[CS M51A WINTER17] HOMEWORK 1

Due: Friday, 01/20/17

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Homework Problems (80 points total)

Problem 1 (15 points)

Find x, y and z such that the following conditions are satisfied and show all the steps of your work.

1. $(B53AD)_{16} = (x)_8 = (y)_4$
2. $(78A)_{11} + (313)_5 = (z)_9$

Problem 2 (10 points)

$X = (x, y, z)$ is a 3-digit weighted mixed-radix number system: x is a radix-8 digit, y a is radix-5 digit, and z is a radix-12 digit.

1. Show the radix vector R and weight vector W for this number system.
2. Convert $X = (4, 3, 10)$ to a decimal number using W vector.
3. What is the largest number of X in decimal?

Problem 3 (20 points)

Show that the following holds using the postulates of Boolean algebra.

1. $wxy + w'xy + x'(zw + zy') + z(x'w' + y'x) = xy + z$
2. $(a'b' + c)(a + b)(b' + a'c')' = bc$

Problem 4 (10 points)

Using identities from Switching Algebra, convert the following truth table to a switching expression and simplify the expression as much as possible.

x	y	z	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Problem 5 (25 points)

F is a function that accepts inputs $x \in \{0, 1, 2\}, y \in \{1, 2, 3\}$, and outputs $z = max(x^2, y)$. Suppose you use binary code to encode x, y, and z. x is encoded as x_1x_0, y is encoded as y_1y_0, z is encoded as $z_2z_1z_0$.

1. (16 points) Fill in the table below.

x_1	x_0	y_1	y_0	z_2	z_1	z_0
0	0	0	0			
0	0	0	1			
0	0	1	0			
0	0	1	1			
0	1	0	0			
0	1	0	1			
0	1	1	0			
0	1	1	1			
1	0	0	0			
1	0	0	1			
1	0	1	0			
1	0	1	1			
1	1	0	0			
1	1	0	1			
1	1	1	0			
1	1	1	1			

2. (3 points) Obtain the minterm expressions (in m-notation) of z_2, z_1 and z_0 respectively.

3. (3 points) Obtain the maxterm expressions (in M-notation) of z_2, z_1 and z_0 respectively.

4. (3 points) Does any of the switching functions (z_2, z_1, z_0) have a dc-set? If so, show the dc-sets.