### B. TECH
### (SEM-III) THEORY EXAMINATION 2019-20
### LASER SYSTEM AND APPLICATIONS

*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. What do you know about dual nature of particle?
   b. Explain Heisenberg's uncertainty principle.
   c. Write down the expression for energy of a particle moving in one dimensional box.
   d. What is Laser? Differentiate between ordinary and Laser light.
   e. What do you know about dye laser?
   f. What is lidar?
   g. What is optical pumping?
   h. What do you understand by an optical resonant cavity?
   i. Why four Laser is better than three level Laser.
   j. Write four applications of Laser.

### SECTION B

2. **Attempt any *three* of the following:**                     **10x3=30**
   a. Calculate the population ration of two states in as lease that produces light of wavelength $6000°$ A at 300K.
   b. What voltage must be applied to an electrons source to produce electrons having wavelength $0.4 A°$.
   c. An electron with K. E of 2000 eV is confined to a region of atomic dimension $10^{-10}$. Find the uncertainty in its linear momentum and compare it with the momentum of the electron.
   d. In $CO_2$ laser, the energy difference between two levels is 0.12 eV. Calculate the frequency of radiation.
   e. The coherence length of sodium light is $2.45 \times 10^{-2}$ and its wavelength is $5890°$A, calculate (i) the frequency (ii) the coherence time.

### SECTION C

3. **Attempt any *one* part of the following:**                  **10x1=10**
   a. Obtain Schrodinger's time independent wave equation. Also explain wave function.
   b. What is Compton effect? Derive approximate expression for Compton shift.

4. **Attempt any *one* part of the following:**                  **10x1=10**
   a. Differentiate between continuous and pulsed laser. Write their specialties.
   b. How laser is different from the ordinary light. Why focusing of laser light is better than the ordinary light.

5. **Attempt any *one* part of the following:**                  **10x1=10**
   a. Draw a diagram and explain about Ga-AS laser. Explain how it is beneficial in industrial application.
   b. What is level of laser? Why four level laser systems is more efficient than three level laser system?

6. **Attempt any *one* part of the following:**                  **10x1=10**
   a. What is photo coagulation, describe it with the help of schematic diagram.
   b. What is industrial application of laser? Explain about laser drilling, cutting and welding.

7. **Attempt any *one* part of the following:**                  **10x1=10**
   a. What do you know about holography? Discuss the holographic reconstruction process.
   b. How lasers useful in the field of medicine? Briefly explain the application of lasers in Ophthalmology and general surgery.

**Physical Constants:**

| | |
|---|---|
| Rest mass of Electron | $m_0 = 9.1 \times 10^{-31}$ kg |
| Rest mass of Proton | $m_p = 1.67 \times 10^{-27}$ kg |
| Speed of light | $c = 3 \times 10^8$ m/s |
| Plank's constant | $h = 6.63 \times 10^{-34}$ J-s |
| Charge on electron | $e = 1.6 \times 10^{-19}$ C |
| Boltzmann's Constant | $k = 1.38 \times 10^{-23}$ J/K |