

Printed Pages—3

EOE—033/EOE—043

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

**PAPER ID : 0929**

Roll No.

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**B.Tech.**(SEM IV) EVEN SEMESTER THEORY EXAMINATION,  
2009-2010**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 : (2x10=20)

- (a) Discuss the biological hazards of a laser beam. What type of protection from such hazards can be taken?
- (b) 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.
- (c) A gas laser is generating a laser beam of 4 mW power. Calculate the number of photons emitted by the laser. The wave length of the emitted radiation is 680 nm.

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2. Attempt **any two** of the following : (2x10=20)

- (a) Discuss the working of resonators of laser systems. How many types of such resonators you know? Explain the working of one resonator in detail.
- (b) What are metastable state? Discuss their role in laser action.
- (c) Find the ratio of population of two energy states of the Ruby Laser, the transition between which is responsible for the emission of photon of wave length  $\lambda = 6928 \text{ \AA}$ . Assume the ambient temperature is 18 K.

3. Attempt **any two** of the following : (2x10=20)

- (a) Discuss the working of a 'Nitrogen Laser'. What are the techniques used for population inversion ? Show the energy level diagram to explain your answer.
- (b) How many methods do you know for optical pumping? Discuss various methods citing examples.
- (c) Explain the working of a semiconductor laser, popularly known as LEDs (Light Emitting Diodes). Discuss 'Recombination Radiation' in order to explain the principle of operation of these LEDs.

4. Attempt **any two** of the following : (2x10=20)
- (a) What are the Einstein's coefficients? Discuss in detail.
  - (b) The ratio population of two energy levels out of which upper one corresponds to a metastable state is  $1.059 \times 10^{-30}$ . Find the wave length of light emitted at a temperature  $T = 330$  K
  - (c) Enumerate the types of lasers on the basis of medium. Discuss their relative merits and demerits.
5. Attempt **any two** of the following : (2x10=20)
- (a) Explain the following industrial applications of lasers :  
Cutting, Welding, Melting, Photolithography, 3-d Measurements 3d-Stereo lithography.
  - (b) Write an essay on "Application of lasers in Medical Science"
  - (c) What are the applications of lasers in military? Discuss in detail.

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