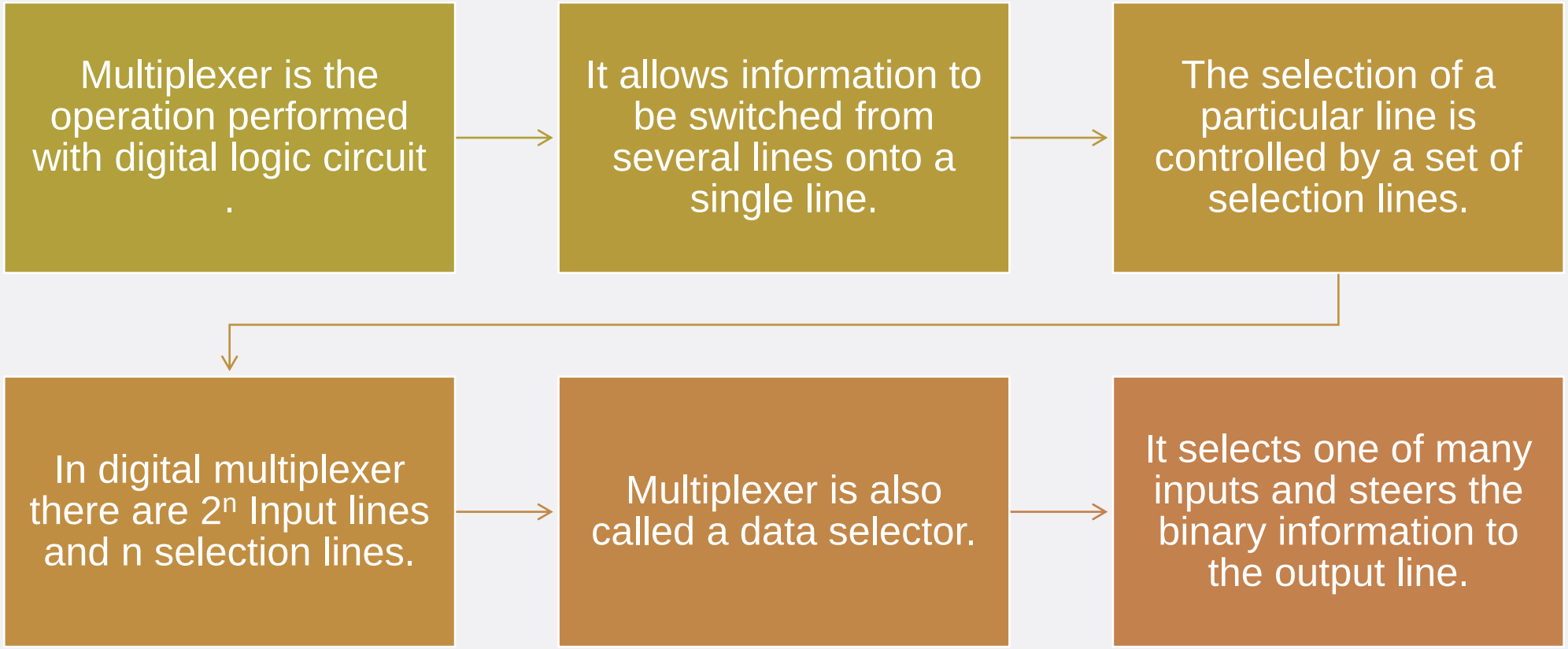
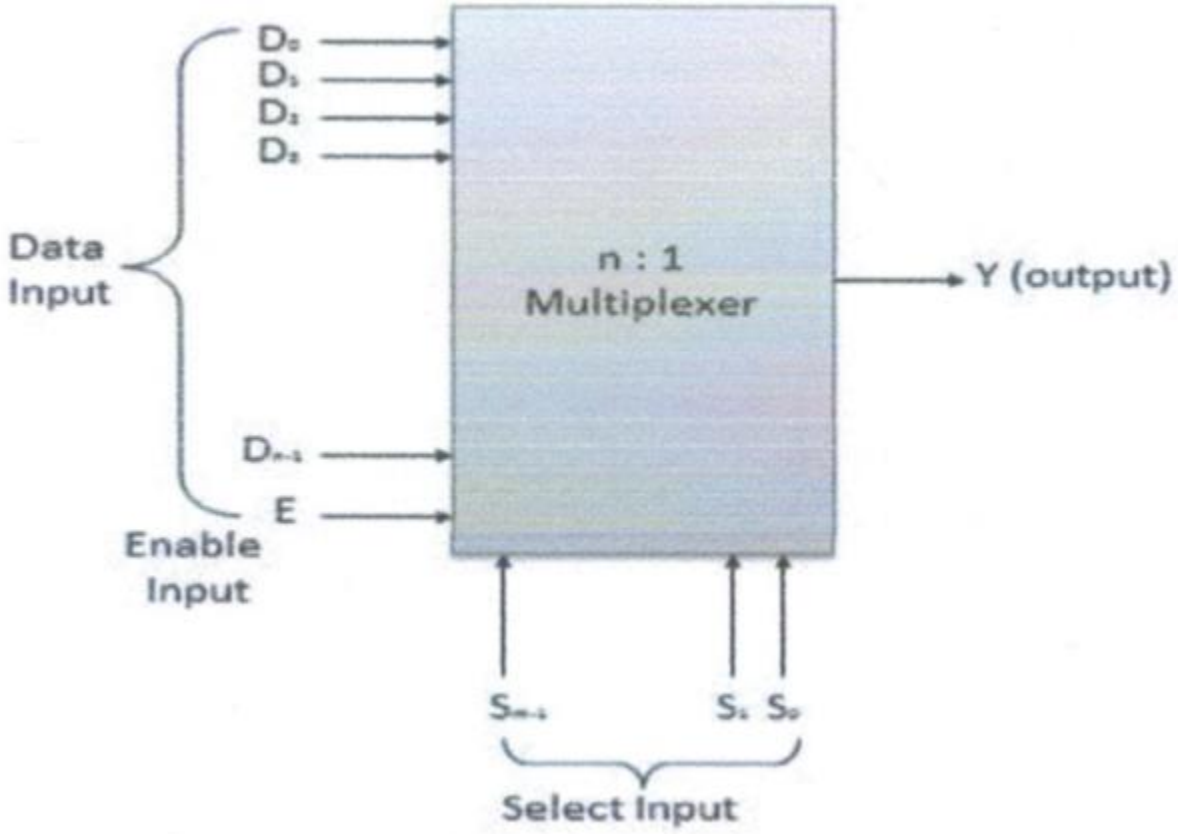

MULTIPLEXER

Definition


Multiplexer is the operation performed with digital logic circuit .
It allows information to be switched from several lines onto a single line.
The selection of a particular line is controlled by a set of selection lines.
In digital multiplexer there are 2^n Input lines and n selection lines.
Multiplexer is also called a data selector.
It selects one of many inputs and steers the binary information to the output line.

Block Diagram Of Multiplexer



Applications of Multiplexer

- •Multiplexer allow the process of transmitting different type of data such as audio, video at the same time using a single transmission line in communication .
- •In telephone network, multiple audio signals are integrated on a single line for transmission with the help of multiplexers.
- •Multiplexers are used to implement huge amount of memory into the computer, at the same time reduces the number of copper lines required to connect the memory to other parts of the computer circuit.
- •Multiplexer can be used for the transmission of data signals from the computer system of a satellite or spacecraft to the ground system using the GPS (Global Positioning System) satellites.

Two to One line Multiplexer

It is a multiplexer which selects one out of two input signals and passes it through the output line. It consists of 2 input lines, 1 output line and 1 data selector line.

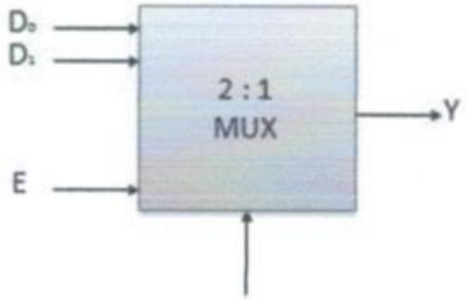


Fig: Block diagram of 2 by 1 Multiplexer

Truth Table

Selector line	Output
S	**Y**
0	D_0
1	D_1

Note: E is assumed to be 1. If it is 0, the circuit wouldn't operate.

So, from the above Truth Table, the Boolean expression for output is: -

$$Y = S'.D_0 + S.D_1$$

Truth table for a 2-to-1 multiplexer

I_1	I_o	A	D
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

4 to 1-line Multiplexer

Four to One Line Multiplexer

It is a multiplexer which selects one out of four input signals and passes it through the output line. It consists of 4 input lines, 1 output line and 2 data selector lines.

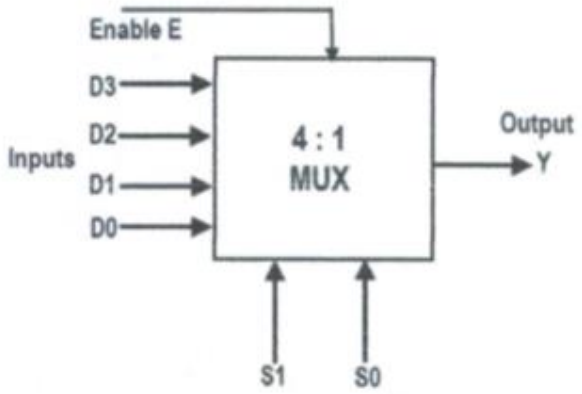


Fig: Block diagram of 4 to 1 Multiplexer

Truth Table

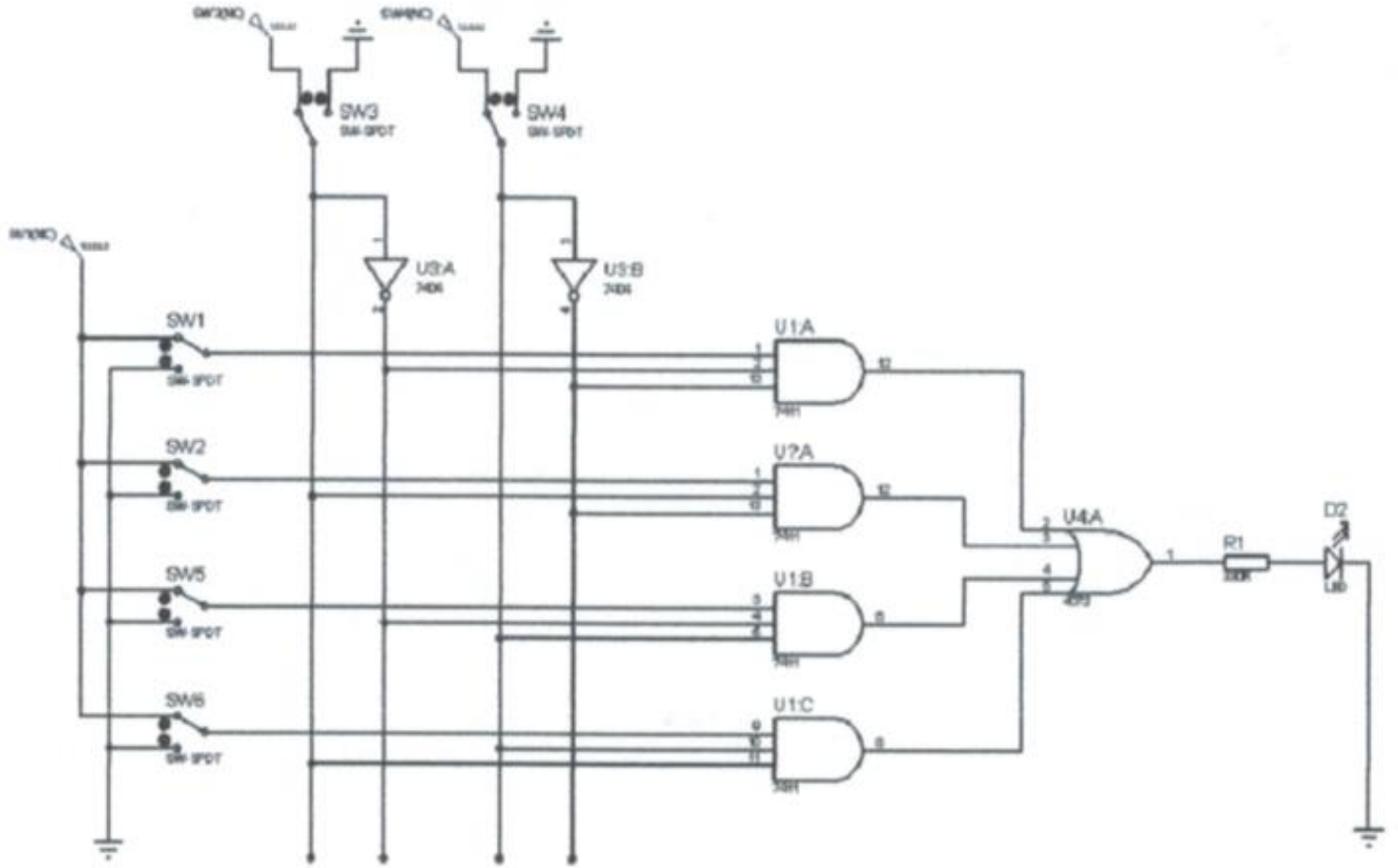
Selectors		Output
S_1	S_0	Y
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

Note: E is assumed to be 1. If it is 0, the circuit wouldn't operate.

So, from the above Truth Table, the Boolean expression for output is: -

$$Y = S_0'.S_1'.D_0 + S_0.S_1'.D_1 + S_0'.S_1.D_2 + S_0.S_1.D_3$$

Practical Diagram For 4 to 1-line Mux



MUX USING NAND

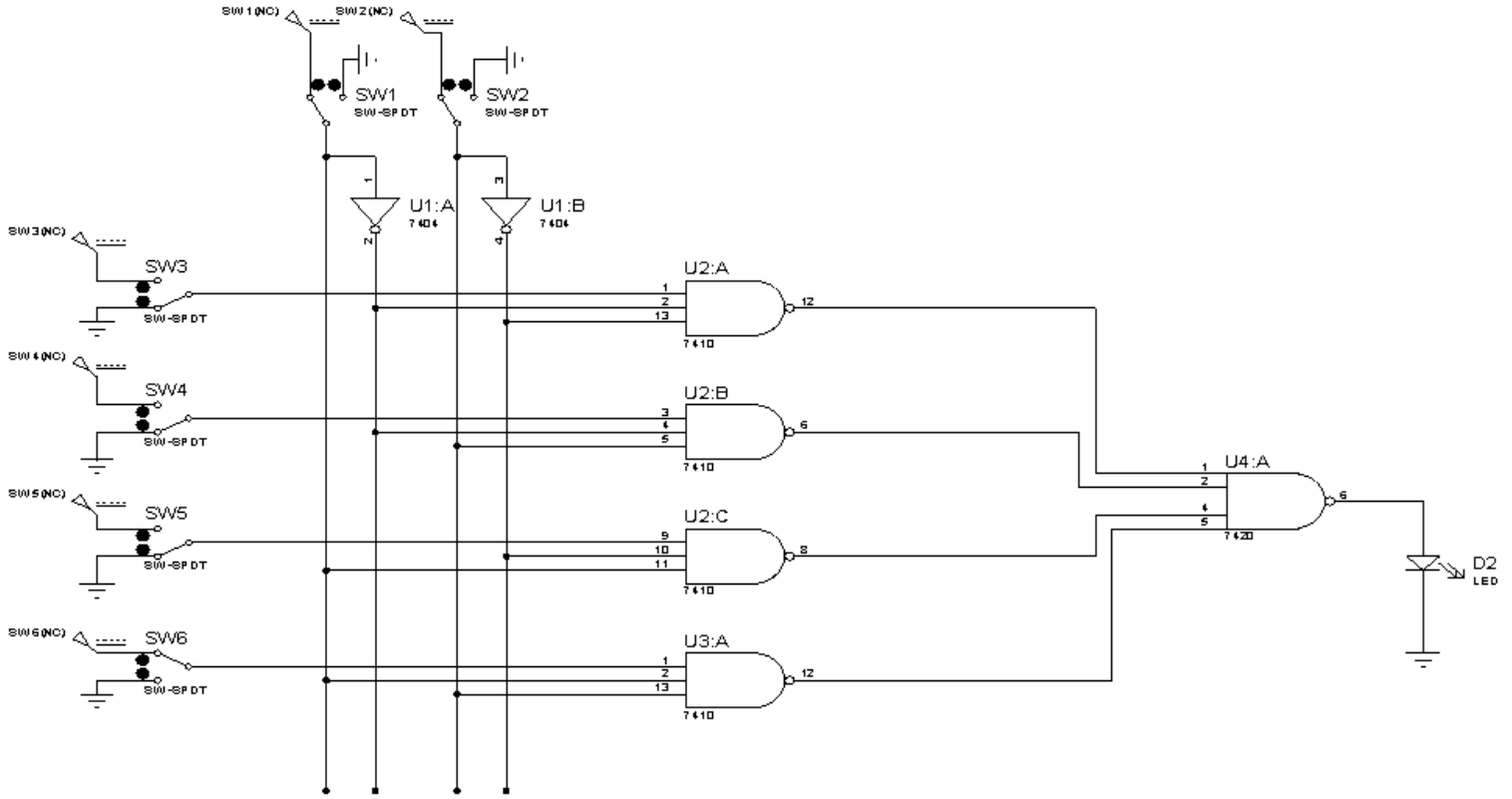
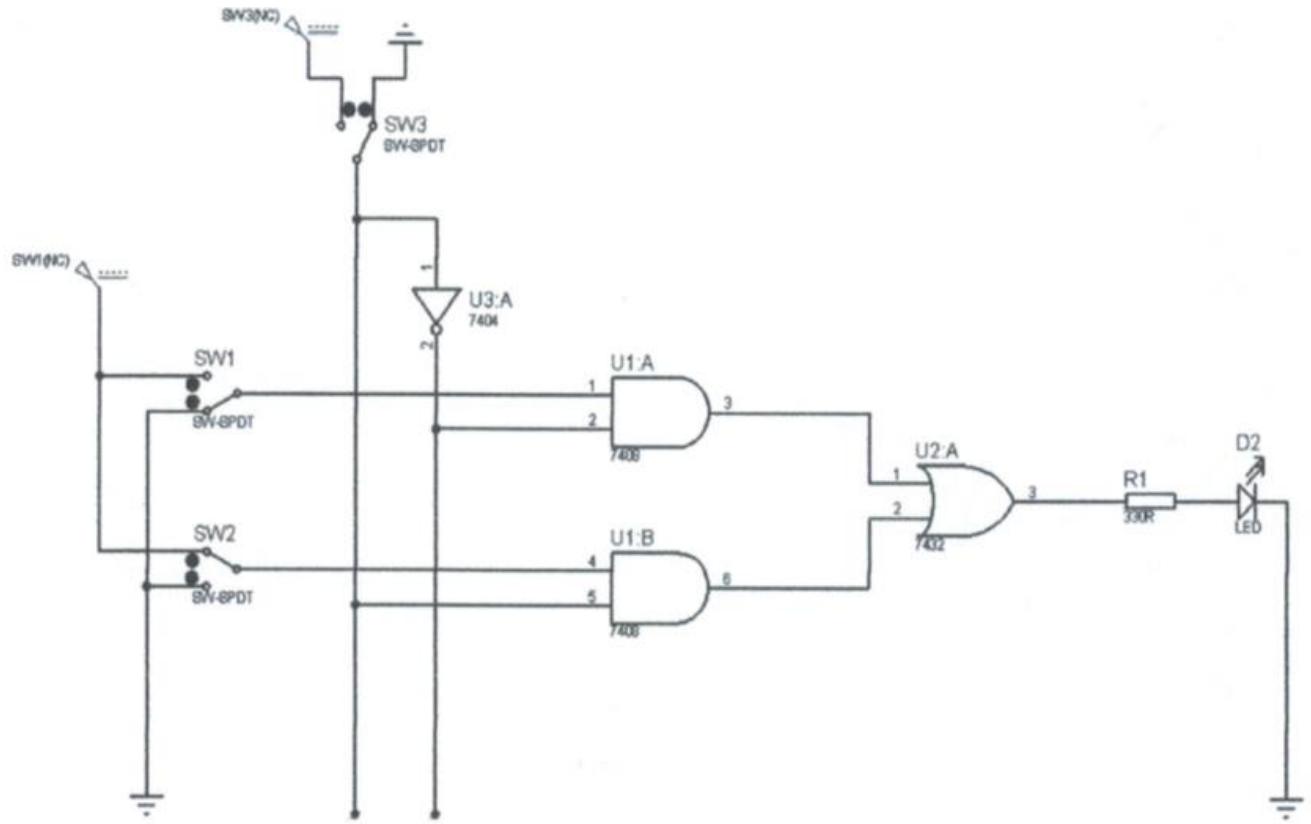


Table to verify 4 to 1 line Mux

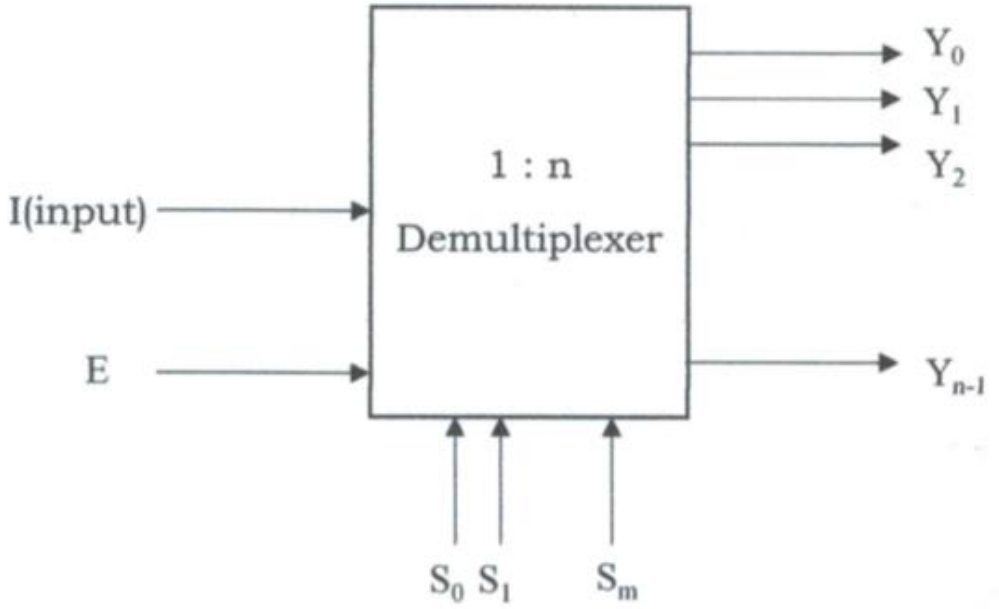
INPUTS				SELECT		OUTPUT
I_0	I_1	I_2	I_3	S_0	S_1	F
1	0	0	0	0	0	
1	0	0	0	0	1	
1	0	0	0	1	0	
1	0	0	0	1	1	
0	1	0	0	0	0	
0	1	0	0	0	1	
0	1	0	0	1	0	
0	1	0	0	1	1	
0	0	1	0	0	0	
0	0	1	0	0	1	
0	0	1	0	1	0	
0	0	1	0	1	1	
0	0	0	1	0	0	
0	0	0	1	0	1	
0	0	0	1	1	0	
0	0	0	1	1	1	

Practical Diagram For 2 to 1-line Mux



Demultiplexer

Conversely, a *demultiplexer (or Demux) is a circuit taking a single input signal and selecting one of many data-output-lines, which is connected to the single input.* A multiplexer is often used with a complementary demultiplexer on the receiving end. A demultiplexer has n select lines, which are used to distribute input signal to 2^n output lines depending on the selector lines. A demultiplexer is also called **data-distributor**.



Understanding 1-to-4 Demultiplexer:

- •The 1-to-4 demultiplexer has 1 input bit, 2 control bit, and 4 output bits.
- •An example of 1-to-4 demultiplexer is IC 74155.
- •The input bit is labelled as Data D.
- •This data bit is transmitted to the data bit of the output lines.
- •This depends on the value of AB, the control input.
- •When AB = 01, the upper second AND gate is enabled while other AND gates are disabled. Therefore, only data bit D is transmitted to the output, giving Y1 = Data.

1 to 4 line Demultiplexer Practical Diagram