RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

KOCHI

FIRST SEMESTER B. TECH EXAMINATION

MODEL QUESTION PAPER

Course Code: 101902/PH900B

Course Name: ENGINEERING PHYSICS B

Max marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks

1. The fundamental frequency of a string is *f*. Keeping the tension unchanged, the length of the string is reduced to one third of its original length. Calculate the new frequency of the string.
2. Discuss underdamped oscillations with equation (no derivation), graph and an example.
3. Explain how Newton's rings experiment can be used to check the flatness of an optical surface.
4. Distinguish between Fresnel and Fraunhofer diffraction.
5. Explain the physical interpretation of wave function.
6. Using quantum confinement, explain the reason why there is a blue shift when the particle size is reduced to nanoscales.
7. Differentiate between streamline and turbulent flow of fluid.
8. Explain the thermal method for detection of ultrasonic waves.
9. What are the three main components of a LASER system?
10. Distinguish between step index and graded index fibers.

PART B

Each question carries 14 marks

11. (a) Obtain the differential equation for a series LCR circuit. Compare the LCR circuit with a damped mechanical oscillator and obtain an analogy between the two. (10)

    (b) A capacitor of 1μF, an inductor of 0.2 H and a resistance of 800 Ω are in series. Show that the circuit is oscillatory. Find the frequency of oscillations. (4)

OR

12. (a) Derive an expression for the velocity of propagation of a transverse wave in a stretched string in terms of its linear density and tension. (10)

    (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. (4)

13. (a) Explain the formation of Newton's rings and show that the radius of n^{th} dark ring is proportional to the square root of natural number.

    (10)

    (b) Determine the highest order of spectrum which may be seen with light of wavelength **5 x I0^{-5}** *cm* by means of grating with **3000** *lines/cm*. (4)

OR

14. (a) What is a plane transmission grating. How are they produced commercially? Derive the grating equation.

    (10)

    (b) A grating has 6000 *lines/cm*. Find the angular separation between the two yellow lines of mercury of wavelength 577 *nm* and 579 *nm* in the second order. (4)

15. Obtain Schrodinger's equation for a particle confined in a one-dimensional box. Obtain the wave function and the permitted energies for the particle confined in this box. Also plot the wavefunction for the first four energy levels.

    (14)

OR

16. Classify nanomaterials based on dimensionality of quantum confinement and explain the following structures. (i) nano sheets (ii) nano wires (iii) quantum dots (14)

17. (a) Explain the principle, construction and working of an ultrasonic wave generator using magnetostriction method. (10)

    (b) Calculate the length of an iron rod which can be used to produce ultrasonic waves of frequency 20 kHz. Young's modulus of iron = 11.6×10^{10} Nm^{-2}. (4)

OR

18. (a) Write Bernoulli's equation for an incompressible fluid and explain each term. Explain the two applications of Bernoulli's equation: airfoil and magnus effect. (10)

    (b) Explain the equation of continuity of fluid flow. (4)

19. (a) Explain the construction and working of Ruby laser. (10)

    (b) What characteristics of LASER makes it an approximation to ideal source of light (4)

OR

20. (a) Describe the optical fiber communication system with the help of a block diagram and explain the function of each block. (10)

    (b) An optical fiber has a numerical aperture of 0.20 in air. Determine the acceptance angle for the same fiber in water having refractive index of 1.33. (4)