

Assignment 1

October 19, 2023

Problem 1 : Design Combinational Circuit

1. $F(W, X, Y, Z) = \sum m(0, 2, 3, 8, 9, 10, 11, 12, 13, 14, 15)$

$\begin{matrix} YZ \\ WX \end{matrix}$	00	01	11	10
00	1	0	1	1
01	0	0	0	0
11	1	1	1	1
10	1	1	1	1

$$\Rightarrow F = W + X'Z' + X'Y$$

2. $F(W, X, Y, Z) = \sum m(3, 9, 11, 12, 13, 14, 15) + \sum d(1, 4, 6)$

$\begin{matrix} YZ \\ WX \end{matrix}$	00	01	11	10
00	0	X	1	0
01	X	0	0	X
11	1	1	1	1
10	0	1	1	0

$$\Rightarrow F = WX + X'Z$$

3. $F(A, B, C, D) = AC'D' + A'C + ABC + AB'C + A'C'D'$

$\begin{matrix} C/D \\ A/B \end{matrix}$	00	01	11	10
00	1	0	1	1
01	1	0	1	1
11	1	0	1	1
10	1	0	1	1

$$\Rightarrow F = C + D'$$

Truth table

A	B	C	D	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

4. $F(A, B, C, D) = A'B'C'D + CD + AC'D$

$\begin{matrix} C/D \\ AB \end{matrix}$	00	01	11	10
00	0	1	1	0
01	0	0	1	0
11	0	1	1	0
10	0	1	1	0

$\Rightarrow F = AD + B'D + CD$

Truth table

A	B	C	D	F
0	0	0	0	0
0	0	0	1	1
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	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

Problem 2 : Design Sequential Circuit

Current State (S)	Next State (S')		Output (Z)
	X=0	X=1	
A	F	B	0
B	A	F	1
C	A	D	1
D	F	E	0
E	D	B	1
F	D	E	0