FACULTY OF SCIENCE
M. Sc. III - Semester (CBCS/Non-CBCS) Examination, December 2014

Subject: PHYSICS
Paper - I: Modern Optics (Common)

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. What is meant by population inversion and explain why it is necessary for lasing action?
2. What are the properties of laser beams?
3. Describe the working of argon ion gas laser.
4. Explain the basic principle of semiconducting laser.
5. Distinguish between photography and holography.
6. Distinguish between plane holography and volume holography.
7. Explain harmonic generation of light.
8. What is the thickness function of a lens? Explain its importance in Fourier optics.

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

9. a) Discuss the absorption and emission processes in lasers. What are Einstein's coefficients and derive expressions for their inter relation.
   OR
   b) Explain threshold condition for lasing action. Compare and contrast three level laser and four level laser.

10. a) Distinguish between atomic gas laser and molecular gas laser. Describe the working of CO₂ molecular gas laser using energy level scheme.
   OR
   b) What are solid state lasers? Describe the working of Nd : YAG laser using energy level scheme.

11. a) Explain the recording and reconstruction procedure in holography with necessary theory.
   OR
   b) What are the limitations of Gabor hologram? Describe how these limitations are eliminated in off-axis hologram.

12. a) i) What is optical mixing ii) Explain self-focussing of light
   OR
   b) Explain the use of thin lens as phase transformation element. Discuss the case where the object is placed behind the lens.

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