

EXPERIMENT NO. 6

TITLE: To design and implement 4x1 multiplexer , 8x1 multiplexer and 1x4 demultiplexer using logic gates.

▪ **OBJECTIVE:**

To analyse 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 , and design and implement_8x1 multiplexer

▪ **APPARATUS REQUIRED:**

- Switches
- Power supply
- Resistances
- LEDs
- IC 7411 NAND Gates, 7404 Hex inverters , etc

▪ **THEORY:**

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)

4x1 Multiplexer –

4x1 Multiplexer has four data inputs D₀, D₁, D₂ & D₃, two selection lines S₀ & S₁ and one output Y.

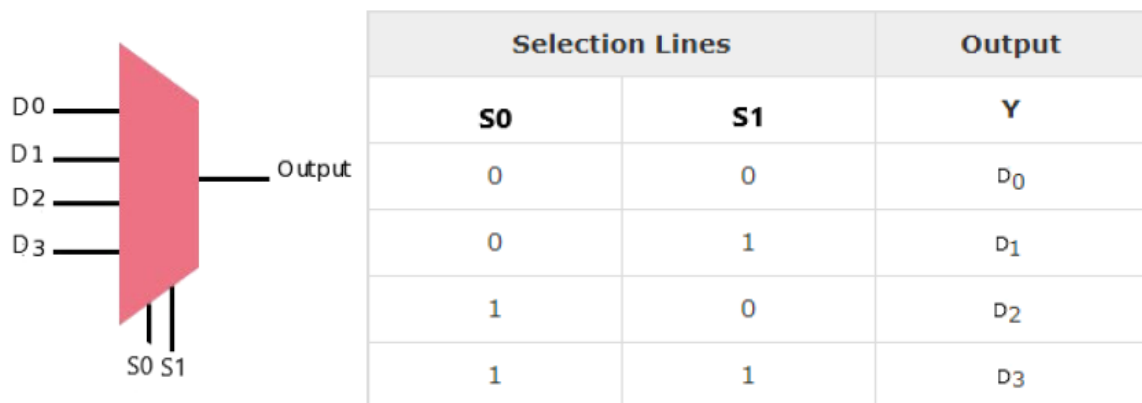


Fig : Truth table of 4x1 Multiplexer

De-multiplexer –

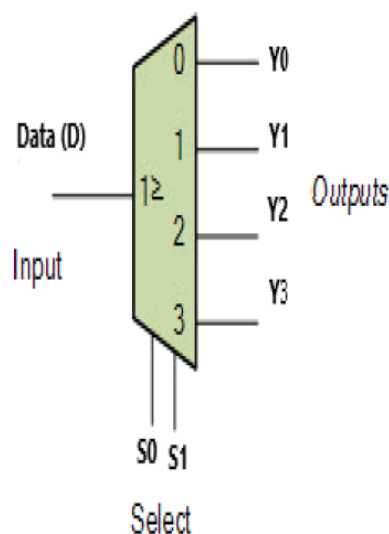
De-multiplexer is also a device with one input and multiple output lines. It is used to send a signal to one of the many devices. The main difference between a multiplexer and a de-multiplexer is that a multiplexer takes two or more signals and encodes them on a wire, whereas a de-multiplexer does reverse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

1x4 De-multiplexer –

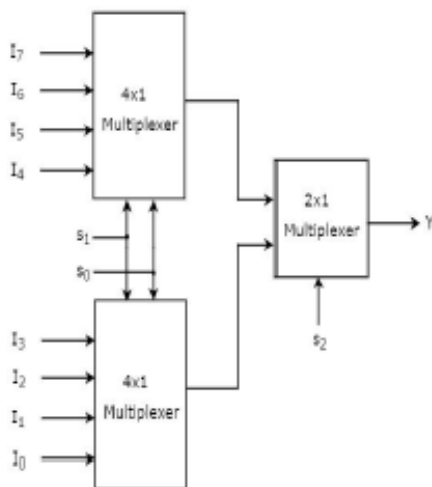
1x4 De-Multiplexer has one input Data (D), two selection lines, S₀ & S₁ and four outputs Y₀, Y₁, Y₂ & Y₃.



Selection Inputs		Outputs			
S ₀	S ₁	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

8x1 Multiplexer –

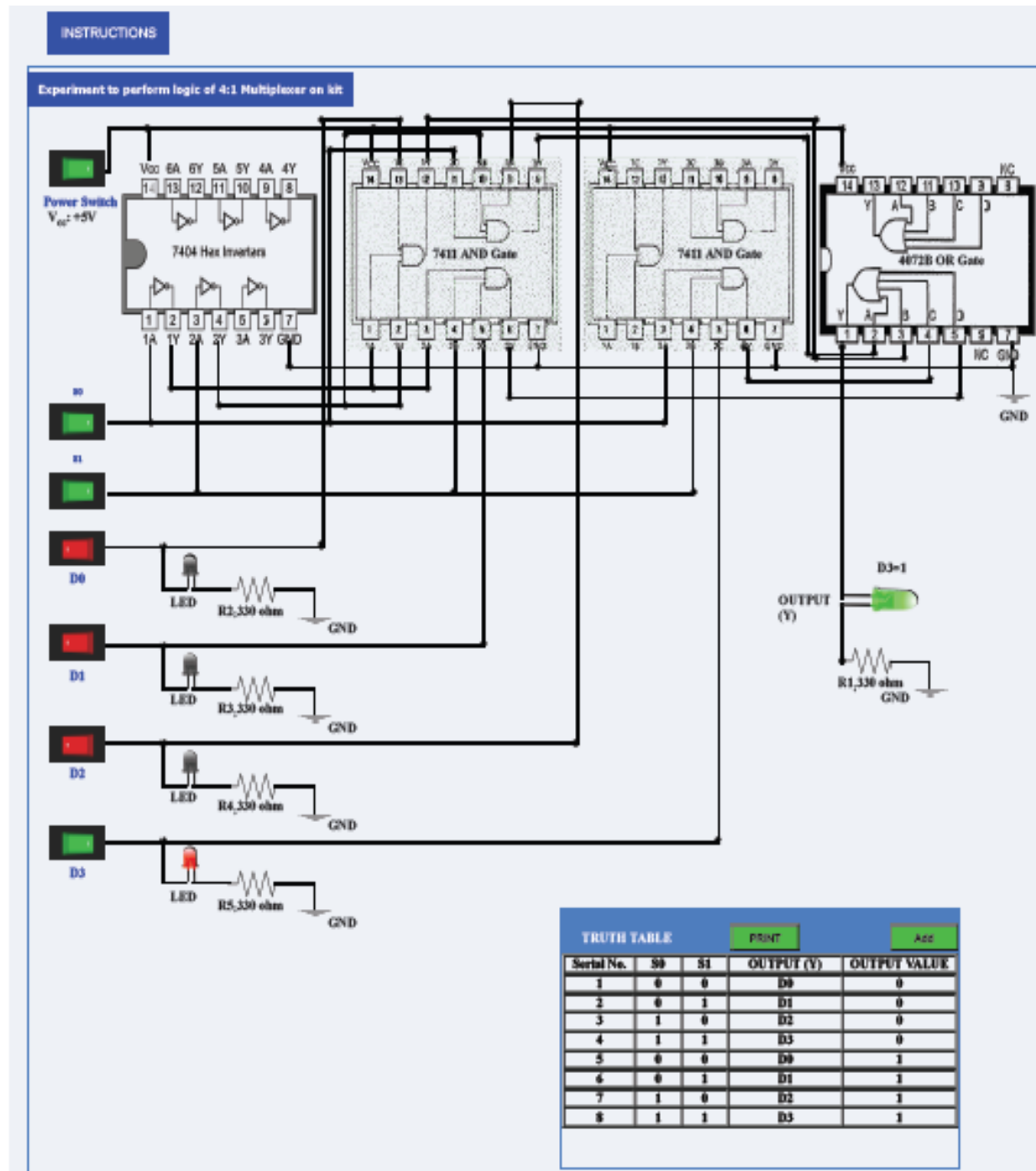
In this section, let us implement 8x1 Multiplexer using 4x1 Multiplexers and 2x1 Multiplexer. We know that 4x1 Multiplexer has 4 data inputs, 2 selection lines and one output. Whereas, 8x1 Multiplexer has 8 data inputs, 3 selection lines and one output. So, we require two 4x1 Multiplexers in first stage in order to get the 8 data inputs. Since, each 4x1 Multiplexer produces one output, we require a 2x1 Multiplexer in second stage by considering the outputs of first stage as inputs and to produce the final output. Let the 8x1 Multiplexer has eight data inputs I_0 to I_7 , three selection lines s_2 , s_1 & s_0 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

CIRCUIT DIAGRAM:

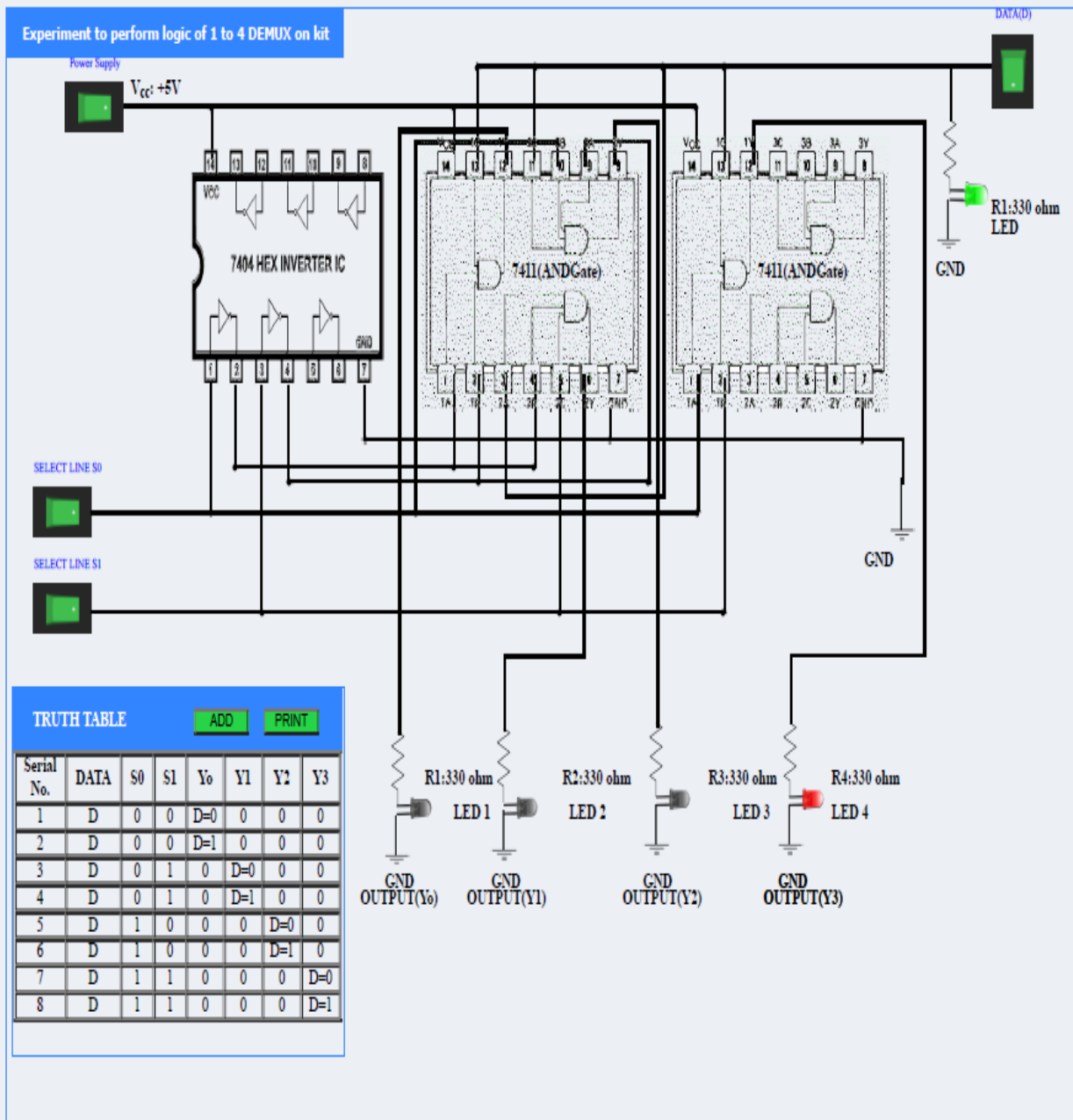
4x1 Multiplexer:



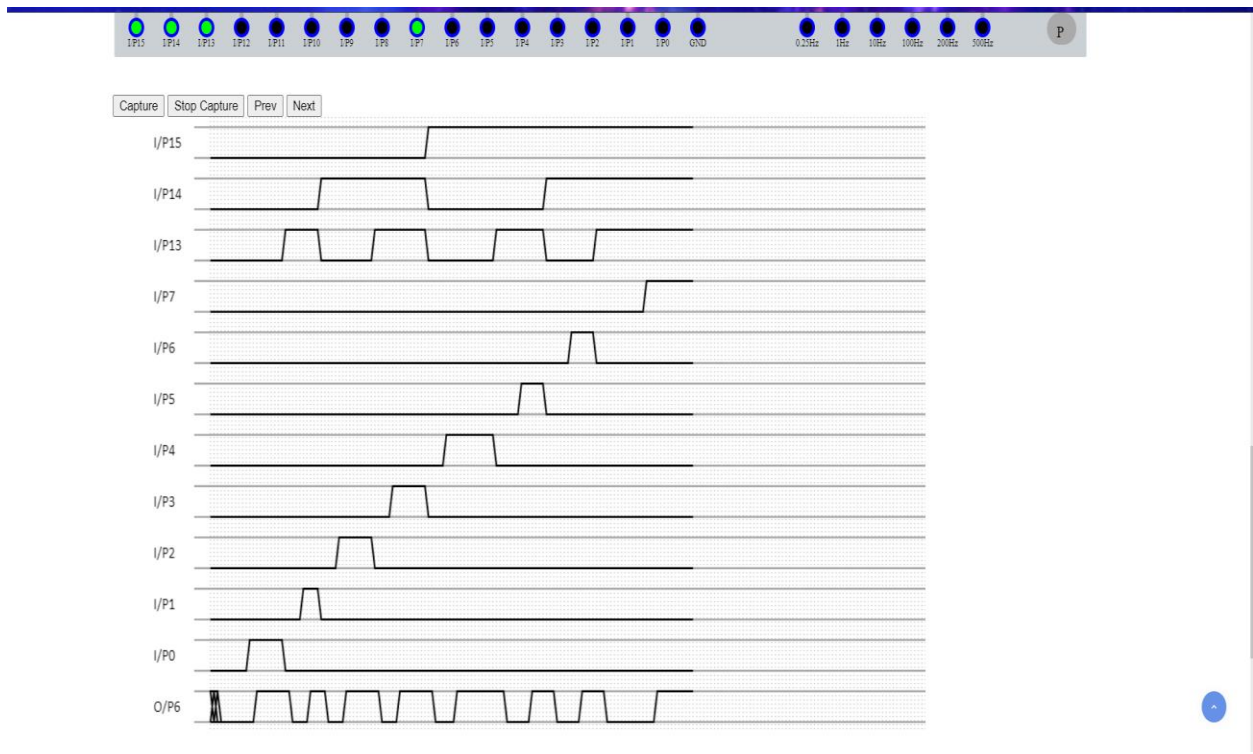
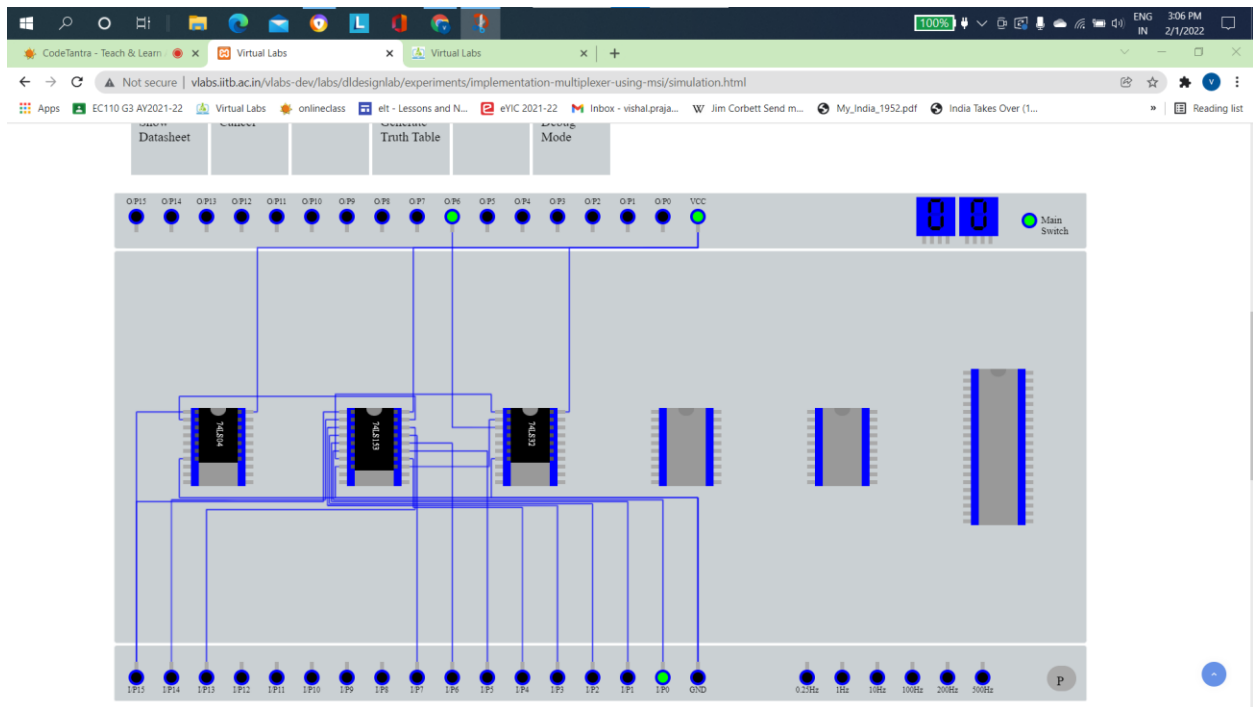
1x4De-multiplexer:

INSTRUCTIONS

Experiment to perform logic of 1 to 4 DEMUX on kit



8x1 Multiplexer:



CALCULATIONS:

VERIFICATION OF TRUTH TABLE 8x1 MULTIPLEXER :

I/P15	I/P14	I/P13	I/P7	I/P6	I/P5	I/P4	I/P3	I/P2	I/P1	I/P0	O/P6
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	1	0	1	1
0	0	0	0	0	0	0	0	1	1	0	0
0	0	0	0	0	0	0	0	1	1	1	1
0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	1	0	0	1	1
0	0	0	0	0	0	0	1	0	1	0	0
0	0	0	0	0	0	0	1	0	1	1	1
0	0	0	0	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	1	1	0	1	1
0	0	0	0	0	0	0	1	1	1	0	0
0	0	0	0	0	0	0	1	1	1	1	1
0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	1	1
0	0	0	0	0	0	1	0	0	1	0	0
0	0	0	0	0	0	1	0	0	1	1	1
0	0	0	0	0	0	1	0	1	0	0	0
0	0	0	0	0	0	1	0	1	0	1	1

VERIFICATION OF TRUTH TABLE 4x1 MULTIPLEXER :

TRUTH TABLE

Serial No.	S0	S1	OUTPUT (Y)	OUTPUT VALUE
1	0	0	D0	0
2	0	0	D0	1
3	0	1	D1	0
4	0	1	D1	1
5	1	0	D2	0
6	1	0	D2	1
7	1	1	D3	0
8	1	1	D3	1

VERIFICATION OF TRUTH TABLE 1x4 DE-MULTIPLEXER :

TRUTH TABLE

Serial No.	DATA	S0	S1	Yo	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=0	0	0
4	D	0	1	0	D=1	0	0
5	D	1	0	0	0	D=0	0
6	D	1	0	0	0	D=1	0
7	D	1	1	0	0	0	D=0
8	D	1	1	0	0	0	D=1

▪ **RESULTS:**

- Verified the Truth table of 4:1 Multiplexer .
- Verified the Truth table of 8:1 Multiplexer .
- Verified the Truth table of 1:4 De-Multiplexer.

▪ **PRECAUTIONS:**

- All the connections should be made properly as per the circuit diagram.
- Connections should be tight and easy to inspect.
- Power supply should be 5v.
- Keep the switch turned off while making connections.