

(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. III) ODD SEMESTER THEORY

EXAMINATION 2012-13

LASER SYSTEM AND APPLICATIONS

Time : 3 Hours

Total Marks : 100

Note :- Attempt all questions. All questions carry equal marks.

1. Answer any **two** parts of the following : **(10×2=20)**
 - (a) What is de Broglie hypothesis ? Describe the Davisson and Germer experiment to prove that material particles possess the wave character.
 - (b) Derive an expression for Compton shift. Find the wavelength and energy of the incident photon if its wavelength doubled on being scattered through 90° .
 - (c) Derive time dependent Schrödinger wave equation for a particle. Give the physical significance of state function ψ used in the equation. What condition must it fulfill ?

2. Answer any **two** parts of the following : **(10×2=20)**
 - (a) Explain the term coherence time and coherence length. Calculate the frequency and coherence time of a light source if its coherence length is 2.5 cm and wavelength 550 nm.

- (b) What is population inversion ? Why it is necessary for laser action ? Describe two methods to achieve it.
- (c) Describe Einstein's coefficients of stimulated and spontaneous emission of radiation. Establish a relation between these coefficients.
3. Answer any **two** parts of the following : **(10×2=20)**
- (a) Show that two level pumping scheme has no practical significance for lasing. Derive the expression for threshold population in a three level laser system.
- (b) What are three level lasers ? Explain the construction and working of Ruby laser.
- (c) What are main components of a laser ? Discuss essential conditions for laser oscillation.
4. Answer any **two** parts of the following : **(10×2=20)**
- (a) Discuss continuous and pulse laser. Explain working of He-Ne laser.
- (b) What are excimer laser ? Describe its properties and application.
- (c) What do you understand by dye laser ? Explain its working. Why does it produce ultra short pulses ?
5. Answer any **two** parts of the following : **(10×2=20)**
- (a) Discuss applications of laser in material sciences.
- (b) What is holography ? Explain use of laser in holography. What are the main characteristics of hologram ?
- (c) What is LIDAR ? How is the process achieved ?