HACETTEPE UNIVERSITY DEPARTMENT OF COMPUTER ENGINEERING BBM231 LOGIC DESIGN

Homework 2 (For all sections)

Assigned : 5.11.2018

Due : 12.11.2018

Hand in your homework solutions in class.

QUESTIONS:

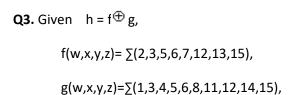
Q1. Simplify the following Boolean functions using four-variable maps:

a)
$$F(w, x, y, z) = \sum (0.1, 4, 5, 6, 7, 8, 9)$$

b)
$$F(A,B,C,D) = A'B'C'D' + A'CD' + AB'D' + ABCD + A'BD$$

a)
$$F(A, B, C, D) = \sum (1,3,4,5,10,11,12,13,14,15)$$

b)
$$F(w, x, y, z) = \sum (0,2,4,5,6,7,8,10,13,15)$$



find the minimal expression for h(w,x,y,z) and draw its circuit using minimum number of two-input-gates. You can use AND, OR, NOT, XOR gates with two-inputs.

Q4. A majority function has an output value of one if there are more 1s than 0s on its inputs.

- a. Express three input majority function in sum of minterms form after filling the truth table.
- b. Implement the **optimized circuit** with only NAND gates.

Q5. Implement the following Boolean function F, together with the don't-care conditions *d*, using no more than two NOR Gates.

$$F(A, B, C, D) = \sum (2,4,6,10,12)$$

$$d(A,B,C,D) = \sum (0,8,9,13)$$

Assume that both the normal and complement inputs are available.