

## OPTICS AND LASERS-II

Time Allowed : Three Hours]

[Maximum Marks : 75

Note : The candidates are required to attempt *one* questions each from Section A , B, C and D carrying 15 marks each and *five* parts of Section E consisting of 8 short answer type questions carrying 3 marks each.

### Section : A

1. (a) What is interference by wavefront division ? Describe role of interference in anti-reflection and high reflection dielectric coatings. 6,4,5
- (b) Discuss conditions for observing interference fringes.
- (c) Write a note on Fabry-Perot Interferometer.
2. (a) Write a detailed note on Michelson's interferometer. 8,7
- (b) What is Coherence ? Explain spatial and temporal coherence.

### Section : B

3. (a) Illustrate Huygens-Fresnel Theory of diffraction.
- (b) What is diffraction grating ? Discuss its resolving power and use as a spectroscopic element.
- (c) Explain, what do you understand by plane polarized and elliptically polarized light ? 5,5,5
4. (a) What is Nicol Prisms ? Discuss distinction between Fresnel and Fraunhofer diffraction.
- (b) What are effects of diffraction in optical imaging ? Explain Fraunhofer diffraction at rectangular and circular apertures. 7,8

### Section : C

5. (a) What do you understand by threshold condition in lasers ? Illustrate three level and four level laser schemes.
- (b) What do you understand by spontaneous and stimulated emission ? Derive relation between Einstein's coefficients. 8,7
6. (a) What is broadening of spectral lines ? Explain it by describing natural, collision and Doppler broadening.
- (b) What are longitudinal and transverse modes ? Discuss elementary theory of optical cavity. 8,7

### Section : D

7. (a) Differentiate between semiconductor and dye lasers.
- (b) What is Q-switching ? Explain.
- (c) Discuss construction and working of CO<sub>2</sub> laser. 6,5,5
8. (a) Give detailed description of construction and working of He Ne laser.
- (b) Discuss any five applications of lasers. 10,5

### Section : E

9. Attempt any *five* parts in short :
  - (a) What do you understand by mode-locking ?
  - (b) What is the resolving power of telescope ?
  - (c) What do you understand by Newton Rings ?
  - (d) Discuss basics of holography.
  - (e) Define coherence time, coherence length and area of coherence.
  - (f) What do you understand by double refraction and zone plates ?
  - (g) What is population inversion ? How is it achieved ?
  - (h) Define line width and line profile.

5×3=15