

## **Model Question Paper**

RegNo:

Name:

### **RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY**

**(AUTONOMOUS)**

### **FIRST SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2021**

#### **100902/PH900B ENGINEERING PHYSICS-B**

**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. Define sound intensity level. Give the values of threshold of hearing and threshold of pain
8. Describe the method of non-destructive testing using ultra sonic waves
9. Explain the condition of population inversion
10. Distinguish between 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 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  $7 \times 10^4$ . 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) Explain reverberation and reverberation time? What is the significance of Reverberation time? Explain the factors affecting the acoustics of a building and their corrective measures?
- (b) The volume of a hall is 3000 m<sup>3</sup>. It has a total absorption of 100m<sup>2</sup> Sabine. If the hall is filled with audience who add another 80 m<sup>2</sup>sabine, then find the difference in reverberation time.
18. (a) With a neat diagram explain how ultrasonic waves are produced by piezoelectric oscillator. Also discuss the piezoelectric method of detection of ultrasonic waves.
- (b) An ultrasonic source of 0.09 MHz sends down a pulse towards the sea bed which returns after 0.55 sec. The velocity of sound in sea water is 1800 m/s. Calculate the depth of the sea and the wavelength of the pulse

### **Module - V**

19. (a) Outline the construction and working of Ruby laser..
- (b) What is the principle of holography? How is a hologram recorded?
20. (a) Define numerical aperture of an optic fiber and derive an expression for the NA of a step index fiber with a neat diagram.
- (b) An optical fiber made with core of refractive index 1.5 and cladding with a fractional index difference of 0.0006. Find refractive index of cladding and numerical aperture.