Manarat International University (MIU)

Department of CSE (Evening)

Digital Logic Design (CSE-209)

Assignment 1

Due Date: 07/07/2017 Total Point: 20

Problem 1 (1 point)

Show the following operations using 2s complement:

a. 10000111 – 1011001

b. 1011001 – 10000111

c. 0.1001 – 0.0101

d. 0.0101 – 0.1001

Problem 2 (1 point)

Determine by means of a truth table the validity of DeMorgan's theorem for three variables: (ABC)' = A' + B' + C'.

Problem 3 (2 points)

Simplify the following expressions using Boolean algebra.

a. AB + A(CD + CD')

b. (BC' + A'D) (AB' + CD')

Problem 4 (2 points)

Given the Boolean expression F = x'y + xyz':

a. Derive an algebraic expression for the complement F'.

b. Show that F·F' = 0.

Problem 5 (2 points)

Simplify the following Boolean functions, using 3-variable maps:

a. F (x,y,z) = Σ(0,2,6,7)

b. F(A,B,C) = Σ (0,2,3,4,6)

Problem 6 (2 points)

Simplify the following Boolean functions, using 4-variable maps:

a. w'z + xz + x'y + wx'z

b. wxy + yz + xy'z + x'y

Problem 7 (2 points)

Simplify the following Boolean function F, together with the don't-care conditions d, and then express the simplified function in sum of minterms:

a. $F(x,y,z) = \Sigma (0,1,2,4,5)$, $d(x,y,z) = \Sigma (3,6,7)$

b. $F(A,B,C,D) = \Sigma (1,3,5,7,9,15)$, $d(A,B,C,D) = \Sigma (4,6,12,13)$

Problem 8 (3 points)

Given the Boolean function F = xy'z + x'y'z + xyz

a. Simplify the function using Boolean algebra

b. List the truth table of the simplified function

c. Draw the logic diagram of the simplified function using only 2-input NAND gates.

Problem 9 (2 points)

Implement the following Boolean function together with the don't-care conditions

d, using no more than three NOR gates:

$F(A,B,C,D) = \Sigma (0,1,9,11)$

$d(A,B,C,D) = \Sigma (2,8,10,14,15)$

Problem 10 (3 points)

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