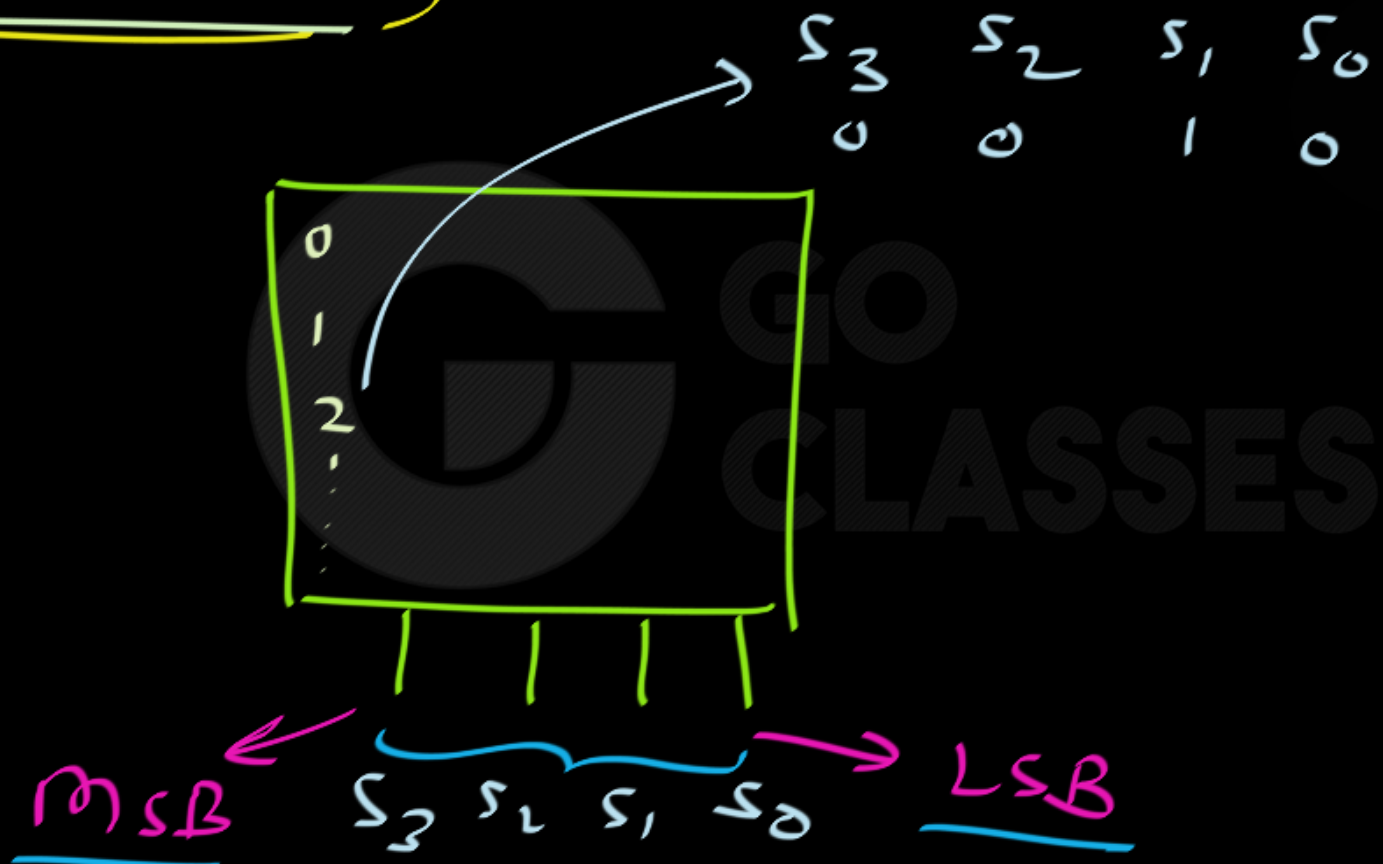
Practice Questions

Multiplexer

Next Topic:

Realization(Implementation) Of Functions using Mux

By default;



Q: $f(a,b) = a \oplus b$ using 4x1 mux.

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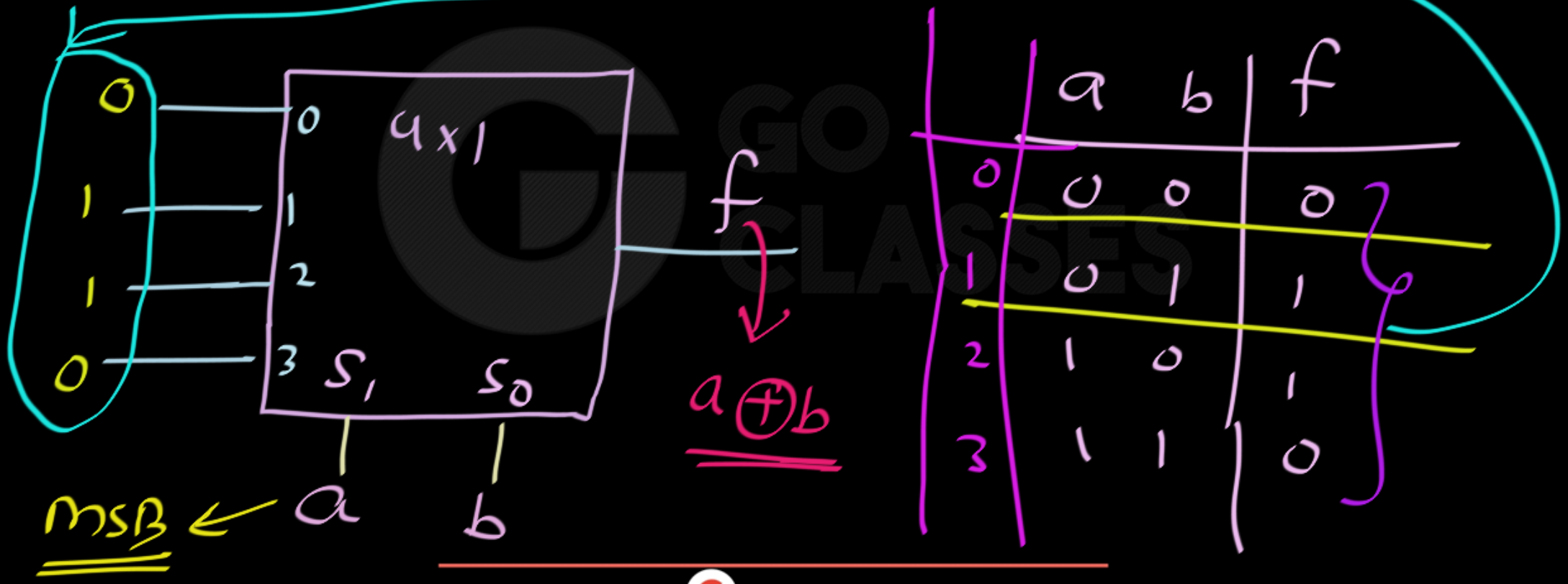
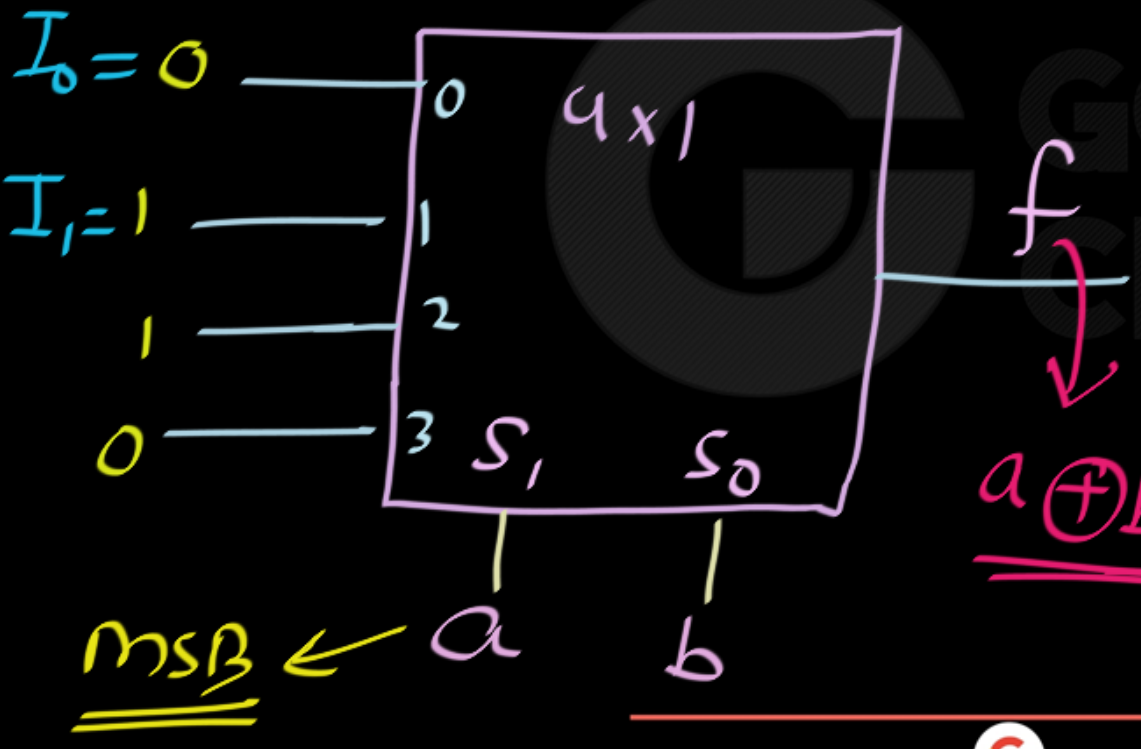


a	b	f
0	0	0
0	1	1
1	0	1
1	1	0

Q: $f(a,b) = a \oplus b$ using 4x1 mux.

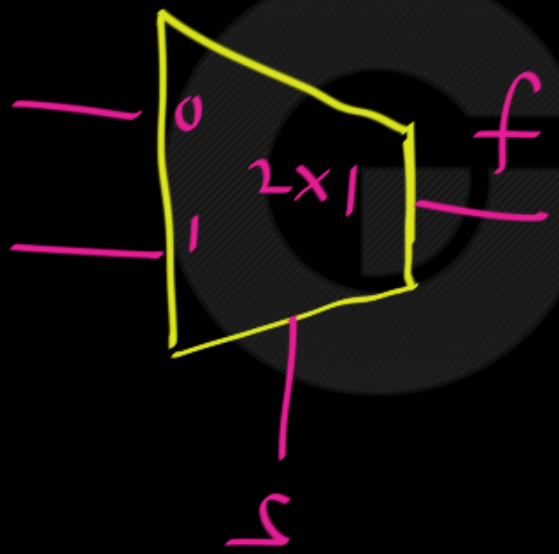


$f_{(a,b)} = \bar{a}\bar{b}0 + \bar{a}b1 + a\bar{b}1 + ab0$

$= \bar{a}b + a\bar{b}$

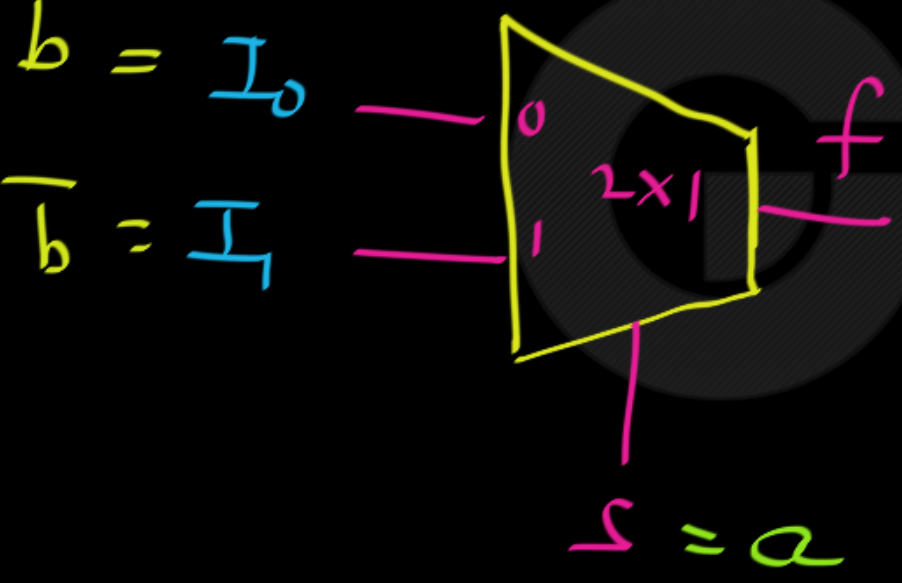
$= a \oplus b$

Q: $f(a,b) = a \oplus b$ using 2x1 mux.



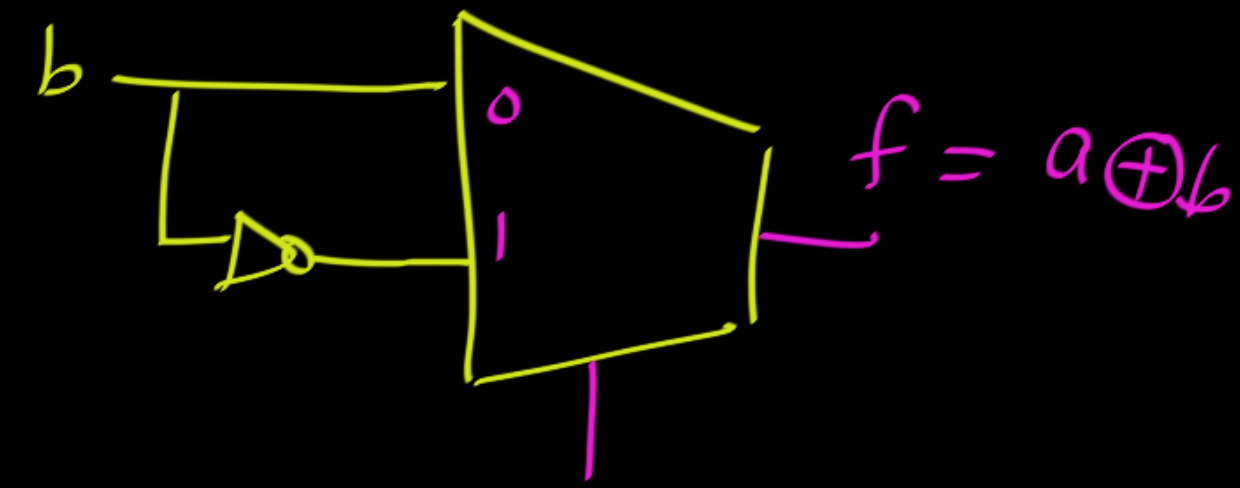
Q: $f(a,b) = a \oplus b$ using 2x1 mux.

$a \oplus b$ → csop: $f = a\bar{b} + \bar{a}b$



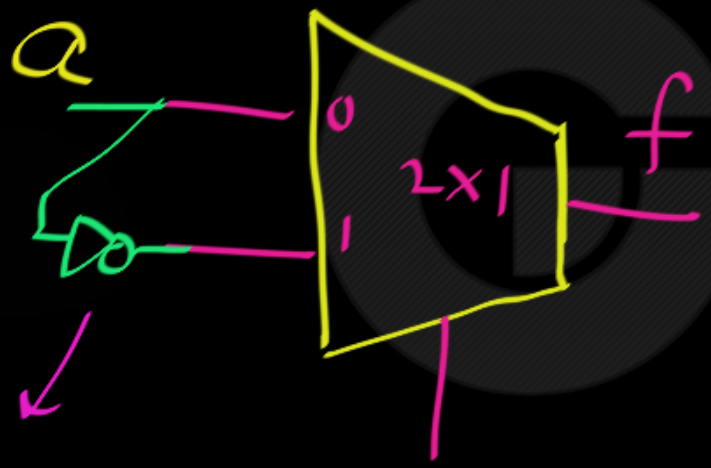
$f = \bar{a} I_0 + a I_1$

$I_0 = b$, $I_1 = \bar{b}$



(2 - 1 mux) + 1 inverter.

Q: $f(a,b) = a \oplus b$ using 2x1 mux.



$f = \bar{b}a + b\bar{a}$

$= a \oplus b$

(2-1 mux) + 1 inverter.

Q: $f(a,b) = a \oplus b$ using 8X1 mux.

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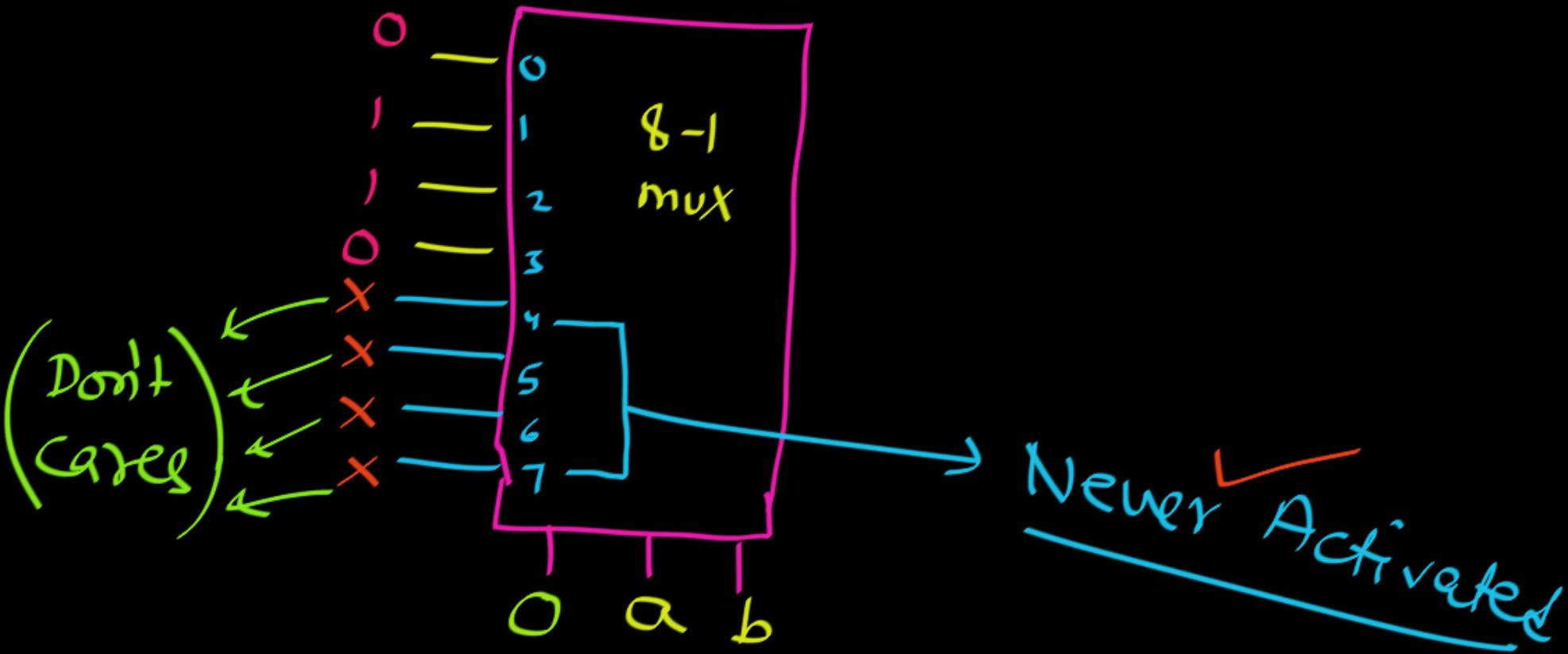
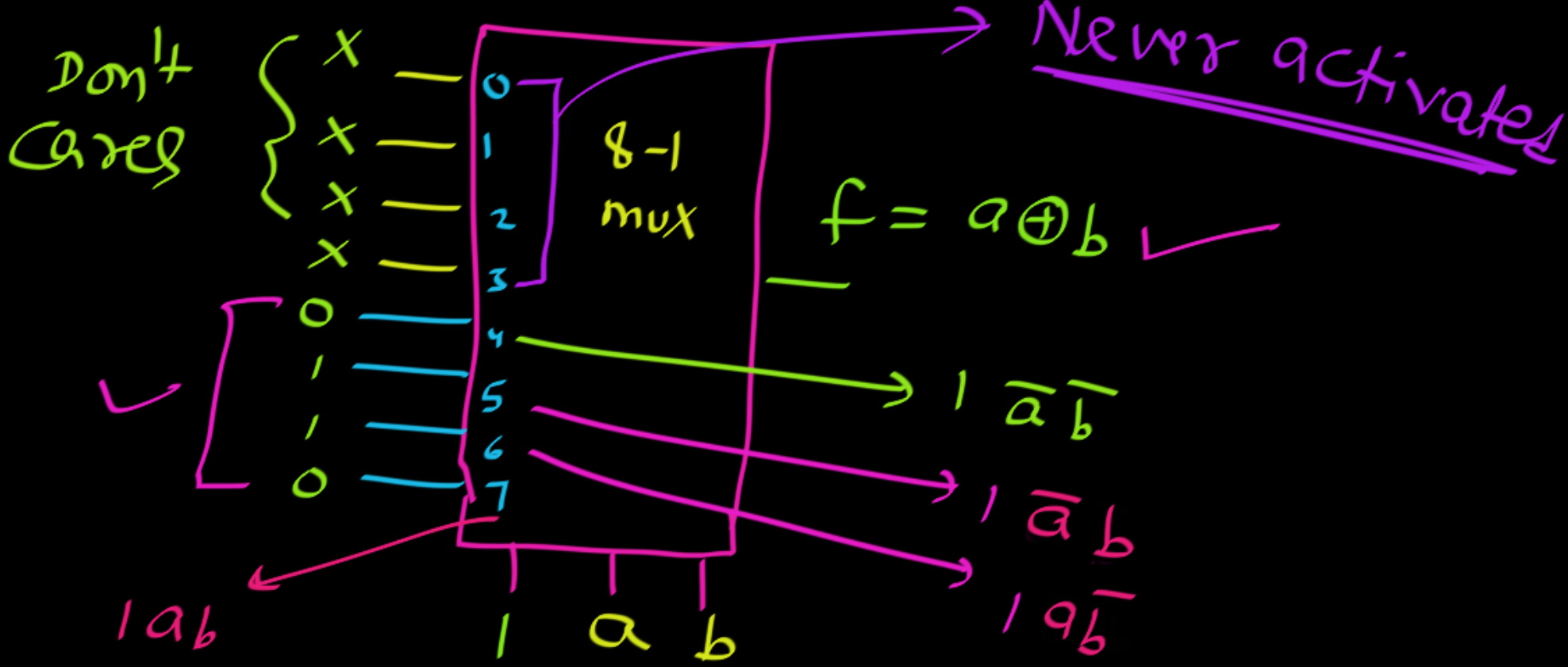
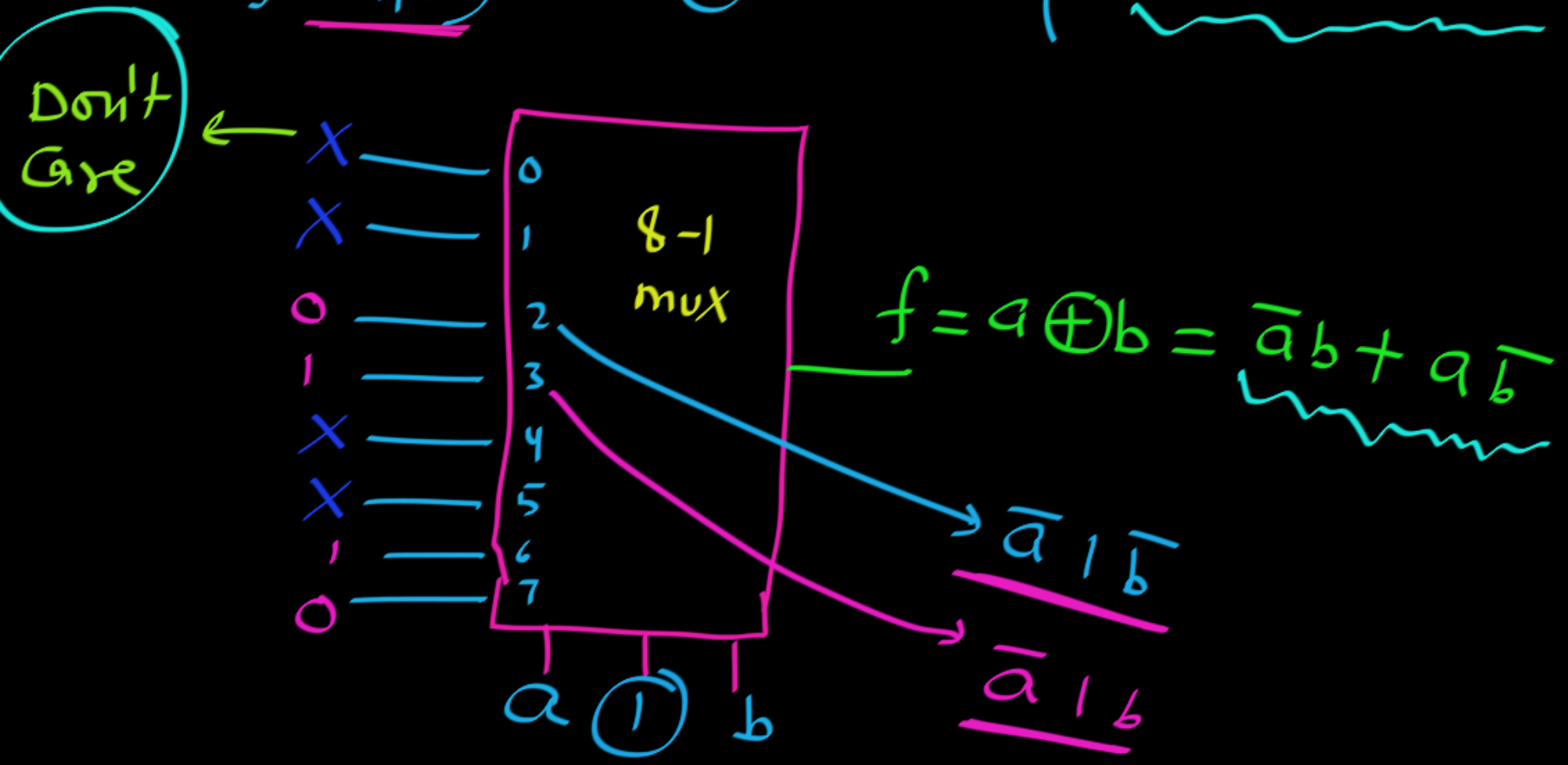


Q: $f(a,b) = a \oplus b$ using 8X1 mux.

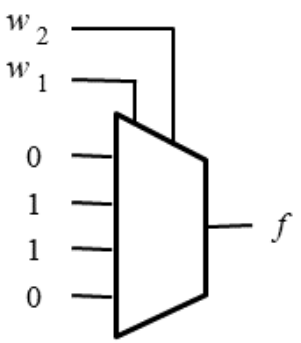


Q: $f(a,b) = a \oplus b$ using 8X1 mux.



Implementation of a logic function with a 4x1 multiplexer

w_1	w_2	f
0	0	0
0	1	1
1	0	1
1	1	0

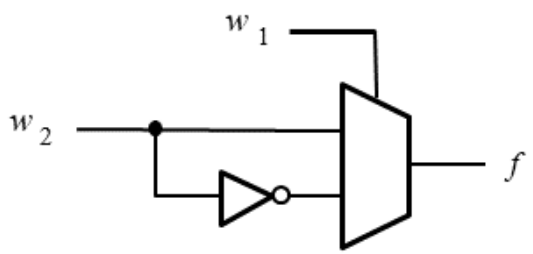


Implementation of the same logic function with a 2x1 multiplexer

w_1	w_2	f
0	0	0
0	1	1
1	0	1
1	1	0

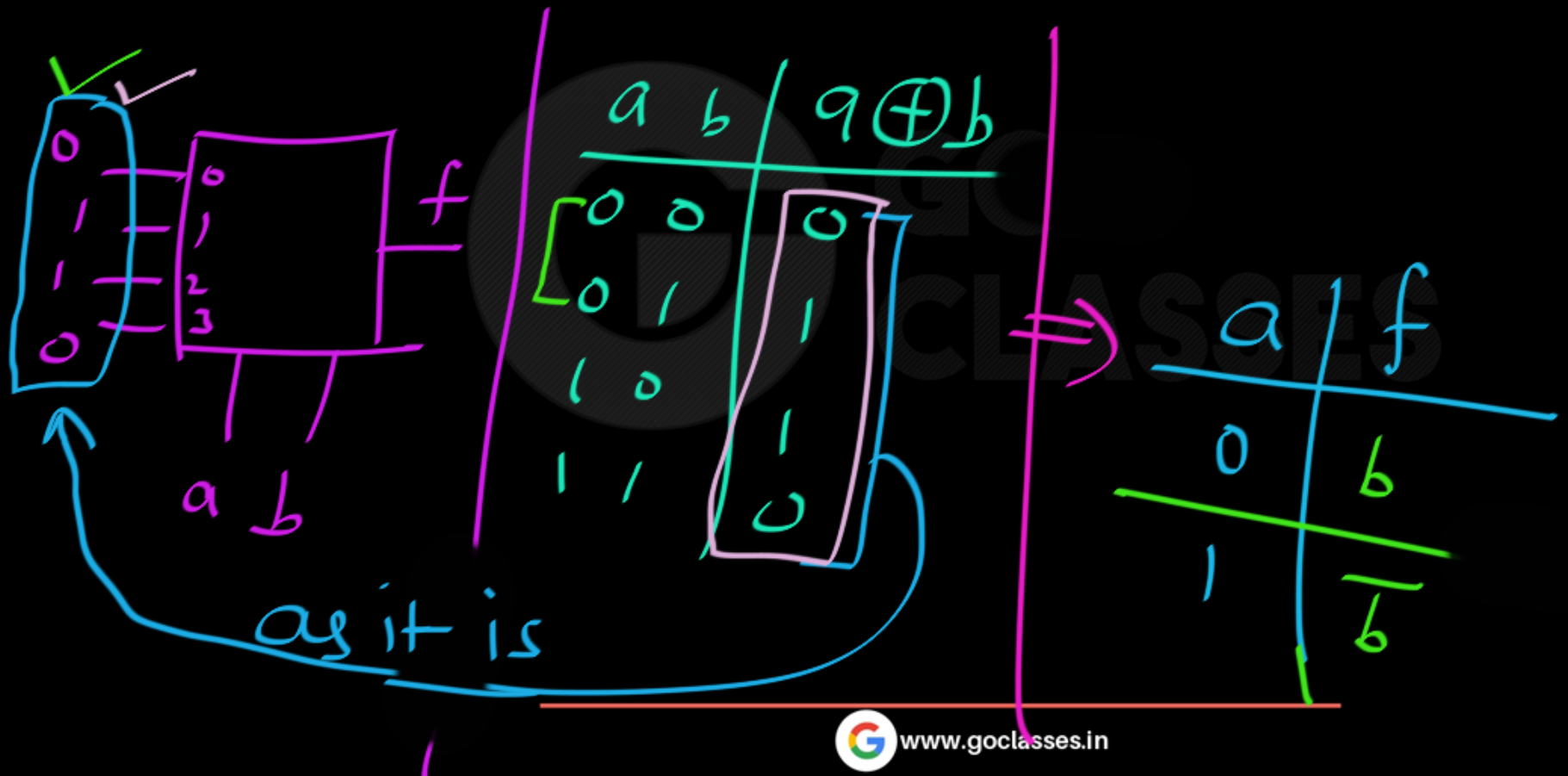
w_1	f
0	w_2
1	$\bar{w}_2$

(b) Modified truth table

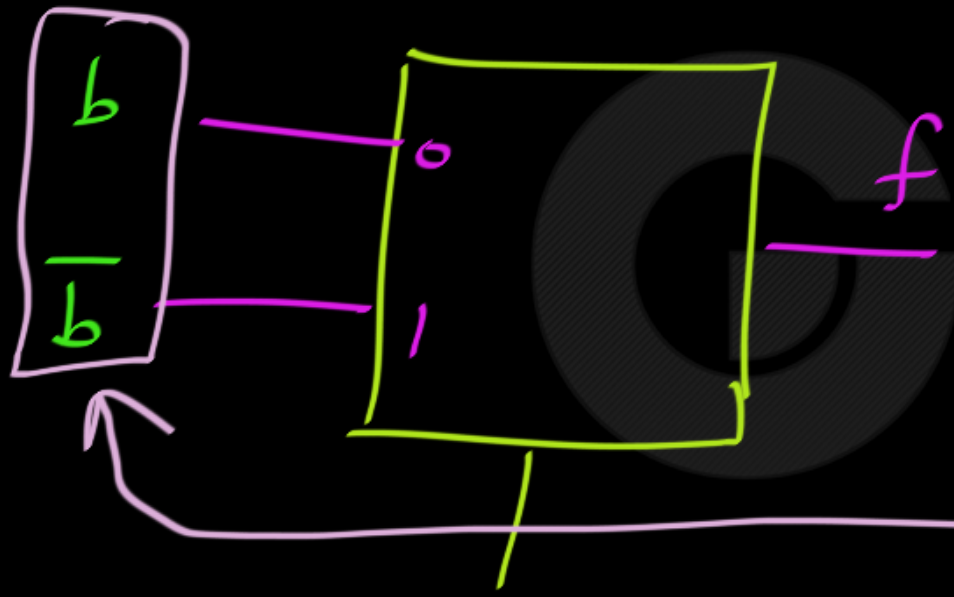


(c) Circuit

$f_{(a,b)} = a \oplus b \Rightarrow$ Best mux : 4x1 → 2 select lines



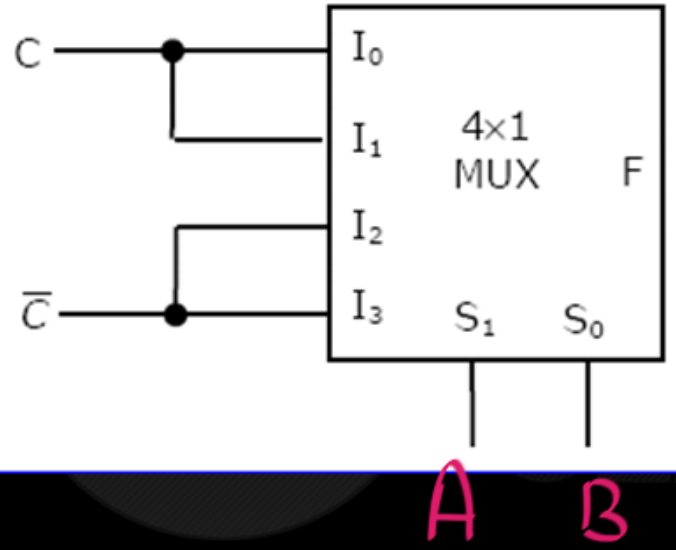
$f(a,b) = a \oplus b \Rightarrow$ using 2 X 1



a	f(a,b)
0	b
1	$\overline{b}$

$S = a \Rightarrow$ Control input

Q:



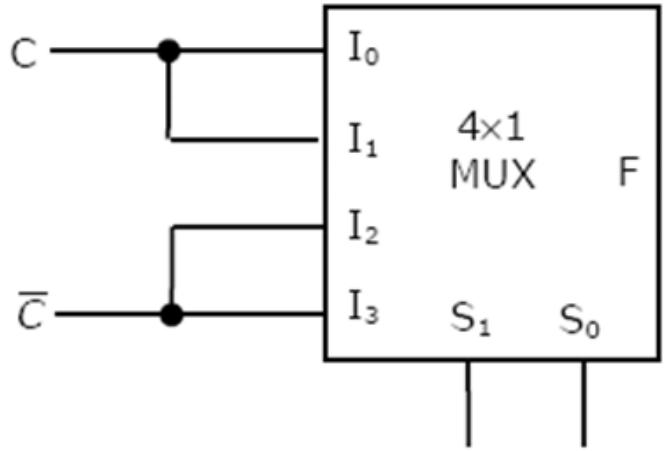
(a) F = A.C

(b) F = A + C

(c) F = B.C

(d) F = B + C

Q:



(a) F = A.C

(b) F = A + C

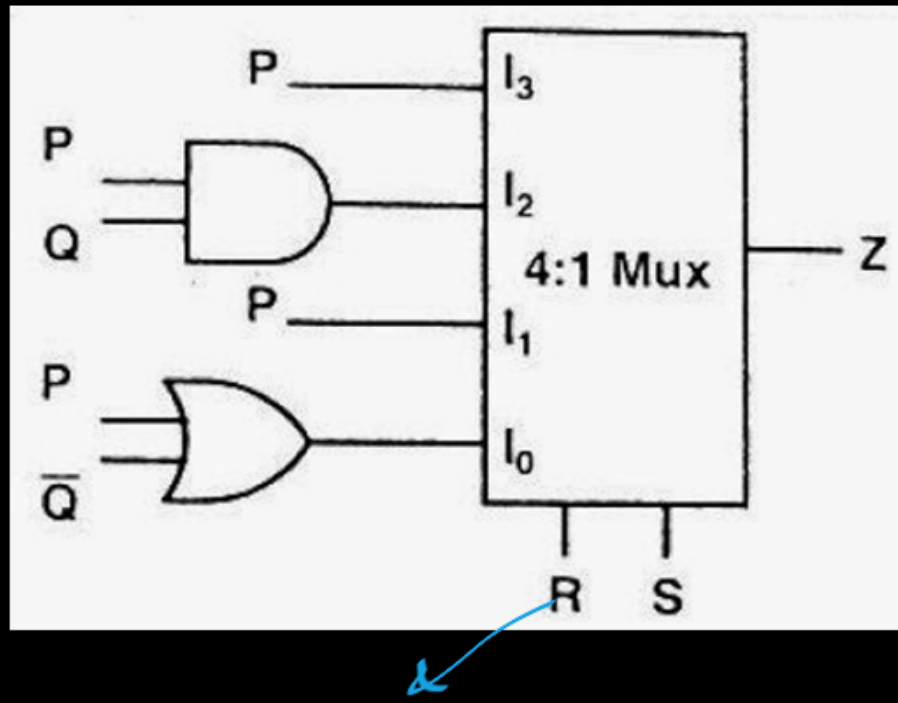
(c) F = B.C

(d) F = B + C

$$F = \overline{A}\,\overline{B}\,C + \overline{A}\,B\,C + A\,\overline{B}\,\overline{C} + A\,B\,\overline{C}$$

$$= \overline{A}C + A\overline{C}$$

Q:



find Z!

(a) $PQ + P\bar{Q}S + \bar{Q}\bar{R}\bar{S}$

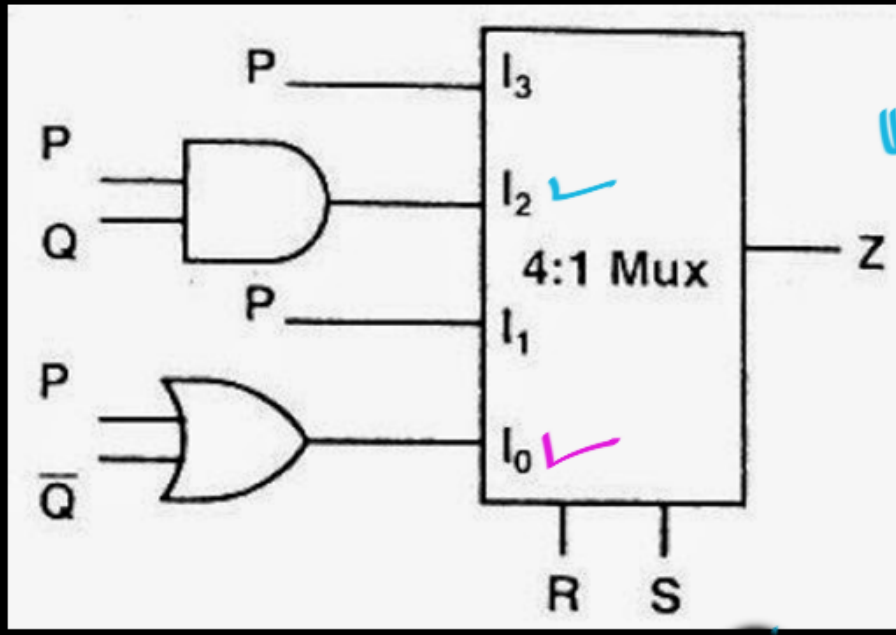
(b) $P\bar{Q} + PQ\bar{R} + \bar{P}\bar{Q}\bar{S}$

(c) $P\bar{Q}\bar{R} + \bar{P}QR + PQRS + \bar{Q}\bar{R}\bar{S}$

(d) $PQ\bar{R} + PQR\bar{S} + P\bar{Q}\bar{R}S + \bar{Q}\bar{R}\bar{S}$

MSB

Q:



what is Z?

(a) $PQ + P\bar{Q}S + \bar{Q}\bar{R}\bar{S}$

(b) $P\bar{Q} + PQ\bar{R} + \bar{P}\bar{Q}\bar{S}$

(c) $P\bar{Q}\bar{R} + \bar{P}QR + PQRS + \bar{Q}\bar{R}\bar{S}$

(d) $PQ\bar{R} + PQR\bar{S} + P\bar{Q}\bar{R}S + \bar{Q}\bar{R}\bar{S}$

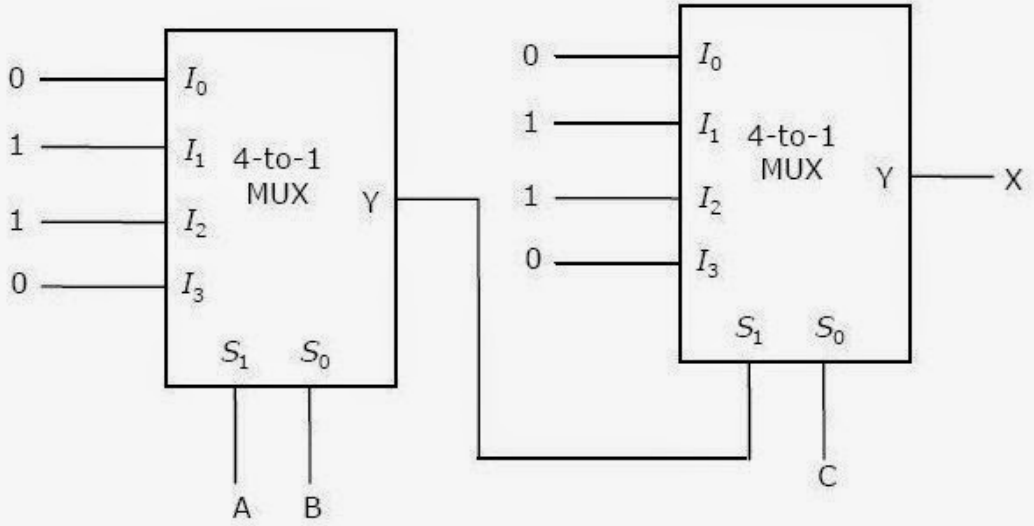
R=0
S=1
Z=P

R=0, S=0
$Z = P + \bar{Q}$

R=S=1
Z=P

Option b ✗
Option c ✗
Option d ✗

R=1, S=0
Z=PQ

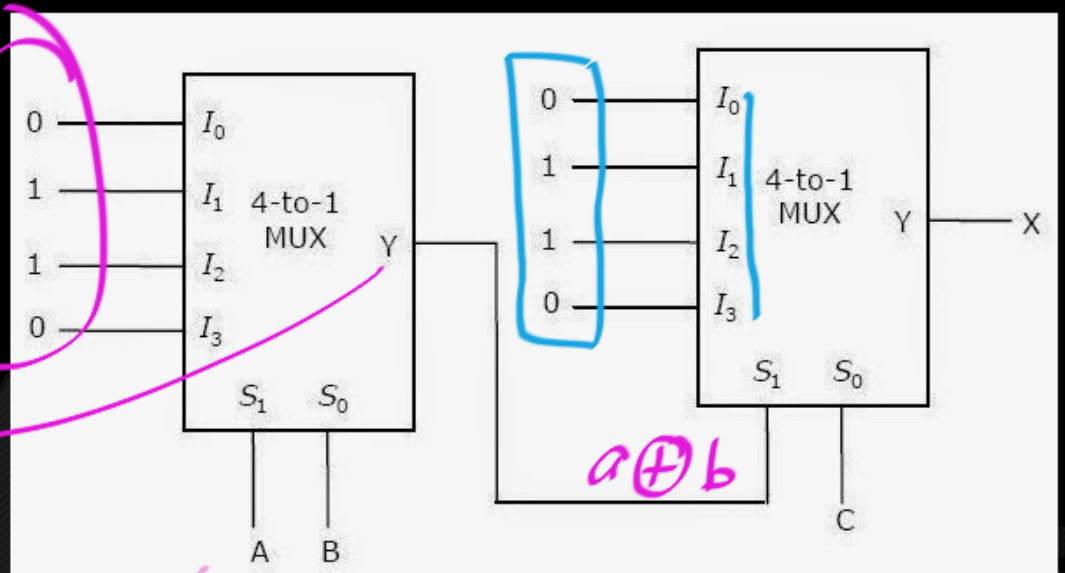


(A) $X = A\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + \overline{A}\,\overline{B}\,C + A\,B\,C$

(B) $X = \overline{A}\,B\,C + A\,\overline{B}\,C + A\,B\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C}$

(C) $X = AB + BC + AC$

(D) $X = \overline{A}\,\overline{B} + \overline{B}\,\overline{C} + \overline{A}\,\overline{C}$



(A) $X = A\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + \overline{A}\,\overline{B}\,C + A\,B\,C$

(B) $X = \overline{A}\,B\,C + A\,\overline{B}\,C + A\,B\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C}$

(C) $X = AB + BC + AC$

(D) $X = \overline{A}\,\overline{B} + \overline{B}\,\overline{C} + \overline{A}\,\overline{C}$

$Y = A \oplus B$

$A \oplus B \oplus C$

$X = (a \oplus b) \oplus c$

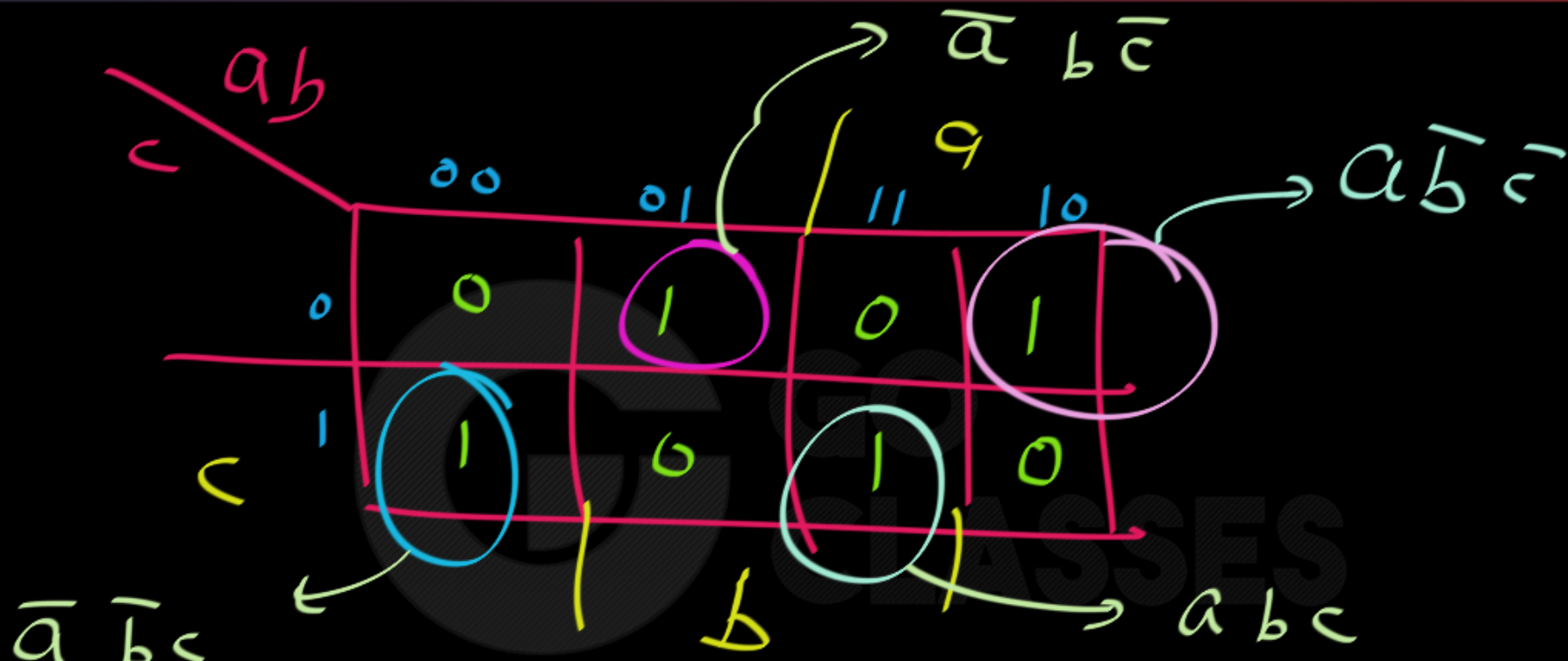
$X = S_1 \oplus S_0$

$= (a \oplus b) \oplus c$

$= a \oplus b \oplus c$

ExOR = "odd function"

Means: ExOR = 1 iff odd number of inputs are 1.



$f = a \oplus b \oplus c$ 3 2 1 function

$a \oplus b \oplus c = a\bar{b}\bar{c} + abc + \bar{a}\bar{b}c + \bar{a}b\bar{c}$

$f = a \oplus b \oplus c$ — Odd function

$f = abc + \bar{a}\bar{b}c + a\bar{b}\bar{c} + \bar{a}b\bar{c}$

abc: all 1

$\bar{a}\bar{b}c$: OR

$a\bar{b}\bar{c}$, $\bar{a}b\bar{c}$: Exactly one is 1

$f = a \oplus b \oplus c \oplus d$: Odd fun

$f = 1$ iff odd number of inputs are 1.

$f =$ Exactly one is 1 OR Exactly three are 1

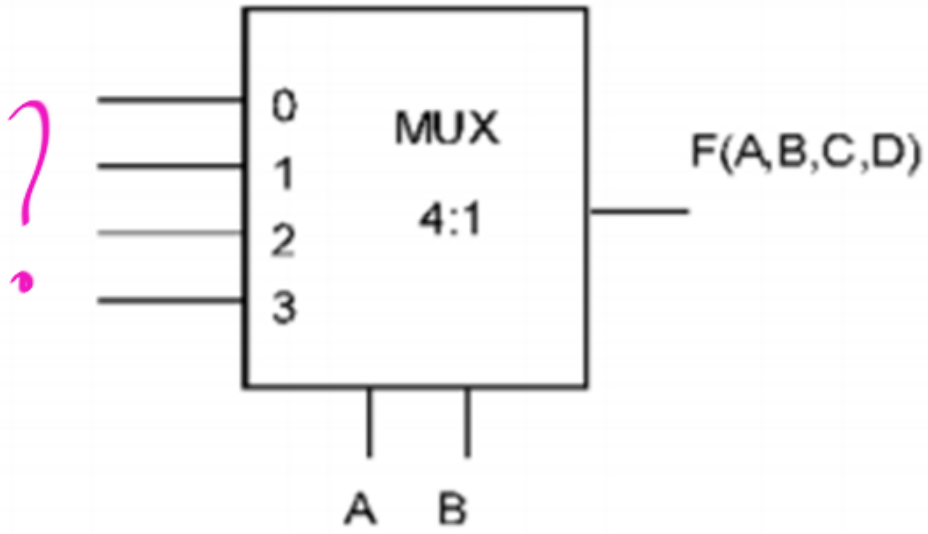
$\bar{a}\bar{b}\bar{c}d + \bar{a}\bar{b}c\bar{d} + \bar{a}b\bar{c}\bar{d} + a\bar{b}\bar{c}\bar{d}$

$+$

$\bar{a}bcd + a\bar{b}cd + ab\bar{c}d + abc\bar{d}$

(a) A logic function is given as $F(A,B,C,D) = AD + BC' + \overline{A + B + C}$

Show how to implement this function by a 4:1 MUX with (A, B) as control inputs (clearly label every input)



$$f(a,b,c,d) = \underline{ad} + \underline{bc} + \underline{\bar{a}\bar{b}\bar{c}}$$

$1\_\_1$

$\{9, 11, 13, 15\}$

$\_11\_$

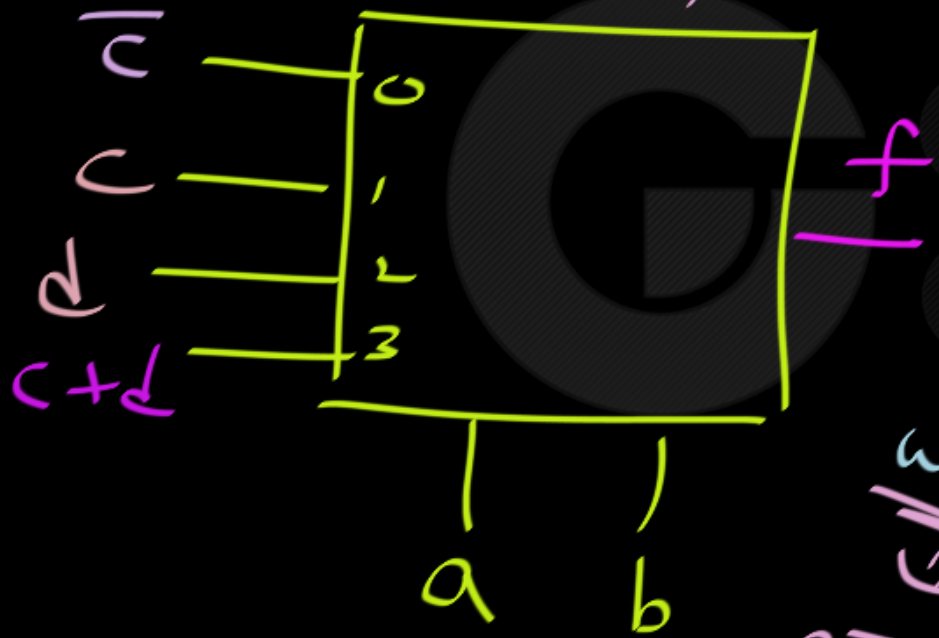
$\{6, 7, 14, 15\}$

$000\_$

$\{0000 = m_0, 0001 = m_1\}$

$f = ad + bc + a'b'd'$

$f = \sum(0,1,6,7,9,11,13,14,15)$



method 1:

find CSOP of f.

with $a\bar{b} \Rightarrow m_{0,1}$

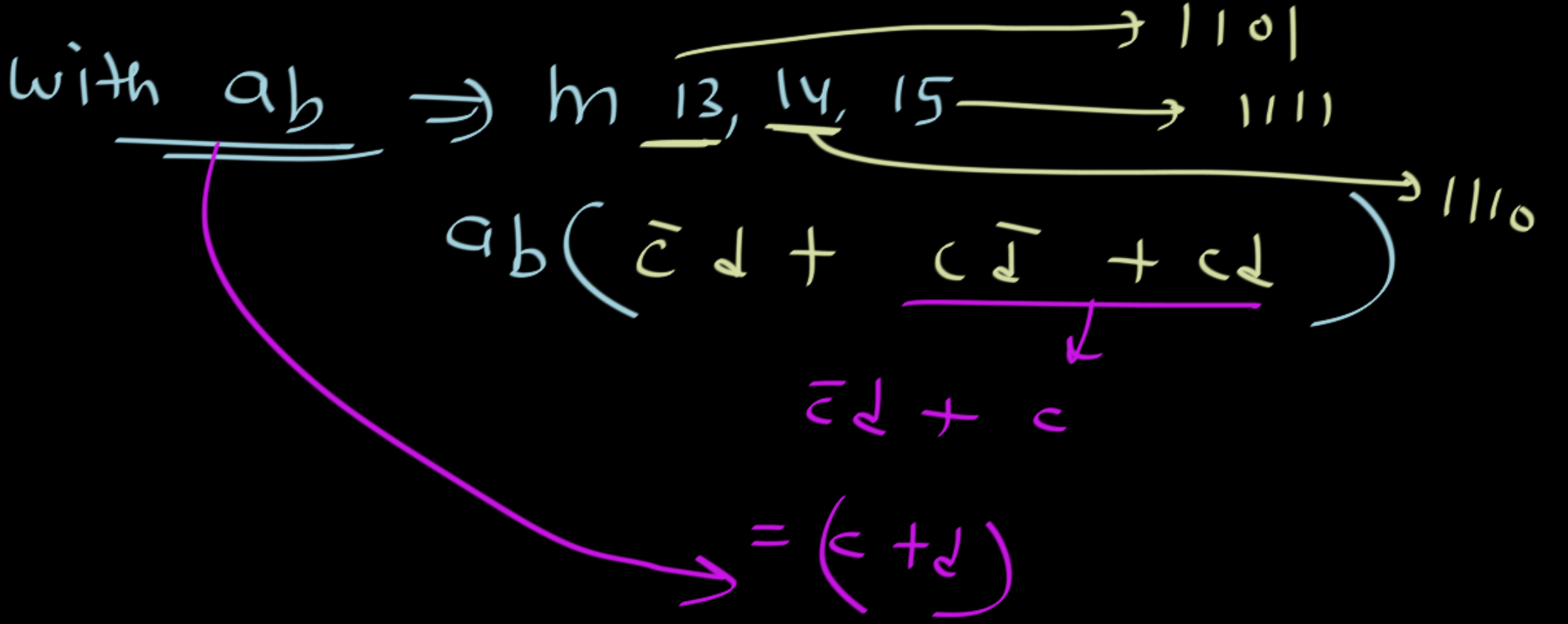
$\bar{a}\bar{b}(\bar{c}\bar{d}+\bar{c}d)$

with $\bar{a}b \Rightarrow m_{6,7}$

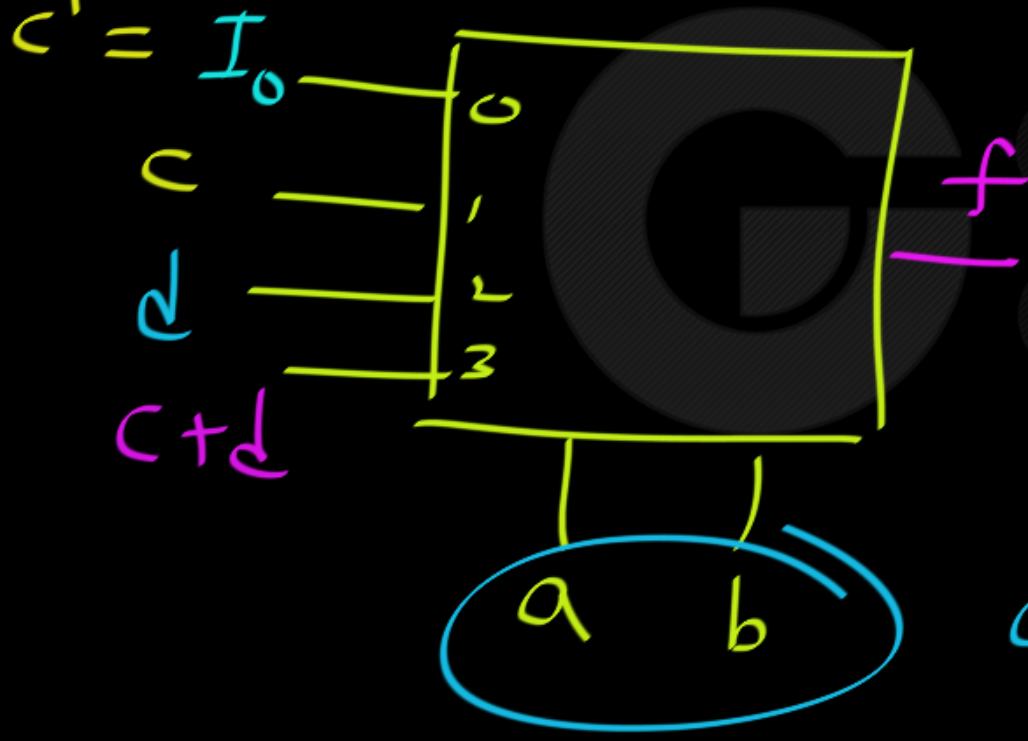
$\bar{a}b(c\bar{d}+cd)$

with $a\bar{b} \Rightarrow m_{9,11}$

$a\bar{b}(\bar{c}d+cd)$


with ab ⇒ m 13, 14, 15
1101
1111
1110
ab(c̄d + cd̄ + cd)
c̄d + cd̄
= (c + d)

$f = ad + bc + a'b'c'$



Method 2 :

I_0 means f when

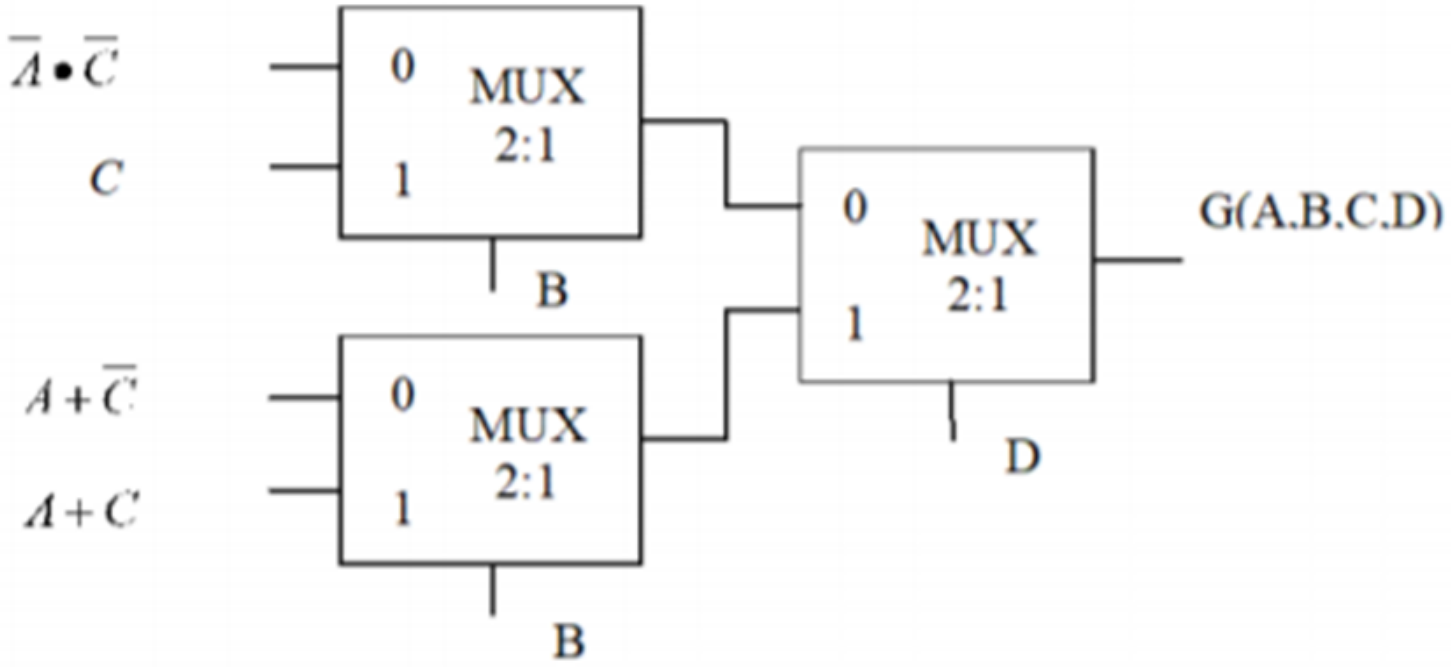
$a=0$, $b=0$ when $a=0=b \Rightarrow f = c'$

$a=0$, $b=1 \Rightarrow f = c$

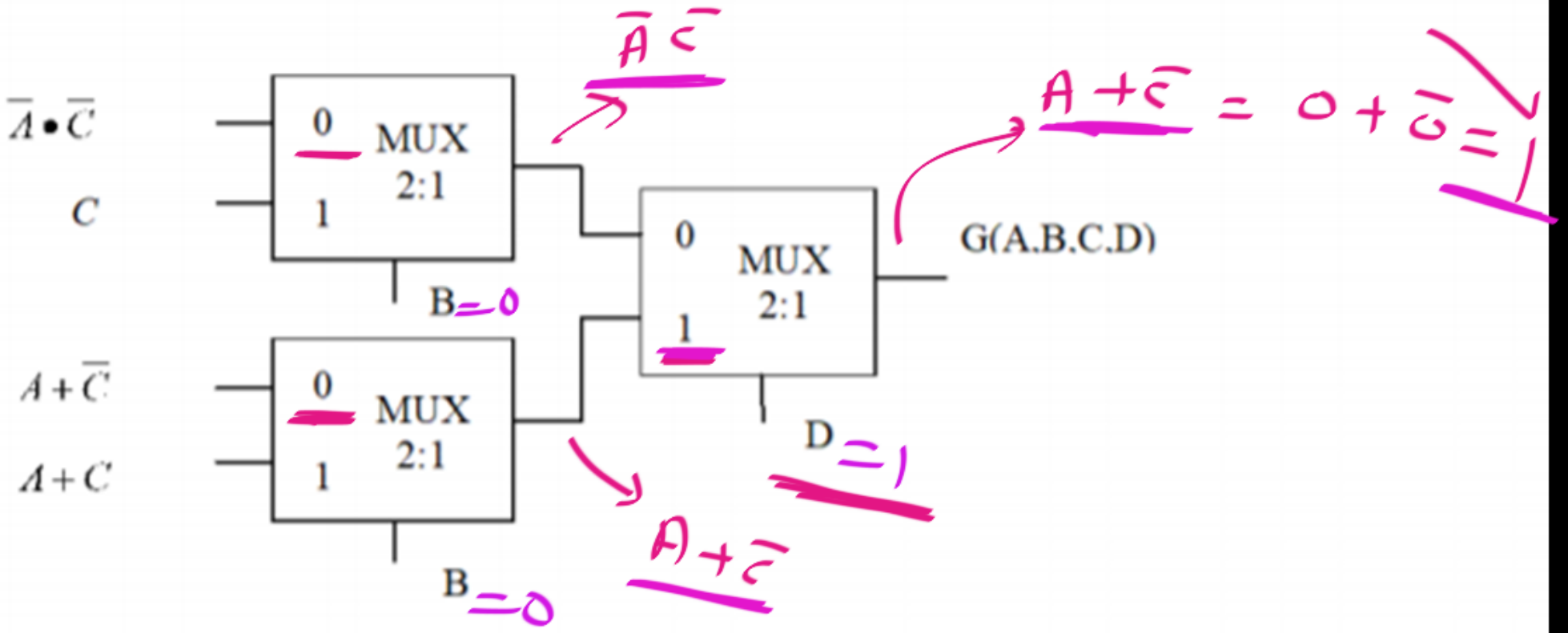
$a=1$, $b=0 \Rightarrow f = d$

$a=1$, $b=1 \Rightarrow f =$

(b) Determine the output function G(A,B,C,D) when ABCD = 0001 for the schematic given below:



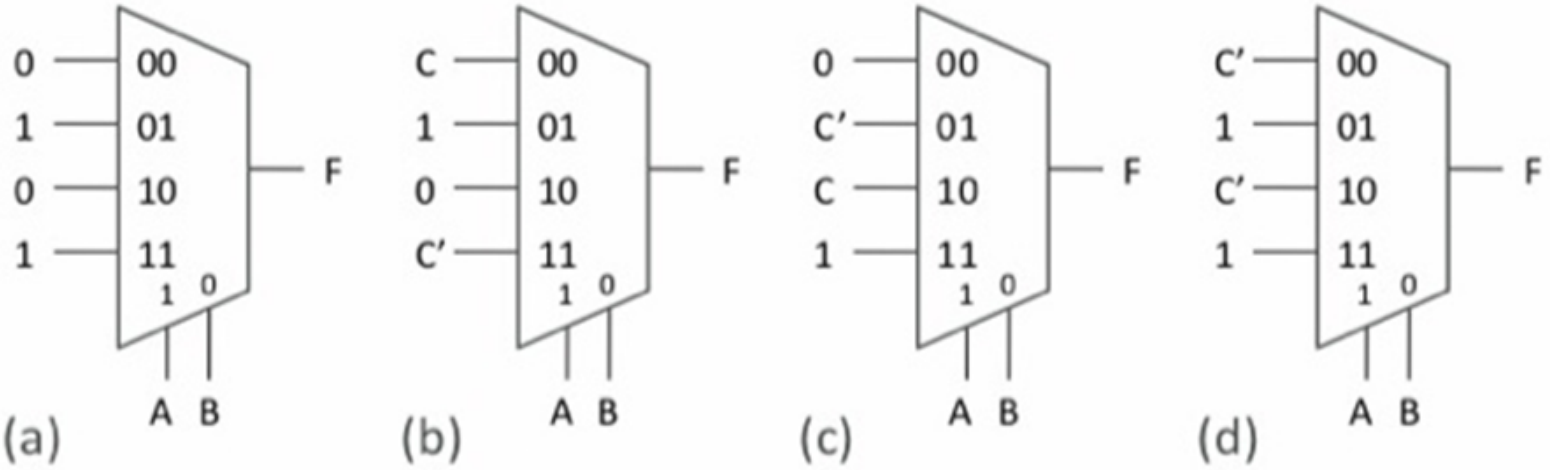
(b) Determine the output function G(A,B,C,D) when ABCD = 0001 for the schematic given below:



Question #7

- Implement the given logic function using an **4-to-1** multiplexer.

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



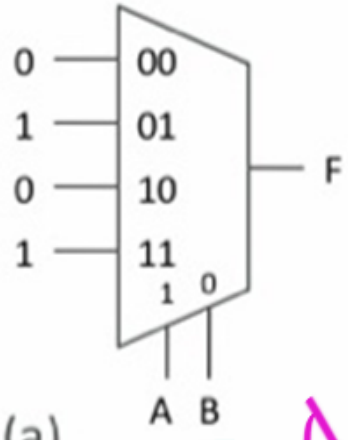
(e) None of the above.

Question #7

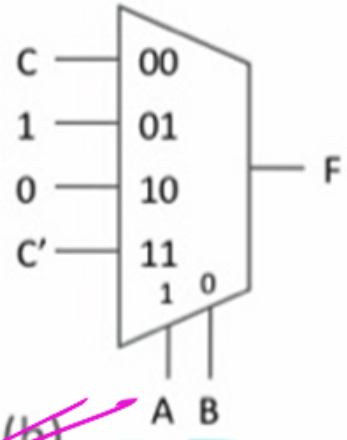
- Implement the given logic function

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

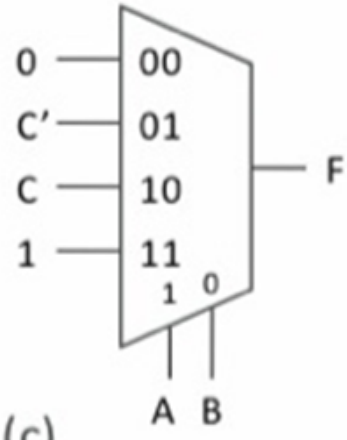
A	B	f(a,b,c)
0	0	C
0	1	1
1	0	0
1	1	C



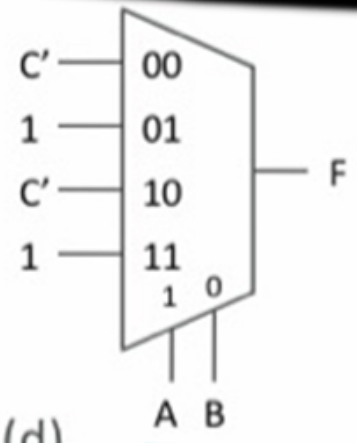
(a)



(b)



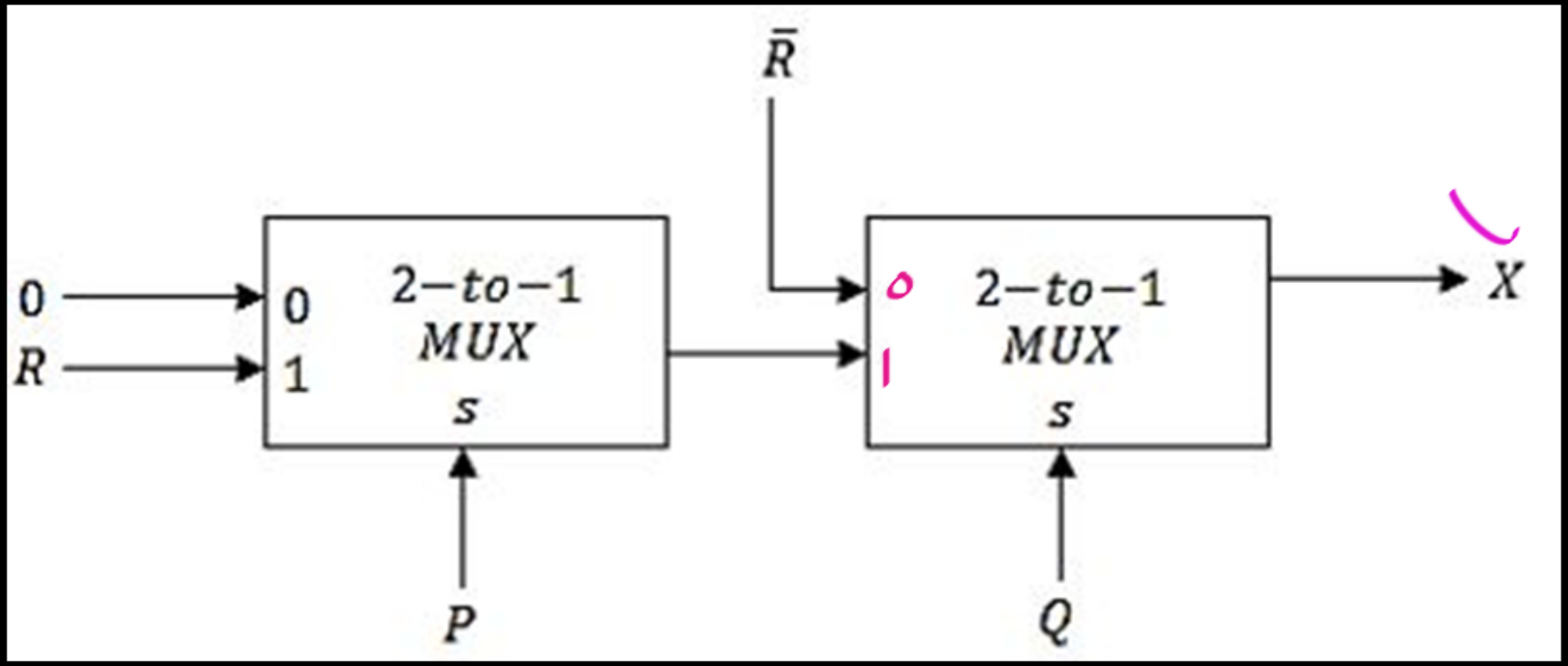
(c)



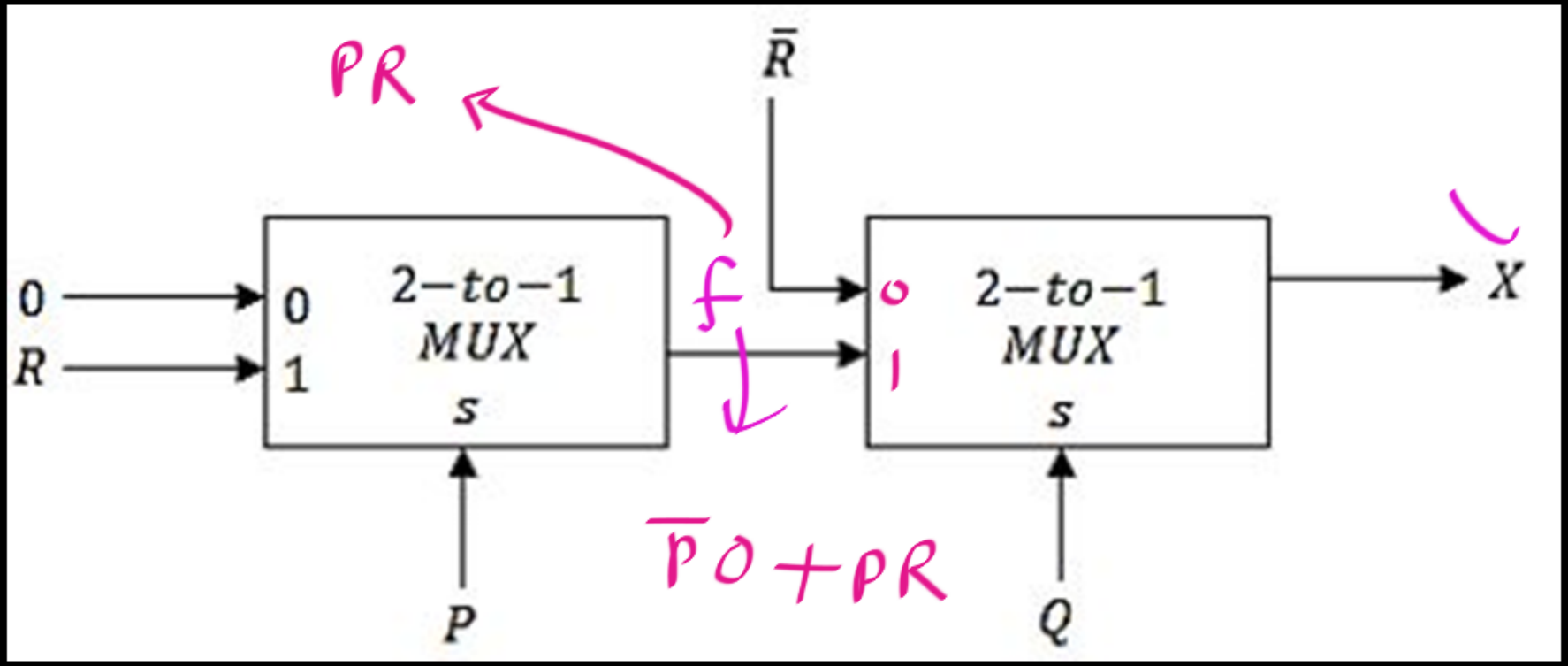
(d)

(e) None of the above.

Q:



Q:



$$X = \bar{Q}(\bar{R}) + Q(PR) = \bar{Q}\bar{R} + PQR$$