# PHYSICS

## Paper–B : Optics and Lazer – II

**Time Allowed : 3 Hours** **Maximum Marks : 22**

**Note :** Attempt **two** questions from Section I, two questions from Section II and **eight** parts of the question in Section III. Only non-programmable calculators are allowed to be used.

### SECTION – I

1. (a) What do you mean by LASER ? Explain the main features of Laser light.
   (b) What is population inversion ? Why is it essential and how is it achieved in a laser ?
2. (a) What do you mean by broadening of spectral lines ? Explain natural broadening.
   (b) Find Doppler broadening for neon line at wavelength 6328Å at temperature 27°C. Atomic weight of neon is 20.
3. (a) Describe the elementary theory of optical canty and transverse and longitudinal modes of vibration of an optical canty.
   (b) For a light of wavelength 5400Å, find the degree of non-mono-chromaticity if the coherence time is $10^{-10}$s.

### SECTION – II

4. (a) Describe the principle, construction and working of He-Ne Laser.
   (b) What are applications of Lasers ?

5. (a) What is Holography ? Describe recording of a hologram and reconstruction of image.

(b) Draw a neat labelled diagram of $CO_2$ Laser.

6. (a) Describe Optical Fibre and its construction. Explain the terms critical angle, acceptance angle and numerical aperture of an optical fibre.

(b) Describe causes of signal attenuation in optical fibre.

## SECTION – III

7. Attempt any eight parts :

(*a*) Define temporal coherence.

(*b*) Define spatial coherence.

(*c*) What do you mean by MASER ?

(*d*) What is Laser pumping ?

(*e*) Light emitted from a conventional light source is said to be incoherent. Why ?

(*f*) Define a metastable energy state.

(*g*) Define maximum acceptance angle of an optical fibre.

(*h*) A Laser beam has a bandwidth of 3000 Hz. Find the coherence time.

(*i*) In above find coherence length.

(*j*) What is cladding ?