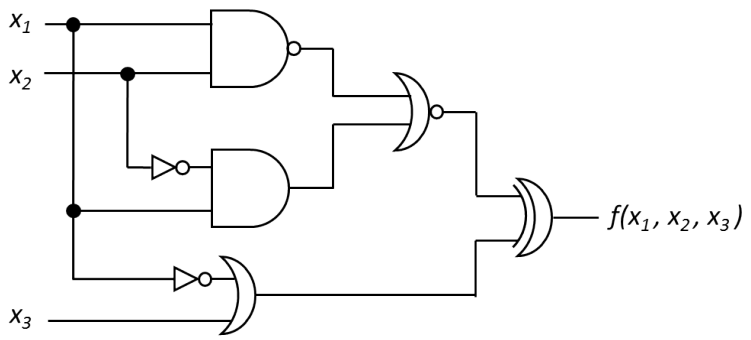
Homework 9

CSCI-UA.0480-005
Special Topics: Electrical Engineering for Computer Scientists
Prof. Rappaport

Due: April 28, 2015 @ 9:30 AM

Questions 1-5 will be graded for 20 points each.
Question 6 will be worth 20 points of extra credit for this homework.

1. Determine the truth table for the following digital logic circuit:



x_1	x_2	x_3	$f(x_1, x_2, x_3)$
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

2. Complete the following conversions and show your work:

   a. Convert 186_{10} to Binary (base 2).

   b. Convert 1011101_2 to Decimal (base 10).

c. Add 45_{10} to 1101011_2 and show the result in both Binary (base 2) and Decimal (base 10).

3. Convert the following expressions to their sum of products (SOP) form:

   a. $(A + B)(\overline{B} + C)(\overline{A} + C)$

   b. $(C + D)(A \cdot \overline{B} + A \cdot C)(\overline{A} \cdot \overline{C} + B)$

   c. $(A + B + C)(A + C + D)(D + F)$

4. Find the minimum-cost sum of product (SOP) form for the function $f(x_1, x_2, x_3) = \sum m(1, 2, 3, 5)$ using a Karnaugh Map. From the expression, design a logic circuit using only two-input **AND**, **OR**, and/or **NOT** gates.

5. From the truth table below, (a) sketch the corresponding Karnaugh Map. (b) Using the Karnaugh Map, determine the simplest sum of products (SOP) form for this function. (c) Draw the circuit diagram using only two-input **AND**, **OR**, and/or **NOT** gates.

A	**B**	**C**	f(**A**,**B**,**C**)
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

6. **Extra Credit (20 points)**: Assume that you have a 1 KHz pulse train, and you need a 500 Hz pulse train. Describe how a T flip-flop can be used to convert a 1 KHz pulse train to a 500 Hz pulse train.