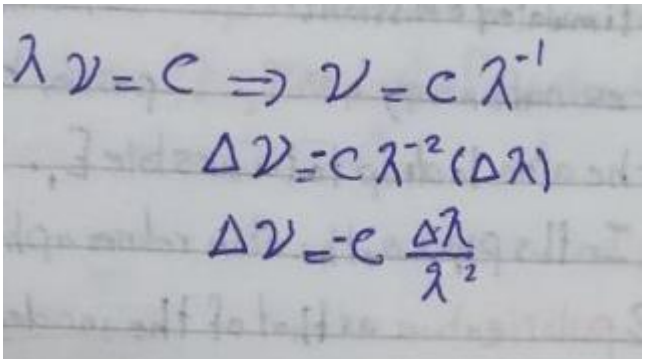
Benha University
Shoubra Faculty of Engineering
Electrical Engineering Department

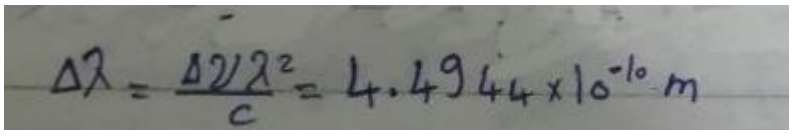
Optical Comm.
4th level

Sheet 5

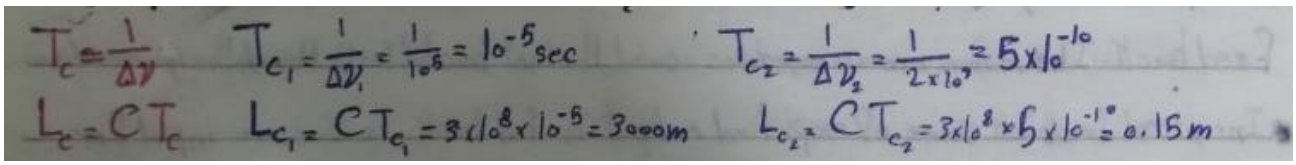
1. A- Drive a relationship between the spectral linewidth and the frequency linewidth.



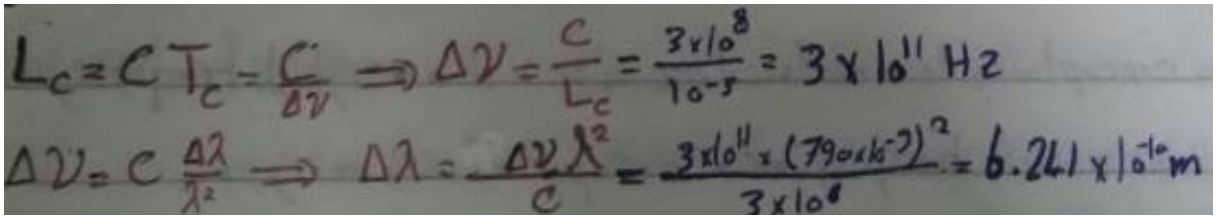
B- For a Nd:YAG laser with a central frequency 1.06 μm and frequency linewidth $\Delta\nu$ = 1.2 × 10^11 Hz, calculate the spectral linewidth of such a laser.



2. Suppose two argon lasers, the first one has one individual mode with a linewidth of 100 kHz. The second type has a gain bandwidth of 2 GHz. Find the coherence time and coherence length for the two laser types.



3. A semiconductor laser operates at a free-space wavelength of 790 nm, and has a longitudinal coherence length of 1 mm. Determine the linewidth in terms of both frequency and wavelength.

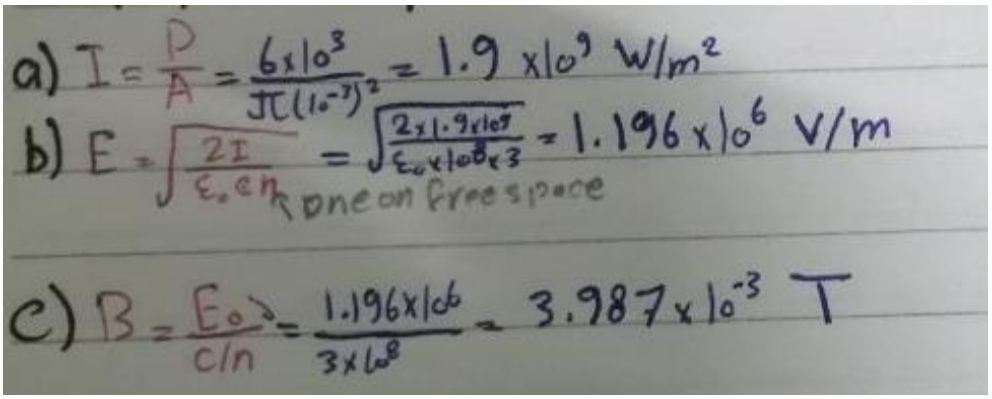


4. A laser beam of radius 1 mm carries a power of 6 kW. Determine:

a. The average irradiance

b. Amplitude of the electric field intensity (E)

c. Amplitude of the magnetic field density (B)



5. To operate a Nd:YAG laser, a power of 2500 W is required to drive the arc lamps. The arc lamps provide pump energy to create the population inversion. The overall laser system is characterized by the following component efficiencies:

80% — power supply operation

30% — arc lamps for pump light energy

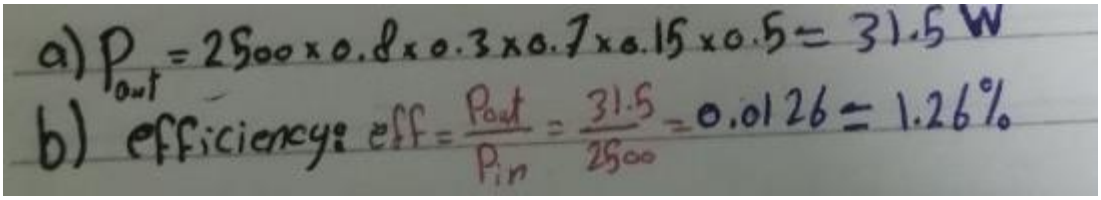
70% — optical reflectors for concentrating pump light on laser rod

15% — for spectral match of pump light to Nd:YAG pump levels

50% — due to internal cavity/rod losses

a. How much of the initial 2500 W is available for power in the output beam?

b. What is the overall operational efficiency for this laser?



1.What does the acronym LASER stand for?

a) Light Absorption by Stimulated Emission of Radiation

b) Light Amplification by Stimulated Emission of Radiation

c) Light Alteration by Stimulated Emission of Radiation

2. Laser source is highly

a) Monochromatic

b) Polychromatic

c) Unpolarised

3.What determines the color of light?

a) its intensity

b) its wavelength

c) its source

4. Which is the property of Laser light

a) Coherent

b) Non-coherent

c) multidirectional

5.Ordinary light emits

a) Coherent light

b) Incoherent light

c) Stimulated light

6.Laser has _____ divergence

a) moderate

b) small

c) large

7. process of radiation one photons called _____

a) spontaneous

b) stimulation

c) radiation