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COE 202, Term 162
Fundamentals of Computer Engineering

Quiz# 2 Solution

Date: Sunday, March 5

Q1. Using algebraic manipulation, simplify the following functions into minimum number of literals in sum-of-product form:

a. $F(A,B,C) = AB'C + B'C' + AB'C' + A'C'$

$$\begin{aligned} &= A B' [C + C'] + B' C' + A' C' \\ &= A B' + B' C' + A' C' && (C + C' = 1) \\ &= A B' + A' C' && (\text{by Consensus}) \end{aligned}$$

b. $F(X,Y,W,Z) = Y + X'Y'WZ + Y'WZ + X'YWZ' + Y'W'Z + XYWZ'$

OR

$$\begin{aligned} &= Y + Y' W Z + Y' W' Z \quad (\text{By absorption}) \\ &= Y [1 + X' W Z' + X W Z] + Y' W Z [1 + X'] + Y' W' Z \\ &= Y + Y' Z (W + W') \\ &= Y + Y' Z && (W + W' = 1) \\ &= (Y + Y') (Y + Z) && (\text{By distributive law}) \\ &= Y + Z && (Y + Y' = 1) \end{aligned}$$

Q2. Find the complement of the following function without any simplification:

$$F = (XY + Z) \cdot W' + E D'$$

$$F = [((XY) + Z) \cdot W'] + (E D')$$

$$F' = [((X' + Y') \cdot Z') + W] \cdot (E' + D)$$

Q3. Consider the following function:

$$F(X,Y,Z) = X Y + (X' + Z)(Y + Z')$$

a. Express F as a sum of minterms using $F = \sum m()$ notation.

$$F = X Y + X' Y + X' Z' + Y Z = Y + X' Z'$$

$$Y \Rightarrow -1- \Rightarrow m2, m3, m6, m7$$

$$X' Z' \Rightarrow 0-0 \Rightarrow m0, m2$$

$$F = \sum m(0, 2, 3, 6, 7)$$

b. Express F as an algebraic sum of minterms.

$$F = X' Y' Z' + X' Y Z' + X' Y Z + X Y Z' + X Y Z$$

c. Express F as a product of maxterms using $F = \prod M()$ notation.

$$F' = \sum m(1, 4, 5)$$

$$F = \prod M(1, 4, 5)$$