Roll No.							

25-PH-42

M.Sc. IV SEMESTER [MAIN/ATKT] EXAMINATION MAY - JUNE 2025

PHYSICS

Paper - II

[Laser Physics]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 Discuss the three – level laser system show that there exists a minimum threshold pump power for the operation of 3 level laser system. **(15 Marks)**

OR

a) Why electrical discharge method is used for achieving population inversion in gas laser ? **(6 Marks)**

b) Describe making use of diagrams the three processes of spontaneous emission, absorption and stimulated emission. **(9 Marks)**

Q. 2 a) Explain why the light emitted by a laser is coherent while that emitted by an ordinary light source is not. **(4 Marks)**

b) Explain the working of an optical resonator with a neat sketch. **(11 Marks)**

OR

a) What are Cavity Modes ? Explain mode selection techniques. **(7 Marks)**

b) Explain Spatial Coherence and its significance for laser beams. How does it differ from temporal coherence ? **(8 Marks)**

Q. 3 a) What are Metastable States ? **(3 Marks)**

b) Describe semiconductor laser and obtain condition for laser action, complete your answer with construction, working and application of intrinsic semiconductor. **(12 Marks)**

OR

a) Explain the role of Helium in the He – Ne laser. **(3 Marks)**

b) What is resonance transfer of energy in He – Ne laser. **(4 Marks)**

c) Draw energy level diagram of CO_2 and explain its working. **(8 Marks)**

P.T.O.

Q. 4 a) Discuss non – linear interaction of light with matter. **(4 Marks)**

b) What is optical mixing and self – focusing of light, **(11 Marks)**

OR

a) Describe the second and third harmonic generation of light. What types of crystal posses these harmonic generations. **(8 Marks)**

b) What is phase matching and parametric generation in non linear optics. **(7 Marks)**

Q. 5 Write down the notes on **(any three)** – **(5 Marks each)**

i) Theory of Holograms.

ii) Application of laser in medicine and industry.

iii) Ruby laser working and energy level.

iv) Threshold condition for laser oscillation.

v) Properties of lasers.