Soln. Tu. 7

① Self study

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③ The limited range of frequencies over which stimulated emission can provide sufficient gain is called the emission linewidth or gain bandwidth. It is also referred to as gain profile.

④ $\Delta\nu = \frac{c}{2n_0 L} = \frac{3\times10^8}{2\times1\times0.5} = 3\times10^8 \text{ Hz}$

⑤ $E = \frac{hc}{\lambda} = \frac{6.626\times10^{-34}\times3\times10^8}{632.8\times10^{-9}}$

$E = 3.141\times10^{-19} \text{ J} = \frac{3.141\times10^{-19}}{1.6\times10^{-19}} \text{ eV}$

$E = 1.96 \text{ eV}$

No. of photons emitted per second

$= \frac{1 \text{ mW}}{E} = \frac{10^{-3} \text{ watt}}{3.141\times10^{-19} \text{ J}} = 3.183\times10^{15}$

⑥ Coherence length $l_c = \frac{\lambda^2}{\Delta\lambda} = \frac{c}{\Delta\nu} = c\Delta t$

$\Rightarrow l_c = 3\times10^8 \text{ m/s} \times 26.7\times10^{-9} \text{ s} = 8 \text{ m}$