Printed Pages : 2 EOE043

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

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

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2012-13

LASER SYSTEMS AND APPLICATIONS

Time : 3 Hours] *[Total Marks : 100*

SECTION – A

1. Attempt **all** question parts. $10 \times 2 = 20$

   (a) What is the role of optical cavity in a laser ?

   (b) How do you define gain of laser activity ?

   (c) What do you mean by coefficient of gain ? Find the expression for it.

   (d) How do you generate short pulse of laser ?

   (e) What is dye laser ?

   (f) Why laser light is monochromatic ?

   (g) How do you define coherence property of laser light ?

   (h) List out the features of materials used for laser action.

   (i) Why a pulse laser is generally used for material processing ?

   (j) Define Stimulated Emission of Radiation.

SECTION – B

2. Attempt any **three** question parts : $10 \times 3 = 30$

   (a) Prove that larger the energy difference between two states, much more likely is spontaneous emission compared to stimulated emission.

   (b) Discuss briefly the different configurations of optical cavities.

   (c) What is LIDAR ? Discuss its components and their role.

   (d) Enlist the conditions in which a laser will work in cw/pulse mode. Show that a cw laser is suitable for time measurement.

   (e) How communication gets facilitated using laser and fibre ? Estimate the number of telephone channels possible to have an optical fibre network using laser of wavelength 1.55 μm.

SECTION – C

Attempt **all** questions : $10 \times 5 = 50$

3. Attempt any **two** parts : $5 \times 2 = 10$

   (a) Explain necessary condition for Laser Action.

   (b) Explain four characteristics of Laser Light.

   (c) Define Q-factor of an optical resonator. Show that $Q = v_o/\Delta v$, where v_o – resonant frequency and Δv – full width at half maximum.

4. Attempt any **one** part : $10 \times 1 = 10$

   (a) How is hologram different from photograph ? Discuss the method used to record and reduce a hologram.

   (b) Describe spontaneous and stimulated emission of radiation and establish a relation between transition probabilities of spontaneous and stimulated emissions.

5. Attempt any **one** part : $10 \times 1 = 10$

   (a) Explain the construction, working and application of excimer laser.

   (b) What do you mean by Q switching ? Describe various methods of Q switching.

6. Attempt any **one** part : $10 \times 1 = 10$

   (a) Describe the working of He-Ne laser with a neat diagram. What are the characteristics of output laser beam from He-Ne laser ?

   (b) With necessary diagram, explain the construction and working of Nd-YAG laser.

7. Attempt any **two** parts : $5 \times 2 = 10$

   (a) Explain the use of laser for construction and reconstruction of image in holography.

   (b) What are the components of optical communication ? Explain how laser becomes important for optical communication.

   (c) Which are the lasers suitable for surgical operations and list out their merits and demerits ?