ECEN 2350: Digital Logic

Assignment #8

1. [5 points.] Shown below is the truth table for the function that says whether a four-digit binary number $a_3a_2a_1a_0$ is a multiple of 3.

a_3	a_2	a_1	a_0	z
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

   Write a Karnaugh map for z, using a_3a_2 to label the columns of the map and a_1a_0 to label the rows. From your map, write a sum of products equation for z. To do that, circle the blocks of 1s ("prime implicants") on the map; then choose enough blocks to cover all the 1s.

2. [5 points.] Circle all prime implicants (largest blocks of ones with dimensions that are a power of two) and find a sum of products for the following Karnaugh map (Note we have left cells containing zeros empty for convenience).

yz \ wx	00	01	11	10
00	1	1		1
01		1	1	1
11		1		
10	1	1		1

3. [5 points.] Circle all prime implicants and find a minimum-cost sum of products for the following Karnaugh map.

yz \ wx	00	01	11	10
00		1	1	
01	1	1	1	
11			1	
10		1	1	

4. [5 points.] Circle all prime implicants and find a minimum-cost sum of products for the following Karnaugh map.

yz \ wx	00	01	11	10
00		1		1
01		1		1
11		1		1
10				

5. [5 points.] Repeat Exercise 4, but this time "cover the zeros." That is, find an optimal sum of products for the negation of the function given in the map, and then apply De Morgan's laws to find an optimal product of sums.