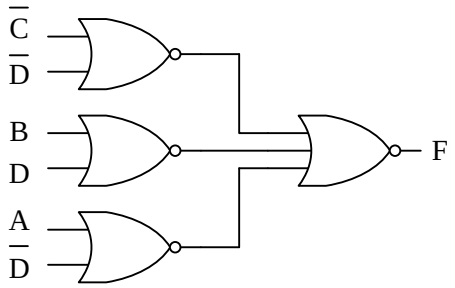
1. $F = (C + \overline{D}).(\overline{B} + \overline{C})$

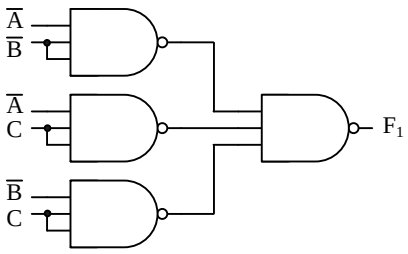
AB \ CD	00	01	11	10
00	1	0	1	1
01	X	0	0	0
11	1	0	0	X
10	1	0	X	1

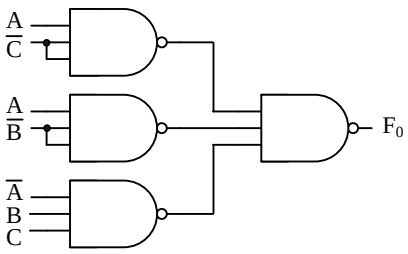
2. $F = (\overline{C} + \overline{D}).(B + D).(A + \overline{D})$

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



3. The functions have to be implemented in NAND-NAND configuration. Implementation using minimize functions require 11 gates : 8 + 3 for the NOT function ($\overline{A}, \overline{B}$ and $\overline{C}$) $\Rightarrow$ 4 chips.





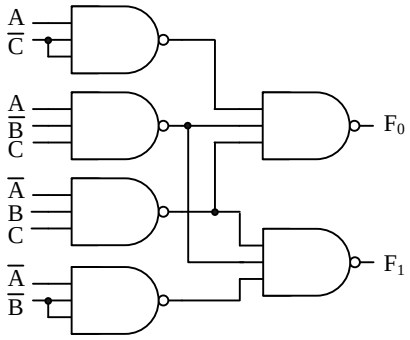
Requires gate sharing

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

$F_1 = \overline{A}.\overline{B} + \overline{A}.B.C + A.\overline{B}.C$

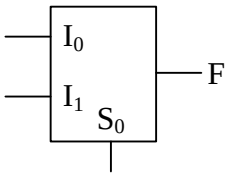
A \ BC	00	01	11	10
0			1	
1	1	1		1

$F_0 = A.\overline{C} + \overline{A}.B.C + A.\overline{B}.C$



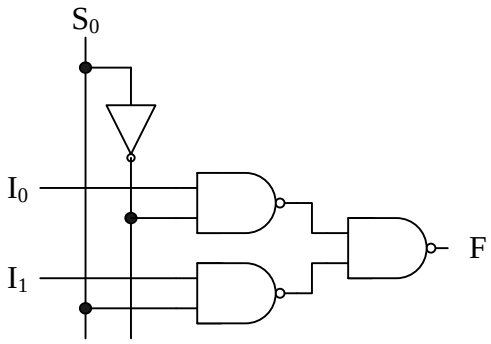
A total of 9 gates : 6 + 3 $\Rightarrow$ 3 chips

4

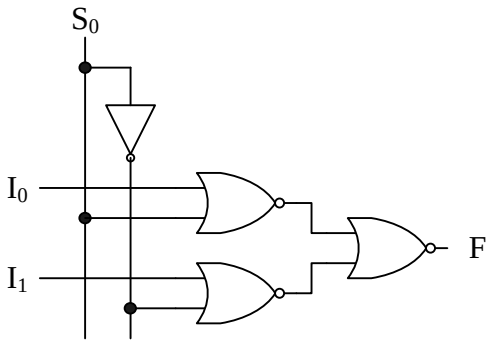


S_0	F	
0	I_0	$\rightarrow$ $\overline{S_0}.I_0$ or $(S_0 + I_0)$
1	I_1	$\rightarrow$ $S_0.I_1$ or $(\overline{S_0} + I_1)$

$F = \overline{S_0}.I_0 + S_0.I_1$

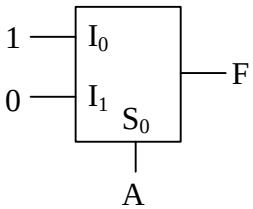


$F = (S_0 + I_0).(\overline{S_0} + I_1)$



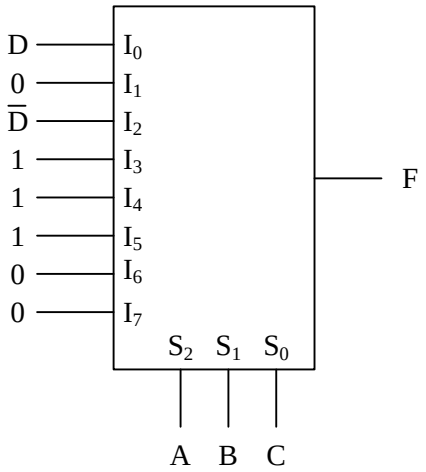
5 (a) F = A.B (And function)

(b)



6. (a)

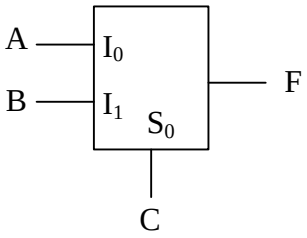
A	B	C	F
0	0	0	D
0	0	1	0
0	1	0	$\overline{D}$
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0



(b) (i) The chip is DISABLED.

(ii) The output is taken at pin 6 (complemented output)

7. Implement the function F(A,B,C) = $A.\overline{C} + B.C$ using a single 2-to-1 multiplexer without any additional logic gates.

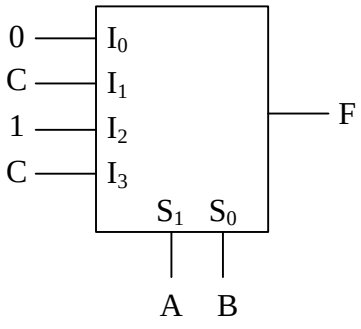


8. F(A,B,C,D) = Π M (3, 9, 11, 12, 13, 14, 15)

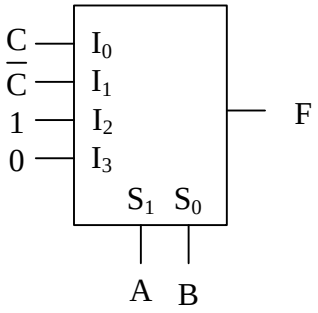
9. A Boolean function F(A,B,C) = $(A + B).(\overline{B} + C)$. Implement the function using a 4-to-1 multiplexer and other logic gates if necessary.

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

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



10.



11.

S_1	S_0	a	b	c	d	e	f
0	0	1	1	0	0	1	0
0	1	0	0	1	1	1	0
1	0	0	1	1	0	0	1
1	1	1	0	0	1	0	1

$a = \overline{S_1 \oplus S_0}$, $b = \overline{S_0}$, $c = S_1 \oplus S_0$, $d = S_0$, $e = \overline{S_1}$, $f = S_1$