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| Sr. No. of Question Paper | : | |
| Unique Paper Code | : | 32223908 |
| Name of the Paper | : | Applied Optics (SEC Paper) |
| Name of the Course | : | B. Sc. (Hons) Physics/B. Sc. Physical Sciences (CBCS) |
| Semester | : | III |
| Question Paper Set No | : | 2 |

Duration: 3 Hours Maximum Marks: 50

Attempt any ***four*** questions. All questions carry equal marks.

1. What is population inversion? Can it be achieved in a two level system? Provide reasons for your answer. Explain the working of a four-level laser system with the help of an energy level diagram,
   An atom has two atomic levels separated by 2.5eV. Calculate the ratio of the population of the upper level to that of the lower level at 400 K. At what temperature is this ratio 1:3?

2. Describe with appropriate diagrams the main components of a laser system, and the functions these perform. What is a metastable state, and why is it necessary for laser action? A 5mW gas laser emits a steady beam of 650nm photons. What is the number of photons emitted per second?

3. Discuss the Fourier transforming properties of a thin lens. What is Fourier Transform Spectroscopy? Explain any two applications of Fourier Transform Spectroscopy.

4. What are the advantages of a hologram over a photograph? Do you agree that a hologram stores more information than a photograph even though it is recorded on a flat film like a photograph? Explain. Discuss the basic principle of recording a hologram. What precautions should be taken while recording the hologram? What is multiplex hologram?

5. What is an optical fiber? Give the basic principle of light guidance through an optical fiber. Differentiate between a GRIN and a step index fibre.
   An optical fiber has a numerical aperture of 0·22 and a cladding refractive index of 1·62. Determine the acceptance angle for the fiber in water, which has a refractive index of 1·33.

6. What is coherence? Differentiate between temporal and spatial coherence. Light from a point source of ordinary light displays what kind of coherence? Differentiate between thin and thick holograms.