M.TECH. LASER SCIENCE AND TECHNOLOGY - FIRST YEAR - 1st SEM 2024

School of Laser Science and Engineering

Jadavpur University, Jadavpur, Kolkata 700032, India

Subject: LASER FUNDAMENTALS AND FABRICATION

Time: 3 hours, Full Marks 100

Ref.:Ex/PG/LST/T/111A/2024

Answer any five questions

1. a) Show that Rate of change of spontaneous emission / Rate of change of stimulated emission = $e^{hv/kT}-1$, where the symbols have their usual meanings.

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2. Show with the three examples by using Franck Condon Principle, how the shapes of the absorption bands change with the change of the equilibrium internuclear distances of the upper potential energy curves with respect to ground state potential energy curves.

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3.(a) Name the four factors which govern the spectral broadening.

Explain each of them. What is FWHM?

(b) What is dissociation and predissociation? Explain them by using Morse model. Deduce the expression of the equilibrium dissociation energy, De

as $D_e = \frac{\bar{\nu}_e}{4x_e}\ cm^{-1}$.

4+8+1+(5+2)

[Turn Over

4a) Deduce the expression of optical amplification when a near monochromatic light of frequency ν propagating along z direction passes through the two plain mirrors each of area "A" and separated by a distance dz;

b) Show that 2 levels are not sufficient for population inversion to occur in a laser.

15+5

5. Explain in details Q switching and Mode-locking. Which mechanism is important for production of femtosecond pulses?

18+2

6. Explain with a flow sheet diagram general classification of laser assisted fabrication of materials for engineering applications. 20