

Logic Course Assignment #3

1- Reduce the following Boolean expressions using the Karnaugh maps (K-map):

(a) $A'C' + ABC + AC'$

(b) $(x'y' + z)' + z + xy + wz$

(c) $A'B(D' + C'D) + B(A + A'CD)$

(d) $(A' + C)(A' + C')(A + B + C'D)$

2- Design (by first drawing the truth table, then the K-map, and finally the simplified gate implementation) a logic circuit whose input is a four bit BCD digit in the form of $b_3b_2b_1b_0$ and it generates two outputs f_3 and f_4 which detect decimal input digits divisible by 3 and by 4, respectively.

3- For the following function either verify that it is in its simplest form or simplify it using the K-map.

$$G(w,x,y,z) = y'z + wxy' + wxz' + wxyz$$

4- Simplify the following Boolean functions using K-map for both SOP and POS forms. Which form yields simpler circuit?

(a) $F(A, B, C, D) = \sum m(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$

(b) $F(A,B,C,D,E) = \prod M(1,5,8,10,12,13,14,15,17,21,24,26,31)$

(c) $F(A,B,C,D) = \sum m(2,9,10,12,13) + d(1,5,14)$

(d) $F(A,B,C,D,E) = \sum m(3,11,12,19,23,29) + d(5,7,13,27,28)$

5- Simplify the for the complement of the following function:

$$F(A, B, C, D) = \sum(0, 1, 2, 3, 4, 8, 9, 12)$$