**OPTICAL SOURCES ASSIGNMENTS**

**(to be submitted on Wednesday 8 April 2015)**

1. An engineer has two  LEDs: one has band gap energy of 1.540 eV and the other has x = 0.015
   1. Find the aluminium mole fraction *x* and the emission wavelength for the first LED
   2. Find the band gap energy and the emission wavelength of the other LED
2. A double heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and nonradiative recombination time sof 25 and 90 ns, respectively. The drive current is 35 mA.
   1. Find the internal quantum efficiency and the internal power level.
   2. If the refractive index of the light source material is n = 3,5, find the power emitted from the device.
3. a GaAl As laser diode has a cavity length which has an effective absorption coeffient of 10 cm-1. For the uncoated facets the reflectives are 0.32
   1. What is the optional gain at the lasing threshold?
   2. If one end of the laser is coated with a dielectric reflector so that its reflectivityis now 90%, what is the optical gain at the lasing threshold?
   3. If the internal quantum efficiency is 0,65, what is the external quantum effiency is cases (a) and (b)?
4. A GaAs laser emitting at 800 nm has a 400  cavity length with a refractive index n = 3.6. If the gain exceeds the total loss  throughout the range 750 nm < < 850 nm, how many modes will exist in the laser?
5. A distributed feedback laser has aBragg wavelength of 1570 nm, a second-order grating with  = 460 nm, and a 300 cavity length. Assuming perfecttly symmetrical DFB laser, find the zeroth-, first-, and the second-order lasing wavelength to a tenth of a nanometer. Draw a relative amplitude-versus wavelength plot.