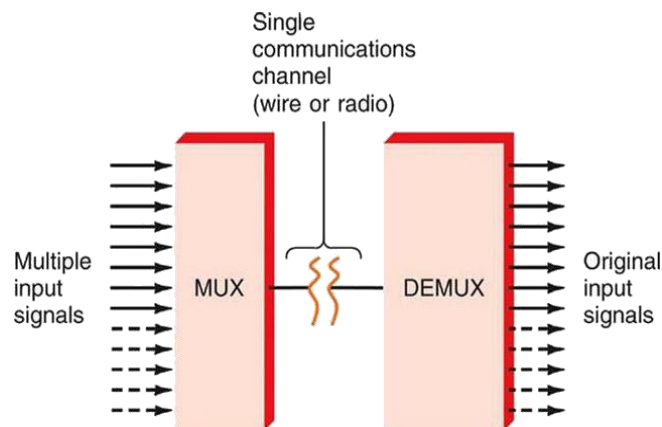


## **Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.**

### **Theory**

### **Introduction**

The function of a multiplexer is to select the input of any 'n' input lines and feed that to one output line. The function of a de-multiplexer is to inverse the function of the multiplexer and the shortcut forms of the multiplexer. The de-multiplexers are mux and demux. Some multiplexers perform both multiplexing and de-multiplexing operations.



**Figure-1:Block diagram of Multiplexer and De-multiplexer**

### **1) Multiplexer**

Multiplexer is a device that has multiple inputs and a single line output. The select lines determine which input is connected to the output, and also to increase the amount of data that can be sent over a network within certain time. It is also called a data selector.

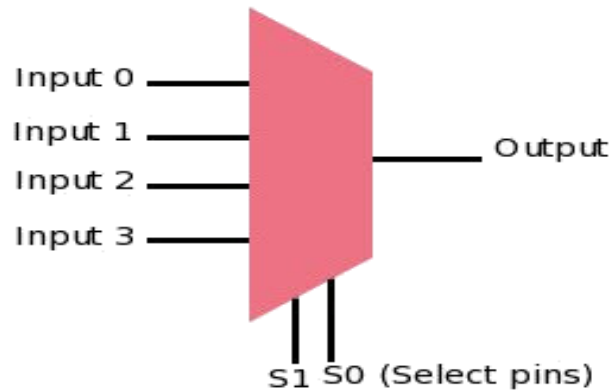
Multiplexers are classified into four types:

- a) 2-1 multiplexer (1 select line)
- b) 4-1 multiplexer (2 select lines)
- c) 8-1 multiplexer(3 select lines)
- d) 16-1 multiplexer (4 select lines)

#### **1.1) 4x1 Multiplexer**

4x1 Multiplexer has four data inputs I3, I2, I1 & I0, two selection lines S1 & S0 and one output Y. The block diagram of 4x1 Multiplexer is shown in the following

figure. One of these 4 inputs will be connected to the output based on the combination of inputs present at these two selection lines. Truth table of 4x1 Multiplexer is shown below.



**Figure-2:Block diagram of 4x1 Multiplexer**

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

**Figure-3:Truth table of 4x1 Multiplexer**

## 2) De-multiplexer

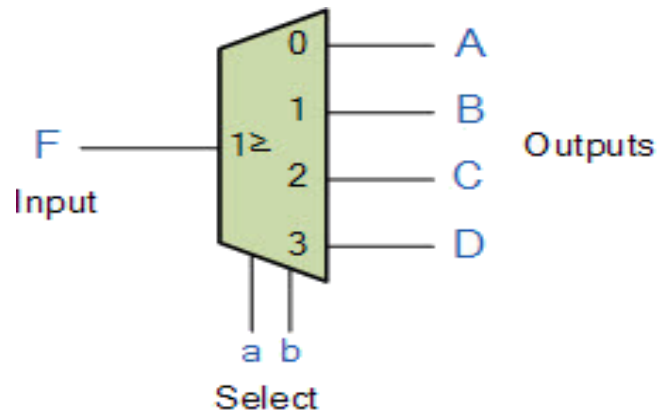
De-multiplexer is also a device with one input and multiple output lines. It is used to send a signal to one of the many devices. The main difference between a multiplexer and a de-multiplexer is that a multiplexer takes two or more signals and encodes them on a wire, whereas a de-multiplexer does reverse to what the multiplexer does.

De-multiplexer are classified into four types:

- a) 1-2 demultiplexer (1 select line)
- b) 1-4 demultiplexer (2 select lines)
- c) 1-8 demultiplexer (3 select lines)
- d) 1-16 demultiplexer (4 select lines)

## 2.2) 1x4 De-multiplexer

1x4 De-Multiplexer has one input I, two selection lines, S<sub>1</sub> & S<sub>0</sub> and four outputs Y<sub>3</sub>, Y<sub>2</sub>, Y<sub>1</sub> & Y<sub>0</sub>. The block diagram of 1x4 De-Multiplexer is shown in the following figure.



**Figure-4:Block diagram of 1x4 De-Multiplexer**

Selection Inputs		Outputs			
S <sub>1</sub>	S <sub>0</sub>	Y <sub>3</sub>	Y <sub>2</sub>	Y <sub>1</sub>	Y <sub>0</sub>
0	0	0	0	0	I
0	1	0	0	I	0
1	0	0	I	0	0
1	1	I	0	0	0

**Figure-5:Truth table of 1x4 De-Multiplexer**