**AKGEC/IAP/FM/02**

**Ajay Kumar Garg Engineering College, Ghaziabad**

**Department of Applied Sciences and Humanities**

**SESSIONAL TEST-2**

Course: B.Tech Semester: III

Session: 2017-18 Section: CS-12,3, EN-1, 2, IT-1,2, EI

Subject: LASER systems and Applications Sub. Code: ROE-033

Max Marks: 50 Time: 2 hours

**Section-A**

**A. Attempt all parts. (5X2= 10)**

**1.** What is the difference between spontaneous emission and stimulated emission of radiation?

**2.** Calculate the number of modes of a laser beam of wavelength 5000Å in a cavity of length 50 cm.

**3.** Compare laser light and ordinary light on the basis of intensity and monochromaticity.

**4.** Why is a four level laser more efficient than a three level laser?

**5.** Find the intensity of a laser beam of 20mW power and having a diameter of 1.3X10-3 m. Assume uniform intensity across the beam.

**Section- B**

**B. Attempt all parts. (5X5=25)**

**6.** What do you mean by population inversion? Describe various methods to achieve it.

**7.** What is the role of resonant cavity in a laser system? Describe different types of resonant cavities and explain stability diagram.

**8.** What do you mean by loop gain? Derive threshold condition of laser oscillation.

**9.** The coherence for a light source is 2.945 X 10-2 mand its wavelength is 5890 Å. Calculate i) the number no. of oscillations corresponding to the coherence length, ii) coherence time, iii) the spectral width.

**10.** What is the meaning of Q-switching in laser system? Describe various methods to achieve it.

**Section- C**

**C. Attempt all parts. (2X7.5=15)**

**11.** What do you mean by coherence? Explain temporal and spatial coherence in detail. Prove that temporal coherence is related to monochromaticity and spatial coherence is related to size of the source.

**12.** Derive Einstein’s relation between Einstein’s coefficients. Why stimulated emission is more probable at higher wavelengths? An atom has two atomic levels separated by 2.26eV in energy. Calculate the temperature at which population ratio () of the two levels will be half.

**Physical Constants**

**Mass of electron :**

**Boltzmann’s constant:**

**Speed of light :**

**Planck’s constant :**