

[4]

SECTION 'C'

$4 \times 10 = 40$

Long Answer questions (Word limit 400-450 words.)

- Q. 1. Describe the basic principle of semiconductor laser by diagram along with the explanation of various types of emission involved in it?

OR

Explain in detail threshold condition which is essential in lasing action.

- Q. 2. What are the characteristics of laser required for precise measurement of length? Explain how precise measurement is made.

OR

What are the components of optical communication? Describe, why is optical fibre regarded as the best channel for communication.

- Q. 3. Describe the basic features of laser in terms of its construction, working and applications of He-Ne laser.

OR

The construction, working and applications of intrinsic semiconductor lasers.

- Q. 4. Write short note on any two of the following –
(a) Application of laser in thermonuclear fusion.
(b) Application of laser in medical science.
(c) Application of laser in industries.

OR

What is laser spectroscopy? Explain Rayleigh and Raman scattering in detail along with stimulated Raman effect.

[1]

ROLL NO.....

PHY. 202/22

II SEMESTER EXAMINATION, 2022

M.Sc. (PHYSICS)

PAPER-II

LASER PHYSICS & APPLICATION

TIME: 3 HOURS

MAX.- 80

MIN.- 16

Note: The question paper consists of three sections A, B & C. All questions are compulsory.

Section A- Attempt all MCQ questions

Section B- Attempt one question from each unit.

Section C- Attempt one question from each unit.

SECTION 'A'

$2 \times 8 = 16$

Multiple Choice Questions

- Mode locking in laser means production of pulses -
(a) In the same phase
(b) In the same amplitude
(c) Both (a) and (b)
(d) None of (a) and (b)
- Ruby laser gives, wave output of -
(a) Continuous
(b) Pulsed
(c) Both (a) and (b)
(d) None of (a) and (b)
- Which scheme of pumping is not feasible?
(a) 4 – level
(b) 3- level
(c) 2- level
(d) None of the above

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4. Metastable energy state means life time of atoms of that state is -
(a) $>10^{-8}$ second (b) $<10^{-8}$ second
(c) $=10^{-8}$ second (d) $\neq 10^{-8}$ second
5. Which one is not the outcome of non-linear optics?
(a) Harmonic generation (b) Optical mixing
(c) Parametric oscillation (d) None of (a), (b) and (c)
6. Phase matching condition, matches the velocities of two waves of -
(a) Different phase (b) the same phase
(c) different frequency (d) the same frequency
7. In order to accomplish, the thermonuclear fusion, two isotopes of Hydrogen used are -
(a) H and D (b) D and T
(c) H and T (d) None of the above
8. LASIK surgery is related to human organ of -
(a) Eyes (b) Ears
(c) Chest (d) Abdomen

[3]

$4 \times 6 = 24$

SECTION 'B'

Short Answer Type Questions

- Q.1. What is the principle of laser? Explain its various characteristics.

OR

What is laser pumping phenomena? Explain laser pumping in two – level lasing system.

- Q.2. Explain the basis on which the laser are classified, explaining the basic principle of ruby laser?

OR

Draw energy level diagram of CO₂ laser and explain in working.

- Q.3. What is mode-locking? Explain its consequences?

OR

What is second harmonic generation? Explain its phase-matching condition.

- Q.4. Define the term NA (Numerical Aperture) of an optical fibre? What is its significance?

OR

What do you mean by the term thermonuclear fusion? How is it accomplished through the laser?