

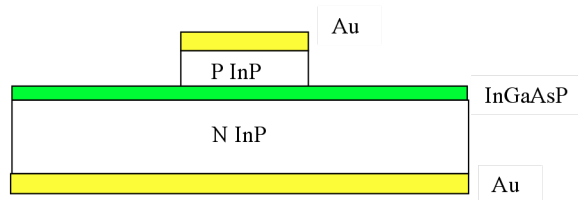
ECE 162C
Spring 2010
Homework #4
Due Monday, May 31

Problem 1: 15.2 Yariv

Problem 2: 15.9 Yariv

Problem 3:

Consider a ridge waveguide bulk InGaAsP /InP bulk laser with internal quantum efficiency of 80% and internal loss of 10 cm^{-1} , cleaved facets, $0.2 \text{ }\mu\text{m}$ thick $1.55 \text{ }\mu\text{m}$ composition active region, differential gain 2000 cm^{-1} and transparency carrier density of $2.8 \times 10^{18} \text{ cm}^{-3}$. a) What is the transverse confinement factor? (use $n_a=3.5$, $n_c=3.17$) B) How many transverse modes exist? C) Assuming the structure below with a 200 μm cavity length, calculate the lateral confinement factor and threshold current as a function of the width of the waveguide. D) For a 2 mm waveguide width, plot the threshold current versus cavity length.



Problem 4:

Consider a DFB laser with a $400 \text{ }\mu\text{m}$ long grating, an effective mode index 3.5 and a grating corrugation period $0.22 \text{ }\mu\text{m}$. Calculate the symmetric modes (wavelengths) that the laser will operate at assuming no $\lambda/4$ phase shift in the grating. What will be the output wavelength if the grating is fabricated with a $\lambda/4$ phase shift in the grating?