Unit 4

Lecture 4

Multiplexers

- A digital multiplexer is a combinational circuit that selects binary information from one of many input lines and directs it to a single output line.

➢ The selection of a particular input line is controlled by a set of selection lines.

➢ Normally, there are 2^n input lines and n selection lines whose bit combinations determine which input is selected.

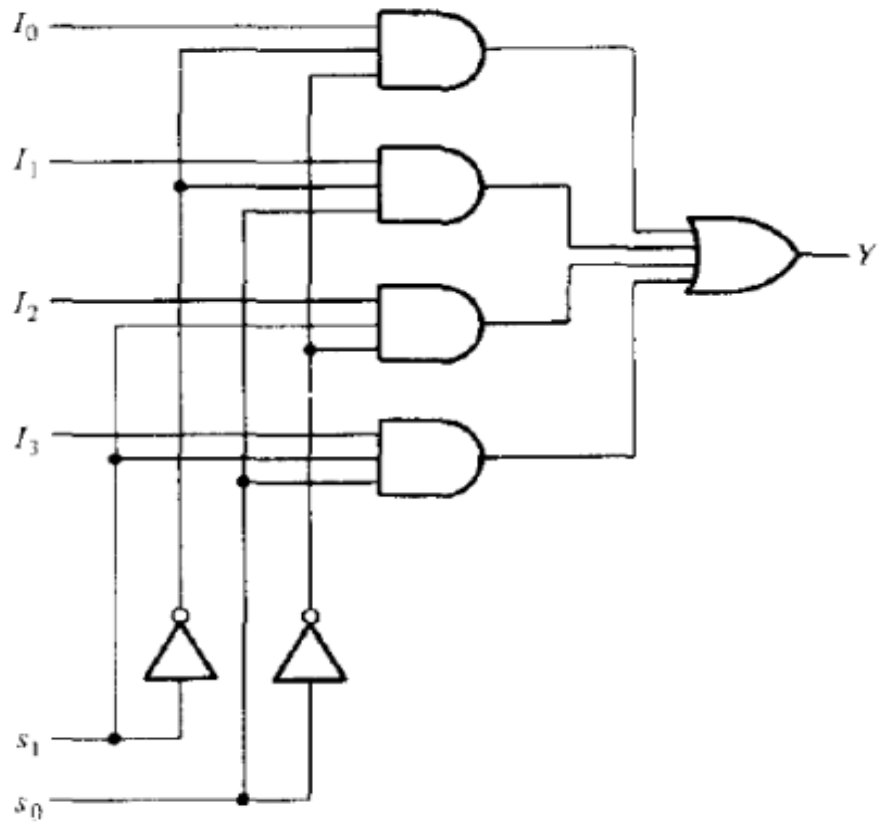


Fig: Logic Diagram: 4-to-1 line Multiplexer

s_1	s_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

Table: Function table

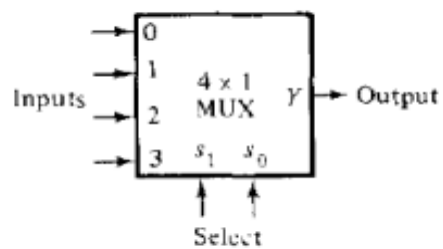


Fig: Block Diagram of Multiplexer

Demultiplexer

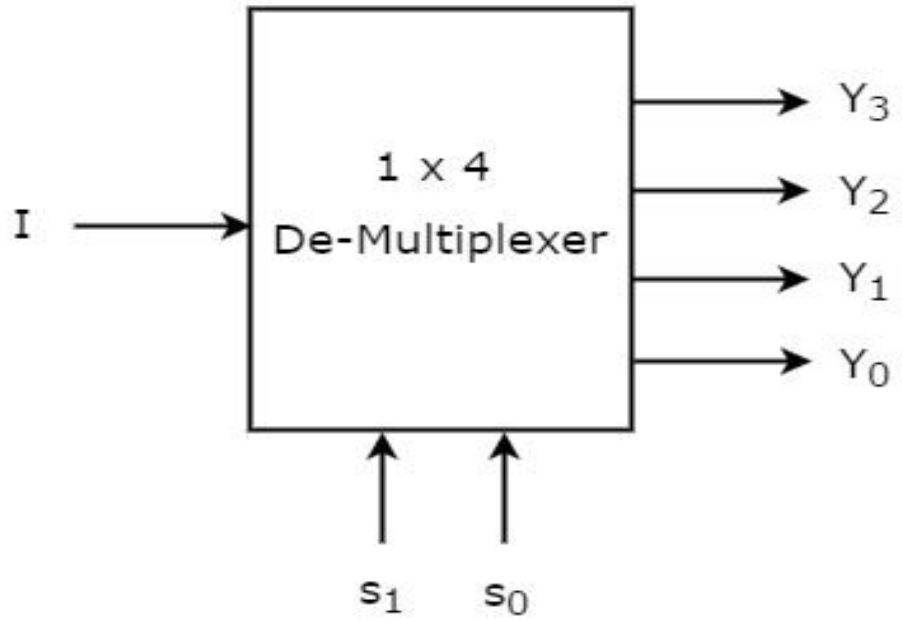
- A demultiplexer is a circuit that receives information on a single line and transmits this information on one of 2^n possible output lines.
- The selection of a specific output line is controlled by the bit values of n selection lines.

➢A Decoder with an enable input can function as a demultiplexer.

➢ Here, enable input and input variables for decoder is taken as data input line and selection lines for the demultiplexer respectively.

1x4 De-Multiplexer

1x4 De-Multiplexer has one input I, two selection lines, s_1 & s_0 and four outputs Y_3, Y_2, Y_1 &Y_0. The ***block diagram*** *of 1x4 De-Multiplexer is shown in the following figure.*



*The single input 'I' will be connected to one of the four outputs, Y_3 to Y_0 based on the values of selection lines s_1 & 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

From the above Truth table, we can directly write the **Boolean functions** for each output as

$Y_2 = S_1 S_0' I$ Y2=s1s0′I

$Y_1 = S_1' S_0 I$ Y1=s1′s0I

$Y_0 = S_1' S_0' I$

From the above Truth table, we can directly write the ***Boolean functions*** *for each output as*

$Y3 = S_1 S_0 I$

$Y2 = S_1 S_0' I$

$Y1 = S_1' S_0 I$

$Y0 = S_1' S_0' I$

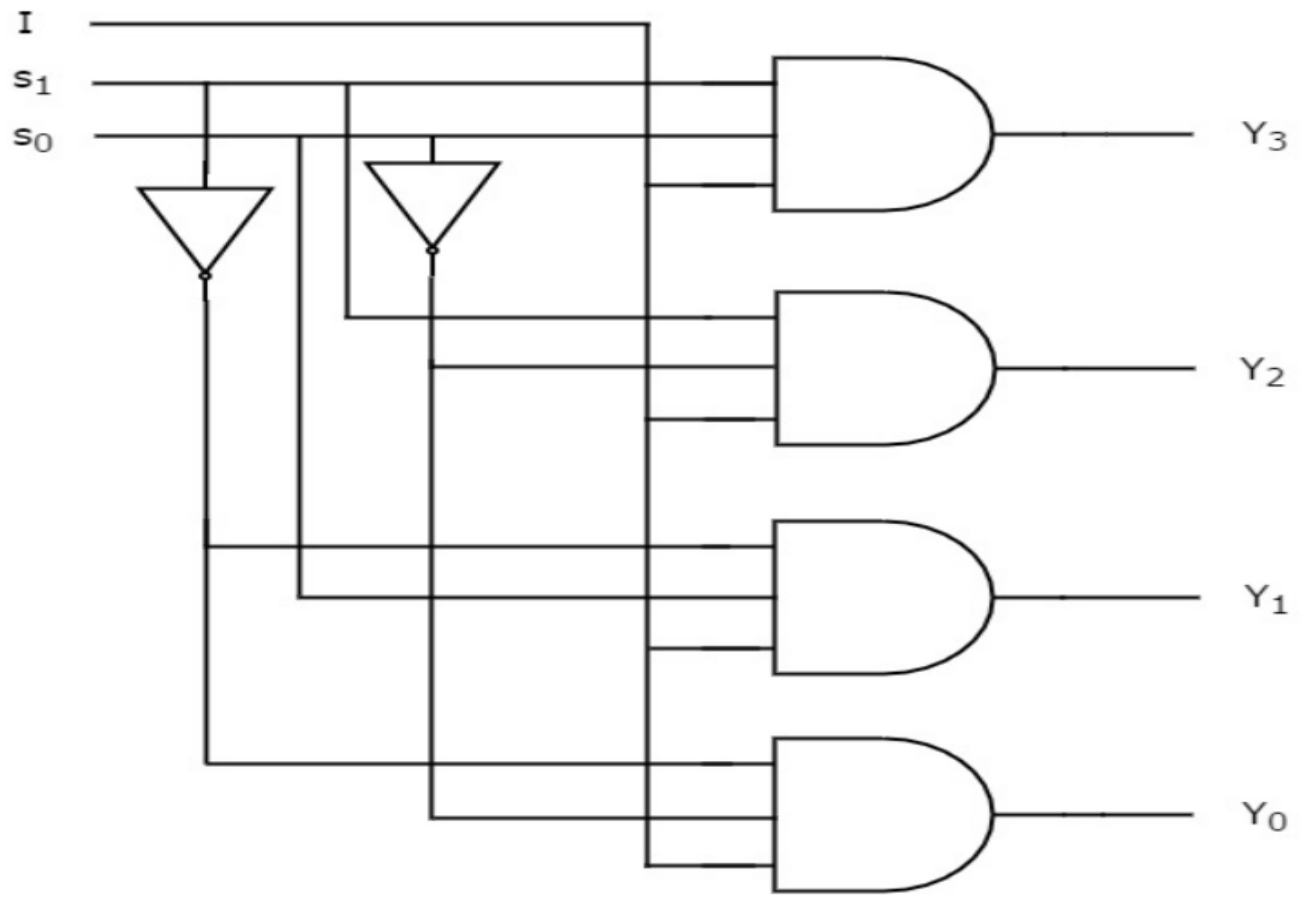


Fig: Logic Diagram