6. (a) What is Laser Cooling and its application ? 10

(b) Define optical pumping. 5

7. Describe the following : 3×5=15

(i) Excimer laser

(ii) Laser Trapping

(iii) Dye Laser.

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Total Pages : 04

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May 2026

M.Sc. (Physics) (Fourth Semester)

Laser Technology (PHP-202-V)

Time : 3 *Hours*] [*Maximum Marks* : 75

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Why population inversion is called a negative temperature state ? 1.5

(b) Define Steady State Condition in Laser. 1.5

(c) What is the use of Meta Stable state In Laser System ? 1.5

(d) Explain schematic diagram for SSL system. 1.5

(e) Why P.I. cannot be achieved by heating the material ? 1.5

(f) Draw Laser basic operation with description. 1.5

(g) What is two photon absorption processes ? 1.5

(h) Differentiate between hetro and homo semiconductors laser. 1.5

(i) Explain multiquantum Photoelectric effect. 1.5

(j) Define optical molasses in laser cooling. 1.5

2. (a) Explain Molecular gas laser working and explain laser action trough energy level diagram. 10

(b) Prove that ratio of coefficients of spontaneous versus stimulated emission is proportional to the third power of frequency of radiation. 5

3. (a) Define Free Electron laser and it Application. 10

(b) Explain the Nd : YAG laser. What is the role of Neodymium (Nd^{3+}) ions. 5

4. (a) Describe the Self focusing in non-linear optics. 10

(b) How to generate second harmonic experimentally. 5

5. (a) Define comparison of various Raman Scattering Effects in non-linear system. 10

(b) Discuss the role of coherence length in Phase matching process. 5