

Course: Digital Systems Design	Course Number: COEN212	Section: U
Examination: Midterm	Date: February 28, 2017	Time: 1 hour 15 min.
Instructor: Dr. M.R. Soleymani		
Books and Material: Only one crib sheet allowed, no calculator allowed.		
Special Instructions: Try all questions.		

1) The following 6-bit signed binary numbers are represented using 2's complement.

a) Obtain 2's complement of :

a. 101010

(1 Mark)

b. 010000

(1 Mark)

b) Perform subtraction of the given number using 2's complement of the subtrahend and addition. Convert the result to decimal system (make sure to show the sign of the result)

a. 001001 – 110101

(2 Marks)

b. 001010 – 010101

(2 Marks)

2) A circuit has four inputs A, B, C and D and an output X. The output is equal to one when two or more of the input bits are one.

a. Draw the truth table of the circuit (2 Marks).

b. Minimize the logic using K-map (3 Marks).

3) Consider the function  $F(w, x, y, z) = \sum(0, 2, 7, 8, 13)$  with don't care condition:

$$d(w, x, y, z) = \sum(1, 5, 10, 14, 15).$$

a. Simplify the function (3 Marks).

b. Implement the function using NOR gates only (2 Marks).

4) Find the complement of,

$$F(A, B, C) = \sum(1, 2, 6, 7)$$

in product of sum form. (3 Marks). Draw the circuit (1 Mark).

5) Consider the Boolean function,  $F(w, x, y, z) = \sum(1, 3, 5, 9, 10, 11, 14, 15)$ .

Minimize the function and implement it using only NAND gates. (5 Marks)