QUIZ 2
Introduction to Computer Systems COMP 273
Mon. Feb. 8, 2016
Professor Michael Langer

LASTNAME: ___________________ FIRSTNAME: ______________ ID: ___________ GRADE: ___________

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.

\[
\begin{array}{cccc|c}
A & B & A+B & \overline{A\cdot B} & Y \\
\hline
0 & 0 & 0 & 1 & 1 \\
0 & 1 & 1 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 \\
1 & 1 & 0 & 0 & 1 \\
\end{array}
\]

\[Y = \overline{A\cdot B} + A\cdot B\]

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.

C

MUX

0 (shift 1)
1 (shift 2)