CSEE 3827: Problem Set 2 — Due: 2/11/09

Complete the following problems. Be sure to show your work for partial credit.

1. Find a minimal Boolean equation for the following function. Remember to take advantage of the don't care entries.

A	B	C	D	F
0	0	0	0	X
0	0	0	1	X
0	0	1	0	X
0	0	1	1	0
0	1	0	0	0
0	1	0	1	X
0	1	1	0	0
0	1	1	1	X
1	0	0	0	1
1	0	0	1	0
1	0	1	0	X
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	X
1	1	1	1	1

2. A circuit has four inputs and two outputs. The inputs, $A_{3:0}$, represent a number from 0 to 15. Output P should be TRUE if the number is prime. Output D should be true if the number is divisible by 3. Give simplified boolean equations for each output and sketch a circuit implementing the functions.

3. Minimize the following function using a Karnaugh map:
$F(A, B, C, D, E) = \Sigma m(1, 5, 8, 10, 12, 13, 14, 15, 17, 21, 24, 26, 31)$

4. You have learned how to use to plot the minterms of a function on a K-map. However, if a function, F, is expressed as a product of maxterms, you can still use K-maps to minimize it. Start by constructing the grid and labels as usual. Then, plot a 0 in the grid for each maxterm in F. You can then simplify F by identifying prime implicants that "cover" these maxterms and taking their product. Apply this technique to find the minimimum POS expression for F, where $F = \Pi M(0, 2, 3, 9, 11, 12, 13, 15)$.