**Question Bank for LASER and Fiber Optics**

Lasers

1. What is LASER? Discuss its different characteristics.
2. Explain absorption, spontaneous emission and stimulated emission with suitable diagrams.
3. Write short note on stimulated emission explaining its importance for laser production.
4. State Boltzmann’s distribution law and hence show that in normal conditions ground state will remain most populated.
5. Explain Einstein’s A and B coefficients in relation with the theory of lasing.
6. What is meant by metastable state? What is its significance?
7. Explain population inversion, active system and pumping?
8. What is meant by pumping? Why it is necessary for laser production? Discuss different types of pumping mechanisms.
9. Explain why simple heating cannot achieve population inversion.
10. Why lasing cannot be obtained using only two energy levels?
11. Distinguish between 3-level and 4-level lasers.
12. What is an optical resonator? Explain in detail how it plays a key role in laser production.
13. Explain the construction and working of a carbon-dioxide laser with energy level diagram. What are the roles of Helium and Nitrogen gases?
14. Explain the construction and working of a Ruby laser with energy level diagram.
15. Explain the construction and working of a Nd:Yag laser with energy level diagram
16. List the applications of laser in different fields.
17. Write a short note on holography.

Fiber optics

1. What is an optical fiber? What is the main principle involved in its working?
2. With a neat diagram explain the structure of an optical fiber.
3. Explain the following terms related to optical fiber: a) critical angle, b) acceptance cone, c) numerical aperture and d) V-number.
4. Describe the propagation of light in an optical fiber and obtain expressions for critical angle, acceptance angle and numerical aperture in terms of its core and cladding refractive indices.
5. Classify the fibers on the basis of refractive index profile, on the basis of modes and on the basis of materials.
6. Differentiate between the step-index and graded-index (GRIN) fiber.
7. What are the advantages of optical fiber over conventional cables?
8. What is meant by normalized frequency or V-number for an optical fiber? How it is related to the number of modes that the fiber can support?
9. Explain the important applications of optical fiber.