

LASERS-II

Semester - IV

Time Allowed : Three Hours]

[Maximum Marks : 40

Note : Attempt any *two* questions each from Section A and B and Section C is compulsory. All Questions carry equal marks.

Section : A

1. What do you mean by broadening of spectral lines? Derive an expression for Doppler broadening. 8
2. (a) Describe the elementary theory of optical cavity. 5
(b) Discuss the three level laser scheme. 3
3. (a) What is population inversion? Why it is essential and how it is achieved in a laser? 2
(b) Calculate the coherence length for a laser beam having band width of 3 KHz. 5
4. (a) Explain the concept of Longitudinal and Transverse modes. 5
(b) A laser beam has a power of 100 mW and has an aperture of 10^{-3} m. It emits light of wavelength 5200\AA . It is focused by a lens of focal length 1m, calculate the area and intensity of the image. 3

- Section : B**
5. Discuss with suitable diagrams, the principle, the construction and working of CO₂ gas laser. 8
 6. What is holography ? With the help of ray diagram, explain the recording and reconstruction of image. 8
 7. (a) Draw the electronic energy level diagram showing the output wavelength/frequency of ruby and Nd : YAG lasers. 5
 - (b) Discuss various components of a laser system. 3
 8. What is semiconductor laser ? Discuss its main features and condition of action. What are its merits and demerits ? 8
- Section : C**
9. Attempt all *eight* parts in short :
 - (i) Explain Mode Locking in lasers.
 - (ii) What is Q-switching in lasers ?
 - (iii) Laser light is highly monochromatic, why ?
 - (iv) What is laser spiking ?
 - (v) Explain why four levels laser is less efficient as compared to three level laser system.
 - (vi) Explain the role of active media in laser action.
 - (vii) Discuss four important applications of lasers.
 - (viii) Can we obtain light amplification in the absence of stimulated emission ? 8×1=8