PAPER ID-411560

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2021-22
LASER SYSTEM & APPLICATION

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

a.	Give postulates of Bohr atom model.
b.	What is the average output in laser in term of power?
c.	Why population inversion is necessary for laser action?
d.	Define pumping? How heating material effects the pumping explain?
e.	Define concept of coherence and describe its types.
f.	Calculate the intensity of laser (He: Ne) beam of power 1mW having diameter 1.4 mm. Assume the intensity to be uniform across the beam.
g.	Define Compton Effect and why it is not observed in case of visible light?
h.	Why are near infrared lasers preferred for optical communication.
i.	What are the main requirements for making good holograms?
j.	Explain in term LASIK.

SECTION B

2.   **Attempt any *three* of the following:**   **10x3=30**

a.	Find the energy of an electron moving in one dimensional of infinite high potential box of width 1 A^0, given mass of electron $=9.11\times10^{-31}$Kg, and Planck's constant $= 6.63 \times10^{-34}$ J-Sec.
b.	Calculate the relative population of two states of the laser that produces light of wavelength 5461 A^0 at 300K. (Boltzmann constant K= 8.6×10^{-5} eV/K).
c.	Explain about Q-switched LASER. Whether Q- switched LASERS are pulsed or continuous wave LASER.
d.	What do you mean by Coherence? Explain temporal coherence and spatial coherence. How is temporal coherence related with coherence length?
e.	What is LIDAR? Write a short note on working of LIDAR with a schematic diagram.

SECTION C

3.   **Attempt any *one* part of the following:**   **10x1=10**

a.	Describe the basic features in terms of construction, working and application of Ruby laser.
b.	Differentiate between three level and four level energy scheme in laser systems. Why is a four level LASER more efficient than a three level LASER?

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4. **Attempt any *one* part of the following:** **10x1=10**

a.	What are the salient features of black- body radiation? Explain Planck hypothesis and write Planck radiation formula.
b.	Prove that the ratio of spontaneous emission and stimulated emission is proportional to v^3. Show that in the optical region spontaneous emission is dominated over the stimulated emission..

5. **Attempt any *one* part of the following:** **10x1=10**

a.	What are important criteria for laser classifications? Explain Dye lasers.
b.	What is optical activity? Describe various types of optical cavities.

6. **Attempt any *one* part of the following:** **10x1=10**

a.	Discuss about semiconductor lasers. Give relevant resin behind the statement "Semiconductor lasers are most useful lasers".
b.	Describe the basic features in terms of construction, working and application of CO_2 laser.

7. **Attempt any *one* part of the following:** **10x1=10**

a.	Describe the following industrial applications in brief with the help of laser beam: (i) Laser Cutting (ii) Laser Drilling
b.	Discuss briefly the medical and industrials applications of Hologram.