

COE 202, Term 162

Digital Logic Design

HW# 2

- Q.1.** Prove the identity of each of the following Boolean functions using algebraic manipulation:
- (i) $A' + AB + AC' + AB'C' = A' + B + C'$
 - (ii) $(A + B + D)(A' + C)(B + C + D) = (A + B + D)(A' + C)$
 - (iii) $XZ + WY'Z' + W'YZ' + WX'Z' = XZ + WY'Z' + W'XY + X'YZ'$
- Q.2.** Simplify the following Boolean expressions to a minimum number of literals using algebraic manipulation:
- (i) $W'X(Z' + Y'Z) + X(W + W'YZ)$
 - (ii) $[(CD)' + A]' + A + CD + AB$
 - (iii) $(A + B' + AB')(AB + A'C + BC)$
- Q.3.** Find the complement of the following Boolean functions and reduce them to a minimum number of literals:
- (i) $WX(Y'Z + YZ') + W'X'(Y' + Z)(Y + Z')$
 - (ii) $ABC + A'CD$
- Q.4.** Using DeMorgan's theorem, express the function $F = A'B' + AB + B'C$
- (i) With only OR and complement operations.
 - (ii) With only AND and complement operations.
- Q.5.** Show that the dual of the equivalence function $F(A,B) = A'B' + AB$ is equal to its complement.
- Q.6.** 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.
- (i) By means of a truth table, find the Boolean function implemented by a 3-input majority gate.
 - (ii) Express the 3-input majority gate as a sum of minterms and a product of maxterms.
- Q.7.** Express the following functions in a sum of minterms and a product of maxterms :
- (i) $F(X,Y,Z) = (XY + Z)(Y + XZ)$
 - (ii) $F(A,B,C,D) = D(A' + B) + B'D$