COMP 230: Computer Architecture and Organization September 6, 2017

Homework 2

Instructor: Robert Utterback *Due: September 15, 2017*

1. Draw logic diagrams for the following:

   (a) $Y = \overline{(A \cdot C)} + (A \cdot C)$

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

   (c) $Y = \overline{\overline{C} + B + A}$

2. Prove or disprove the following using truth tables.

(a) $A \cdot (B + C) = (A \cdot B) + (A \cdot C)$

(b) $(A \cdot B) + A = A$

(c) $\overline{A + B} = \overline{A} + \overline{B}$

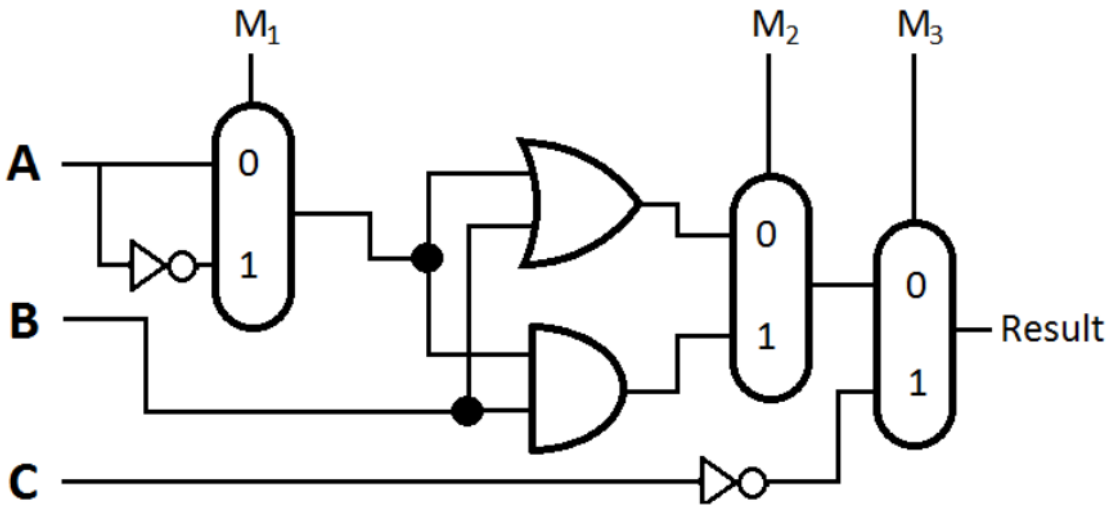
3. Use the following truth table for the questions below:

Inputs		Outputs		
A	B	X	Y	Z
0	0	1	1	1
0	1	1	1	0
1	0	1	0	0
1	1	1	0	1

(a) Write out the values of X, Y, and Z as a product of sums.

(b) Draw the PLA for the table above using the condensed (grid-like) notation.

4. Consider the following logic diagram:



With the following inputs to the multiplexors, what is the logical representation in terms of A, B, and C?

(a) $M_1 = 1, M_2 = 0, M_3 = 0$

(b) $M_1 = 0, M_2 = 1, M_3 = 0$

(c) $M_1 = 0, M_2 = 0, M_3 = 1$

5. Convert the following to binary and add. Assume an 8 bit signed adder (using two's complement).

   (a) $19 + 13$

   (b) $109 - 100$

   (c) $-42 + -117$

6. What is the longest chain of gates through a 4-bit ripple-carry adder? Through a 4-bit carry lookahead adder? Assume it takes two levels of gates (as in a PLA) to compute a sum bit, carry out bit, propagate bit or generate bit.