62125

Reg. No. | | | | | | | | |

III Semester M.Sc. Degree Examination, March/April - 2025

PHYSICS

Lasers and their Applications (Elective)

(CBCS New Scheme 2020-21)

Paper : PHY 305a

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates: All questions are compulsory.

Answer All the questions. Each question carries 15 marks. **(3×15=45)**

1. a) Define population inversion, saturation intensity and laser amplification. How is population inversion achieved for a three level system?

   b) Explain the advantages of a 4 level laser system over that of a 3 level system. **(9+6)**

(OR)

2. a) Discuss the spherical and plane parallel resonator cavity configurations in lasers with proper diagrams.

   b) Explain the properties of laser modes. **(10+5)**

3. a) Describe the characteristics of a diode laser. How is tuning achieved in such laser?

   b) Explain the monochromaticity, coherence and directionality of laser beam. **(9+6)**

(OR)

4. a) Describe the principle and construction, working of Nd: YAG laser.

   b) Why is CO_2 laser effective in high power emission? Explain. **(10+5)**

5. a) Discuss the laser Raman scattering and fluorescence techniques used in the pollution studies.

   b) Discuss the application of laser in spectroscopic studies. **(10+5)**

(OR)

6. a) Discuss the use of lasers in ultra-high resolution spectroscopy and their uses.

   b) Explain the types of attenuation of laser in optical fibers. **(10+5)**

|P.T.O.

Answer any Five of the following: **(5×5=25)**

7. a) Explain the necessary conditions for lasing action.

   b) Describe the properties of Gaussian beams.

   c) Briefly explain the working of He-Ne laser.

   d) Explain the mechanism of excimer lasers

   e) Write a note on laser cooling and its uses.

   f) Mention in detail medical application of lasers