DSM LAB REPORT - 4

Lab 4:
Multiplexers and
De-multiplexers

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Objective:

To design assemble and test a (4:1) Multiplexer and (1:4) De-multiplexer using basic logic gates

Part A: To design a 4:1 Multiplexer

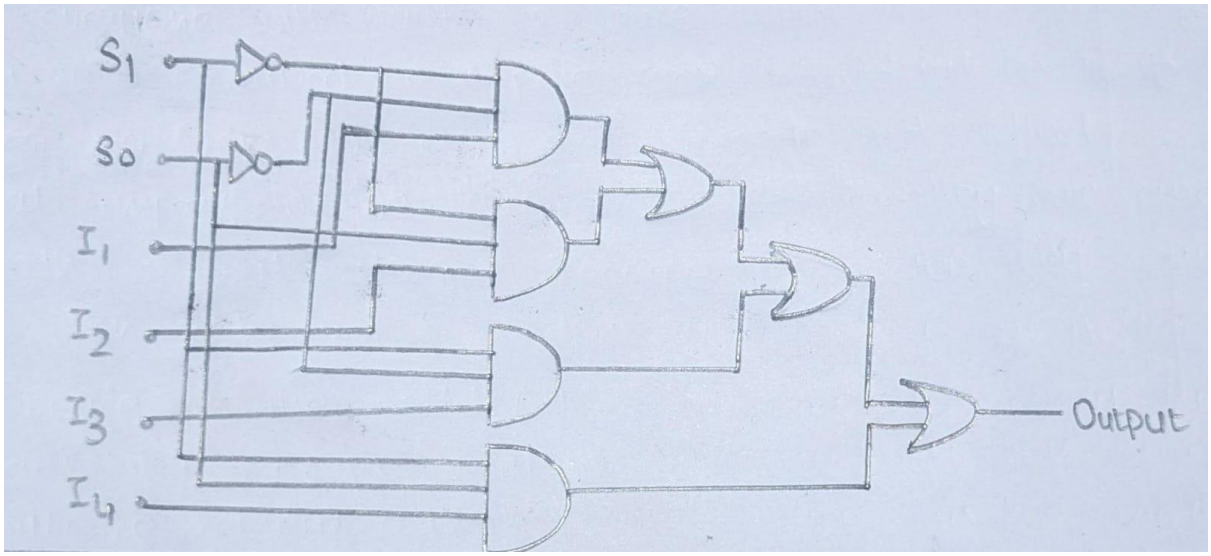
Objective:

To design a 4:1 Multiplexer using basic logic gates.

Components Used:

Digital Test Kit, Hex Inverter, Triple input AND gate, Quad OR gate, and wires

Reference Circuit:

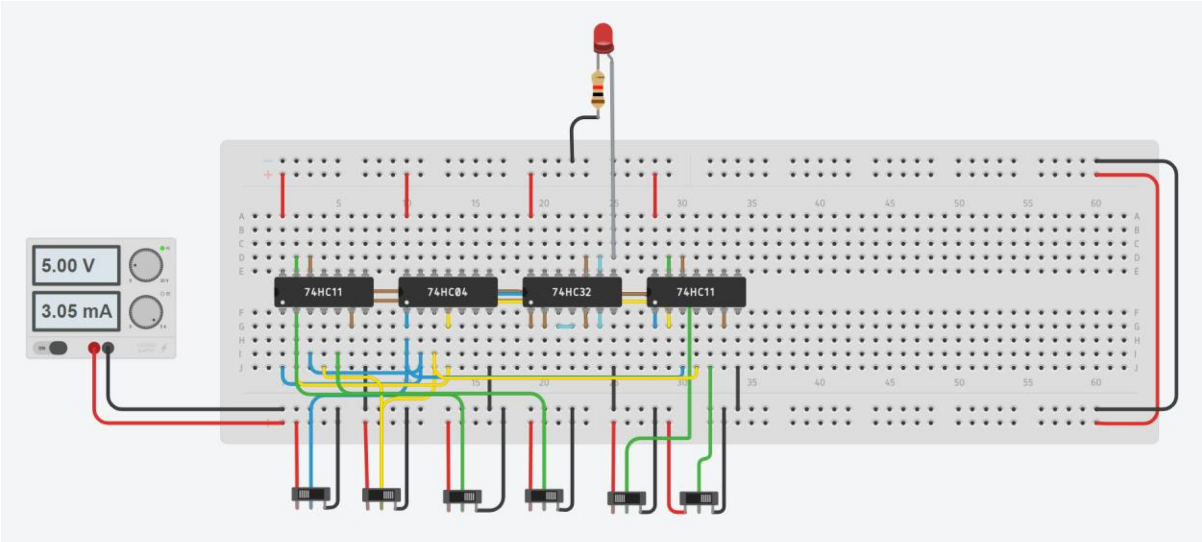


Procedure:

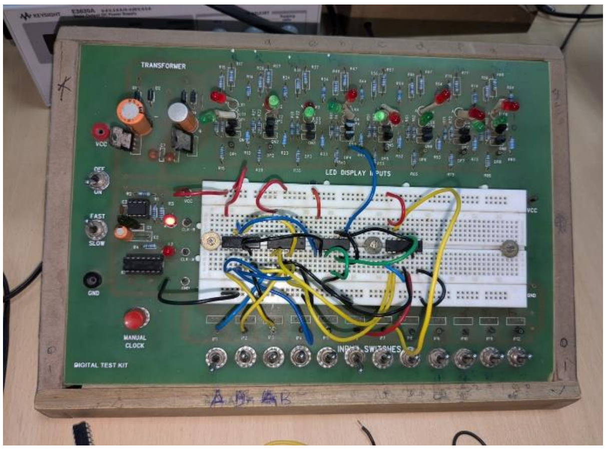
1. Connect the VCC and GND of the Digital Test Kit to the VCC and GND Pins of the ICs.
2. Connections were made as depicted in the reference circuit.

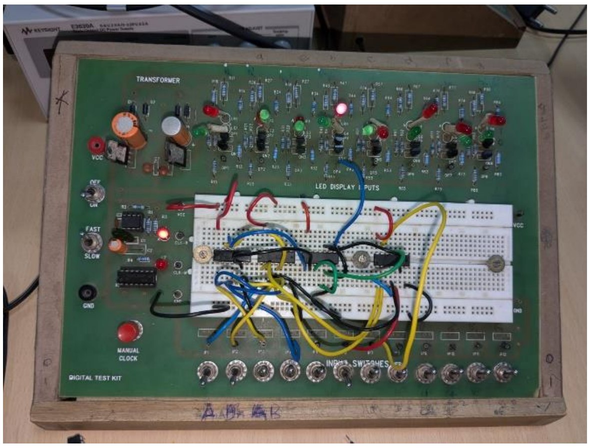
Tinkercad Simulation:

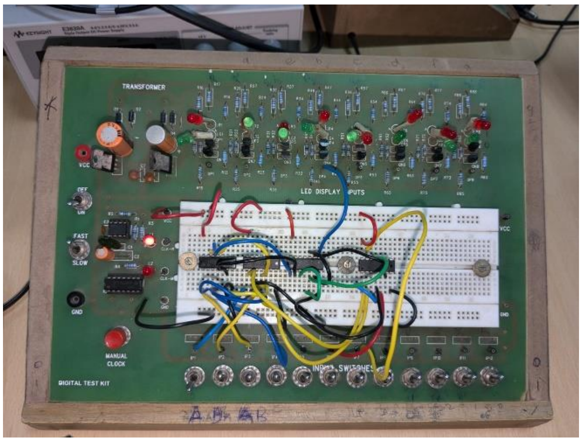
https://www.tinkercad.com/things/3VGWGHkWOh0-dsmlab4exp1?sharecode=YQm4DgE0ltEGQ_G4uqREKJ_Nc--mnib8FghPg5f2JdQ

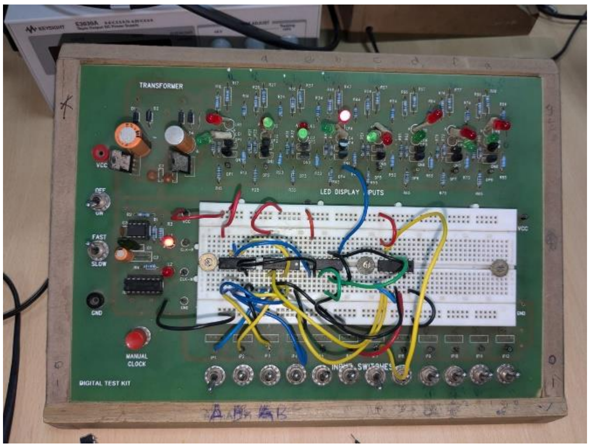


Output:









Conclusion:

A 4:1 multiplexer has been successfully designed with inputs I1 to I4 and selection lines S0 and S1, producing a single output. The following equation was used to design the multiplexer based on observations from the truth table:

- Output = I1S0'S1' + I2S1'S0 + I3S1S0' + I4S1S0

S1	S0	OUTPUT
0	0	I1
0	1	I2
1	0	I3
1	1	I4

Part B: To design a 1:4 De-Multiplexer

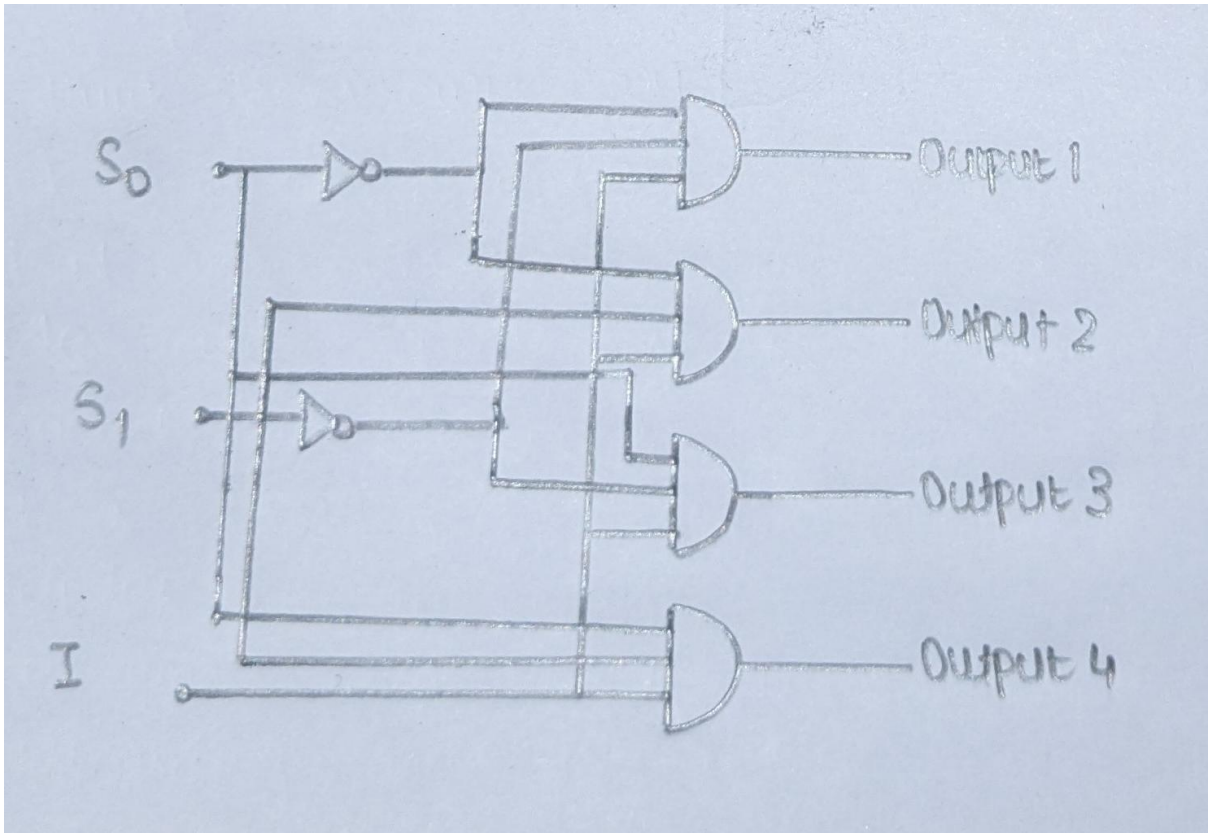
Objective:

To design a 1:4 De-Multiplexer using basic logic gates.

Components Used:

Digital Test Kit, Hex Inverter, Triple input AND gate, and wires

Reference Circuit:

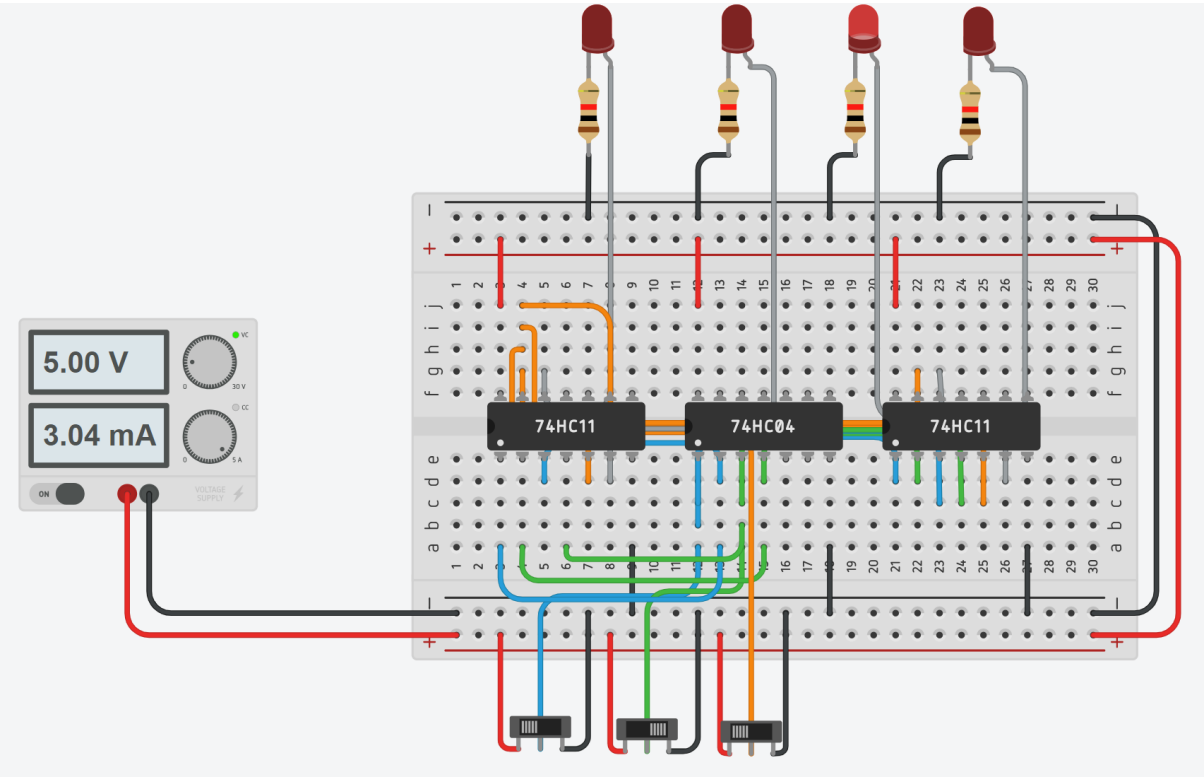


Procedure:

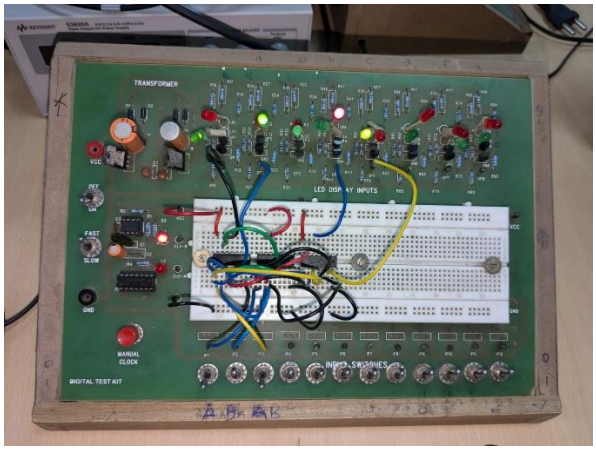
1. Connect the VCC and GND of the Digital Test Kit to the VCC and GND Pins of the ICs.
2. Connections were made as depicted in the reference circuit.

Tinkercad Simulation:

https://www.tinkercad.com/things/d2QXvbOnkav-dsmlab4exp2?sharecode=wONYd1rHcar8DSj-ODgJSpfNlhvG_p-3miGZYJLHTm0



Output:




Conclusion:

A 1:4 De-Multiplexer has been designed with outputs labelled Output1 to Output4, having selection lines S0 and S1, and a single input. The De-Multiplexer design was based on observations from the truth table and the following equation was used:

- Output = IS0'S1' + IS1'S0 + IS1S0' + IS1S0
- Output1 = IS0'S1', Output2 = IS1'S0, Output3 = IS1S0', Output4 = IS1S0

S1	S0	OUTPUT
0	0	Output1
0	1	Output2
1	0	Output3
1	1	Output4

Part C: To design a 1:4 De-Multiplexer

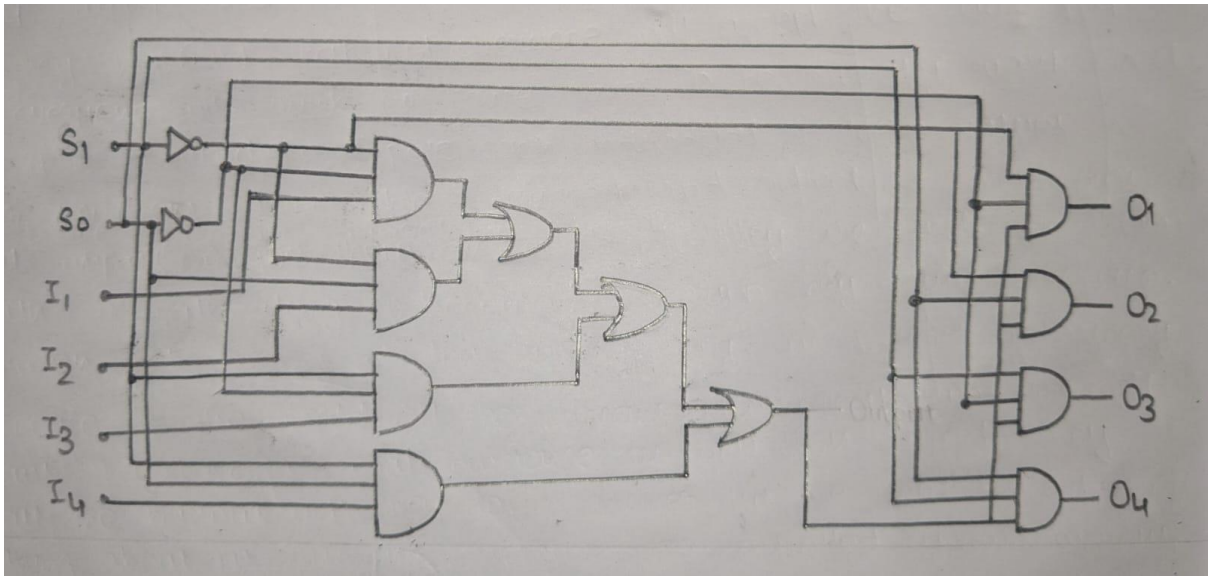
Objective:

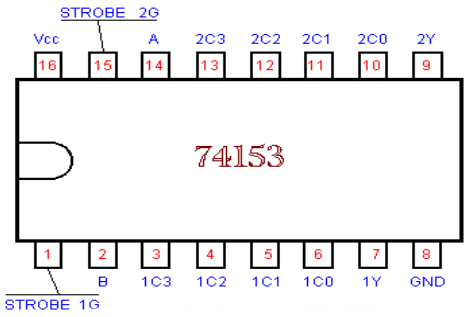
To assemble and test the (4:1) Multiplexer and (1:4) De-Multiplexer.

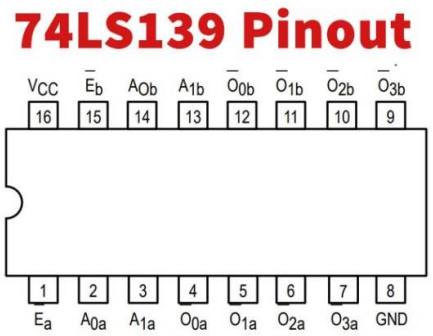
Components Used:

Digital Test Kit, Multiplexer IC, De-Multiplexer IC, and wires

Reference Circuit:







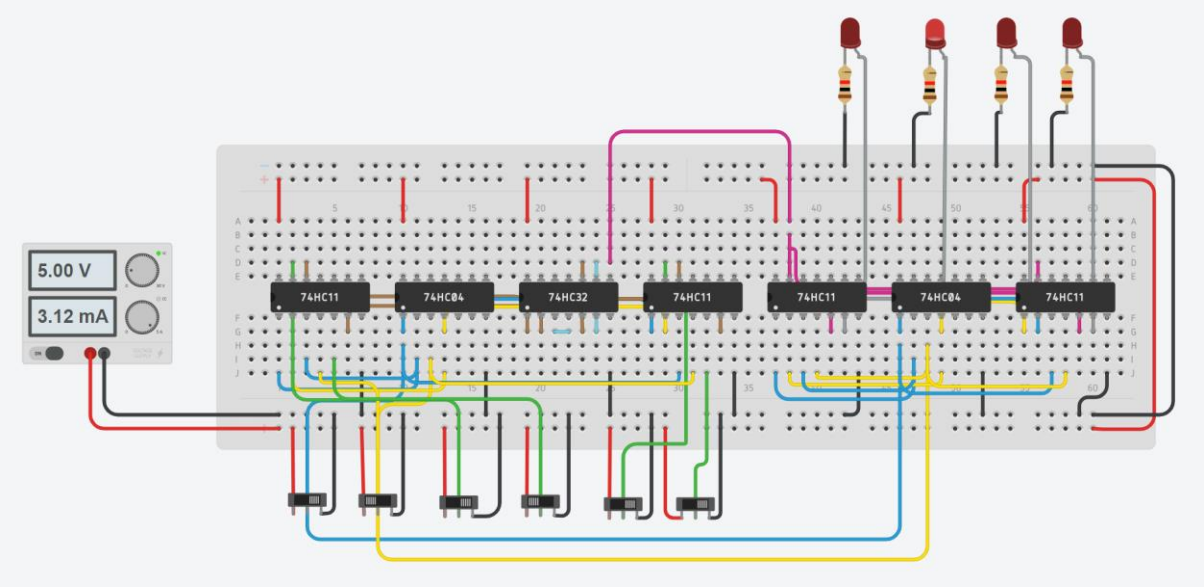
Procedure:

1. Connect the VCC and GND of the Digital Test Kit to the VCC and GND Pins of the ICs.
2. The strobe 1G is an enabler for the MUX IC, it needs to be connected to the GND of the Digital test kit.

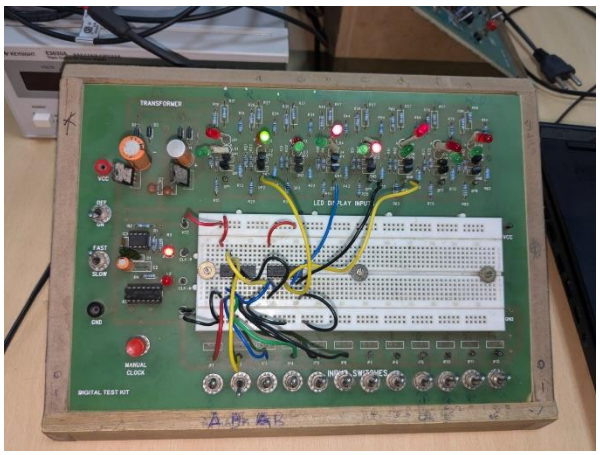
3. Then connect the input pins of the MUX IC to the Digital Test Kit as shown in the reference diagram.
4. Connect the output of the MUX IC to the strobe 1G of the De-MUX IC and connect the GND of the De-MUX IC to the GND of the Digital Test Kit.
5. Lastly, connect the De-MUX IC output pins to the Digital Test Kit display points.

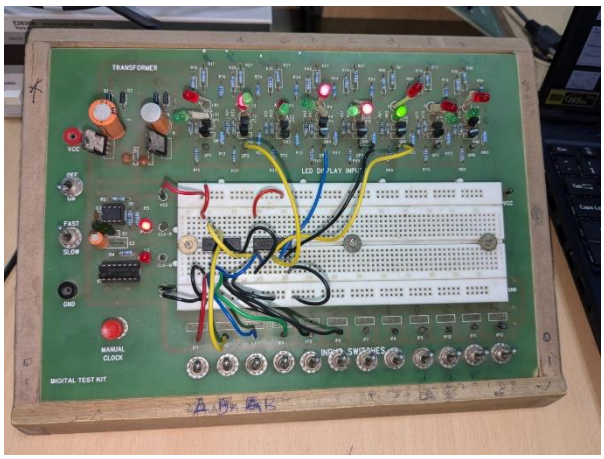
Tinkercad Simulation:

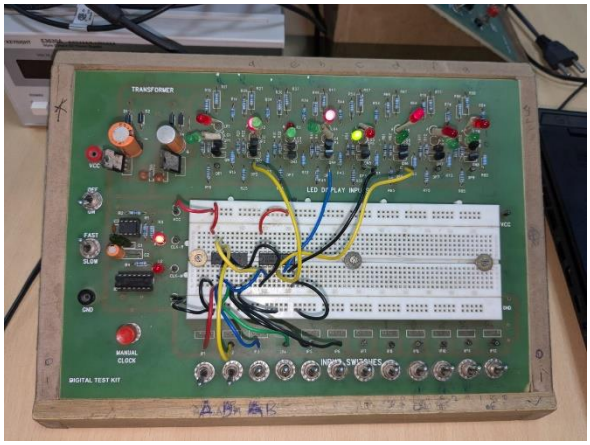
https://www.tinkercad.com/things/lTPjJy41ikY-dsmlab4exp3?sharecode=ybxeqYuMHsJxZZD-4ig8Sf0gwLtRLhFNWXxzKGqPaRA

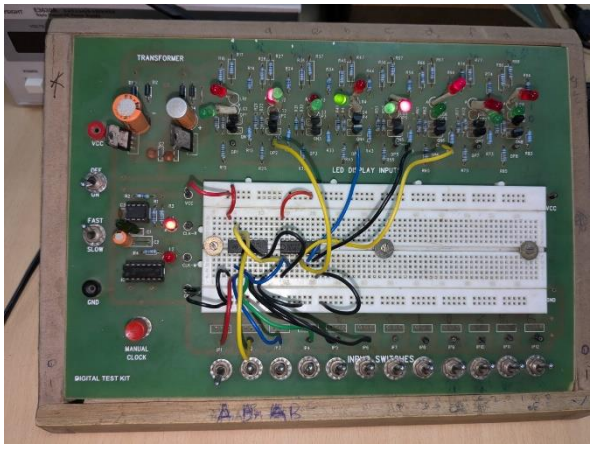


Output:









Conclusion:

We infer that the (4:1) MUX and the (1:4) De-MUX are successfully working as seen in the following truth table:

S0	S1	O1	O2	O3	O4
0	0	I1	0	0	0
0	1	0	I2	0	0
1	0	0	0	I3	0
1	1	0	0	0	I4