IEE5049-Spring 2012 Digital Integrated Circuit Exercise 1

Voltage Transfer Characteristic

The voltage transfer characteristic (VTC) describing V_{out} as a function of V_{in} under DC conditions can be found for various input voltage values.

In this exercise, you are requested to plot VTC curves of an inverter under different conditions:

Minimum width is 120nm and minimum length is 90nm.

A. Different PMOS to NMOS transistor width ratio (VDD=1V, T=25°C)

   a. W_p/W_n=1/1
   b. W_p/W_n=2/1
   c. W_p/W_n=3/1
   d. W_p/W_n=4/1
   e. W_p/W_n=8/1

B. Different supply voltage (W_p/W_n=3/1, T=25°C)

   a. VDD=1V
   b. VDD=0.9V
   c. VDD=0.8V
   d. VDD=0.7V
   e. VDD=0.6V
   f. VDD=0.5V

C. Different temperature (W_p/W_n=3/1, VDD=1V)

   a. T=-25°C
   b. T=0°C
   c. T=25°C
   d. T=125°C

Use HSPICE simulator and PTM 90nm technology model to simulate the inverter under different conditions. Then use the measured results to plot the VTC curves. The curves should be like the ones in pp.30, 31 and 32 of Lec 04a.

Exercise Submission

Your submission should include:

1. Report

A brief report of your results and plots. The operating point should be clearly specified (voltage, temperature, width ratio, etc.)

2. Source code of your simulation

The netlist files (.sp), the log file (.lis), and the measurement file (.mt#).

Zip all your files in *ex1(student ID number).zip* and mail to TA.

Due time: 2011.04.11