

Module 1 Unit 3

PRINCIPLES OF LASERS – NUMERICAL PROBLEMS

1. Find the ratio of population of two energy states of an active medium emitted laser radiation at 694.3 nm at room temperature (27 °C). Comment on the result.
 2. Show numerically that spontaneous emission dominates over stimulated emission at room temperature
 3. The wavelength of laser emission is 6000 Å and the coefficient of spontaneous emission is $10^6/s$. Determine the coefficient for the stimulated emission.
 4. At what temperature are the rates of spontaneous and stimulated emission equal? Take $\lambda = 5000$ Å.
 5. The length of a laser tube is 150 mm and the gain factor of the laser material is 0.0005/cm. If one of the cavity mirrors reflects 100% light, what is the required reflectance of the other cavity mirror?
 6. A laser source is emitting a laser beam with an average power of 4.5 mW. Find the number of photons emitted per sec by the laser. The wavelength emitted is 6328 Å.
 7. A pulsed laser emits photons of wavelength 780 nm with average power of 20 mW/pulse. Calculate the number of photons in each pulse if the pulse duration is 10 ns.
 8. A diode laser operates at 3.6 V and 130 mA current. If its optical power is 10 mW, calculate its efficiency.
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