

implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates

Aim:

To analyze the truth table and working of 1x4 De-Multiplexer by using 3-input NAND and 1-input NOT logic gate ICs and 4x1 Multiplexer by using 3-input AND, 3-input OR, and 1-input NOT logic gate ICs.

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 demultiplexer 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 demultiplexing operations.

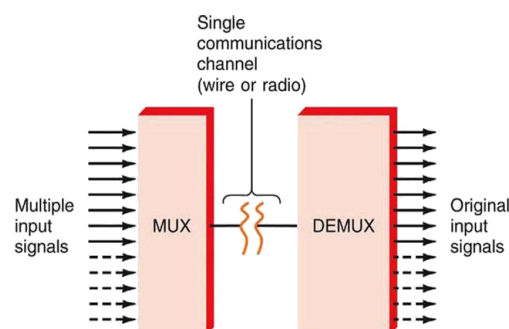


Figure-1: Block diagram of Multiplexer and Demultiplexer

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 increase the amount of data that can be sent over a network within a 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 D₀, D₁, D₂ & D₃, two selection lines S₀ & S₁ 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.

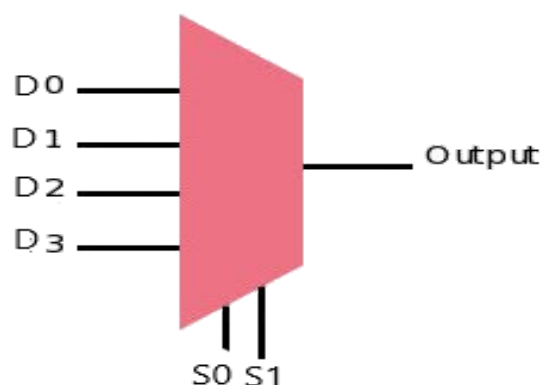


Figure-2: Block diagram of 4x1 Multiplexer

Selection Lines		Output
S0	S1	Y
0	0	D ₀
0	1	D ₁
1	0	D ₂
1	1	D ₃

Figure-3: Truth table of 4x1 Multiplexer

2) **Demultiplexer:** 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 demultiplexer is that a multiplexer takes two or more signals and encodes them on a wire, whereas a demultiplexer does reverse to what the multiplexer does.

De-multiplexers 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 Demultiplexer

The 1x4 Demultiplexer has one input Data(D), two selection lines, S0 & S1 and four outputs Y0, Y1, Y2 & Y3. The block diagram of 1x4 Demultiplexer is shown in the following figure.

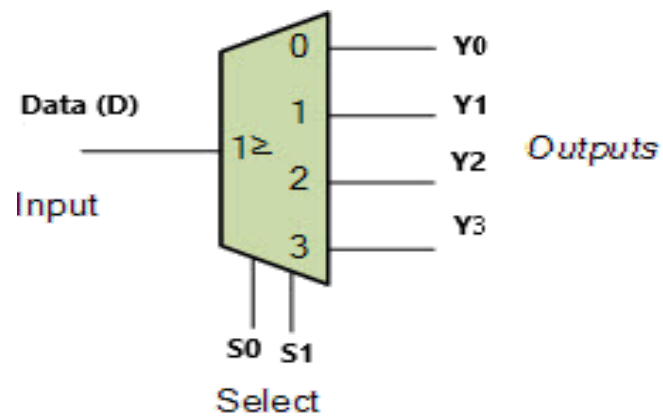
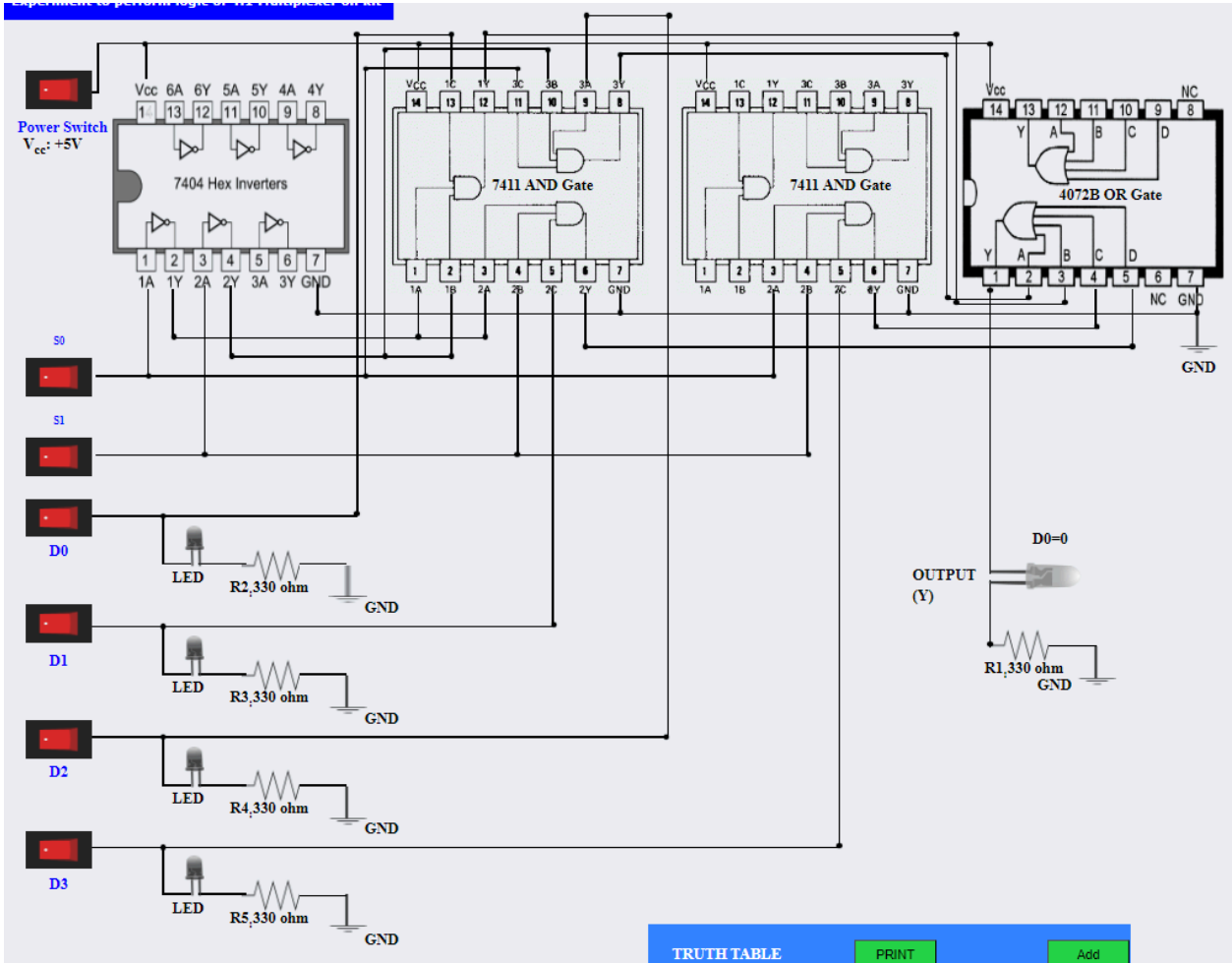


Figure-4: Block diagram of 1x4 Demultiplexer

Selection Inputs		Outputs			
s0	s1	Y ₃	Y ₂	Y ₁	Y ₀
0	0	0	0	0	D
0	1	0	0	D	0
1	0	0	D	0	0
1	1	D	0	0	0

Figure-5: Truth table of 1x4 Demultiplexer

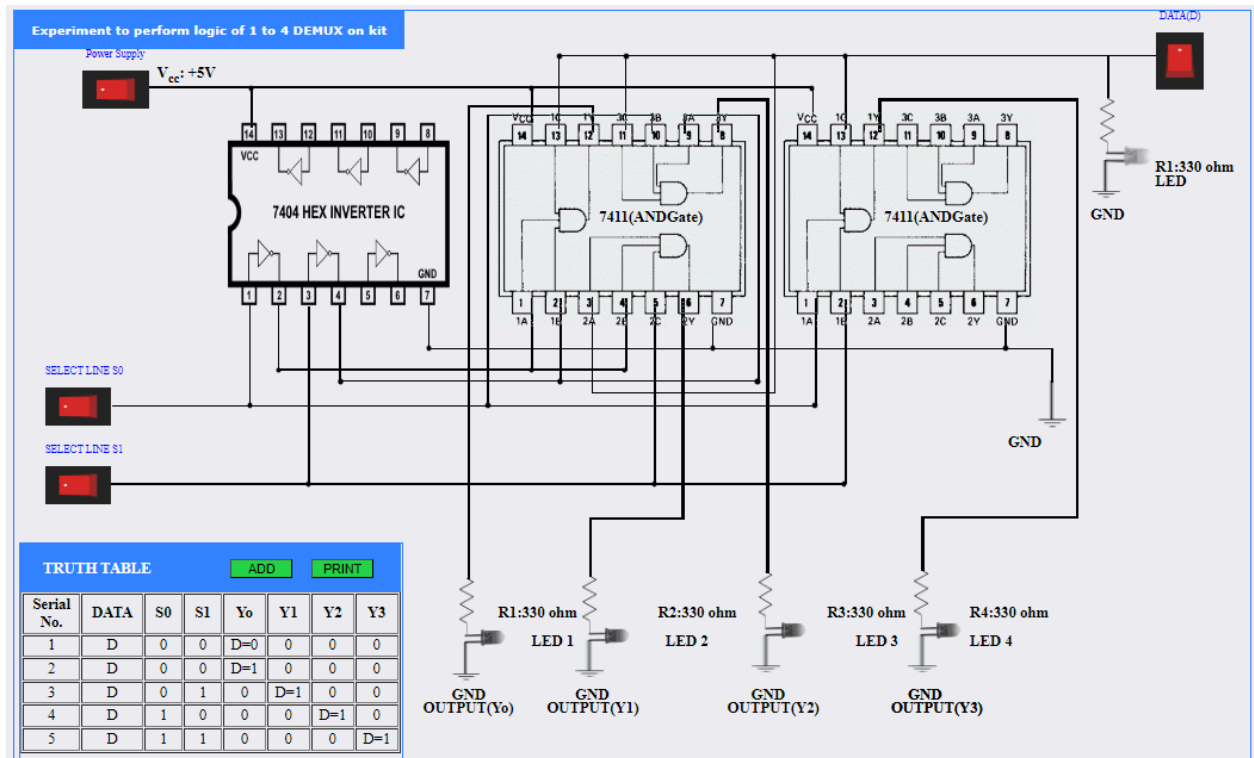
Experiment to perform 4:1 Multiplexer:



TRUTH TABLE FOR 4:1 MULTIPLEXER:

TRUTH TABLE			PRINT	Add
Serial No.	S0	S1	OUTPUT (Y)	OUTPUT VALUE
1	0	0	D0	1
2	0	1	D1	1
3	1	0	D2	1
4	1	1	D3	1

Experiment to perform 1:4 Demultiplexer:



TRUTH TABLE FOR 1:4 Demultiplexer:

TRUTH TABLE								ADD PRINT	
Serial No.	DATA	S0	S1	Y0	Y1	Y2	Y3		
1	D	0	0	D=0	0	0	0		
2	D	0	0	D=1	0	0	0		
3	D	0	1	0	D=1	0	0		
4	D	1	0	0	0	D=1	0		
5	D	1	1	0	0	0	D=1		