School of Computer Science
CS 2614: Computer Organization
Fall 2024
Homework 3

Due: Sep 10, 2024
Quiz: Sep 12, 2024
Submission: Upload to Canvas

Textbook problems:

1. Problem 1-3 (a, b, c, d)
2. Problem 1-5 (a, b)
3. Problem 1-7 (a, b, c, d, e)

Boolean functions calculation:

4. Simplify the following Boolean functions:
   a. $F=AB+ BC + B'C$
   b. $F= A + A'B$
   c. $F= A'B'C + A'BC + AB'$
   d. $F = AB + (AC)' + AB'C(AB + C)$
   e. $F = ((XY' + XYZ)' + X(Y + XY'))'$
5. Obtain the sum of product form of the following functions using Minterms:
   a. $F (A, B, C) = A + BC$
   b. $F (A, B, C, D) = AB + ACD$
6. Obtain the product of sums form of the following functions using Maxterms:
   a. $F (A, B, C) = A + B'C$

Boolean algebra:

7. Find the complement of each of the functions by applying DeMorgan's theorem as many times, as necessary:
   a. $F1 = X'YZ' + X'Y'Z$
   b. $F2 = X(Y'Z' + YZ)$
8. Simplify the following expression using Boolean algebra:
   a. $A'BC + AB'C + ABC' + ABC$
   b. $(A' + B)' + B (A' + AC) + ABC'$
9. Construct a logic diagram for the given Boolean expressions:
   a. $AB + BC (B + C)$
   b. $ABC + A (B' + C')$

10. Find the dual of the function, F = xyz + x'yz' + y'z
11. Find the dual of the function, F = AB (C + (DL' G (B' + A + E))) (H + (J'A'B))

Logic Circuit Implementation:

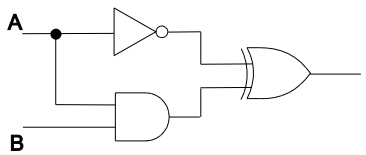
12. Implement the function of the following truth table using Sum-of-Products form:

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

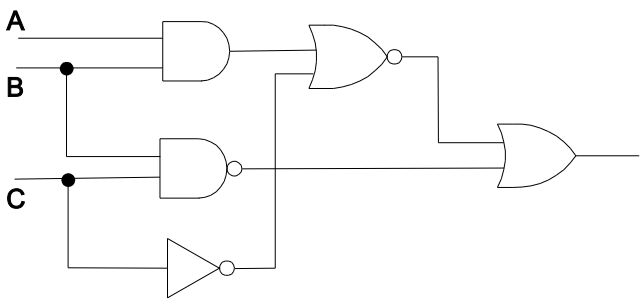
13. Implement the function of the following truth table (Output is z) using Sum-of-Products form:

a	b	c	d	z
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

14. Show the behavior of the following circuit using a truth table:



15. Show the behavior of the following circuit using a truth table:


A
B
C