

COMP 230: Computer Architecture and Organization

HOMEWORK 2

Assigned: September 7, 2017

Due: September 17, 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) $Y = \overline{\bar{C} + B + A}$

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

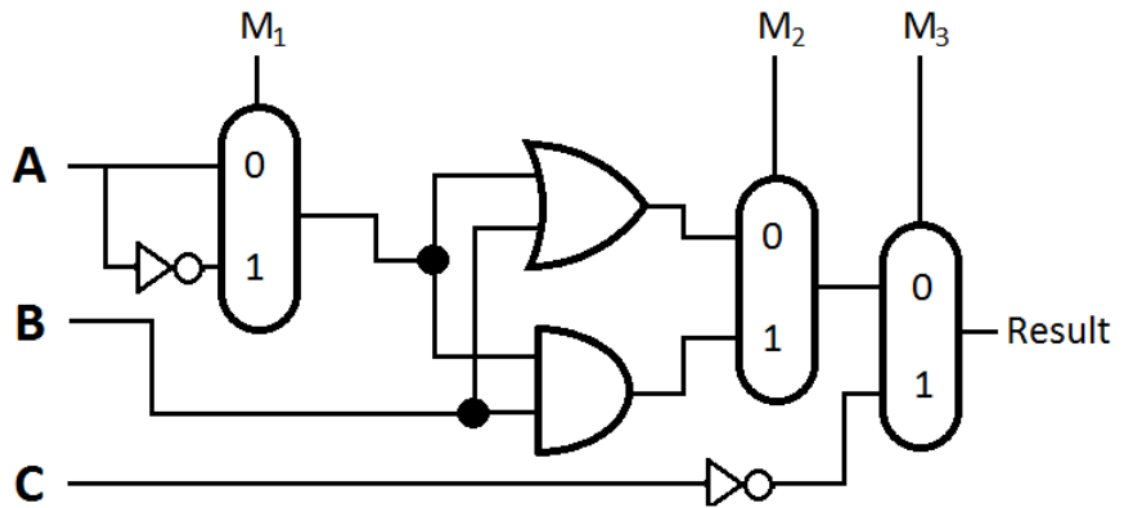
3. Use the following truth table for the questions below:

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.

(a) Draw the PLA for a 1-bit adder. Use the formulas from the book, i.e.,

$$\text{CarryOut} = (b \cdot \text{CarryIn}) + (a \cdot \text{CarryIn}) + (a \cdot b)$$

$$\text{Sum} = (a \cdot \bar{b} \cdot \overline{\text{CarryIn}}) + (\bar{a} \cdot b \cdot \overline{\text{CarryIn}}) + (\bar{a} \cdot \bar{b} \cdot \text{CarryIn}) + (a \cdot b \cdot \text{CarryIn})$$

(b) What is the gate delay through a 4-bit ripple-carry adder? Use your 1-bit adder above as a building block.

(c) What is the gate delay through a 4-bit carry lookahead adder?