

**EELE 414 – Introduction to VLSI Design**  
**Homework #5**

**Name:** \_\_\_\_\_

**Grade:** \_\_\_\_\_ /10

1) CMOS Inverter Voltage Transfer Characteristics (Hand Calculations)  
(6 Points)

- a) For our Generic 0.25um CMOS inverter with the parameters specified in the **Level 1** model, calculate the 5 critical voltages ( $V_{th}$ ,  $V_{IL}$ ,  $V_{IH}$ ,  $V_{OL}$ ,  $V_{OH}$ ) if  $L_n=L_p=0.25\mu m$ ,  $W_n=2.5\mu m$ ,  $W_p=5\mu m$ . For this process,  $V_{DD}=+2.5v$
- b) Calculate the Noise Margins ( $NM_H$  &  $NM_L$ )

2) CMOS Inverter Voltage Transfer Characteristics (SPICE)  
(4 Points)

Run a DC simulation on your CMOS inverter ( $V_{in}$  vs.  $V_{out}$ ) and mark on the plot the 5 critical voltages. It helps when determining  $V_{th}$  if you also plot  $V_{in}$  on the dependant axis. It will be a straight diagonal line but will show you the exact crossing where  $V_{in}=V_{out}$ .