**Homework #3**

**Show your work for each question! Simply give an answer is not enough!**

1. Simplify the following Boolean functions using 3-variable maps.

(a) F(a, b, c) = Σ (2, 3, 4, 5) (b) F(x, y, z) = Σ (2, 4, 5, 6, 7)

(c ) F(x,y,z) = xyz + x’y’z + xy’z’+xyz’ (d) F(A,B,C) = ABC’ + BC + A’

1. Simplify the following Boolean functions using 4-variable maps. One of the functions might have been simplified.

(a) F(A,B,C,D) = Σ (0,1,2,5,8,9,10,13,14) (b) F(A,B,C,D) = Σ (1,3,4,5,10,12,13,15)

(c) f(a, b, c, d) = acd + ab + cd’ + a’b’cd (d) f(w, x, y, z) = x’z’ + wxy’z + w’y’z’ + x’y

1. Simply the following Boolean function F, together with the don’t-care conditions d, and then express the corresponding simplified function in sum of minterms:

(a) F(x,y,z) = Σ (1,2,4) d(x,y,z) = Σ (0,3,7)

(b) F(A,B,C,D) = Σ(1,5,6,7,13) d(A,B,C,D) = Σ (8,4)

4. Simplify the following Boolean functions in **product of sums**:

(a) F(A,B,C,D) = A’B’+CD’+ABC+A’B’CD’+AB’CD (b)

5. NAND/NOR implementation:

(a) Simplify the following function and implement it with two-level NAND gate circuit: F(A, B, C, D) = A’B’C’D + CD + AC’D

(b) Simplify the following function and implement it with two-level NOR gate circuit: F(w, x, y, z) = Σ (0, 3, 12, 15)

6. Multilevel NAND/NOR implementation:

(a) Draw the multiple-level NAND circuit for the following expression:

w(x + y + z) + xyz

(b) Draw the multiple level NOR circuit for the following expression:

CD(B+C)A + (BC’ + DE’)

7. Derive the circuits for a three-bit parity generator and four-bit parity checker using odd parity bit.