

**Spring Semester 2021**

**CSE463M-563M: Digital Integrated Circuit Design and Architecture**

**Homework #4**

1. **2-input CMOS NOR gate design problem (including layout)**

 **Design a two input CMOS NOR gate with the following specifications:**

* **logic threshold of VTH = 2.5V when all inputs are connected to VTH**
* **minimum rise time of rise < 2ns for load capacitance of 100fF.**

 **Present the following for your homework:**

 **a) Show all hand calculations used to get the appropriate size of all transistors.**

 **b) Draw the schematic of the two input NOR gate and create a symbol.**

 **c) Simulate the NOR gate. Plot the DC characteristics when all inputs are connected together.**

 **Plot the transient characteristics for all transitions of the inputs and verify that the**

 **specifications were met.**

 **d) Draw the layout of the NOR gate. Measure the size of the layout and use the ruler in layout**

 **to show the dimensions.**

 **e) Run a DRC, extract the layout and LVS the design. Cut and Paste the messages generated in**

 **the CIW (the main Cadence window) when the DRC is executed. Print the LVS result – make**

 **sure it has successfully passed LVS.**

1. **2-input CMOS NAND gate design problem (including layout)**

 **Design a two input CMOS NAND gate with the following specifications:**

* **logic threshold of VTH = 2.5V when all inputs are connected to VTH**
* **minimum fall time of fall < 2ns for load capacitance of 100fF.**

 **Repeat the same steps as in Problem 1 and print all results as requested in Problem 1.**