ES50 Problem Set

1. Simplify the following function using K map and the don't care states d: then express the simplified function as a sum of min terms:

   $F(x, y, z) = \Sigma(0, 1, 2, 4, 5)$

   $d(x, y, z) = \Sigma(3, 6, 7)$

2. Simplify the following function using K map and the don't care states d: then express the function as both a sum of products and a lproduct of sums;

   $F(w, x, y, z) = \Sigma(0, 1, 2, 3, 7, 8, 10)$

   $d(w, x, y, z) = \Sigma(5, 6, 11, 15)$

3. A logic circuit implements the following function:

   $F = A'C + AC'D'$

   It is found that the input combination $A = C = 1$ can never occur. Find a simpler expression fkor F using the proper don't care conditions.

4. Complete the design started in class for a BCD to decimal decoder making use of don't care states, if any, to simplify the logic.

5. A combinational circuit is defined by the following three functions. Design the circuit using a decoder and external gates:

   $F1 = x'y'z' + xz$

   $F2 = xy'z' + x'y$

   $F3 = x'y'z + xy$

6. A combinational circuit is defined by the following functions. Design the circuit using a decoder and minimal external lkogic:

   $F1 = \Sigma(2, 4, 7)$

   $F2 = \Sigma(0,3)$

   $F3 = \Sigma(0, 2, 3, 4, 7)$

7. Construct a 5x32 decoder using four 3x8 decoders with enable and one 2x4 decoder. Use block diagrams.

8. Implement the following function with an 8x1 MUX:

   $F(A,B,C,D) = \Sigma(0, 3, 5, 6, 8,9, 14, 15)$

9. An 8x1 MUX has inputs A, B, and C connected to the select inputs s2, s1, and s0 respectively. The data inputs D0 through D7 are as follows; $D1 = D2 = D7 = 0$; $D3 = D5 = 1$; $D0 = D4 = D$; and $D6 = D'$. Determine the function that the MUX implements.

10. Implement the following function using a 4x1 MUX and external logic:

    $F(A, B, C, D) = \Sigma(1, 3, 4, 11, 12, 13, 14, 15)$