COE 202, Term 141

Digital Logic Design

HW# 2 Solution

# Prove the identity of each of the following Boolean functions using algebraic manipulation:

## A` + AB + AC` + AB`C` = A` + B + C`

## (A + B + D)(A` + C)(B + C + D) = (A + B + D)(A` + C)

## XZ + WY`Z` + W`YZ` + WX`Z` = XZ + WY`Z` + W`XY + X`YZ`

# Simplify the following Boolean expressions to a minimum number of literals using algebraic manipulation:

## W`X(Z` + Y`Z) + X(W + W`YZ)

## [(CD)` + A]` + A + CD + AB

## (A + B` + AB`)(AB + A`C + BC)

# Find the complement of the following Boolean functions and reduce them to a minimum number of literals:

## WX(Y`Z + YZ`) + W`X`(Y`+Z)(Y+Z`)

## ABC + A`CD

# Using DeMorgan`s theorem, express the function F=A`B` + AB + B`C

## With only OR and complement operations.

## With only AND and complement operations.

# Show that the dual of the equivalence function F(A,B)=A`B` + AB is equal to its complement.

# A majority gate is a digital circuit whose output is equal to 1 if the majority of inputs are 1`s. The output is 0 otherwise.

## By means of a truth table, find the Boolean function implemented by a 3-input majority gate.

## Express the 3-input majority gate as a sum of minterms and a product of maxterms.

# Express the following functions in a sum of minterms and a product of maxterms :

## F(X,Y,Z) = (XY + Z)(Y + XZ)

## F(A,B,C,D) = D(A` + B) + B`D

