# Chapter 2: Boolean Algebra & Logic Gates

### Problem: 2-1

Demonstrate by means of truth tables the validity of the following identities:

- (a) DeMorgan's theorem for three variables: (x+y+z)' = x'y'z' and (xyz)'=x'+y'+z'
- (b) The distributive law: x+yz = (x+y)(x+z)

### Problem: 2-2

Reduce the following Boolean expressions to the indicated number of literals:

- (a) A'C' + ABC + AC' to three literals (b) (x'y'+z)' + z + xy + wz to three literals (c) A'B(D'+C'D) + B(A+A'CD) to one literal
- (d) (A'+C)(A'+C')(A+B+C'D) to four literals

### Problem 2-3:

Find the complement of F = x + yz; then show that FF' = 0 and F + F' = 1

# Problem 2-4:

List the truth table of the function: F = xy + xy' + y'z

# Problem 2-5:

Draw the logical diagrams for the following Boolean expressions:

a) Y=A'B'+B(A+C).

d) Y = (A+B)(C'+D).

### Problem 2-6

Given the Boolean function F=xy'z+x'y'z+w'xy+wx'y+wxy.

- (a) Obtain the truth table of the function.
- (b) Draw the logical diagram using the original Boolean expression.
- (c) Simplify the function to a minimum number of literals using Boolean algebra.
- (d) Obtain the truth table of the function using the simplified expression.
- (e) Draw the logical diagram from the simplified expression and compare the total number of gates with the diagram of part (b).