

EE 330 Fall 2012

Homework 3

Due Friday September 7 at the beginning of the lecture. You MUST clearly indicate your name and SECTION on the first page of your HW. Submissions that do not include the section WILL NOT be graded.

Problem 1 (10 points):

Please solve problem 1.6, parts (b) and (c) in (WH). Modify this problem to design of these functions using both the compound gate approach and the static CMOS gate approach. Compare the number of levels of logic and the total transistor count in the two approaches.

Problem 2 (10 points):

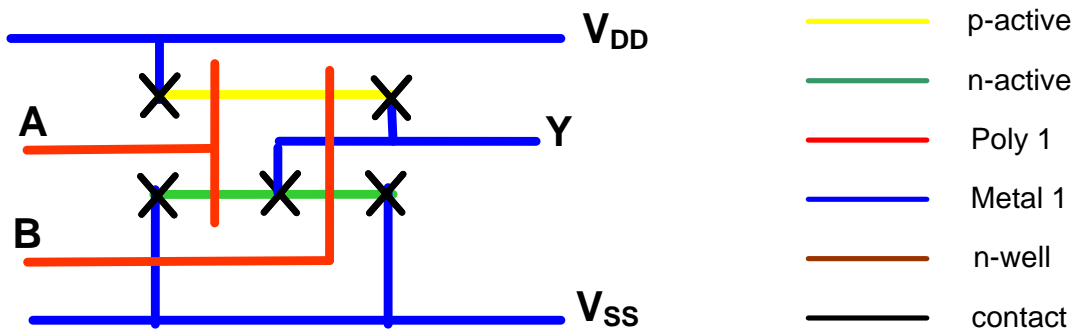
Please solve problem 1.7, parts (c) and (d) in (WH).

Problem 3 (10 points):

Please solve problem 1.16, parts (a) and (b) in (WH).

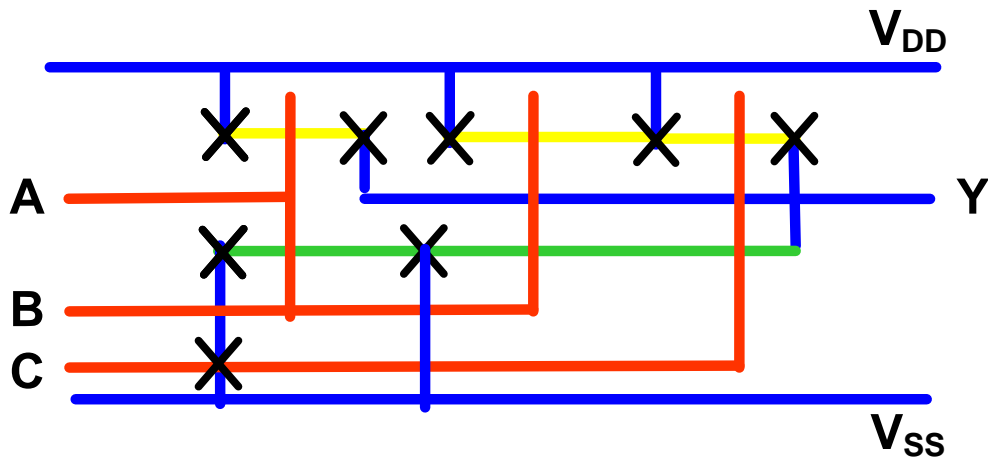
Problem 4 (10 points):

The stick diagram of a circuit is shown below. Draw the circuit schematic for this circuit. The color code for the stick diagram is shown to the right of the diagram.



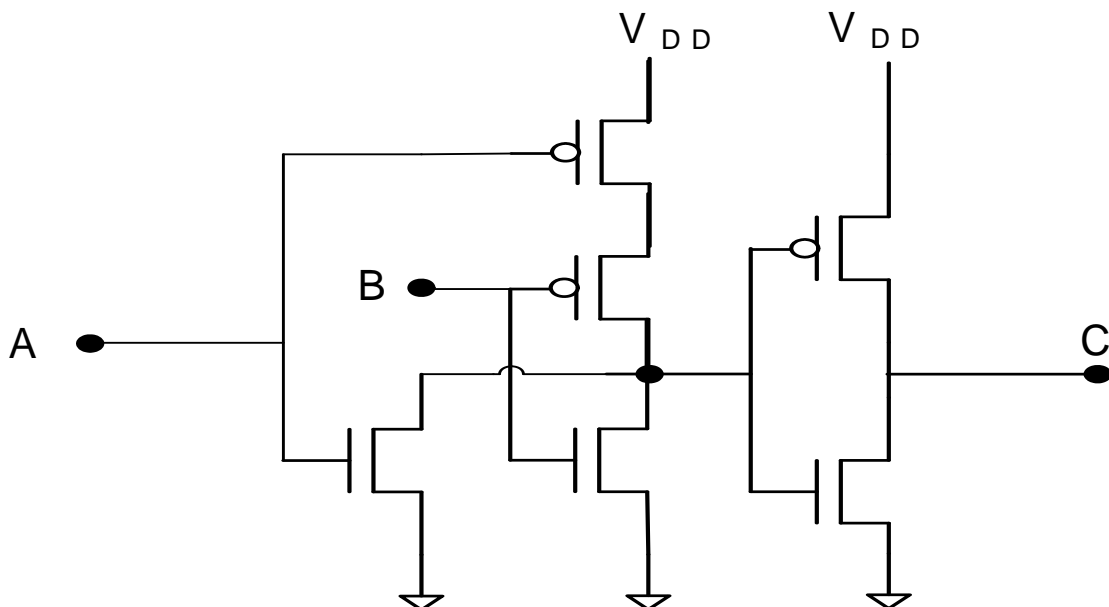
Problem 5 (10 points):

A stick diagram has been put together for a 3-input CMOS NAND gate and is shown below. There are one or more errors in this stick diagram. Identify and correct all the errors in the stick diagram. Use the same color code for the stick diagram in problem 4.



Problem 6 (10 points):

Draw a stick diagram for the cascade of the two CMOS gates shown below.



Problem 7 (15 points):

Design a circuit that implements the Boolean function given with both static CMOS logic gates and compound logic gates and compare the number of transistors and the number of levels of logic in the two implementations. Assume the input variables are A, B, and C

$$Y = (A + \bar{B}) \cdot C$$

Problem 8 (10 points):

Assume a CMOS inverter designed in the ON 0.5u CMOS process drives 8 identical devices and the supply voltage is 3.5V. If a step input from 0V to 3.5V is applied at the input, what is the HL output transition time?

Problem 9 (15 points):

Build a basic digital switch for use in a security camera program. If the input SWITCH is high, the output should be equal to the camera watching the jewels (input JEWELS). If SWITCH is low, the output should be equal to the camera watching the rare artifacts (input ARTIFACTS). Note that this is a terrible scheme for a security camera program as it will easily be thwarted by any criminal mastermind from a wide range of heist movies. Complete the switch:

- A) Using an "if-else" statement
- B) Without using any "if" statements

Remember that your textbook has an excellent discussion of Verilog in Appendix A. As always, verify your switch with proper simulation.