Assignment-10

1. Obtain the truth table for the following function: (x.y+z)(y+x.z) and write it as sum of products (SOP) and product of sums (POS).

2. Implement an 8 input OR gate using only 2 input AND and 2 input OR gates.

3. Show that you can implement 2 input AND, 2 input OR and NOT gates using only 2 input NAND gates. Similarly show that you can implement 2 input AND, 2 input OR and NOT gates using only 2 input NOR gates.

4. Implement a 2-input exclusive OR gate with only 2 input NAND gates.

5. Simplify the following 4-variable functions into sum-of-products form using K-map.

a. $\sum(1,5,6,7,14)$ b. $\sum(0,4,6,8)$

c. $\sum(0,1,4,6,8,9,14)$ d. $\sum(1,4,7,11,13,14)$

6. Simplify the following 4-variable functions into product-of-sums form using K-map

a. $\Pi\ (1,3,5,7,13,15)$ b. $\Pi\ (1,3,6,9,11,12,14)$

c. $\Pi\ (1,3,5,7,9,11,12,13,14,15,)$ d. $\Pi\ (0,1,3,4,5,7,12,13,15)$

7. Simplify the following expressions into sum-of-products form using the don't care conditions (d) into account.

a. $F(A,B,C,D)=\sum(4,5,7,12,13,14)$, $d(A,B,C,D)=\sum(1,9,11,15)$

b. $F(A,B,C,D)=\sum(1,2,12,13,14)$, $d(A,B,C,D)=\sum(8,9,10,11)$

8. For the Boolean expression given below, implement it using two levels of logic first as AND-OR and then as OR-AND.

$$F(a,b,c,d)=(ab+cd)(\bar{a}b+\bar{c}d+a\bar{c})$$

9. Implement the following expression using only 2-input NAND gates and then repeat the problem with only 2 input NOR gates.

$$F(a,b,c,d)=ab+\bar{a}bc+\bar{a}\bar{b}\bar{c}d$$

10. Design a combinational circuit with 3 inputs and 1 output

(a) The output is 1 when the binary value of the inputs is less than 3. The output is 0 otherwise

(b) The output is 1 when the binary value of inputs is an odd number.