

QUIZ 2

Introduction to Computer Systems COMP 273

Mon. Feb. 8, 2016

Professor Michael Langer

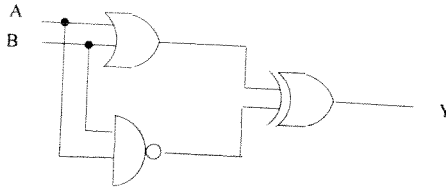
LASTNAME: _____ FIRSTNAME: _____ ID: _____ GRADE: 4

Instructions:

This is a closed book quiz. You are allowed one crib sheet. You are *not* allowed a calculator. Once you finish, turn your paper over and wait for the end of the quiz.

1. (2 points)

Write a sum-of-products representation of the circuit below which consists of a NOR, NAND, and XOR gate. Show your work, including a truth table.



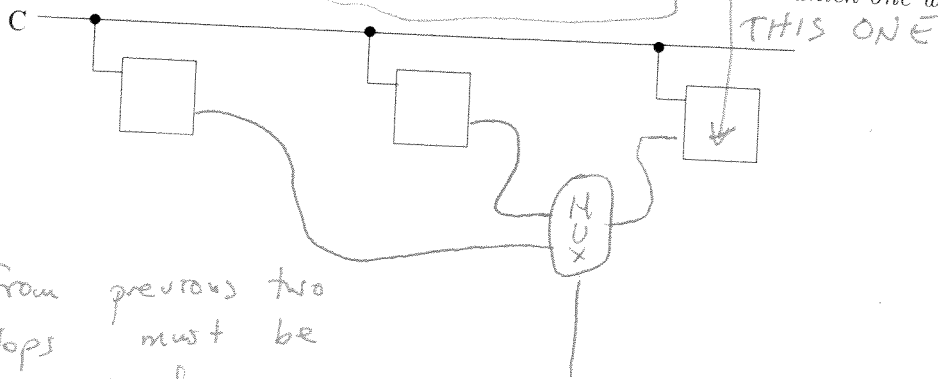
A	B	A+B	$\overline{A \cdot B}$	Y
0	0	0	1	1
0	1	1	1	0
1	0	1	1	0
1	1	1	0	1

$$Y = \overline{A \cdot B} + A \cdot B$$

2. (2 points)

Consider a shift-right register which has many bits. The figure below shows three of the flipflops from such a shift right register. To shift by m bits to the right would require m clock cycles. Add circuitry (wires and gates) to the figure which would allow the shifts to be either 1 or 2 positions in each clock cycle. Note that such circuitry could be used to reduce the number of clock cycles from m to about $m/2$.

It is sufficient to show a complete circuit of just one of the three flipflops. Choose which one wisely.



① wires from previous two flipflops must be used

① MUX done properly

Select
0 (shift 1)
1 (shift 2)