Summer 2012
Ve320 Introduction to Semiconductor Device
Homework #5, due July 6, 2012 **before class**
Note: 1. homework can be submitted to my mail box.
2. **You are advised to finish problem 1-3 before the exam on June 29.**

1. RFP 6.6
2. RFP 6.10
3. Consider an ideal silicon pn junction diode at room temperature, with $N_A = 10^{17} cm^{-3}$ and $N_D = 10^{16} cm^{-3}$. Assume that L_N=20 μm and L_P=10 μm and that the diffusion coefficients can be obtained from the mobilities listed in Fig 3.5. The diode has a cross-sectional are of $100\,\mu m \times 100\,\mu m$.

   Assuming that the ideal diode equation holds. Plot the magnitude of the current (log scale) versus applied voltage over the range of -5V to +0.7V.

4. Starting from a copy of your plot from problem 3, indicate how each of the following non-idealities would change the overall I-V relationship (and label the dominant non-ideality in each region):

a) Reverse breakdown with a VBR = -4 V. (4V is used for illustration, but actual breakdown voltages are typically much higher for the stated doping densities)
b) R-G current
c) A series resistance of ~ 100 ohms.

5. Consider the capacitance for the silicon diode described in Prob. 3.

a) Find the zero-bias depletion region capacitance
b) Find the depletion capacitance a V_D = - 5V
c) Find the depletion capacitance at V_D = + 0.5V

6. RFP 6.13