

**RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS),
KOCHI**

FIRST SEMESTER B. TECH EXAMINATION

MODEL QUESTION PAPER

Course Code: 100009/PH100E

Course Name: PHYSICS FOR COMPUTING SCIENCE

Max marks: 100

Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks

1. Compare electrical and mechanical oscillators.
2. Compare the phenomenon of interference and diffraction.
3. Distinguish between Fresnel and Fraunhofer diffraction.
4. Explain double refraction.
5. Obtain the continuity equation for current densities.
6. State and explain Heisenberg's uncertainty principle.
7. Briefly explain the Debye Scherrer powder method of X-ray diffraction
8. Explain the condition of population inversion
9. Distinguish between step index and graded index fibers
10. State and explain the second law of thermodynamics.

PART B

Each question carries 14 marks

11. (a) Derive the differential equation of damped harmonic oscillator and deduce its solution. Discuss the cases of heavy, critical and light damping. (10)
(b) The frequency of a tuning fork is 500 Hz and its Q-factor is 7×10^4 . Find the relaxation time. Calculate the time after which the energy becomes $\frac{1}{10}$ of its initial undamped value. (4)

OR

12. (a) Derive the differential equation of forced harmonic oscillator and deduce the expressions for amplitude and phase. (10)

(b) Explain resonance. Draw the amplitude response curve. (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)

(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)

OR

14. (a) Obtain the condition for the central maximum, secondary maxima and secondary minima in the case of Fraunhofer diffraction at a single slit. (10)

(b) Distinguish between circularly and elliptically polarized light. (4)

15. (a) What are electromagnetic waves? Derive the Maxwell's equations of electromagnetic waves for free space. (10)

(b) Derive the equation of continuity of current densities. Write the Maxwell's equations for a conducting medium. (4)

OR

16. (a) Starting from the time dependent Schrodinger wave equation, derive the time independent Schrodinger wave equation. (10)

(b) Explain the classification of materials based on the band theory of solids (4)

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

(b) Explain the important properties of laser beam. (4)

OR

18. (a) Briefly explain the important industrial, communication and medical applications of optical fiber. (10)

(b) An optical fibre is made with a core of refractive index 1.5 and a cladding with a fractional index difference of 0.0006. Find refractive index of cladding and numerical aperture.

(4)

19. (a) State and explain the first law of thermodynamics. (4)

(b) Briefly discuss the applications of the first law of thermodynamics. (10)

OR

20. (a) Define the term entropy. Discuss the change in entropy in reversible and irreversible processes.

(10)

(b) During a cyclic process, a heat engine absorbs 500 J of heat from a hot reservoir, does work and ejects an amount of heat 300 J into the surroundings (cold reservoir). Calculate the efficiency of the heat engine? (4)