SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECB201 – DIGITAL SYSTEMS DESIGN

II YEAR/ III SEMESTER

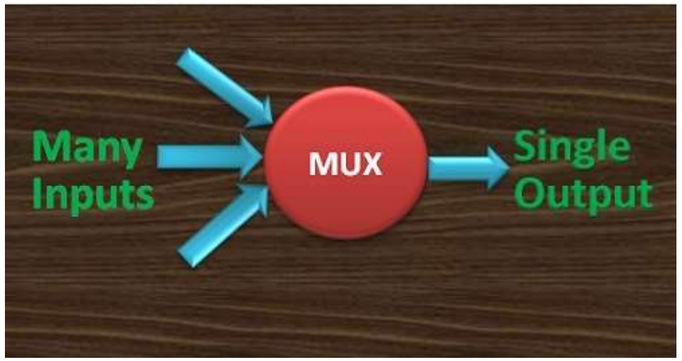
UNIT 2 – COMBINATIONAL CIRCUITS

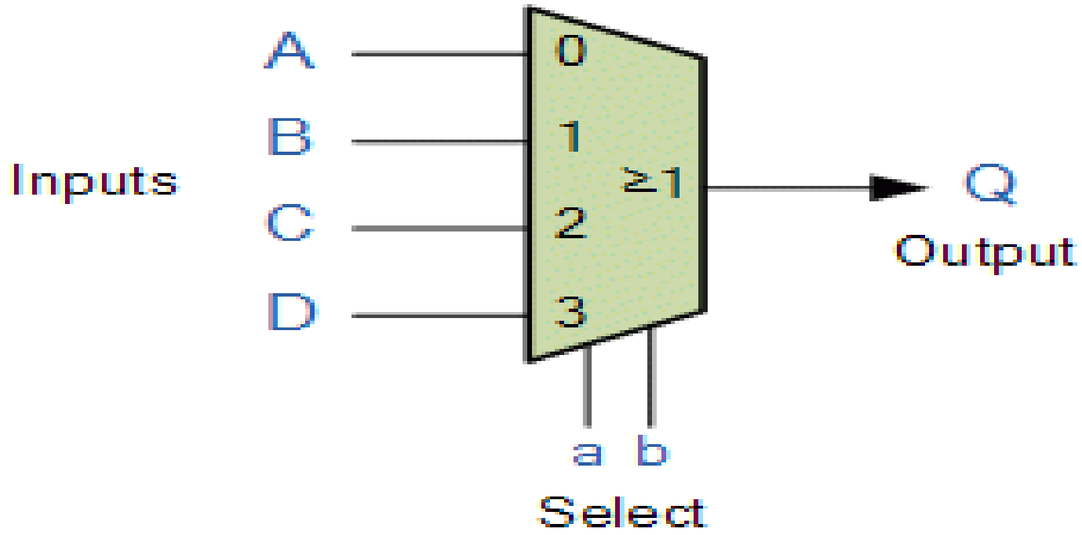
TOPIC- 2.3 – MULTIPLEXER and DEMULTIPLEXER

What is a Multiplexer?

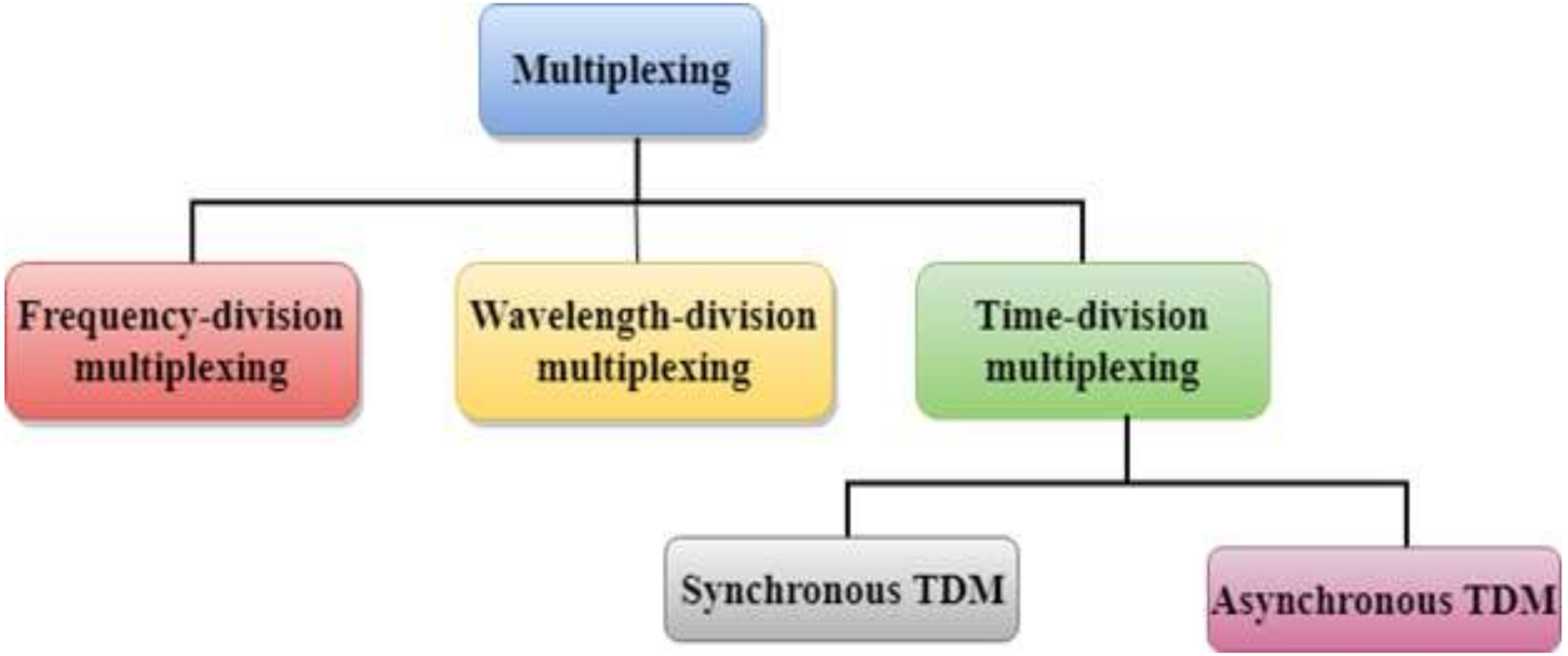
- Multiplexer is a combinational circuit that has maximum of 2n data inputs, ‘n’ selection lines and single output line.

- One of these data inputs will be connected to the output based on the values of selection lines..



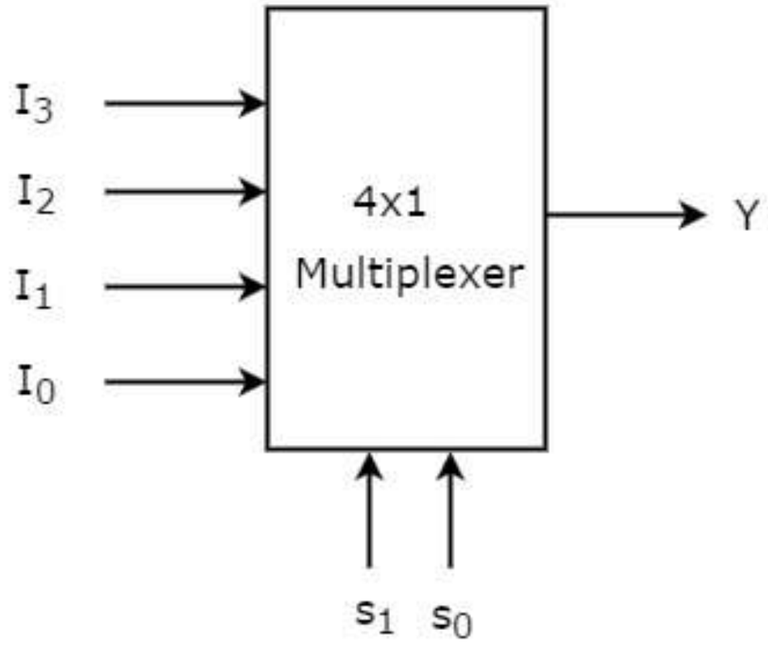


Multiplexing Techniques



4x1 Multiplexer

- 4x1 Multiplexer has four data inputs I3, I2, I1 & I0, two selection lines s1 & s0 and one output Y.



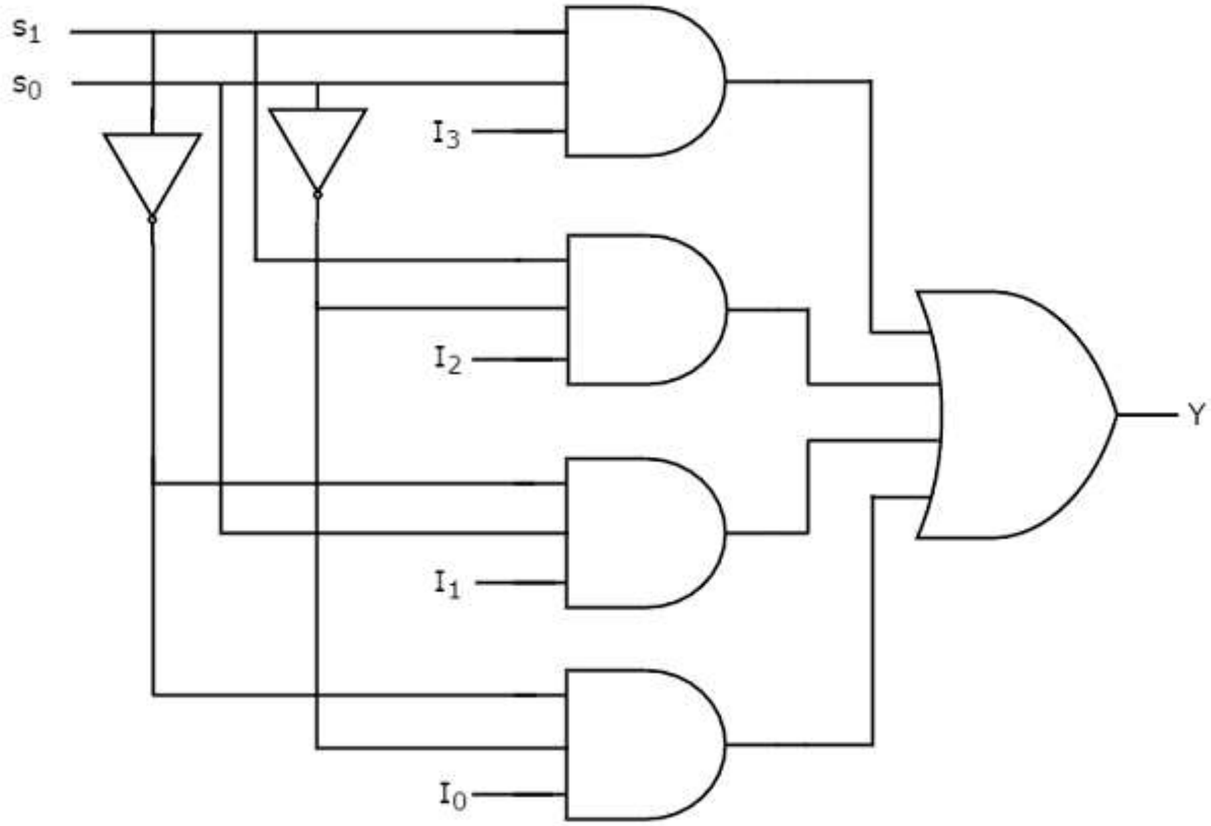
4x1 Multiplexer

- One of these 4 inputs will be connected to the output based on the combination of inputs present at these two selection lines.

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

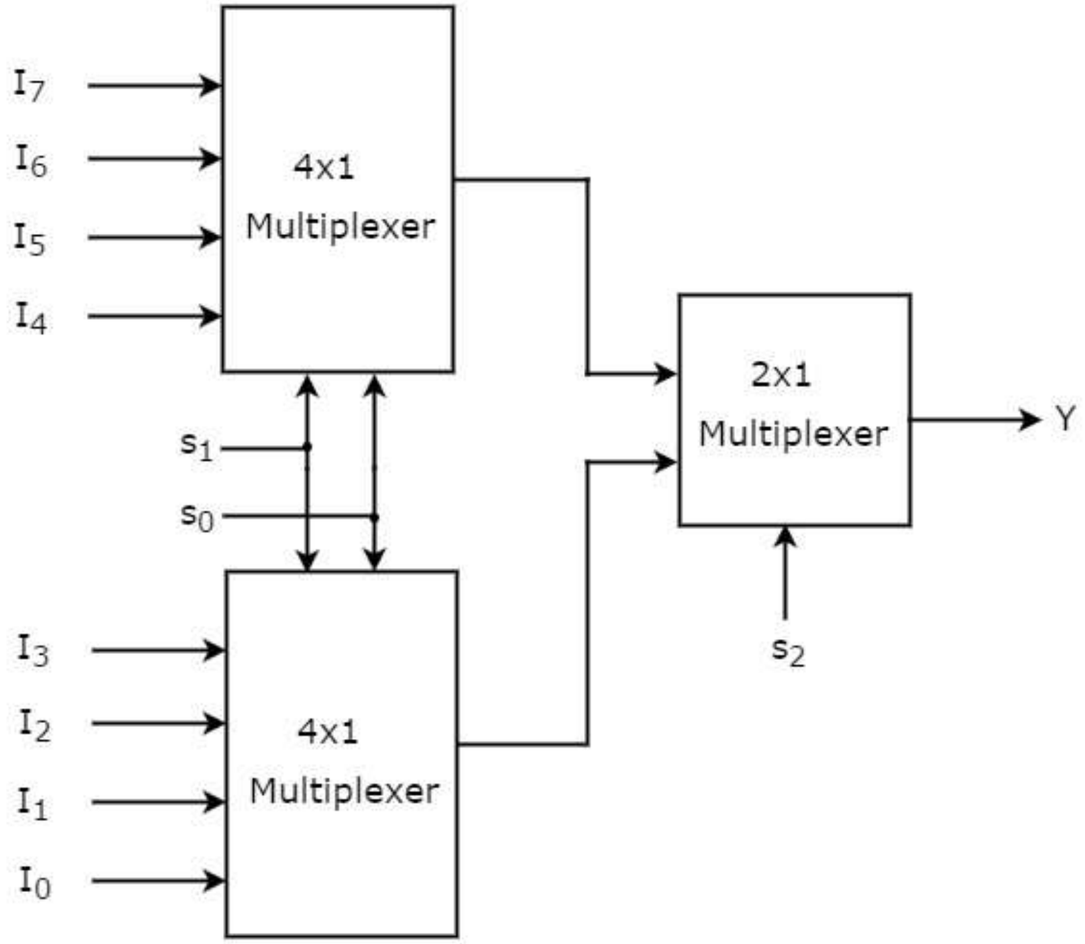
4x1 Multiplexer

- We can implement this Boolean function using Inverters, AND gates & OR gate.



8x1 Multiplexer

- We require two 4x1 Multiplexers in first stage in order to get the 8 data inputs.



8x1 Multiplexer

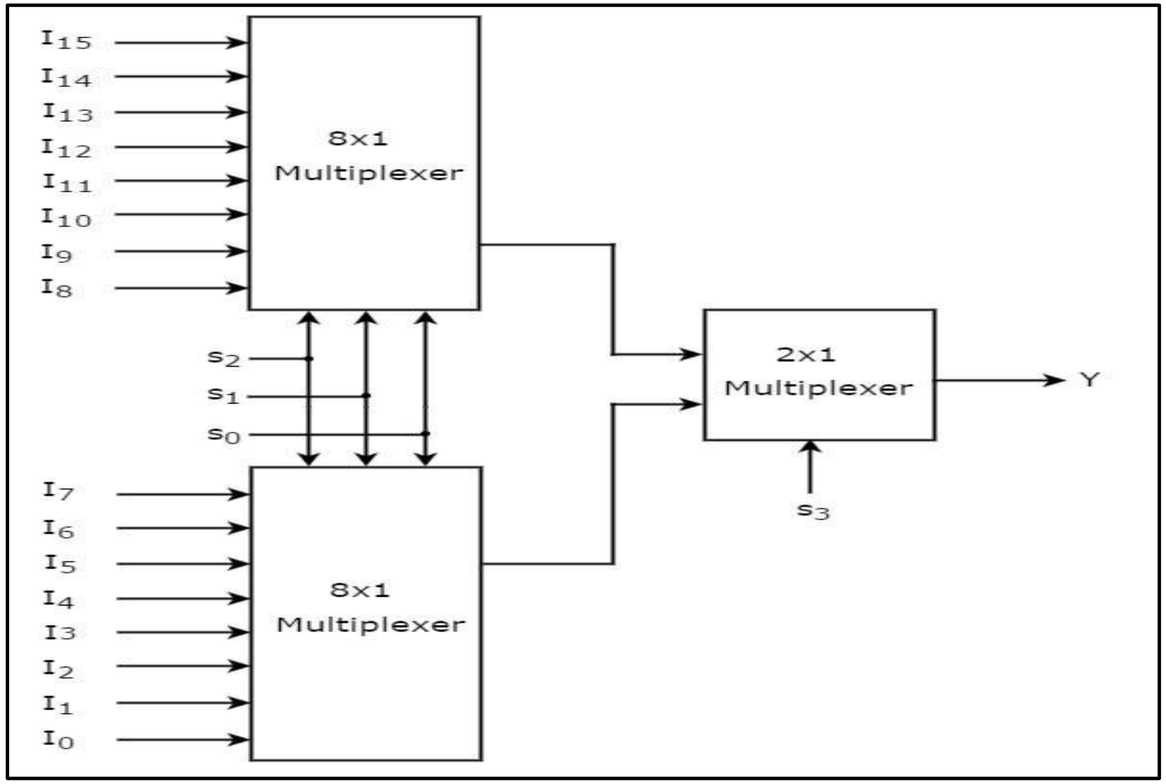
- **Let the 8x1 Multiplexer has eight data inputs I7 to I0, three selection lines s2, s1 & s0 and one output Y**

Selection Inputs			Output
S_2	S_1	S_0	Y
0	0	0	I_0
0	0	1	I_1
0	1	0	I_2
0	1	1	I_3
1	0	0	I_4
1	0	1	I_5
1	1	0	I_6
1	1	1	I_7

Activity Time

16x1 Multiplexer

- We require two 8x1 Multiplexers in first stage in order to get the 16 data inputs.

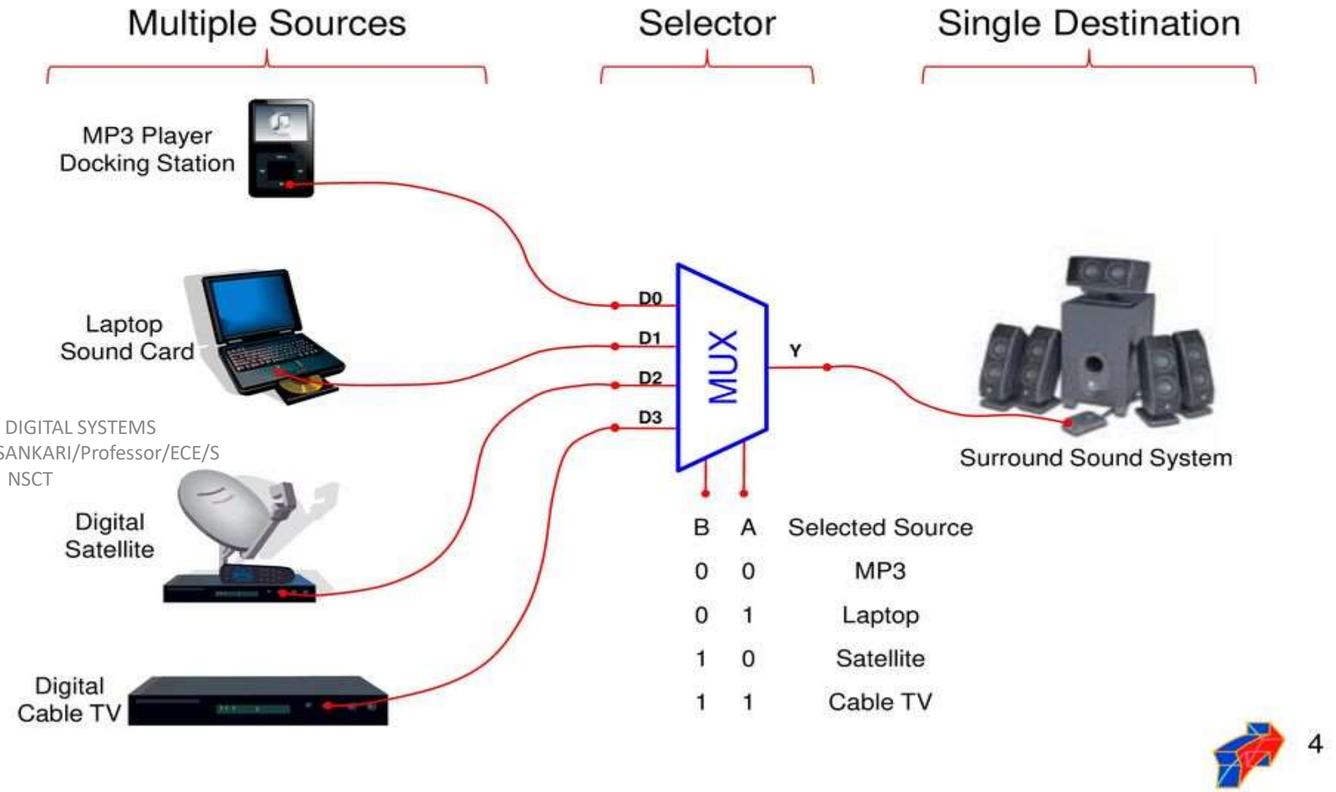


16x1 Multiplexer

- 16x1 Multiplexer has sixteen data inputs I15 to I0, four selection lines s3 to s0 and one output Y.

Selection Inputs				Output
S_3	S_2	S_1	S_0	Y
0	0	0	0	I_0
0	0	0	1	I_1
0	0	1	0	I_2
0	0	1	1	I_3
0	1	0	0	I_4
0	1	0	1	I_5
0	1	1	0	I_6
0	1	1	1	I_7
1	0	0	0	I_8
1	0	0	1	I_9
1	0	1	0	I_{10}
1	0	1	1	I_{11}
1	1	0	0	I_{12}
1	1	0	1	I_{13}
1	1	1	0	I_{14}
1	1	1	1	I_{15}

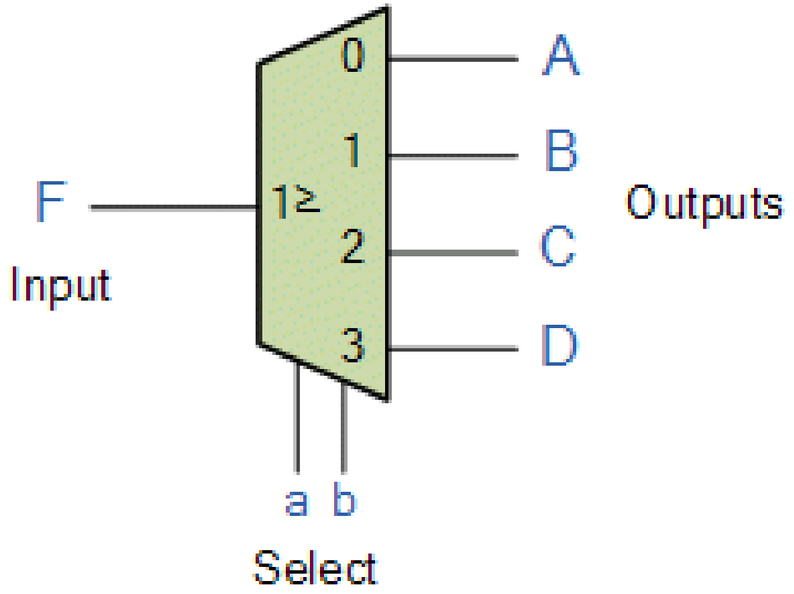
Typical Application of a MUX



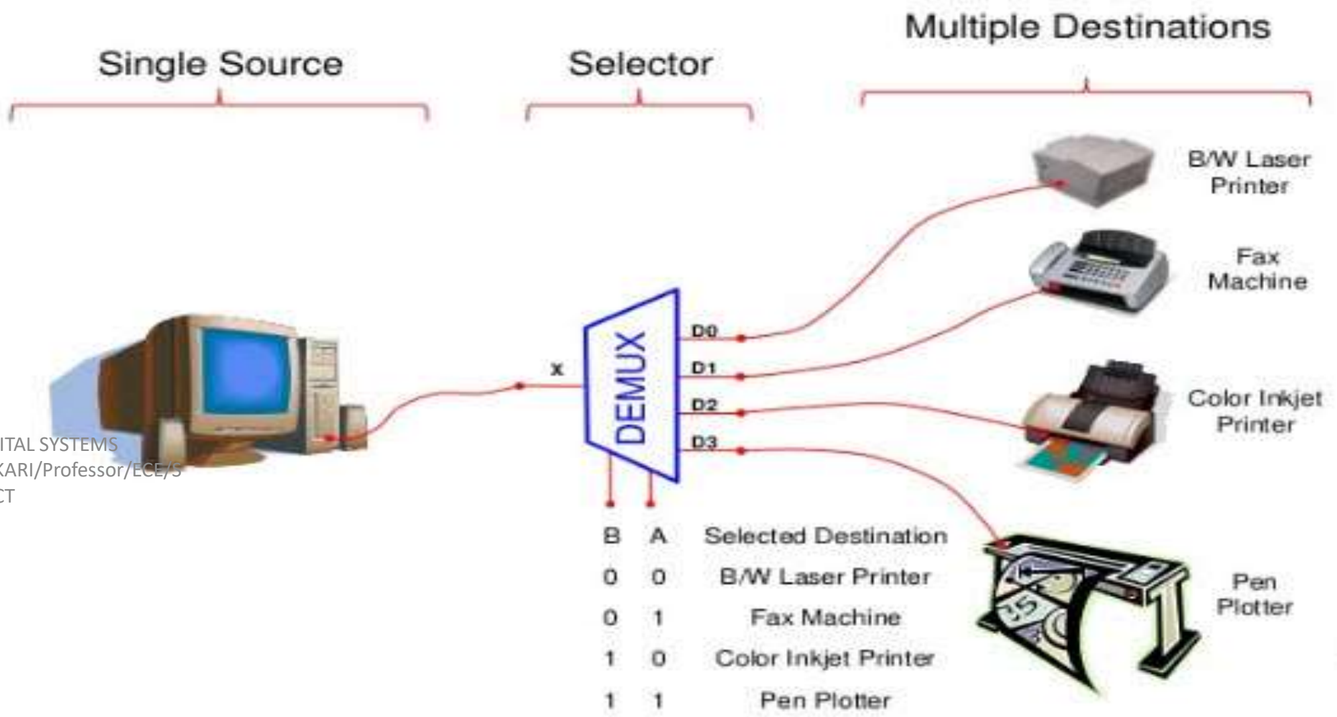
What is De Multiplexer?

- De-Multiplexer is a combinational circuit that performs the reverse operation of Multiplexer. It has single input, ‘n’ selection lines and maximum of 2n outputs.

- One of these data inputs will be connected to the output based on the values of selection lines..

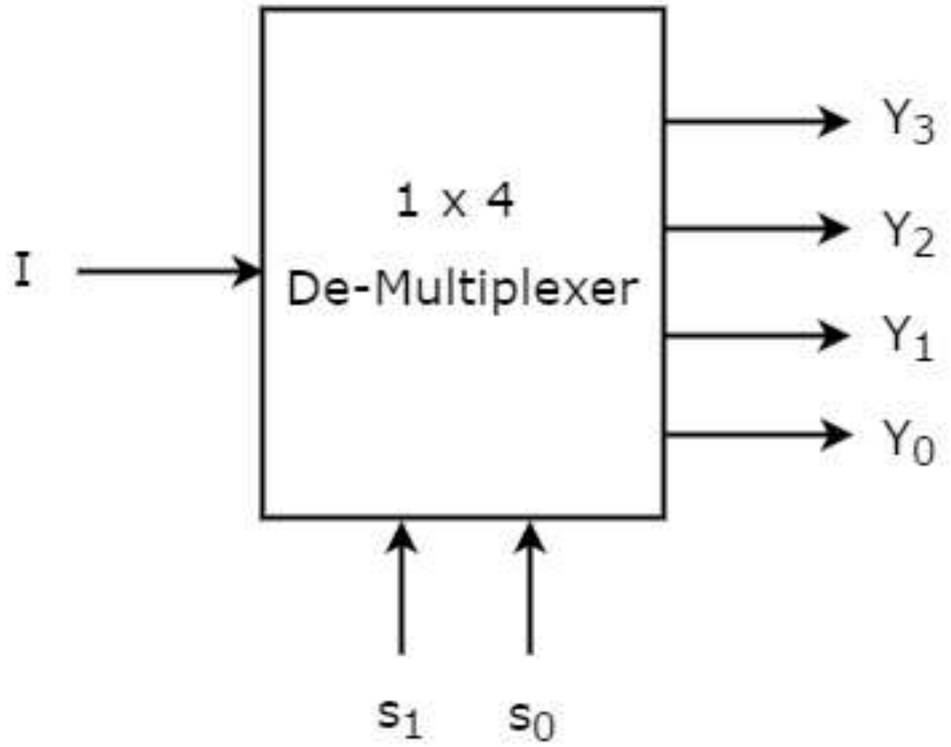


DeMultiplexer - Types



1x4 De-Multiplexer

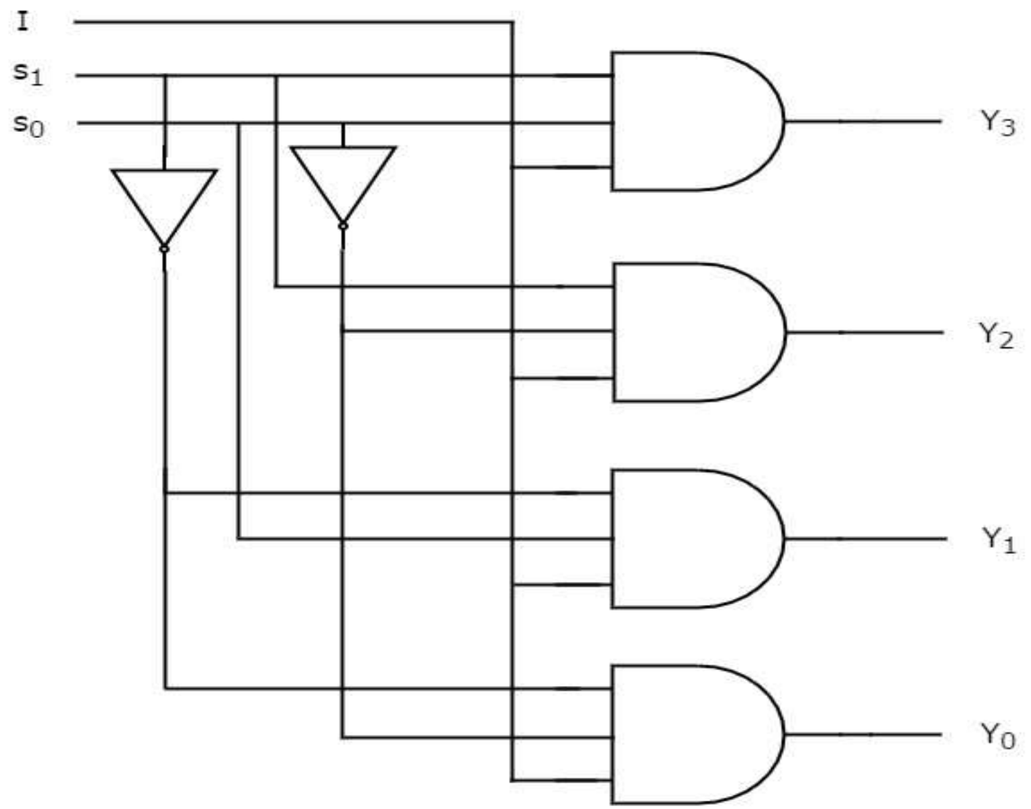
- 1x4 De-Multiplexer has one input I, two selection lines, s1 & s0 and four outputs Y3, Y2, Y1 &Y0.



- The single input ‘I’ will be connected to one of the four outputs, Y3 to Y0 based on the values of selection lines s1 & s0. The Truth table of 1x4 De-Multiplexer is shown below.

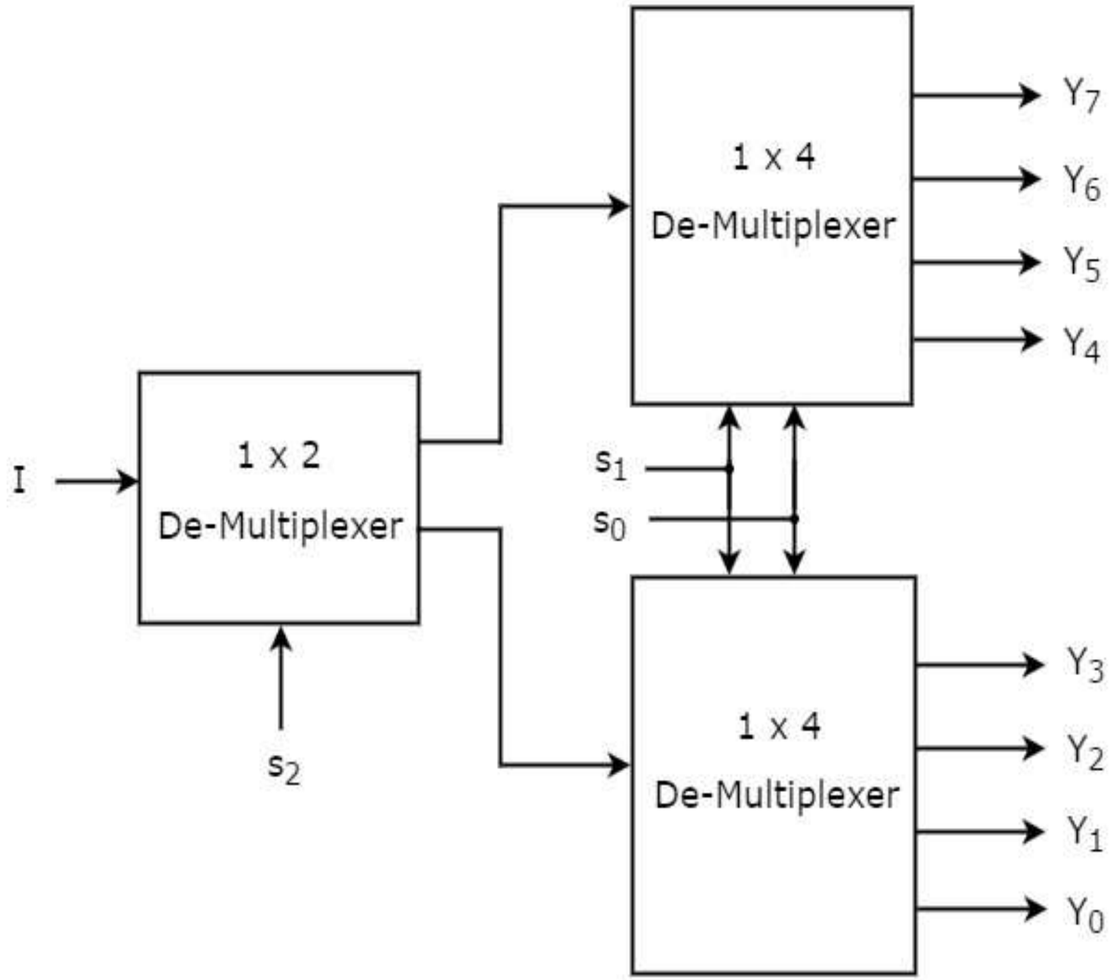
Selection Inputs		Outputs			
S_1	S_0	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	I
0	1	0	0	I	0
1	0	0	I	0	0
1	1	I	0	0	0

We can implement these Boolean functions using Inverters & 3-input AND gates. The circuit diagram of 1x4 De-Multiplexer is shown in the following figure.



1x8 De-Multiplexer

1x8 De-Multiplexer has single input, three selection lines and eight outputs.

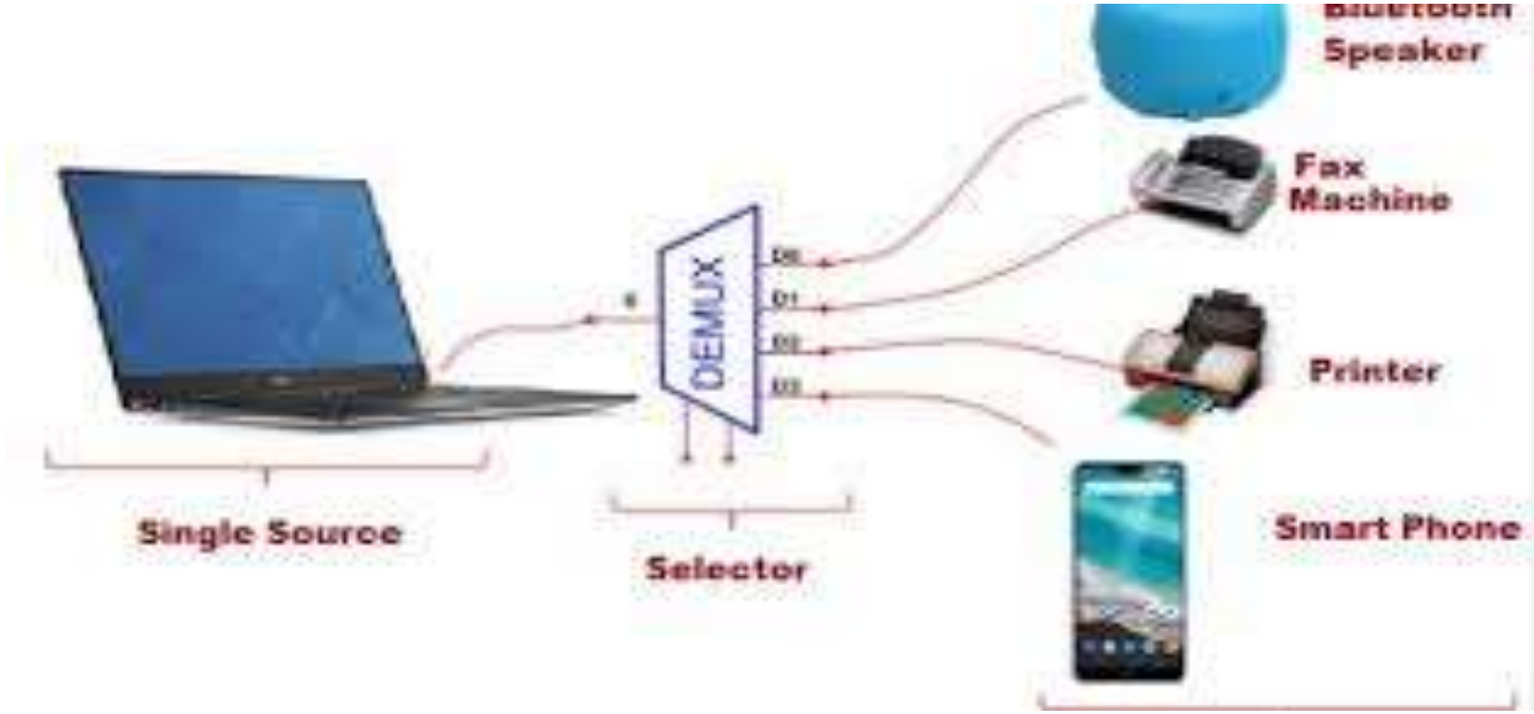


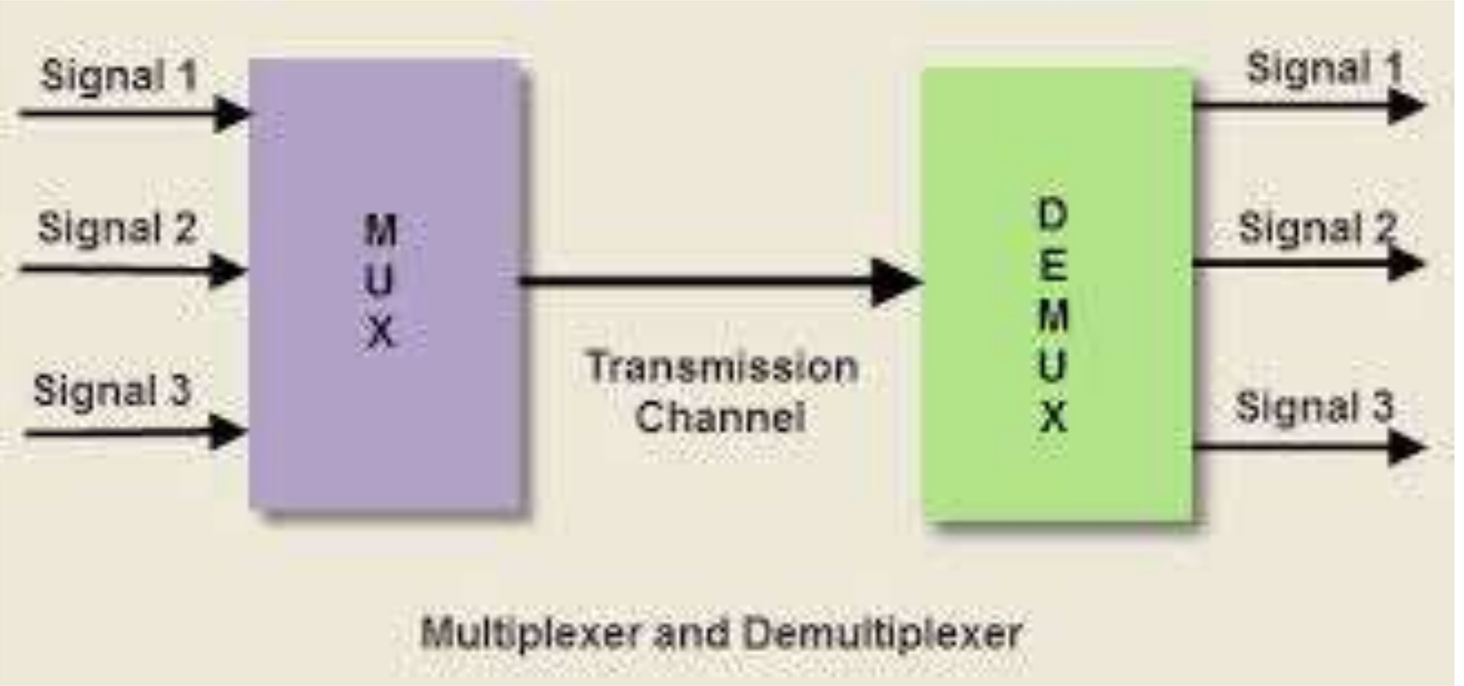
1x8 De-Multiplexer has one input I, three selection lines s2, s1 & s0 and outputs Y7 to Y0. The Truth table of 1x8 De-Multiplexer is shown below.

Selection Inputs			Outputs							
s_2	s_1	s_0	Y_7	Y_6	Y_5	Y_4	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	0	0	0	0	0	I
0	0	1	0	0	0	0	0	0	I	0
0	1	0	0	0	0	0	0	I	0	0
0	1	1	0	0	0	0	I	0	0	0
1	0	0	0	0	0	I	0	0	0	0
1	0	1	0	0	I	0	0	0	0	0
1	1	0	0	I	0	0	0	0	0	0
1	1	1	I	0	0	0	0	0	0	0

Applications

Demultiplexer is used to connect a single source to multiple destinations. The main application area of demultiplexer is communication system where multiplexer are used.





Multiplexer and Demultiplexer

ASSESSMENTS

PAIR
(With a partner)

THINK
(Yourself)

SHARE
(Whole class)

THANK YOU