1212 – 12 – 509 – 003

Code No. 8985 / CBCS/ Non-CBCS

FACULTY OF SCIENCE

M. Sc. III – Semester **(CBCS / Non-CBCS)** Examination, November / December 2013

Subject : Physics

Paper – I : Modern Optics

Time : 3 Hours Max. Marks: 80

Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.

PART – A (8 x 4 = 32 Marks)
(Short Answer Type)

1. Distinguish between spontaneous emission and stimulated emission of radiation.
2. What are the important properties of lasers?
3. Explain basic principle of a semi-conducting laser.
4. Describe some important scientific and industrial applications of lasers.
5. Explain the recording of amplitude and phase of hologram with necessary conditions.
6. What are the interferometric applications of holograms?
7. Explain the process of generation of sum frequency and difference frequency components in non-linear optics.
8. Explain how a lens performs Fourier transformation in Fourier optics.

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

9.(a) What are laser rate equations? Derive laser rate equations for a three level system and obtain pumping threshold condition.

OR

(b) What are Einstein's relations? Establish a relation between Einstein's A and B coefficients.

10.(a) Distinguish between atomic and molecular gas lasers. Describe the principle, construction and working of He-Ne Laser.

OR

(b) Give the classification of lasers with high dense active media. Describe the principle, construction and working of Nd : YAG Laser.

11.(a) What is holography? How it is different from photography? Discuss the detailed theory of holography.

OR

(b) Describe the in-line holography. What are its limitations? How are these limitations are removed in off-axis holography?

12.(a) Distinguish between linear and non-linear optics. Explain harmonic generation of light and obtain phase matching condition for second harmonic.

OR

(b) Explain phase transformation property of a thin lens. Discuss the case where the object is placed in front of the lens.

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