

George Mason University

Department of Electrical and Computer Engineering

ECE 680 --- Physical VLSI Design

Fall 2008

Homework 1

Due: Thursday, 9/18/2008

Policy: Provide details of the solution for each problem. A solution with only final results will not get credit.

Problem 1

CMOS Inverter

- a. Use Microwind software to design and layout a CMOS inverter with $L = 0.25 \mu\text{m}$, $W_n = 0.38 \mu\text{m}$ and $W_p = 1.13 \mu\text{m}$.
- b. Find the values V_M , V_{OH} , V_{OL} , V_{IH} , and V_{IL} . Plot the transfer characteristics (V_{OUT} vs. V_{IN}) Assume $V_{DD} = 2.5 \text{ V}$. (DC voltage-current simulation)
- c. Manual calculation: calculate the R_{eq} of the NMOS and PMOS, calculate the propagation delay t_{pLH} and t_{pHL} of the CMOS inverter. Assume $C_L = 6 \text{ fF}$. (see equations in page 200 – 201)
- d. Find the average power consumption of the CMOS inverter. Assume $f = 20 \text{ GHz}$. (use transient simulation)