In-Lab-Exam Example – nor2 Design

The exam will be open-book open-note and open-handout, but not “open-discussion”. The only person you can talk to during the exam is your TA.

*What you would be given:*

Schematic

Length and Width of all MOS are 0.6µm and 1.5µm, respectively. (These are the default/minimal lengths and width. The L and W might not be minimal during the exam.)
Symbol:

The nor2 symbol is imported from library NCSU_Digital_Parts’ nor2 symbol. (You should add myvdd and mygnd pins to the symbol, as usual.)

Testbench Schematic

The inputs are set as

Vdc: 5 V DC

Vpulse to input A: Voltage 1: 0 V, Voltage 2: 5 V, Delay time: 10n S, Rise time: 1n S, Fall time: 1n S, Pulse width: 20n S, Period: 40n S

Vpulse to input B: same as input to A, except Delay time is 20n S

Load resistor: 100G
**What you are asked to do:**

1. **Show up during exam time (2 point)**  
   - Estimated time: 0 min  
   - Difficulty: N/A

2. **Draw the schematic of nor2 in Virtuoso Schematic Editor (1 point)**  
   - Estimated time: 5 mins  
   - Difficulty: Low

3. **Create a symbol for nor2 in Virtuoso Symbol Editor (1 point)**  
   - Estimated time: 3 mins  
   - Difficulty: Moderate – just make sure you rename BOTH the pin and the label

4. **Draw the testbench schematic in Virtuoso Schematic Editor (1 point)**  
   - Estimated time: 5 mins  
   - Difficulty: Moderate – do not set the parameters like 5V V

5. **Conduct a schematic simulation in Affirma and get correct output (according to nor2 function) (1 point)**  
   - Estimated time: 5 mins  
   - Difficulty: Low

6. **Draw layout for nor2 gate in Virtuoso Layout Editor (XL) with correct transistor chaining (1 point), pass DRC check (1 point) and LVS check (1 point)**  
   - Estimated time: 25-30mins  
   - Difficulty: High – you need to practice enough to get this done correctly

7. **Conduct post-layout simulation in Affirma and get correct output (1 point)**  
   - Estimated time: 3 mins  
   - (This is shorter than pre-layout simulation because if you just leave the previous simulation open, all you need to do is to add “extracted” keyword to the environment setting and hit “run”!)  
   - Difficulty: Low

The total time allowed is 60 mins. (51 + 9 margin)
Here a sample layout of nor2 and the simulation result are shown for your practice reference.