Homework #2 Computer Organization Due: February 15, 2008 (F)

1) Use Booth's algorithm to calculate the 8-bit product of 0110_2 x 1101_2.

Multiplicand

0 1 1 0

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1 0 1 0

"Product register"	"Multiplier register"	"Previous bit"
0 0 0 0	1 1 0 1	0

2) The ASCII code for character 'c' is 99_{10}.

a) What would be the 7-bit binary value used to represent 'c'?

b) Even-parity prepends a 0 or 1 so as to make the total number of 1's be even. What is the 8-bit ASCII value for 'c'?

c) What errors cannot be detected by even-parity?

3) For the 8-bit data 01101001_2 develop the Hamming codeword for one-bit error detection and correction:

12	11	10	9	8	7	6	5	4	3	2	1
D_7	D_6	D_5	D_4	P_8	D_3	D_2	D_1	P_4	D_0	P_2	P_1
0	1	1	0		1	0	0		1		
4+8	1+2+8	2+8	1+8	8	1+2+4	2+4	1+4	4	1+2	2	1

4) Consider the 10-bit data 0111010010_2 and generator polynomial $G = x^5 + x^2 + 1$ (100101_2). Using the Cyclic Redundancy Check (CRC) method:

a) what code word (data and remainder) would be sent to the receiver?

b) Upon receiving a codeword, how does a receiver check for an error in transmission?

c) If the receiver does not detect an error, can it be certain that no error occurred? Explain you answer.

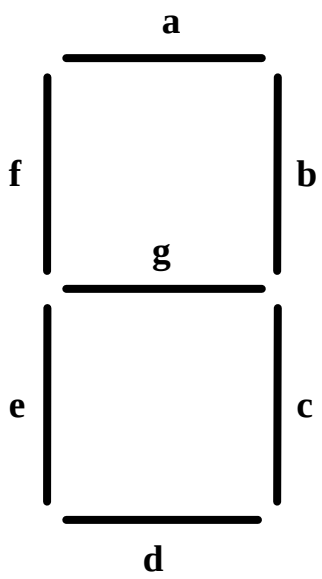
5) Simplify the following using K-maps:

a) $F_1 = AB\overline{C} + \overline{B}\overline{C} + A\overline{B}C + \overline{A}BC + \overline{A}B\overline{C}$

b) $F_2 = \overline{A}\overline{B}CD + A\overline{B}\overline{C} + \overline{B}C\overline{D} + \overline{A}\overline{C}\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{C}D$

6) Consider the BCD to seven-segment LED display,

Decimal Value	x_1	x_2	x_3	x_4	**a**	**b**	**f**
0	0	0	0	0	1	1	
1	0	0	0	1	0	1	
2	0	0	1	0	1	1	
3	0	0	1	1	1	1	
4	0	1	0	0	0	1	
5	0	1	0	1	1	0	
6	0	1	1	0	1	0	
7	0	1	1	1	1	1	
8	1	0	0	0	1	1	
9	1	0	0	1	1	1	
10	1	0	1	0	d	d	
11	1	0	1	1	d	d	
12	1	1	0	0	d	d	
13	1	1	0	1	d	d	
14	1	1	1	0	d	d	
15	1	1	1	1	d	d	



a) In the above truth table, should the desired output for the LED-segment **f** (Use "d"s for don't cares)**.**

b) Using a K-map, what would be the **simplified SOP** expression for the "f" segment?

c) Since there are so many 1's in function c above, consider implementing $\overline{f}$ and then negating it.