CS 160, Fall 2006
Dr Beck
HW #1: Boolean algebra and logic
Due 9/12

1. (10 pts)
a) Write an expression for the function F in sum-of-minterms form

$$F(x,y) = \overline{(\bar{x}y + x\bar{y})}$$

b) Give the truth table for the above function.

2. (20 pts) Prove these expressions equivalent using standard identities given in Table A.4 on page 670 of Hamacher.

a. $xyz + (\bar{x}y + xy\bar{z}) = y$

b. $(x + y)(\bar{x} + \bar{y}) = x\bar{y} + \bar{x}y$

c. $x(y\bar{z} + z\bar{w}) + x = ((y\bar{z} + z\bar{w})+((\bar{y} + z)(\bar{z} + w))) x$

d. $\bar{x}yz + xyz + x\bar{z} = x$

e. $\bar{x}y + \bar{y}z + \bar{z}x = x\bar{y} + z\bar{x}$

3. (30 pts) Use a Karnaugh maps to find minimal SOP expressions for the functions described in Problems A.6 - A.9 in Hamacher. For each of A.6 - A.9, show a circuit that is lower cost than the minimal SOP form if one exists.

4. (20 pts) Using a PAL of the type shown in Figure A.42 in Hamacher, show how to implement

a) The function from problem 1.

b) The majority function of three inputs

F(x,y,z) = value taken by the majority of x, y, and z

5. (20 pts) Use a Karnaugh map to derive a boolean expression in minimal SOP form that is equivalent to each truth table. Show the map and rectangles.

a)

x1	x2	x3	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

b)

x1	x2	x3	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1