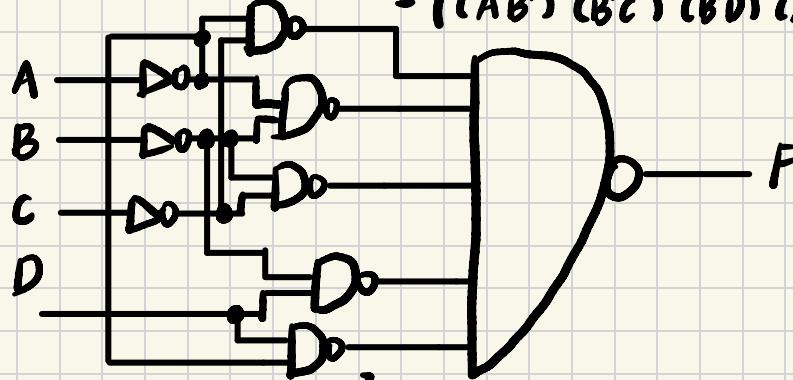


T1

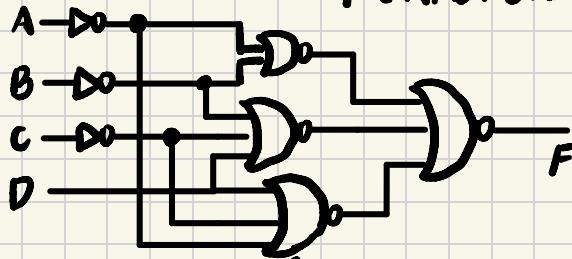
		CD	AB	00	01	11	10
		00	x	1	x	1	
		01	1	x	1		
		11					
		10	1	1	1		

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

(a) NAND gate: $F(A, B, C, D) = (A'B' + B'C' + B'D + A'C' + A'D')''$
 $= ((A'B')'(B'C')'(B'D)'(A'C')'(A'D))''$



(b) NOR gate: $F'(A, B, C, D) = AB + BCD' + ACD'$
 $F(A, B, C, D) = (AB + BCD' + ACD')'$
 $= ((A'+B')' + (B'+C'+D)' + (A'+C'+D)')'$



T2 (a) $T_1 = B'C$ $T_2 = A'B$ $T_3 = A + T_1 = A + B'C$

$$\begin{aligned} T_4 &= T_2 \oplus D = T_2 D' + T_2' D = A'BD' + (A'B)'D \\ &= A'BD' + (A+B')D = A'BD' + AD + B'D \end{aligned}$$

$$\begin{aligned} F_1 &= T_3 + T_4 = A + B'C + A'BD' + \cancel{AD} + B'D \\ &= A + B'C + BD' + B'D \end{aligned}$$

$$F_2 = T_2 + D' = A'B + D'$$

(b)

ABCD	T ₁	T ₂	T ₃	T ₄	F ₁	F ₂
0000	0	0	0	0	0	1
0001	0	0	0	1	1	0
0010	1	0	1	0	1	1
0011	1	0	1	1	1	0
0100	0	1	0	1	1	1
0101	0	1	0	0	0	1
0110	0	1	0	1	1	1
0111	0	1	0	0	0	1
1000	0	0	1	0	1	1
1001	0	0	1	1	1	0
1010	1	0	1	0	1	1
1011	1	0	1	1	1	0
1100	0	0	1	0	1	1
1101	0	0	1	1	1	0
1110	0	0	1	0	1	1
1111	0	0	1	1	1	0

T_{3.}
(a)

ABC	F ₁	F ₂	F ₃
000	0	1	0
001	0	1	1
010	1	0	0
011	0	1	0
100	0	1	1
101	1	0	0
110	1	0	1
111	1	1	0

(b) F₁:

A	X	Bc	00	01	11	10
0	0	0	0	0	0	1
1	0	1	1	1	1	1

$$F_1 = AC + BC'$$

F₂:

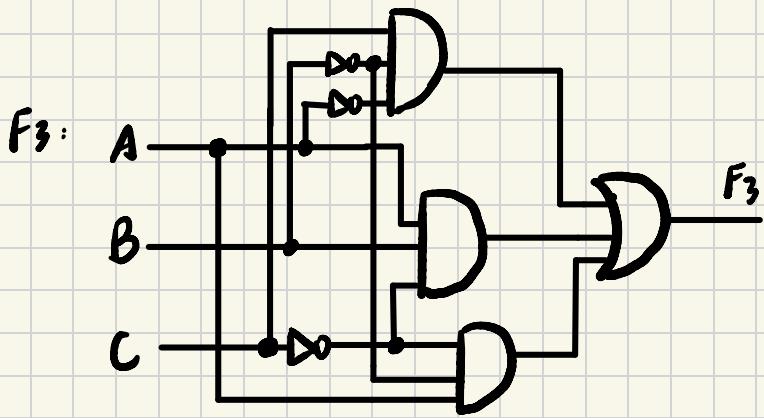
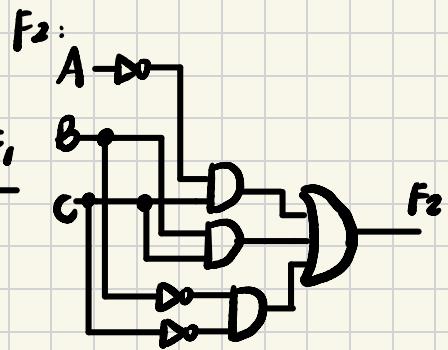
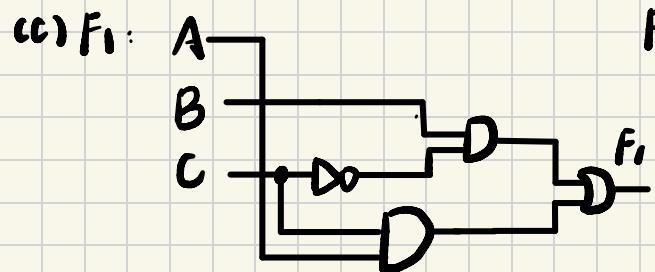
A	X	Bc	00	01	11	10
0	0	1	1	1	1	0
1	1	0	1	1	0	0

$$F_2 = B'C' + A'C + BC$$

F₃:

A	X	Bc	00	01	11	10
0	0	0	1	0	0	0
1	1	0	0	1	0	1

$$F_3 = AC' + A'B'C$$



$$T4. \quad F_1 = ((AB + A'B'C')')' = ((AB)'(A'B'C')')' = ((A'+B')(A+B+C'))' \\ = (A'B + A'C + AB' + BC')'$$

for F_1' :

	Bc	00	01	11	10
A	0	1	1	1	1
	1	1	1	1	1

$$F_1' = \sum(1, 2, 3, 4, 5)$$

$$F_1 = (\sum(1, 2, 3, 4, 5))'$$

$$F_2 = ((A+B+C')')' = (A'B'C')' = (\sum(1))'$$

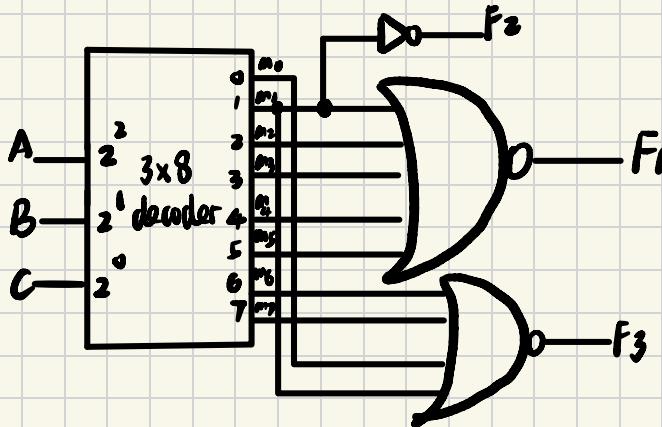
$$F_3 = ((A'B + AB')')' = ((A'B)'(AB')')' = ((A+B')(A'+B))' = (AB + A'B')'$$

for F_3' :

	Bc	00	01	11	10
A	0	1	1	1	1
	1	1	1	1	1

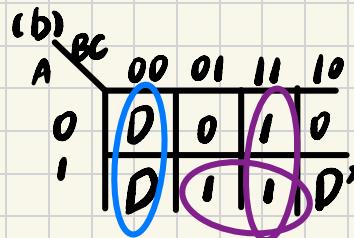
$$F_3' = \sum(0, 1, 6, 7)$$

$$F_3 = (\sum(0, 1, 6, 7))'$$



T5. (a)

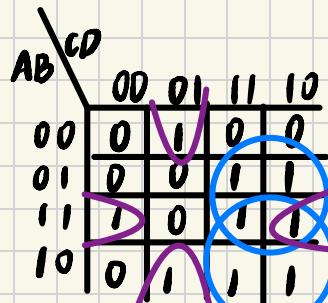
ABC	F
000	D
001	0
010	0
011	1
100	D
101	1
110	D'
111	1



$$F = B'C'D + BC + AC + ABD'$$

(c)

AB CD	F
0 0 0 0	0
0 0 0 1	1
0 0 1 0	0
0 0 1 1	0
0 1 0 0	0
0 1 0 1	0
0 1 1 0	1
0 1 1 1	1
1 0 0 0	0
1 0 0 1	1
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



$$F = BC + AC + ABD' + B'C'D$$

$$\text{let } I_0 = C'D, I_1 = C, I_2 = C + C'D = C + D$$

$$I_3 = C + D'$$

$$F = A'B'I_0 + A'BI_1 + AB'I_2 + ABI_3$$

