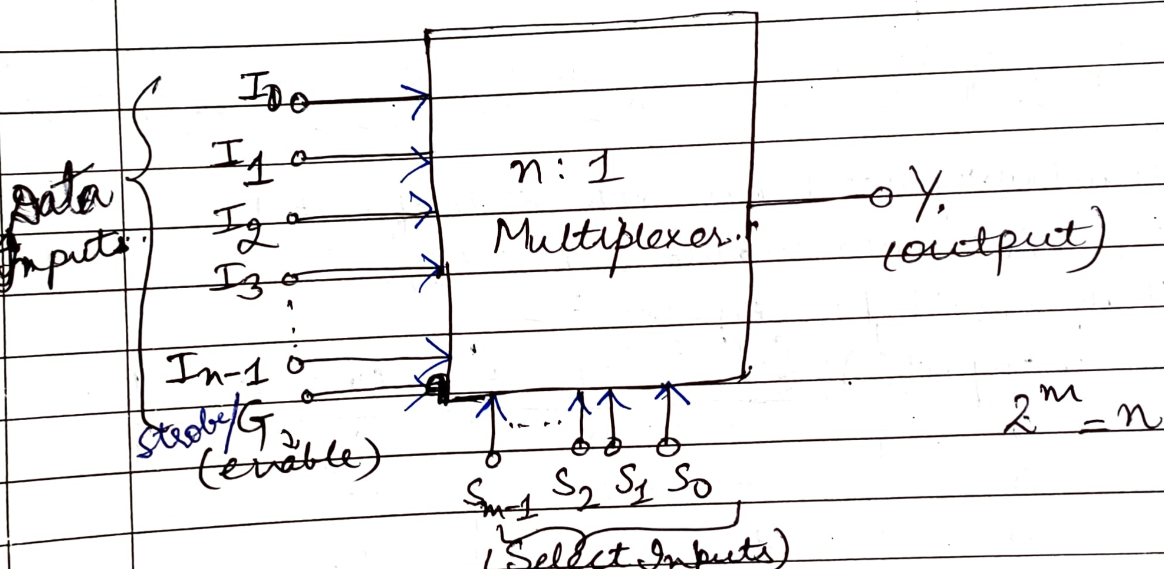
Multiplexer:→ It is a special combinational circuit that gates one out of the several inputs to a single output, and it is one of the most widely used standard logic circuits in digital design. It has been fabricated as MSI IC and is commercially available in various sizes, like 2:1, 4:1, 8:1 and 16:1 multiplexers.

The fig(a) below shows the block diagram of a multiplexer, with n input lines and one output line. In a MUX, the input selected is controlled by a set of select inputs. For selecting one out of n inputs for connection to the output, a set of m select inputs is required, where $2^m = n$. Depending upon the digital code applied at the select inputs one out of n data sources is selected and transmitted to a single output channel.



Fig(a):- B/D of a digital multiplexer.

Normally a strobe (or enable) input (G) is incorporated which helps in cascading and it is generally active-low, which means it performs its intended operation when it is LOW.

As shown in fig(b) the multiplexer acts like a digitally controlled single pole, multiple way switch.

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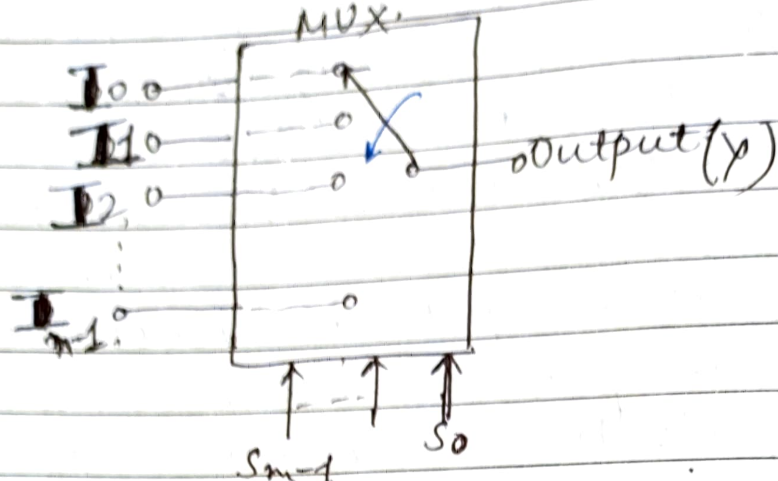
The output gets connected to only one of the n-data inputs at given instant of time.



(b) Equivalent circuit.

Its output Y is given by :-

$$Y = \bar{G}.\left[\bar{S}_{m-1}.\bar{S}_{m-2}\cdots\bar{S}_1.\bar{S}_0.I_0 + \bar{S}_{m-1}\bar{S}_{m-2}\cdots\bar{S}_1 S_0.I_1 + \cdots + S_{m-1}S_{m-2}\cdots S_1\bar{S}_0 I_{n-2} + S_{m-1}S_{m-2}\cdots S_1 S_0 I_{n-1}\right] \quad (1)$$

Table below gives the truth table of a 4:1 multiplexer with active low enable input ($\bar{G}$).

T/T of a 4:1 Multiplexer :-

Enable Input ($\bar{G}$)	Select Inputs S_1	S_0	Output (X)
0	0	0	I_0
0	0	1	I_1
0	1	0	I_2
0	1	1	I_3
1.	X	X	0

Using eq (1), ~~its~~ the O/P of a 4:1 multiplexer will be:-

$$Y = (\bar{S}_1\bar{S}_0 I_0 + \bar{S}_1 S_0 I_1 + S_1\bar{S}_0 I_2 + S_1 S_0 I_3).\bar{G}$$

Demultiplexer:→ It performs the reverse operation of a multiplexer. It accepts a single input and distributes it over several outputs. The select input code determines to which output the data input will be transmitted. The no. of output lines is n, and the no. of select lines is m, where $n = 2^m$. ~~The~~ but It has only 1 input.

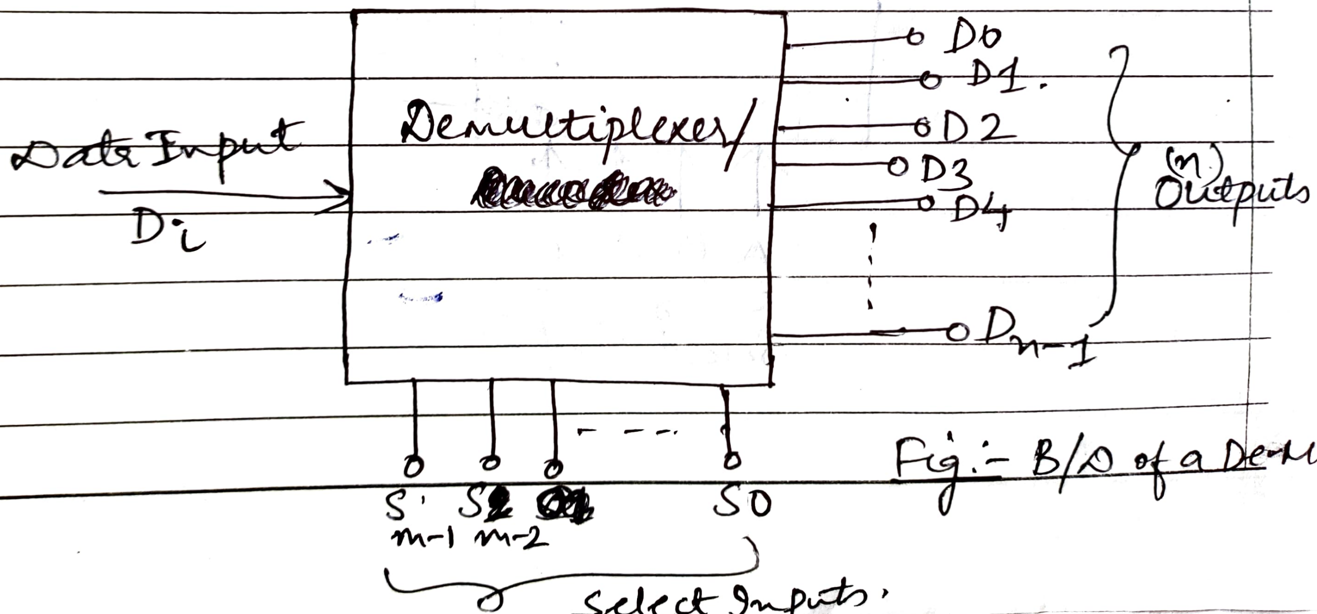


Fig:- B/D of a De-MUX

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The data input D_i will appear on the output line selected by the select input. for eg:- If the decimal equivalent of the select input is 4, then the data will appear on D_4 output line.

Q:- Similar to the multiplexers, the demultiplexers are classified as follows:- 1) 1:2 demux, 2) 1:4 demux 3) 1:8 demux, 4) 1:16 demux

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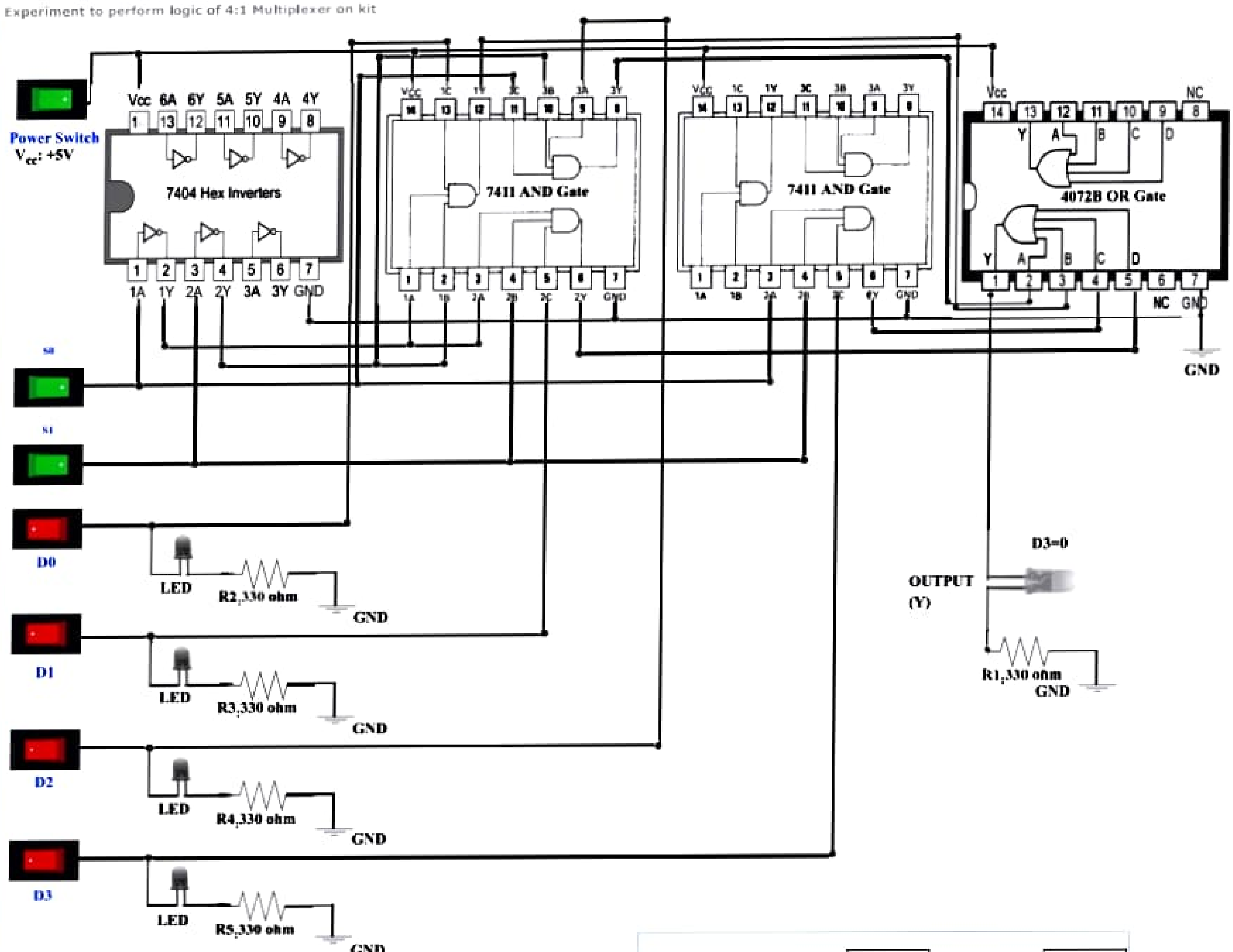
INSTRUCTIONS

Experiment to perform logic of 4:1 Multiplexer on kit

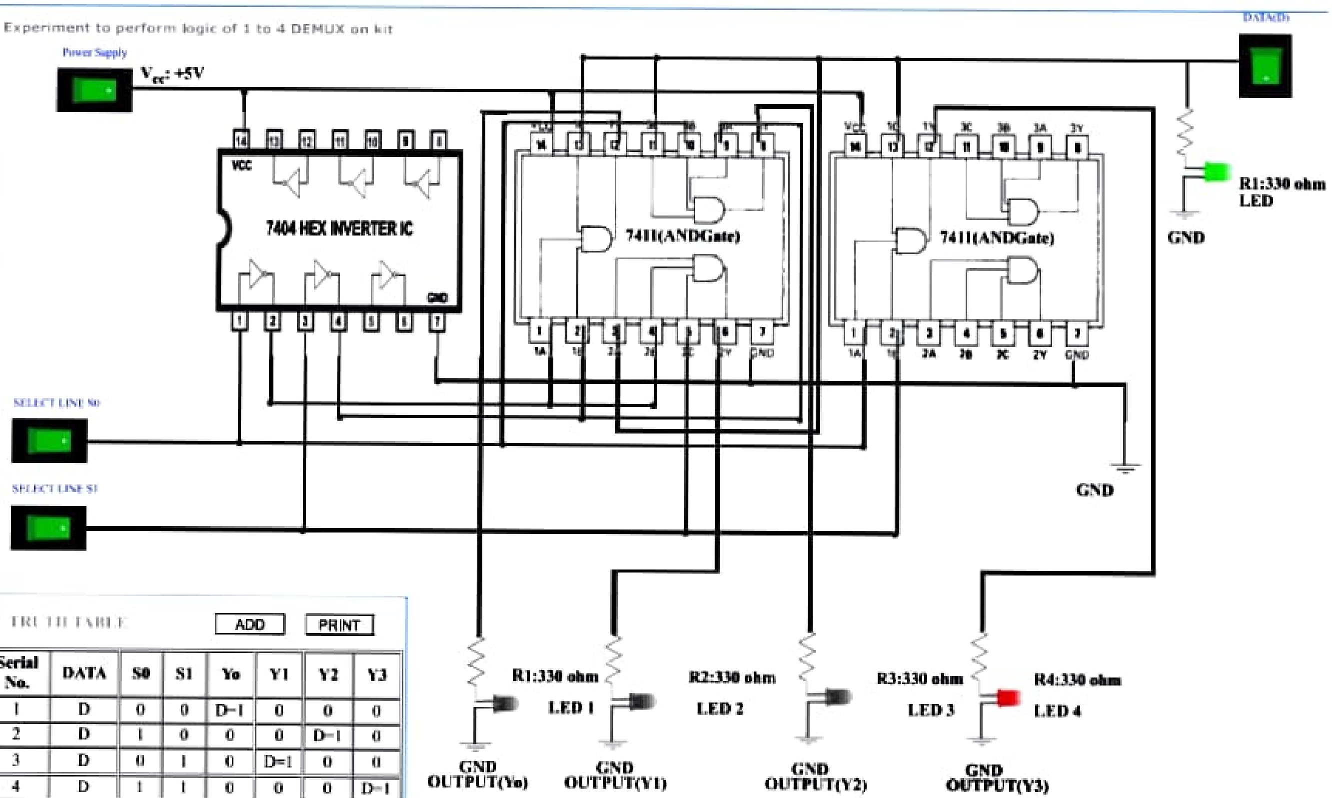


TRUTH TABLE PRINT Add

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

INSTRUCTIONS

Experiment to perform logic of 1 to 4 DEMUX on kit



TRUTH TABLE

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Serial No.	DATA	S0	S1	Yo	Y1	Y2	Y3
1	D	0	0	D=1	0	0	0
2	D	1	0	0	0	D=1	0
3	D	0	1	0	D=1	0	0
4	D	1	1	0	0	0	D=1