EXPERIMENT NO. 6

TITLE: To design and implement 4x1 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 .

- **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)2-1multiplexer(1selectline)

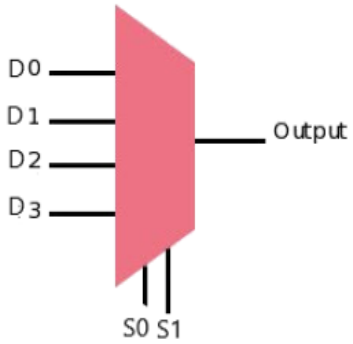
b)4-1multiplexer(2selectlines)

c)8-1multiplexer(3selectlines)

d) 16-1 multiplexer(4selectlines)

4x1 Multiplexer –

4x1 Multiplexer has four data inputs D0, D1, D2 & D3, two selection linesS0 & S1 and one output Y.



Selection Lines		Output
S0	**S1**	**Y**
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

Fig : Truth table of 4x1 Multiplexer

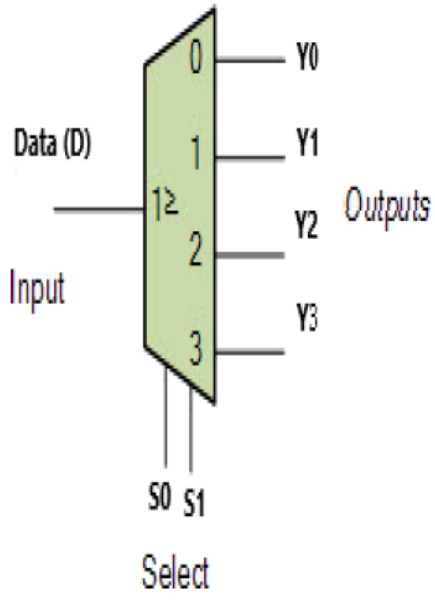
De-multiplexer –

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)1-2demultiplexer(1selectline)
b)1-4demultiplexer(2selectlines)
c)1-8demultiplexer(3selectlines)
d)1-16 demultiplexer(4selectlines)

1x4De-multiplexer –

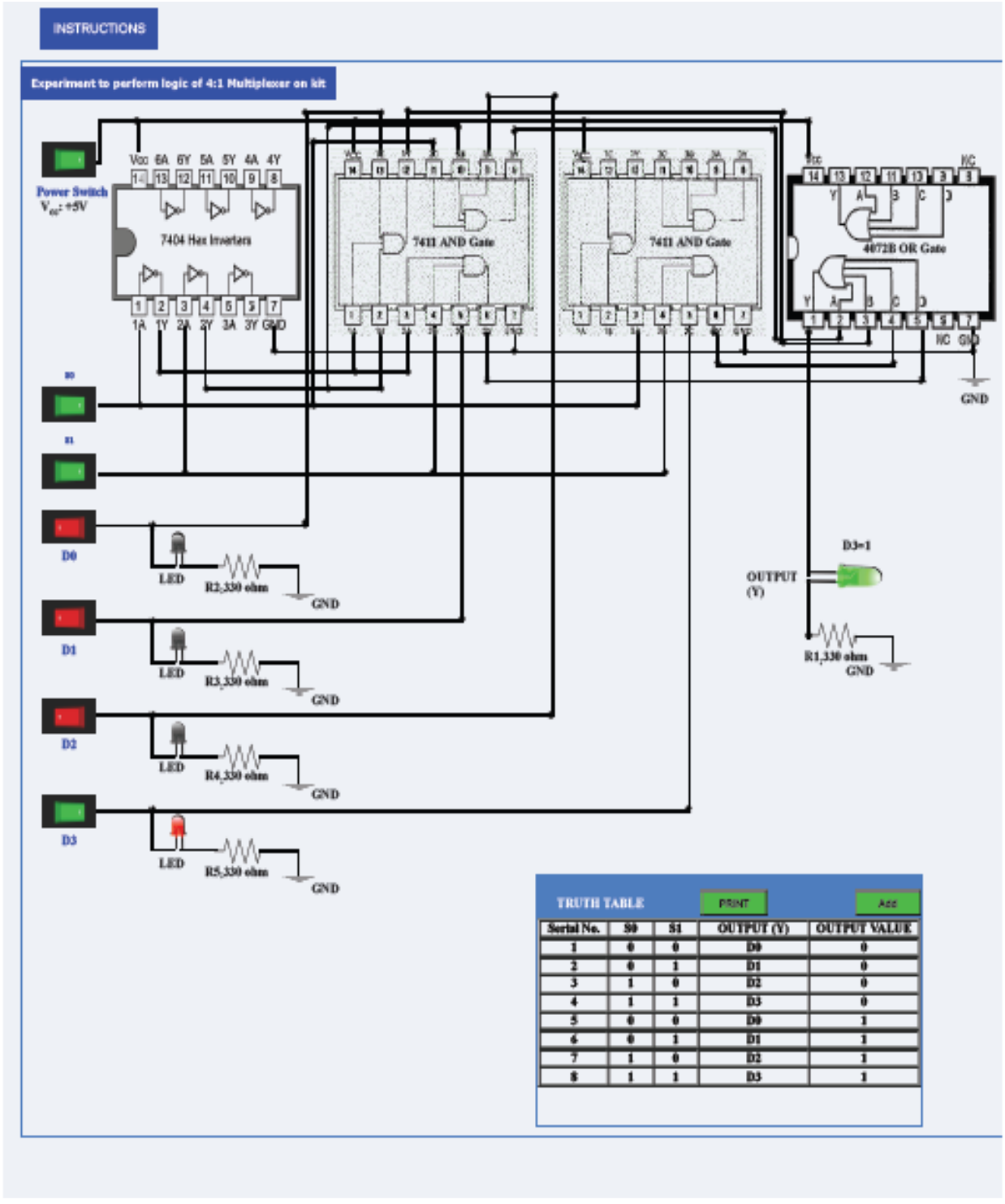
1x4 De-Multiplexer has one input Data(D), two selection lines, S0 & S1 and four outputs Y0, Y1, Y2 & Y3.



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

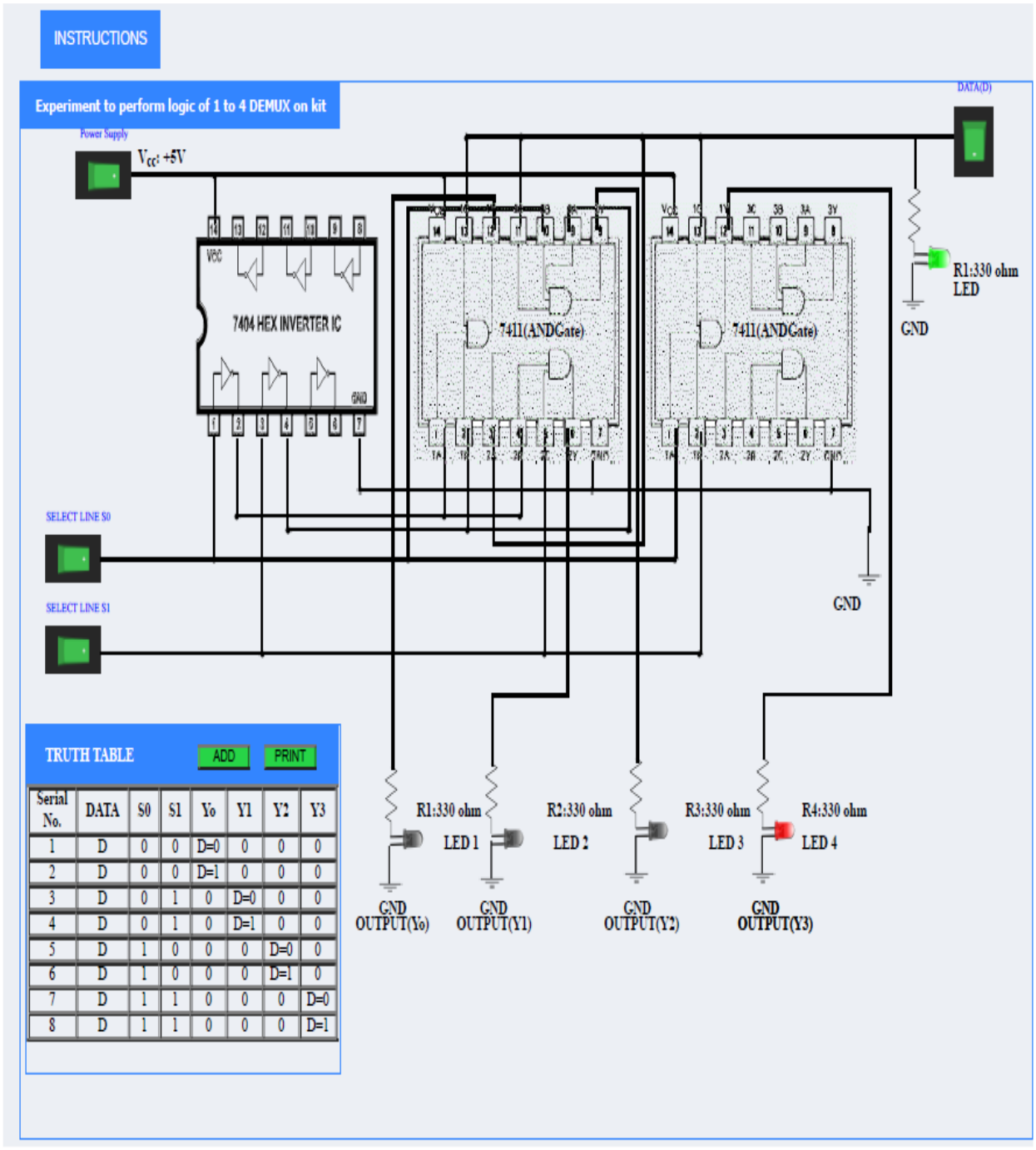
CIRCUIT DIAGRAM:

4x1 Multiplexer:



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

1x4De-multiplexer



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

CALCULATIONS:

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 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.