(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0929 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. IV) THEORY EXAMINATION 2010-11

LASER SYSTEM AND APPLICATIONS

Time : 3 Hours *Total Marks : 100*

Note : (i) Attempt **all** questions.

(ii) All questions carry equal marks.

1. Attempt any **two** of the following : **(2×10=20)**

(a) Derive time independent schrödinger's wave equation. What is the physical significance of wave function ?

(b) Establish relation between Einstein's coefficient.

(c) Find the intensity of a laser beam of 20 mW power and having a diameter of 1.3 mm. Assume uniform intensity across the beam.

2. Attempt any **two** of the following : **(2×10=20)**

(a) What are the important features of stimulated emission ? Discuss the essential requirement of producing a laser beam.

(b) Discuss the working of resonators in laser system. How many types of such resonators you know ? Explain the working of one resonator in detail.

(c) Explain the terms : coherence time and coherence length. Laser beam has a band width of 2500 Hz. What are the values of coherence time and coherence length ?

3. Attempt any **two** of the following : **(2×10=20)**

(a) What are the techniques used for population inversion ? Discuss the construction and working of a Ruby Laser.

(b) What do you mean by Q switching ? Describe two methods for Q switching.

(c) Explain the working of semiconductor laser. Discuss recombination radiation in order to explain the principle of operation of LEDs.

4. Attempt any **two** of the following: **(2×10=20)**

(a) Draw a neat diagram of He-Ne laser and describe its working. What are the characteristics of output laser beam from He-Ne laser ?

(b) Describe generation and measurement of short laser pulses.

(c) The ratio population of two energy levels out of which upper one corresponds to a metastable state is 1.059×10^{-30}. Find the wavelength of light emitted at a temperature T = 330K.

5. Attempt any **two** of the following : **(2×10=20)**

(a) Discuss applications of lasers in material processing.

(b) Explain the following industrial applications of lasers :

(i) 3d-stereolithography

(ii) Photolithography.

(c) Explain recording and reconstruction of a hologram. Discuss the intensity variation in a hologram.