Homework # 3

EE 3161 - Spring 2008

Due Friday, March 14 in class

1) a) Problem 5.5 of Pierret. In your comparison to problem 5.4, you do not need to rework the problem; merely point out the major differences that would occur between the two.
b) For problem 5.5, sketch the band diagram for forward bias and for reverse bias.

2) Problem 6.1 a) – f) of Pierret.

3) A silicon p-n diode has $N_a = 2\times10^{15}$ cm^{-3} in the p-region and $N_d = 4\times10^{16}$ cm^{-3} in the n-region. If this diode is uniformly illuminated such that $G_L = 6\times10^{18}$ cm^{-3} sec^{-1}, find the quasi-fermi levels in the p and n regions (ignore the depletion region). Assume $\tau_n = \tau_p = 1\mu s$.

4) Assume the diode in problem 4.
a) Sketch the I-V curve for this diode for the case without illumination and with illumination. How did the curve change and why?
b) How would the I-V curve change if we raised the temperature from 300K to 1000K?

5) [*Problem 2, midterm exam #1, spring 2007*]
Consider the silicon p-n diode below.
a) What is the approximate built-in voltage of the diode?
b) What is the approximate depletion width if $V_a = 0$V? What about if $V_a = -5$V?
c) Approximately how much of the voltage drop for $V_a = -5$V occurs across the p+ (heavily doped) region? The p-region? The n-region?