B.A./B.Sc. (General) 4th Semester

(2042)

PHYSICS

Paper : B Optics and Lazer-II

Time Allowed : Three Hours]　　　　　　[Maximum Marks : 44

Note :— (1) Attempt **five** questions in all, selecting **two** questions each from Unit-1 and Unit-2. Question No. **7** (Unit-3) is compulsory.

(2) Use of non-Programmable calculator is allowed.

## UNIT–1

1. (a) What are Einstein's coefficients ? Derive a relation between Einstein's Spontaneous and Stimulated emission coefficients.　　　　　　6

(b) A laser beam of 1.3 mm diameter has a power of 20 mW. Find the intensity of beam.　　　　　　3

2. (a) What do you mean by broadening of spectral lines ? Derive the expression for Doppler broadening.　　　　　　6

(b) Find Doppler broadening for neon line at wavelength 6328 Å at temperature 27°C. Atomic weight of Neon is 20.　　3

3. (a) Laser is basically a three component device. Explain with necessary diagram.　　　　　　6

(b) What are longitudinal and transverse modes ?　　　　3

## UNIT-2

4. (a) Explain the construction and working of Ruby laser by drawing suitable energy diagram. Also explain what is spiking. 6

(b) What are applications of laser ? 3

5. (a) Describe the construction and working of Nd: YAG laser. 6

(b) Give a detailed account of Intermodal and Intramodal dispersion. 3

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

(b) An optical fibre whose refractive index is 1.5 and cladding refractive index 1.47. Calculate acceptance angle in air for the core. 3

## UNIT-3

7. Attempt any eight parts :

(a) What is Luminescence ?

(b) What is laser pumping ?

(c) What is the cause of high coherence in lasers ? Explain.

(d) What are the advantages of four level scheme over three level scheme ?

(e) What is importance of metastable state in a laser ?

(f) Why is dye laser known as tuneable laser ?

(g) Write any two features of semiconductor laser.

(h) Why cladding is necessary in optical fibre ?

(i) How the resonant transfer of energy takes place in a $CO_2$ laser ?

(j) Differentiate between photograph and a hologram. $1 \times 8 = 8$