

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

Paper ID 100363/100353

Roll No.

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B.TECH**(SEM. III) THEORY EXAMINATION, 2015-16****LASER SYSTEM AND APPLICATIONS****[Time : 3 hours]****[Maximum Marks : 100]****Note : The Question Paper contain three Sections.****Section-A**

Q.1 Attempt all parts of the following. All parts carry equal marks. Write answer of each part in short. ($2 \times 10 = 20$)

- What are modified and unmodified radiations?
- Explain normalized wave function.
- What do you mean by active medium?
- Discuss the process of stimulated emission of radiation.
- What do you understand by quality(Q) factor in laser?

- (f) Describe, how the process of 'hole burning' takes place in the laser gain curve.
- (g) Mention the fields in which excimer lasers can be used.
- (h) How is pumping done in solid state lasers?
- (i) Deduce an expression for de-Broglie wavelength of an electron.
- (j) What are the applications of LIDAR?

Section-B

Note: Attempt any **five** questions from this section of the following : (10×5=50)

- Q2. What are the failure of classical physics? Explain Planck's quantum theory.
- Q3. Discuss the working of resonators in laser system. Classify resonators and explain working of one of them in detail.
- Q4. What is pumping and discuss its various methods. Find the intensity of a laser beam of 100mW power and having a diameter of 1.3mm. Assume the intensity to be uniform.
- Q5. Derive the laser rate equation in three-level laser system.

- Q6. What do you mean by short pulse generation? Explain any one method to produce it in detail.
- Q7. Describe the construction and working of He-Ne laser.
- Q8. Explain the principle of holography and discuss its applications.
- Q9. Write short notes on-
 - (a) Laser applications in ophthalmology.
 - (b) Laser in diagnostics

Section-C

Note: Attempt any **two** questions from this section.

(15×2=30)

- Q10. (a) Derive time independent Schrodinger's wave equation for a free particle.
 - (b) Describe the applications of laser in optical communication.
 - (c) Explain the construction and working of Ruby laser.
- Q11. (a) What is de-Broglie hypothesis? Derive an expression for de-Broglie wavelength of an electron.
 - (b) Describe the principle of laser action?

- (c) The ratio of population of the energy levels is 1.059×10^{-30} . Find the wavelength of light emitted at 300K.

- Q12. (a) Explain the functioning and characteristics of excimer lasers with appropriate diagram.
- (b) Discuss the applications of laser in material processing.
- (c) What are the processes of spontaneous and stimulated emission of radiation?

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