Homework 2 Due February 20th

- 1. If the resistivity of aluminum is 2.8x10-8 Ω-m and the resistance of a metal wire in a particular process is 0.06 Ω/square, what's the thickness of the wire? (5 *pts*)
- 2. a. What is the delay from VIN to VOUT in the following circuit. Assume that the wire resistance is 0.06 Ω /square and the wire area capacitance is 0.03fF/µm² and the wire fringing capacitance is 0.04fF/µm. k_n=.2 mA/V², k_p=.1 mA/V² for minimum sized transistors. The equivalent resistance for the nMOS and pMOS transistors are 13k Ω and 31k Ω respectively. Assume that the input capacitance is 5fF for a minimum sized transistor. (20 pts)



b. If you scale the second inverter by a factor of 2, i.e. increase the width by a factor of 2, what happens to the delay time?

c. If you keep on scaling the second inverter, will the delay continue to go down? Why or why not?

3. Given the following circuit, estimate the delay time from node 1 to node 2. Again, the wire resistance is 0.06Ω/square and the wire capacitance is .04fF/µm². For all inverters, the equivalent resistance is 10KΩ, and the input capacitance of each inverteris 10fF. Ignore the fringing capacitance.

