PART - A

Answer all questions. Each question carries 4 marks.

1. Draw the frequency response curve of a forced harmonic oscillator and discuss resonance.

2. State and explain Poynting’s theorem.

3. Explain the terms ‘critical temperature’ and critical magnetic field’ and discuss their significance.

4. How will you determine the refractive index of a liquid using Newton’s rings experiment ?

5. Write a short note on X-ray diffraction.

6. Discuss a method to distinguish :
   a) Circularly polarized light from unpolarized light and
   b) Elliptically polarized light from partially polarized light.

7. Explain the phenomenon ‘length contraction’ in special theory of relativity. Deduce an expression for the contracted length.

8. What do you mean by ‘eigen values’ and ‘eigen functions’ ? Check whether $\sin^2 x$ can be an eigen function of the operator $\frac{d^2}{dx^2}$.

9. Explain Fermi level and Fermi energy. Obtain the expression for Fermi energy.

10. Deduce the expression for the numerical aperture of a step index fiber.

(10x4=40 Marks)

P.T.O.
PART – B

Answer any two from each Module. Each question carries 10 marks.

Module – I

11. Derive an expression for the fundamental frequency of vibration of a stretched string.

12. Starting from the basic laws of electricity and magnetism deduce Maxwell’s equations.

13. What are Miller indices? Explain how they are obtained. Obtain the expression for interplanar spacing of cubic system. (2×10=20 Marks)

Module – II

14. Give the theory of formation of interference bands in thin films under reflected system.

15. What is Fraunhofer diffraction? Give the theory of formation of diffraction pattern when light pass through a single slit. Explain how the phenomenon of diffraction affects the focussing ability of a lens.

16. Derive an equation to represent the light coming out of a doubly refracting crystal act parallel to the optic axis. Explain the production of circularly polarized light and elliptically polarized light as special cases. (2×10=20 Marks)

Module – III

17. What is tunneling? Give an example. Explain how time independent Schrödinger equation can be obtained from time dependent equation.

18. Write down the fundamental postulates in MB, BE and FD statistics. Derive Planck’s radiation formula assuming black body radiations as boson gas.

19. With necessary diagrams, explain the principle, working and construction of ruby laser. Mention some of the applications of laser. (2×10=20 Marks)