24MPH9106T

Printed Pages : 4

End Term Examination 2024-25 (Pawas)

PG Semester-I

PHYSICS (DSE)

(Laser Physics)

Time Allowed : Three Hours

Max./Min. Marks : 100/40

Note : 1. All questions are to be answered in main answer book. No supplementary answer book will be provided.

2. All the parts of a question or its various parts are to be answered together, at one place in the answer book.

3. This question paper has **03** sections:-

Section-A contains **10** very short answer type questions (answer in 1 or 2 lines) Each question carries **2** marks. All questions are compulsory. **(10×2=20 marks)**

Section-B contains **8** short answer type questions (two question from each unit). The candidates will have to answer **4** questions, selecting one question from each unit. Each answer will have word limit of **200** words. In all, **4** questions are to be answered in section-B. Each question carries 10 marks. **(4×10=40 marks)**

Section-C contains of **4** long answer type questions. The candidates have to answer any two questions, Each answer has will have the word limit of **400** words. Each question carries **20** mark **(2×20=40 marks)**

Section-A

1. (i) Distinguish between Ordinary light and Laser light.

(ii) What is meant by population inversion?

(iii) Define active medium.

(iv) What are Einstein's coefficients?

(v) What is carrier wave communication?

(vi) Write the basic formula for calculating the numerical aperture of an optical fibre.

(vii) Explain different types of an optical fibre.

(viii) Define material dispersion in optical fibre.

(ix) Explain the concept of zero material dispersion wavelength (ZMDW).

(x) Explain Ray paths is homogeneous and square law profiles.

Section-B

Unit-I

2. Explain construction and working of CO_2 gas laser.

3. Discuss the applications of Laser in various fields or list of characteristics of laser.

Unit-II

4. Derive the rate equations for three level laser system and explain the process of achieving population inversion.

5. Explain penetration depth with respect to total internal reflection in optical fibres.

Unit-III

6. Write the basic formula for calculating the numerical aperture of an optical fibre.

7. Explain the different types of aptical fibres.

Unit-IV

8. Derive the conditions for achieving the zero material dispersion wavelenght (ZMDW) and its significance in optical communication.

9. What is the significance of transit time calculation in optical waveguide and expression for Transit time calculation in step index waveguide?

Section-C

10. Derive Einstein's relation for stimulated emission and hence explain the existance of stimulated emission.

11. Discuss the working of a four level laser system with appropriate energy level diagrams.

12. Discuss the concepts of ray paths and pulse dispersion in optical waveguides.

13. Discuss the causes of material dispersion and how it can be minimized?

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