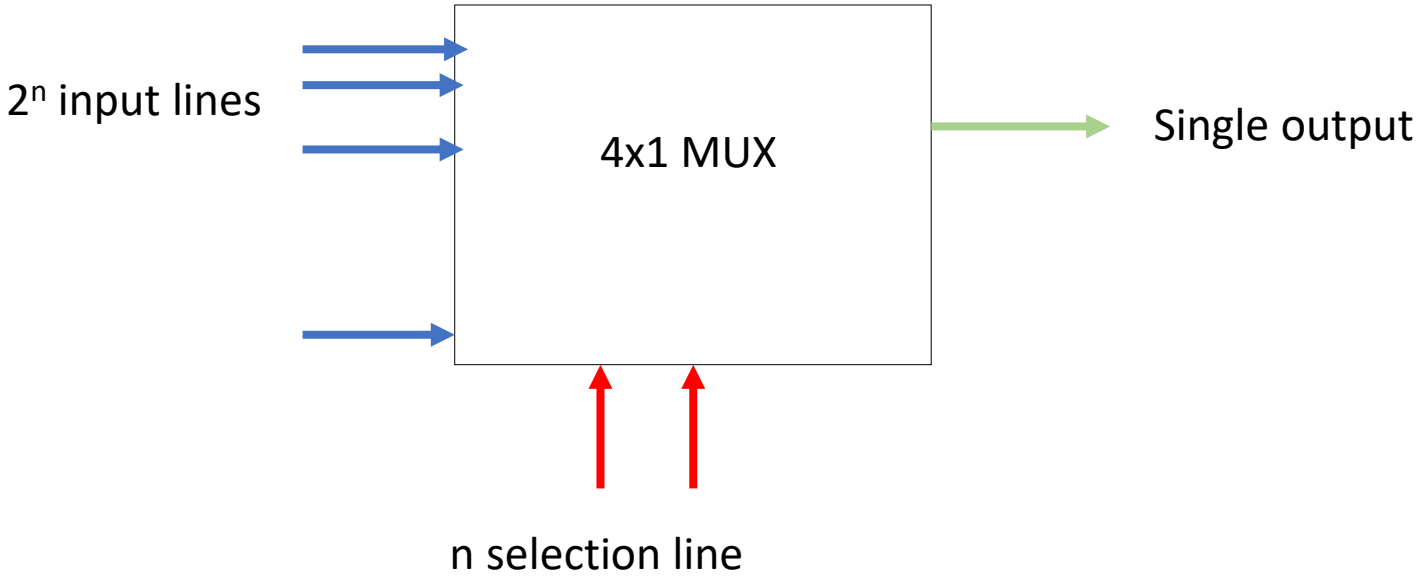
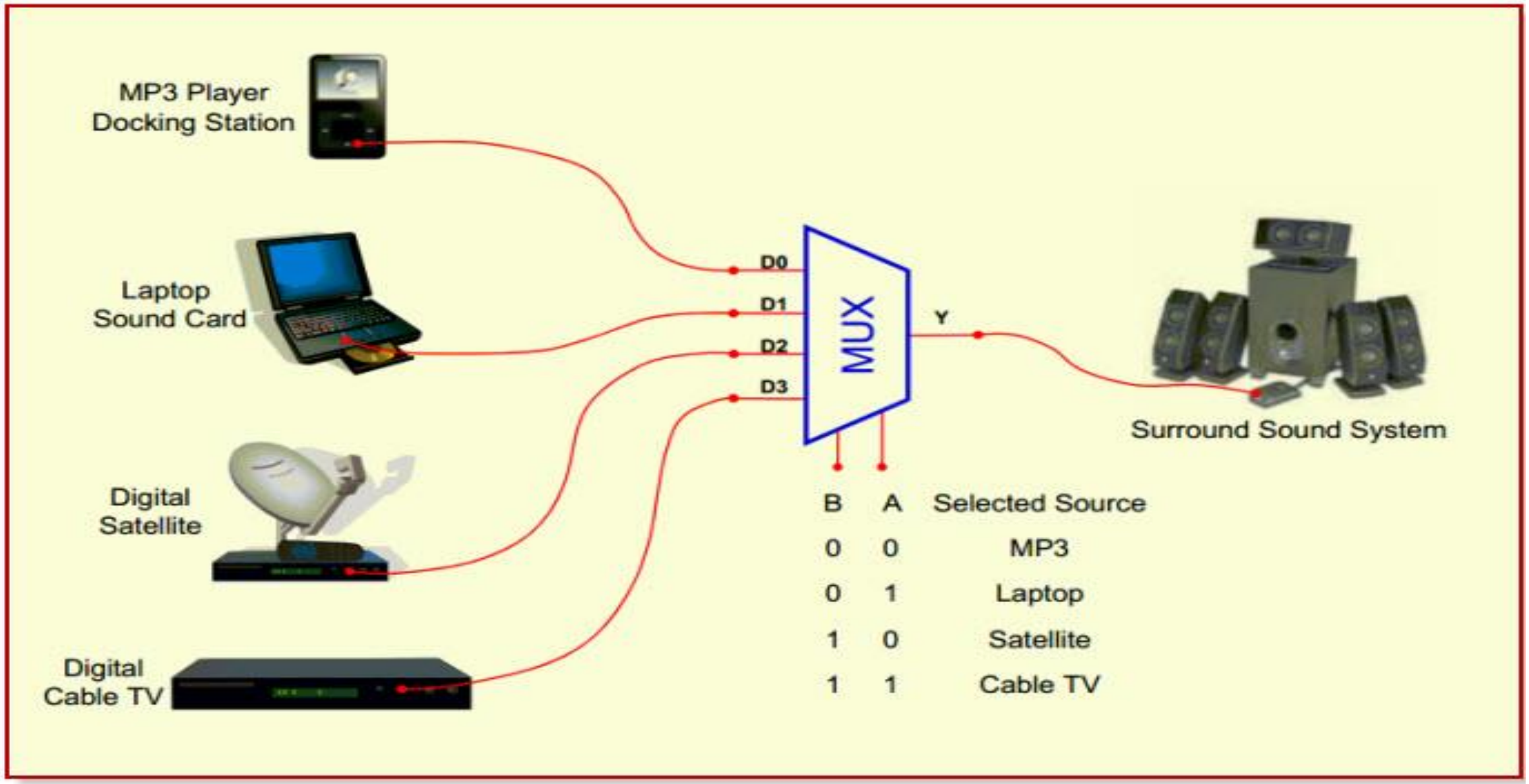
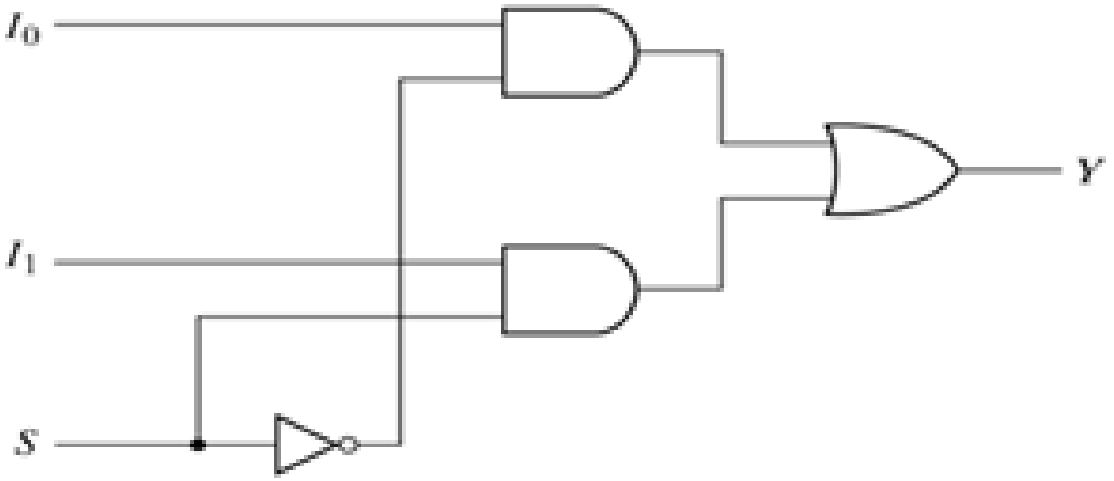
Multiplexer(Data selector):

- The term multiplex means ‘many to one’ . Multiplexing is the process of transmitting many number of information in a single line.
- It is also called a data selector since it selects one of many inputs and steers the information to the output.

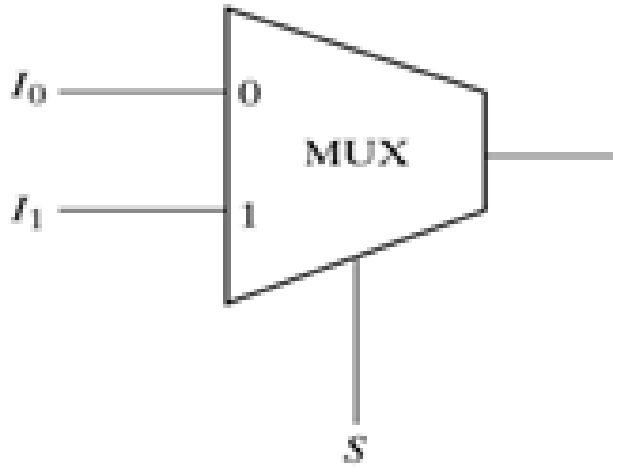



MP3 Player
Docking Station
Laptop
Sound Card
Digital
Satellite
Digital
Cable TV
D0
D1
D2
D3
MUX
Y
Surround Sound System
B A Selected Source
0 0 MP3
0 1 Laptop
1 0 Satellite
1 1 Cable TV

2x1 multiplexer:



(a) Logic diagram



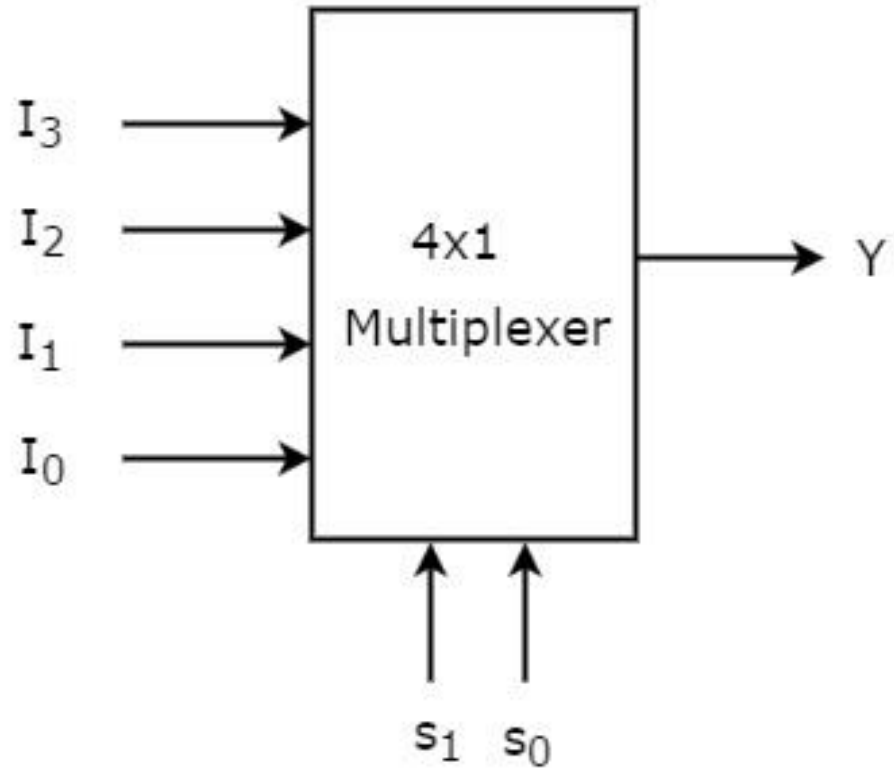
(b) Block diagram

S	Y
0	I0
1	I1

$Y=S'I_0 +S\ I_1$

4x1 Multiplexer

- 4x1 Multiplexer has four data inputs I_3, I_2, I_1 & I_0, two selection lines s_1 & s_0 and one output Y.

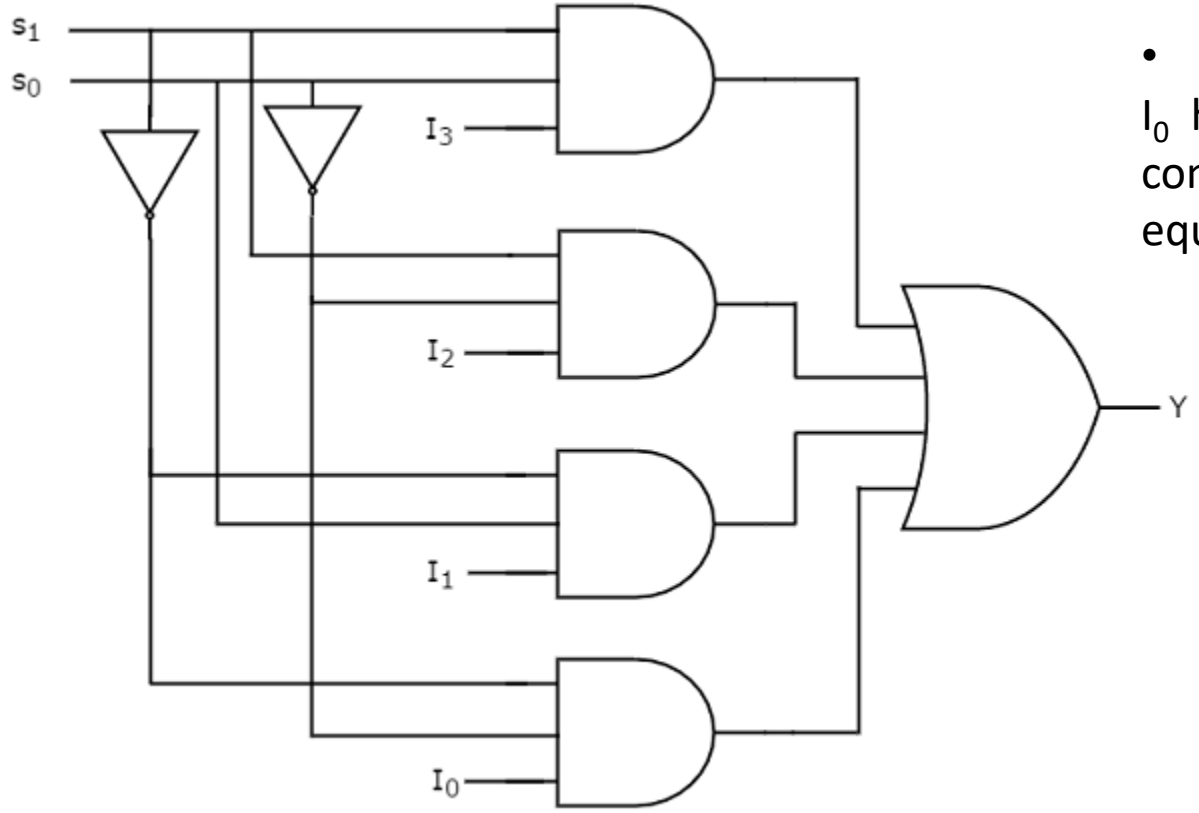


Selection Lines		Output
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

$$Y=S_1'S_0'I_0+S_1'S_0I_1+S_1S_0'I_2+S_1S_0I_3$$

4x1 Multiplexer logic diagram

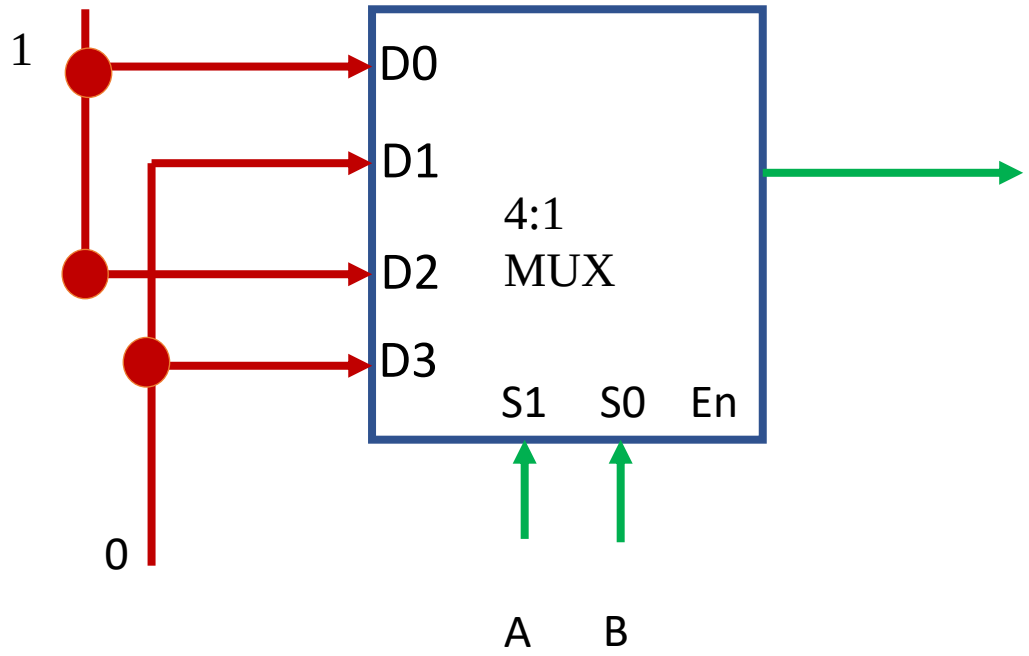
$$Y=S_1'S_0'I_0+S_1'S_0I_1+S_1S_0'I_2+S_1S_0I_3$$



- When S_0 S_1 =00 AND gate associated with data input I_0 has two of its input is equal to 1 and third input is connected I_0. other three AND gates at least one input equal to zero.

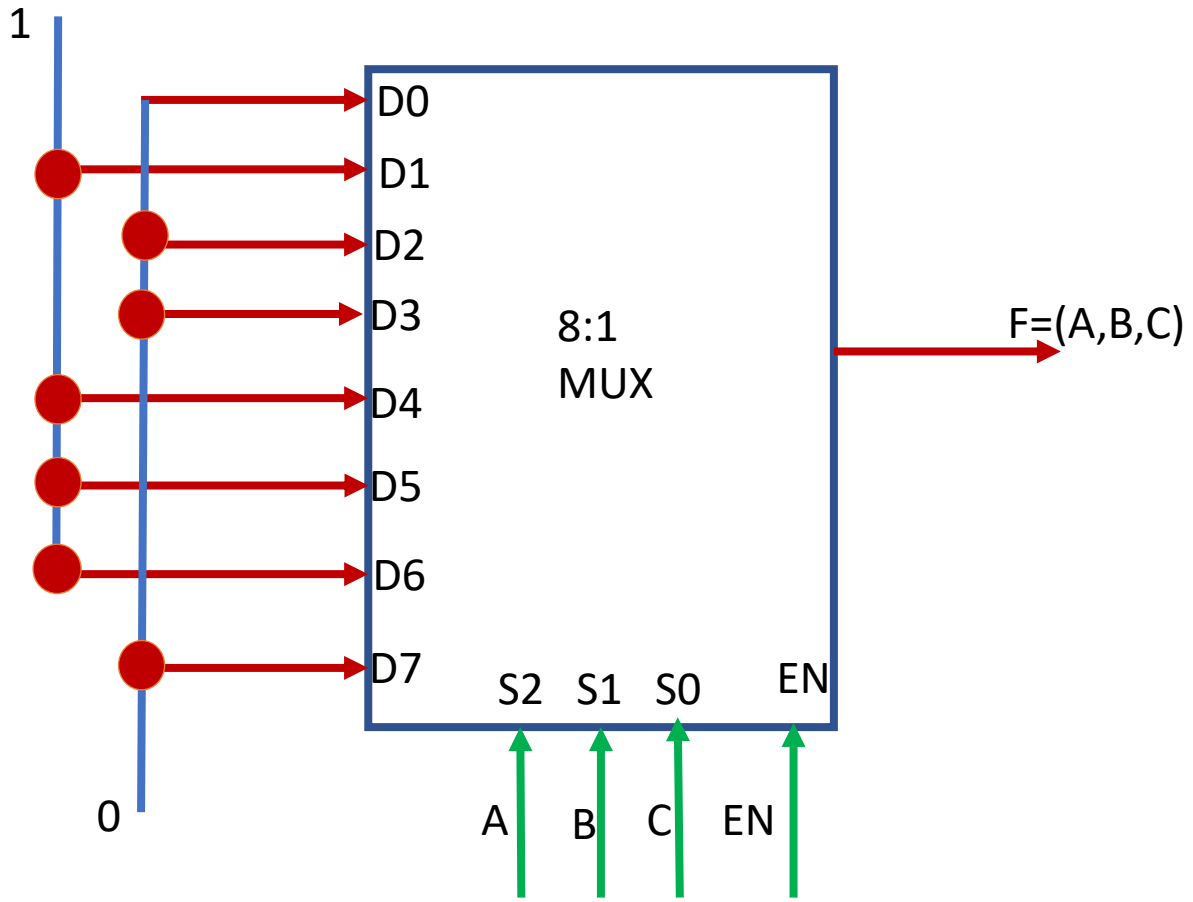
Boolean function implementation Using MUX

1.Implement the following Boolean function using 4:1 mux f (A,B)=∑(0,2)



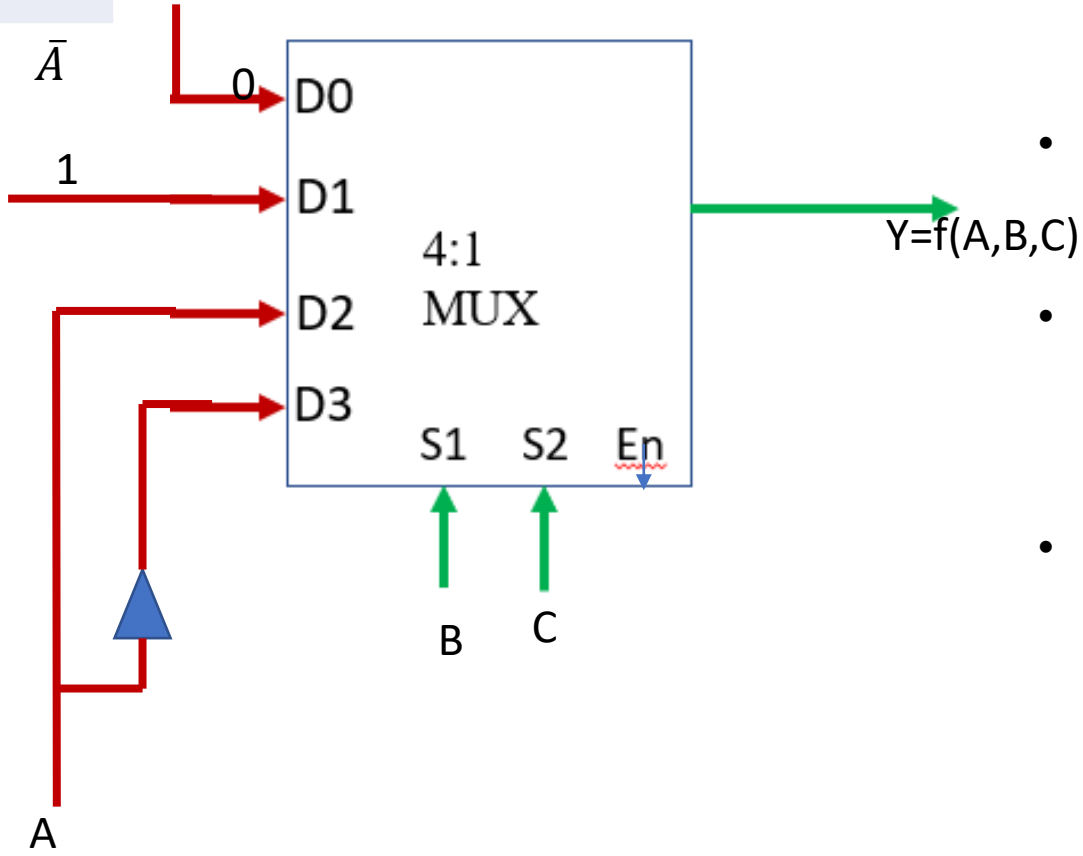
Connect the minterms (D0,D2)to high and other (D1,D3) to low.

- Implement the following Boolean function using 8:1 multiplexer.
  F(A,B,C)=$\sum(1,4,5,6)$



- Implement the following Boolean function using 4:1 multiplexer f(A,B,C)=$\sum(1,3,5,6)$.

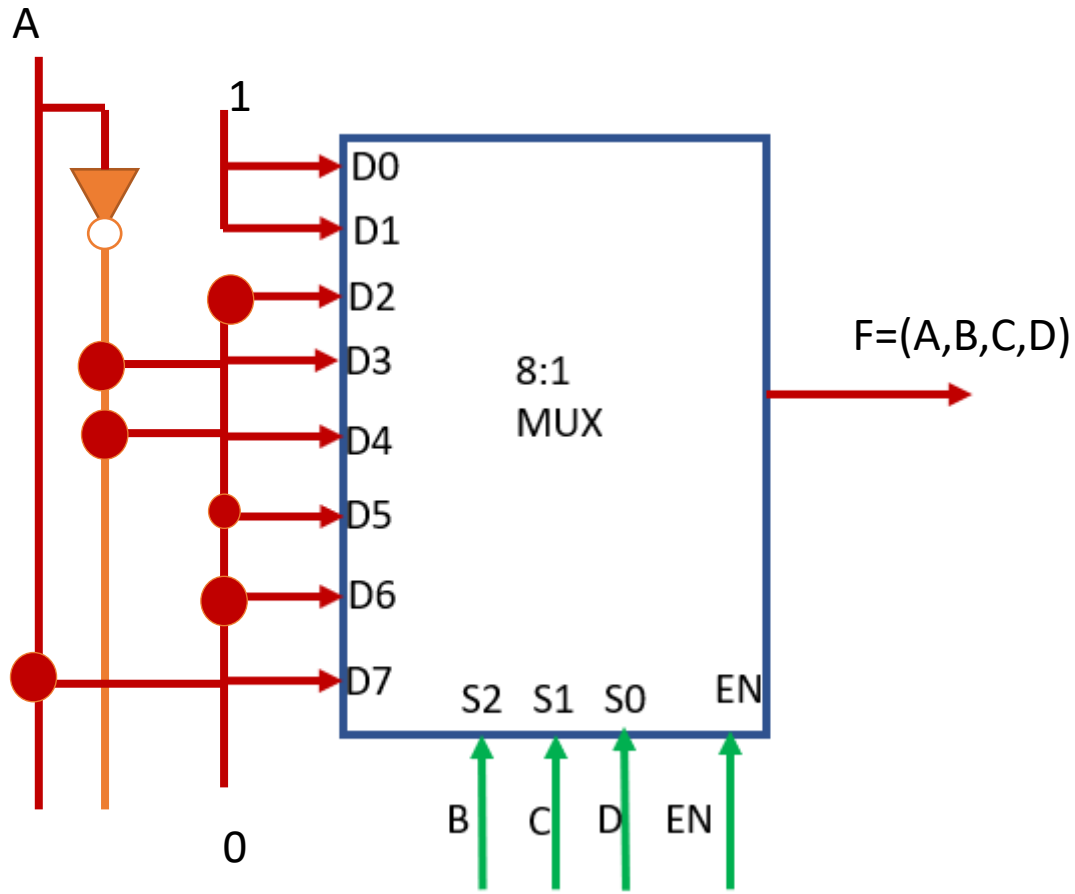
		D0	D1	D2	D3
0	$\bar{A}$	0	1	2	3
1	A	4	5	6	7
		0	1	A	$\bar{A}$



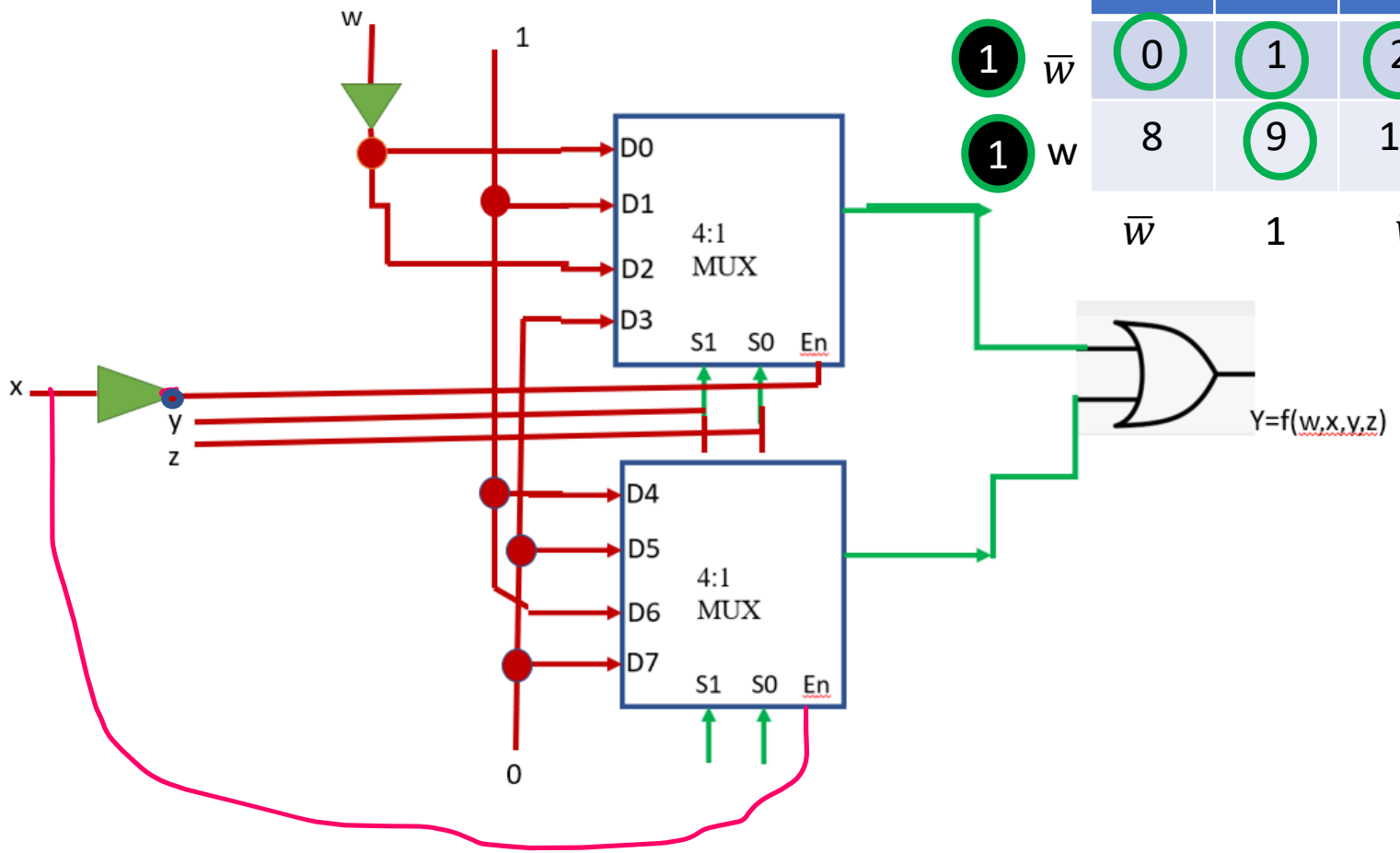
- In order to implement 8 input mux using 4:1 ,the 8 input mux function is first converted into 4 input mux (D0,D1,D2,D3) and two selection line ,one output.
- Two minterms in a column are not circled ,0 is applied to the corresponding input.
- Two minterms in a column are circled ,1 is applied to the corresponding input.
- If the minterms in the first row is circled, $\bar{A}$ is applied to corresponding input
- If the minterms in the second row is circled, A is applied to corresponding input

- Implement the following Boolean function using 8:1 multiplexer f(A,B,C,D)=∑(0,1,3,4,8,9,15).

	D0	D1	D2	D3	D4	D5	D6	D7
0 $\bar{A}$	0	1	2	3	4	5	6	7
1 A	8	9	10	11	12	13	14	15
	1	1	0	$\bar{A}$	$\bar{A}$	0	0	A



- Implement the following Boolean function using 4:1 multiplexer f(w,x,y,z)=∑(0,1,2,4,6,9,12,14).



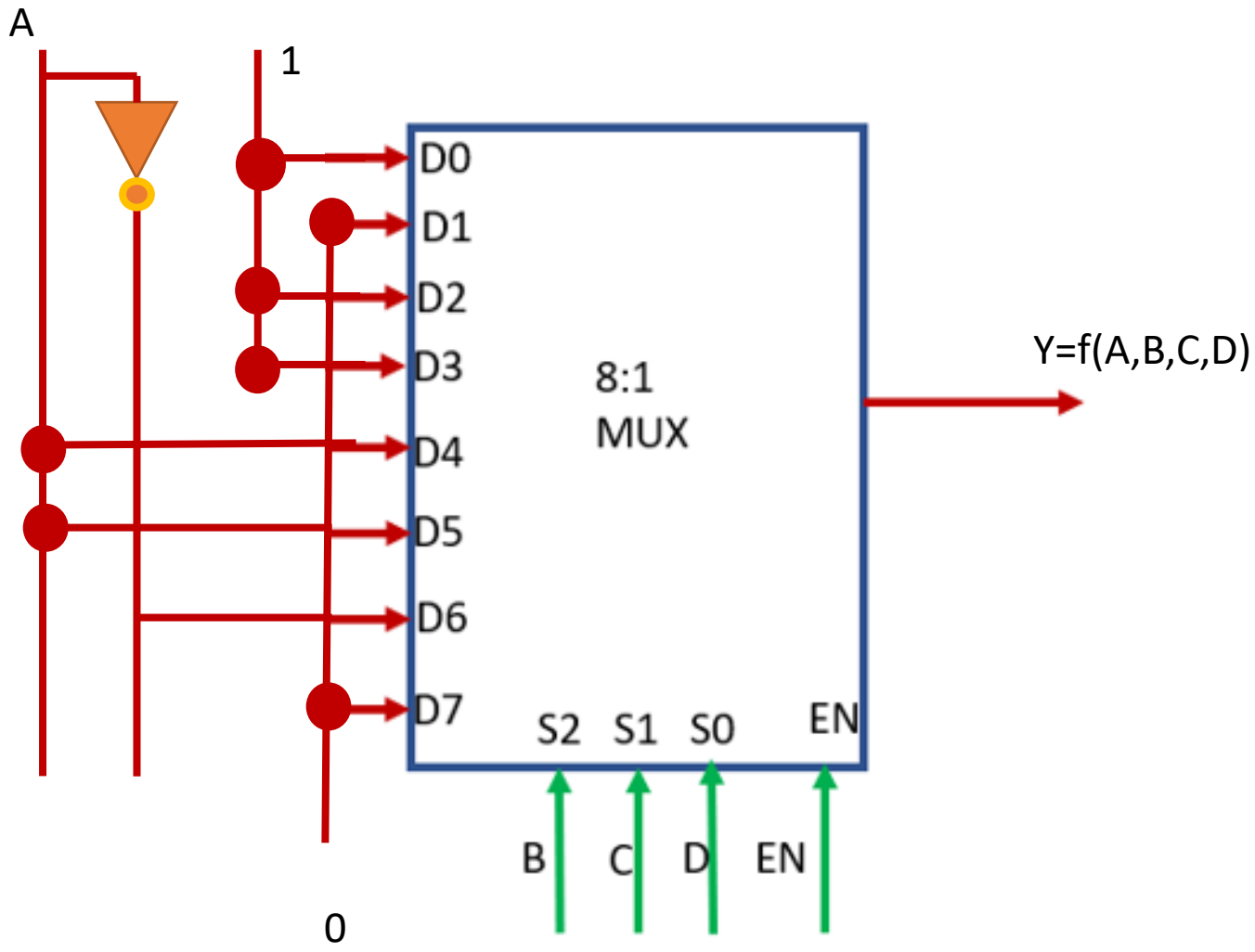
D0	D1	D2	D3	D4	D5	D6	D7
0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
$\overline{w}$	1	$\overline{w}$	0	1	0	1	0

- Implement the following Boolean function using 8:1 multiplexer f(A,B,C,D)=$\sum(0,2,6,10,11,12,13) + d(3,8,15)$

		D0	D1	D2	D3	D4	D5	D6	D7
0	$\bar{A}$	0	1	2	3	4	5	6	7
1	A	8	9	10	11	12	13	14	15
		$\bar{A}$	0	1	A	A	A	$\bar{A}$	0

		D0	D1	D2	D3	D4	D5	D6	D7
0	$\bar{A}$	0	1	2	3	4	5	6	7
1	A	8	9	10	11	12	13	14	15
		1	0	1	1	A	A	$\bar{A}$	0

If we apply don't care 3 in the first table we get D3 as 1 .if we apply don't care 8 ,we get D0 as 1.But if we apply don't care 15 we get D7 as A. So the don't care we need to apply are (3,8)


A
1
D0
D1
D2
D3
8:1
MUX
D4
D5
D6
D7
Y=f(A,B,C,D)
S2
S1
S0
EN
B
C
D
EN
0