

Practice sheet 2 solutions

Q1.

a.

$F(x, y, z) = \sum(0, 1, 5, 7)$

	BC 00	01	11	10
A 0	1	1	0	0
1	0	1	1	0

$= \bar{A}\bar{B} + AC$

b.

AB \ CD	00	01	11	10
00			1	
01			1	
11		1	1	1
10			1	

$CD + ABD + ABC$

c.

AB \ CD	00	01	11	10
00			1	1
01			0	
11	1	1	1	1
10			0	

$AB + \bar{A}\bar{B}C$

d.

$$F(w, x, y, z) = \sum (1, 3, 7, 11, 15)$$

$$d(w, x, y, z) = \sum (0, 2, 5)$$

$$F = (0001, 0011, 0111, 1011, 1111)$$

$$d = (0000, 0010, 0101)$$

$y \backslash xz$	00	01	11	10
00	X	1	1	X
01		X	1	
11			1	
10			1	

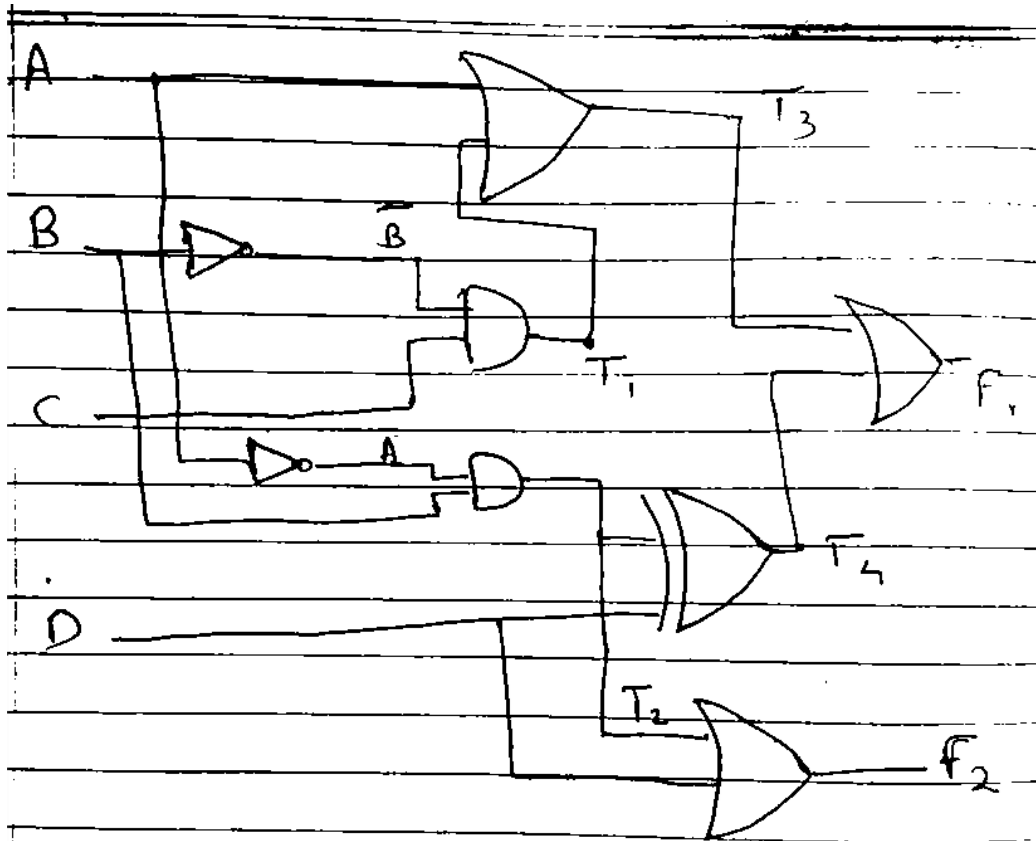
$$= w'x' + yz$$

$y \backslash xz$	00	01	11	10
00	X	1	1	X
01		X	1	
11			1	
10			1	

$$= w'z + yz$$

$$= (w' + y)z$$

2.



$$T_1 = \bar{B} \cdot C \quad T_2 = \bar{A} B \quad T_3 = A + \bar{B} C \quad T_4 = \bar{A} B \oplus D$$

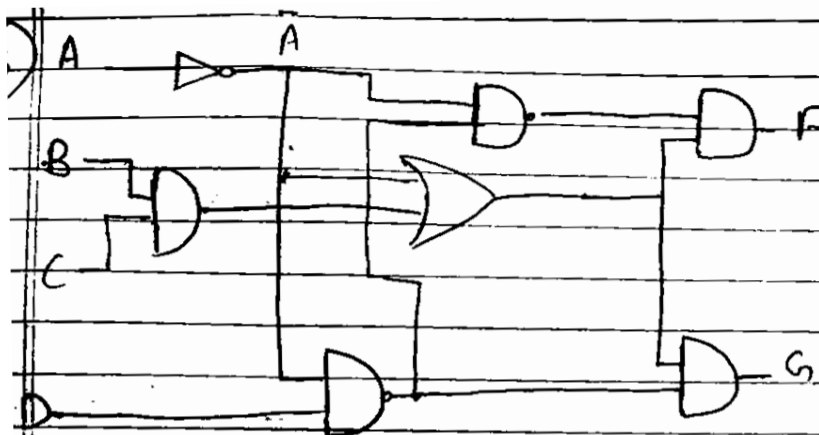
$$F_2 = \bar{A} B + D \quad F_1 = [A + \bar{B} C] + \bar{D} \bar{A} B + D A + D \bar{B}$$

$$= A + \bar{B} C + A D + \bar{B} D + \bar{A} B \bar{D}$$

$$= A + B' C + B' D + B D'$$

$$= A + B'(C + D) + B D'$$

3.

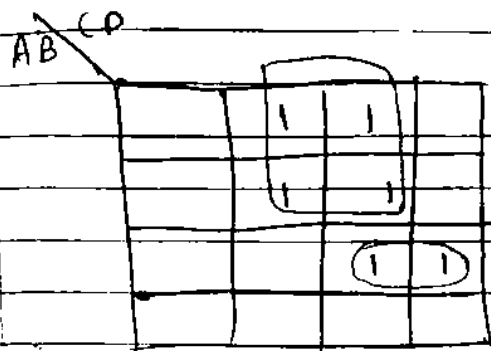


$$F = [\bar{A}(A+\bar{D})]' \cdot [\bar{A}+Bc]$$

$$= [A+\bar{D}][\bar{A}+Bc] = ABC + \bar{A}D + BCD$$

$$G = [\bar{A}+Bc][A+\bar{D}] = \bar{A}\bar{D} + ABC + Bc\bar{D}$$

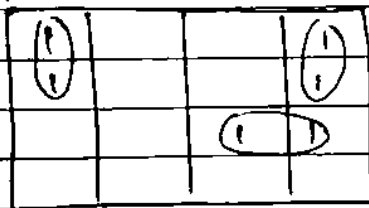
$$ABC + \bar{A}D + BCD$$



$$F = \bar{A}D + ABC$$

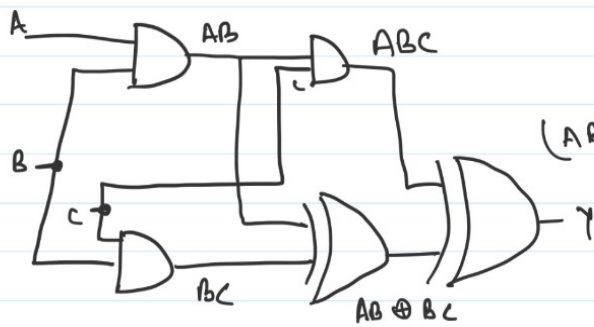
$$\bar{A}\bar{D} + ABC + Bc\bar{D}$$

AB \ CD



$$G = \bar{A}\bar{D} + ABC$$

4.

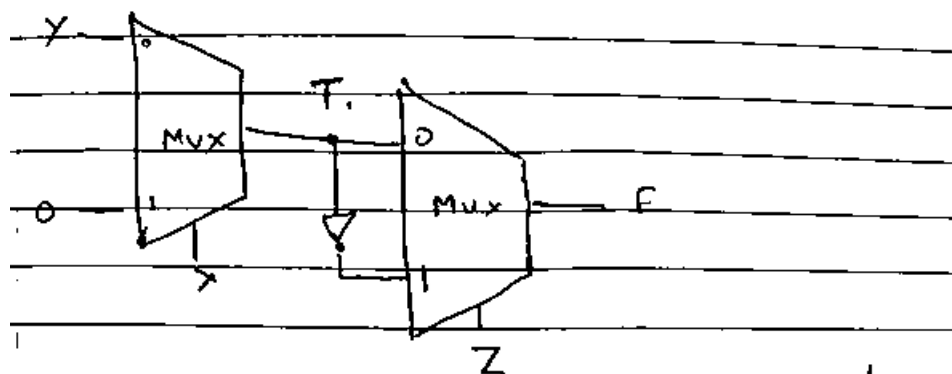


$$(ABC) \oplus AB \oplus BC$$

$$ABC \Rightarrow AB \text{ and } BC \therefore ABC \Rightarrow Y$$

$$\begin{aligned} & ABC + AB \oplus BC \\ &= ABC + B(AC + A'C) \\ &= B(AC + AC' + A'C) \\ &= B(A + C) \end{aligned}$$

5.



$$T_1 = \bar{X}Y \quad ; \quad F = \bar{X}Y\bar{Z} + [\bar{X}Y]'Z$$

$$F = \bar{X}Y\bar{Z} + Z(X + \bar{Y})$$

6.

a.

X	Y	Z	out
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$$\begin{aligned}
 P(x,y,z) &= \\
 &= \bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}y\bar{z} \\
 &= \bar{x}\bar{y} + \bar{x}y\bar{z} \\
 &= \bar{x}(\bar{y} + z)
 \end{aligned}$$

b.

X	Y	Z	OUT
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

$$\begin{aligned}
 P(x,y,z) &= \\
 &= \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z} + \\
 &\quad x\bar{y}\bar{z} + x\bar{y}z \\
 &= \bar{x}\bar{z} + x\bar{z} \\
 &= \bar{z}
 \end{aligned}$$

7.

Inputs	Outputs
0000	0000
0001	1111
0010	1110
0011	1101
0100	1100
0101	1011
⋮	⋮
1111	0001

