ECE 340 Homework XV Spring 2003

Due: Wednesday, April 30, 2003

1. For an n-channel Si MOSFET with an oxide thickness d=150 Å, a channel mobility μ_n = 1000 cm^2 /V-s, Z=100 μm, and L=5 μm, determine the threshold voltages for $N_a = 10^{15}$ and $10^{17}/cm^3$, respectively. Calculate and tabulate $I_D(V_D,V_G)$ in the linear region at 300 K. Allow V_D to take on values of 0.1, 0.3, 0.5, 0.7, 0.9 and 1.1 V for V_G =2, 3, 4, and 5 V. Assume that $Q_i = 5x10^{11}$ qC/cm^2 . Also, determine I_{Dsat} in the saturation region for each gate bias and doping.

2. Plot I_D vs. V_D for V_G = -2, -3, and -4V for a thin-oxide (100Å) p-channel transistor. The substrate doping and effective interface charge are $N_d=10^{16}$ cm^3 and $Q_i = 5x10^{10}$q C/cm^2, respectively. Assume that I_{Dsat} remains constant beyond pinch-off and μ_p=200 cm^2/V-s and Z=10L.