RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS), KOCHI

FIRST SEMESTER B. TECH EXAMINATION

MODEL QUESTION PAPER

Course Code: 101906/PH900B

Course Name: ENGINEERING PHYSICS A

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. What is meant by Amplitude resonance?
3. Explain the reason for the circular fringes in Newtons rings experiment
4. Distinguish between Fresnel and Fraunhofer diffraction.
5. Explain the physical interpretation of wave function.
6. Why there is a blue shift when the particle size is reduced to nanoscales?
7. Write the four Maxwell’s equation for electromagnetism in differential form.
8. What is meant by Fermi level?
9. What is meant by Superconductivity? Explain Meissner effect.
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 resistor 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 $\mathbf{y = 0.0327 \sin (72.1x - 2.72t)}$, 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 $\mathbf{5 \times 10^{-5}}$ *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) Starting from Maxwell's equations, derive an expression for the velocity of electromagnetic waves in free space. (10)

(b) Explain the Fermi Dirac distribution (4)

OR

18. (a) Differentiate between Diamagnetic, paramagnetic and Ferromagnetic materials (10)

(b) State and explain Gauss's Divergence theorem. (4)

19. (a) Differentiate between Type I and Type II superconductors. (10)

(b) Prove that a superconductor is a perfect diamagnet in its superconducting state (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)