evaluate (i) Amplitude (ii) Wavelength (iii) Frequency and (iv) Velocity of the wave.

Module – II

13. (a) Explain the formation of Newton's rings and show that the radius of dark ring is proportional to the square root of natural numbers. How can we use Newton's rings experiment to determine the refractive index of a liquid?

    (b) Two pieces of plane glass are placed together with a piece of paper between two at one end. Find the angle of the wedge in seconds if the film is viewed with a monochromatic light of wavelength 4800Å. Given $\beta = 0.0555$ cm.

14. (a) Explain the diffraction due to a plane transmission grating. Obtain the grating equation.

    (b) A grating has 6000 lines per cm. find the angular separation of the two yellow lines of mercury of wavelengths 577 nm and 579 nm in the second order.

Module - III

15. (a) Derive time dependent and independent Schrodinger equations.

    (b)An electron is confined to one dimensional potential box of length 2Å. Calculate the energies corresponding to the first and second quantum states in eV.

16. (a)Classify nanomaterial based on dimensionality of quantum confinement and explain the following nanostructures. (i) nano sheets (ii) nano wires (iii) quantum dots.

    (b) Find the de Broglie wavelength of electron whose kinetic energy is 15 eV.

Module - IV

17. (a) State Poynting's Theorem. Calculate the value of Poynting vector at the surface of the sun if the power radiated by the sun is 3.8 x 10 26 W and its radius is 7 X 10 ^{8}m.

    (b) Distinguish between paramagnetic, diamagnetic and ferromagnetic materials.

18. (a) Starting from Maxwell's Equations, derive electromagnetic wave equations in free space. (b) If the magnitude of H in a plane wave is 1 A/m, find the magnitude of E in free space.

Module - V

19. (a) Show that superconductors are perfect diamagnets. Distinguish between Type I and Type II superconductors with suitable examples.

    (b) Write a short note on high temperature superconductors.

20. (a) Define numerical aperture(NA) of an optic fiber and derive an expression for the NA of a step index fiber with a neat diagram.

    (b) Calculate the numerical aperture and acceptance angle of a fiber with a core refractive index of 1.54 and a cladding refractive index of 1.50 when the fiber is inside water of refractive index 1.33.