EE 231

Exam 2

October 15, 2008

Name: _____

Show all work. Partial credit will be given. No credit will be given if an answer appears with no supporting work.

1. Conside the following Boolean function: $F(w, x, y, z) = \sum(1, 3, 5, 7, 8, 9, 11, 15)$.

   (a) Find all the prime implicants of the function, and indicate which are essential.

   (b) Use a Karnaugh map to simplify the function.

2. Simplify the Boolean function $F(w, x, y, z) = \sum(0, 1, 5, 6, 9)$ with the don't-care conditions $d(w, x, y, z) = \sum(2, 8, 10, 13, 15)$.

3. Consider the following circuit constructed with a 4-to-1 multiplexor. Determine a Boolean expression for the output F.
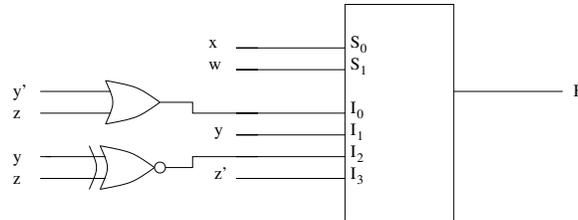
4. Design a circuit which implements the function $F = x'y' + xyz'$ using a 3-to-8 decoder and some OR gates.

5. Design a division detector device that receives a 4-bit binary number $A_3 A_2 A_1 A_0$ and outputs a 1 whenever the input is evenly divisible by either 4 or 5.

   (a) Find the truth table for the device

   (b) Use a Karnaugh map to find a reduced sum-of-products form for the device.