INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY

HYDERABAD

Lab Report-4

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Course: Digital Systems and Microcontrollers Lab

Contents

1 4:1 MUX

1.1 Objective

Design a 4:1 Multiplexer using basic logic gates

1.2 Equipment Required

1. Digital circuit Kit
2. 4 Tripple Input AND(7411) gates
3. 2 NOT(7404) gates
4. 1 OR(7432) gate
5. Connecting wires

1.3 Schematic

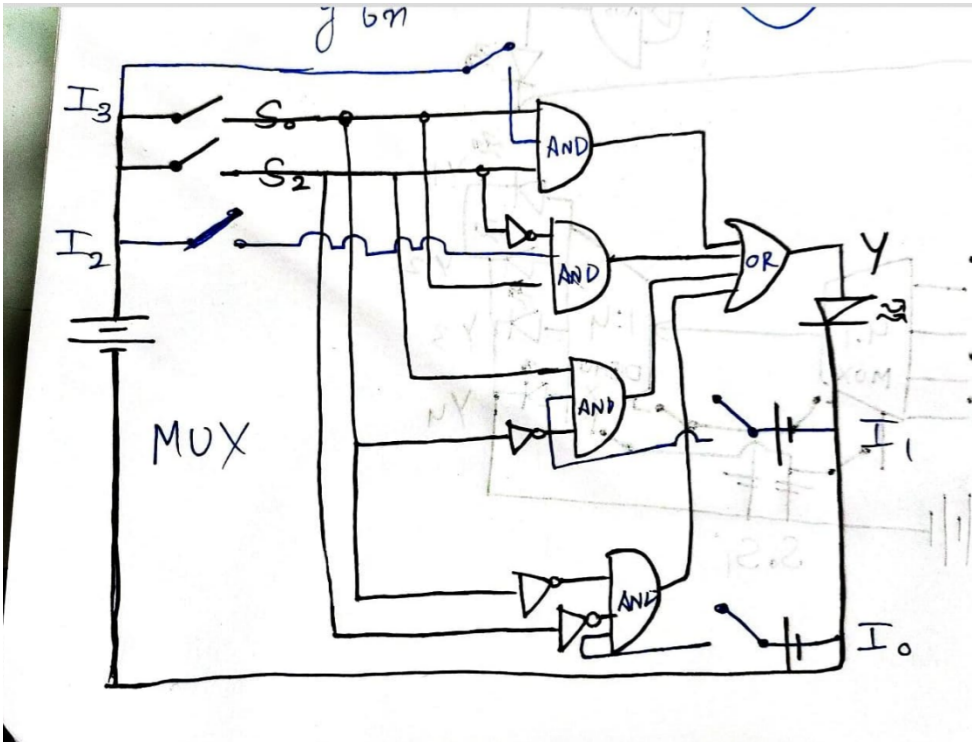

Figure 1: MUX schematic

1.4 LAB photo

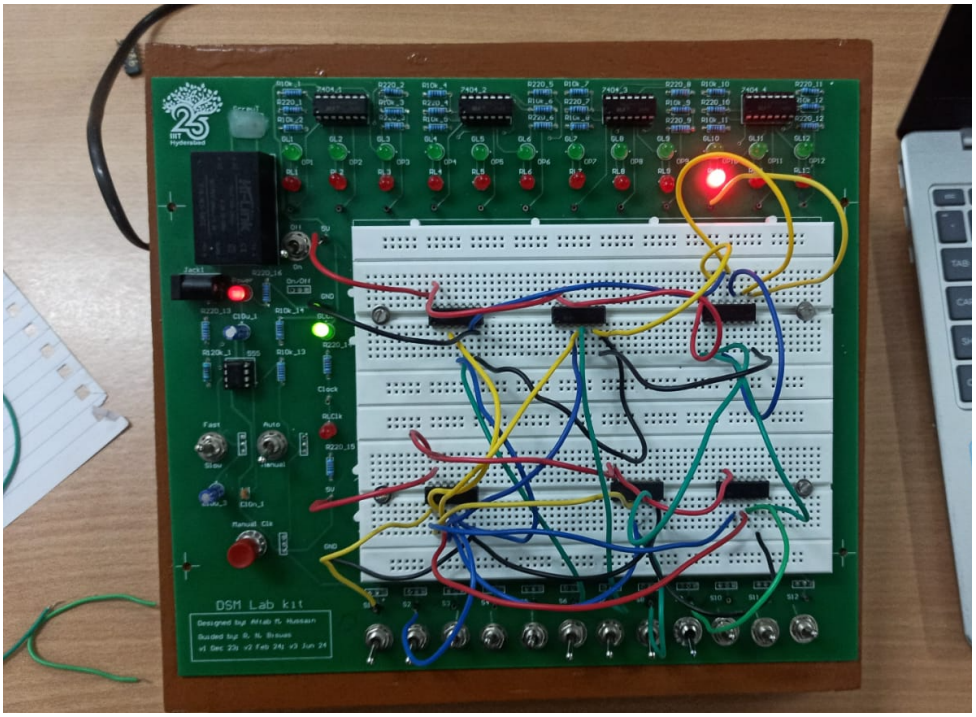

Figure 2: MUX

1.5 Procedure

1.5.1 Multiplexer Design(4:1) MUX

1. Place the ICs on the breadboard
2. Connect Vcc and ground to the ICs
3. Connect 2 select line switches (S_0, S_1) to choose the input line
4. Connect 4 input switches (I_0, I_1, I_2, I_3) to the multiplexer inputs.
5. Use NOT gates to invert the select lines as needed.

1.5.2 Circuirt Implementation

$$\mathrm{Y} = \mathrm{I}_0(S_1)'(S_0)' + I_1(S_1)'(S_0) + I_2(S_1)'(S_0) + I_3(S_1)(S_1)$$

0. Connect the Final Output to the LED
1. Compare the out put with the truth table

1.6 Observation

Our circuit followed this truth table

S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

this is the Truth Table for MUX

1.7 TinkerCAD

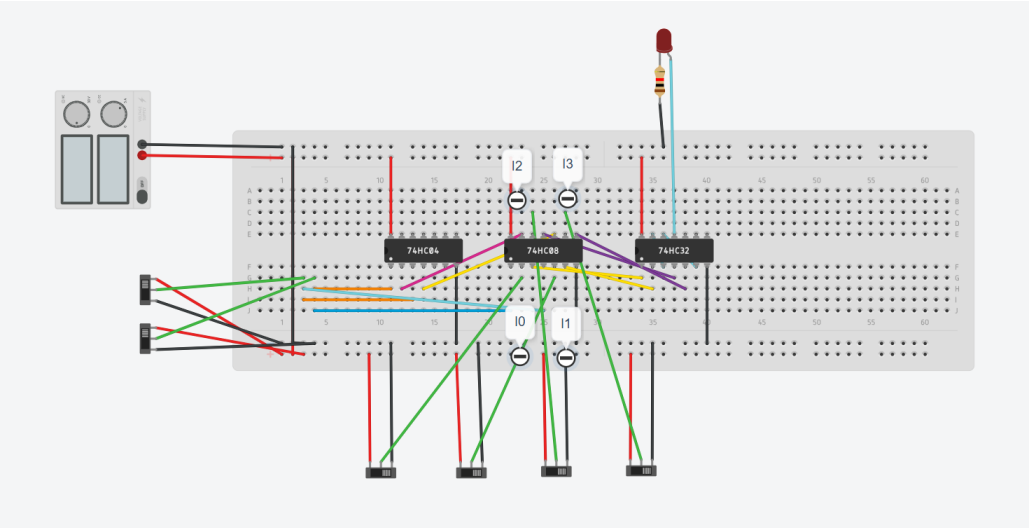

Figure 3: 4:1 MUX

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1.8 Conclusion

We have designed and verified the workings of a MUX

2 1:4 DE-MUX

2.1 Objective

Design a 1:4 De-Mux using basic logic gates

2.2 Equipment Required

1. Digital circuit Kit
2. 4 Triple Input AND(7411) gates
3. 2 NOT(7404) gates
4. Connecting wires
5. Enabler

2.3 Schematic

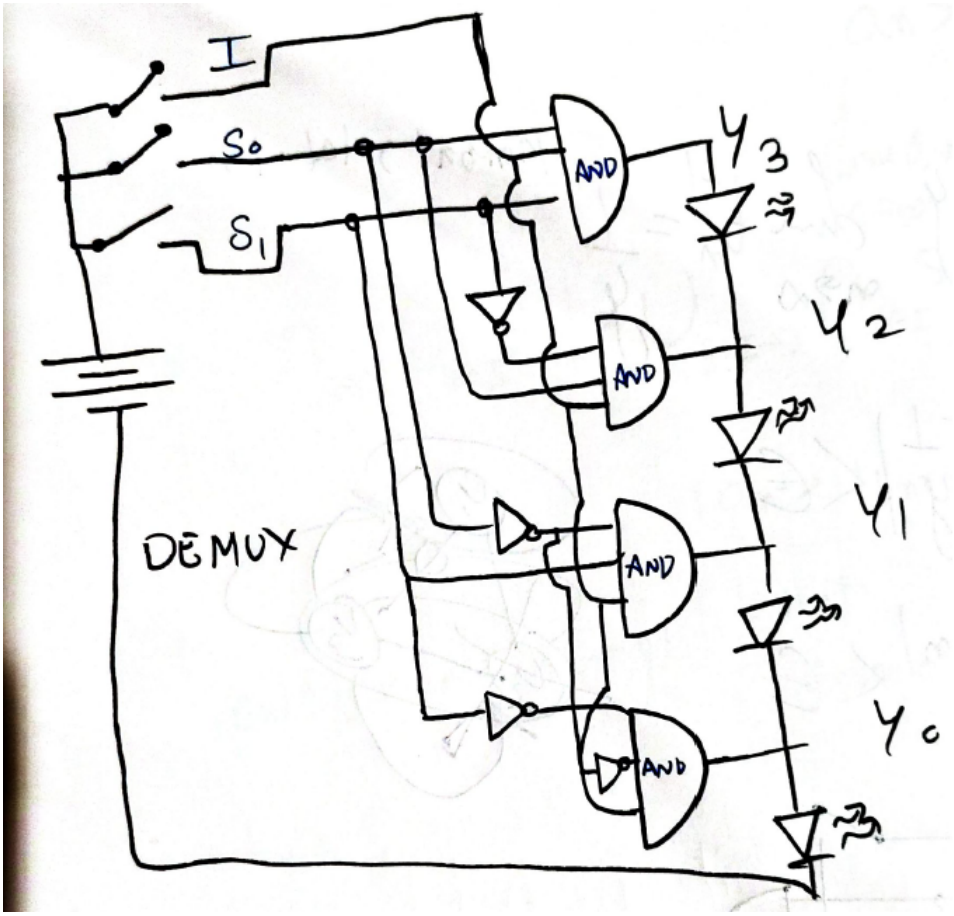


Figure 4: DEMUX schematic

2.4 LAB Photo

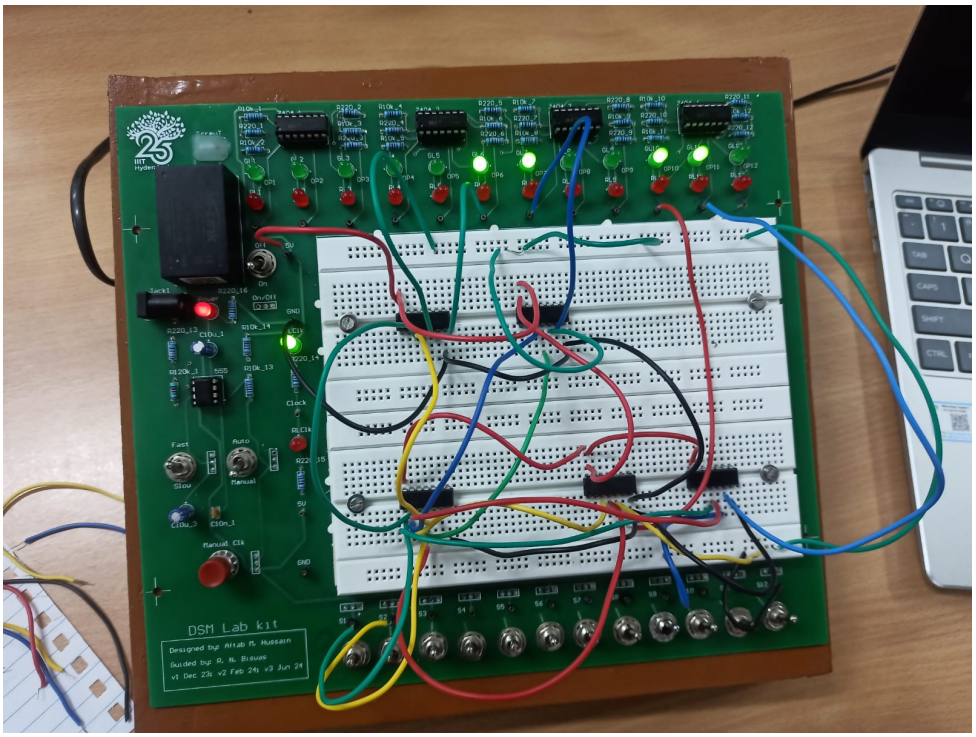


Figure 5: DeMUX

2.5 Procedure

2.5.1 De-MUX Design

1. Place the ICs on the breadboard
2. Connect Vcc and ground to the ICs
3. Connect one input switch and label it the Enabler
4. Connect 2 select line switches(S_0, S_1)

2.5.2 Circuit Implementation

1. $Y_0 = E(S_1)'(S_0)'$
2. $Y_1 = E(S_1)'(S_0)$
3. $Y_2 = E(S_1)'(S_0)$
4. $Y_3 = ES_1S_0$
5. Connect the Outputs to LEDs

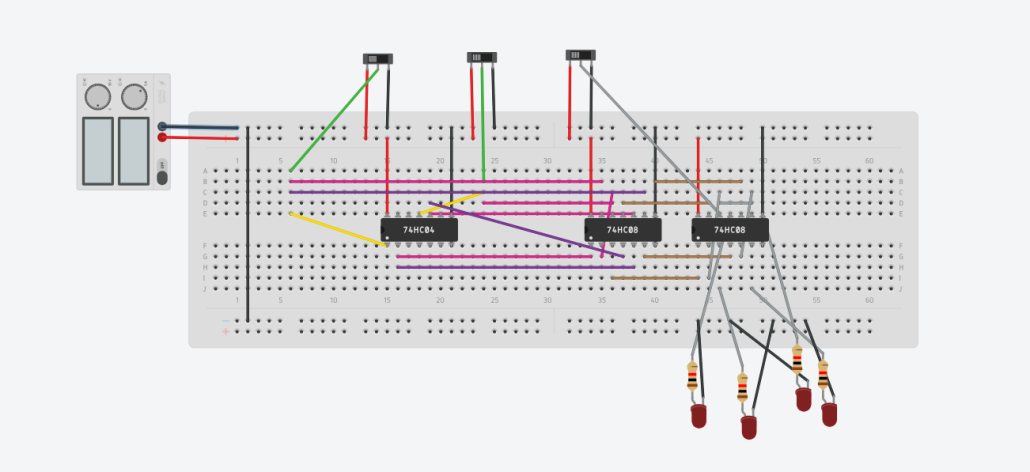
2.6 Observation

Our circuit was found to follow this truth table

S_1	S_0	D	Y_0	Y_1	Y_2	Y_3
0	0	0	0	0	0	0
0	0	1	1	0	0	0
0	1	0	0	0	0	0
0	1	1	0	1	0	0
1	0	0	0	0	0	0
1	0	1	0	0	1	0
1	1	0	0	0	0	0
1	1	1	0	0	0	1

this is the truth table for DEMUX

2.7 TinkerCAD



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2.8 Conclusion

We have designed and verified the workings of a DEMUX

3 Combined Multiplexer-DeMultiplexer

3.1 Objective

To verify that MUX and DeMux do exactly the opposite function

3.2 Equipment Required

1. 74LS153 MUX IC
2. 74LS139 DeMUX IC
3. Connecting wires
4. Digital test kit

3.3 Schematic

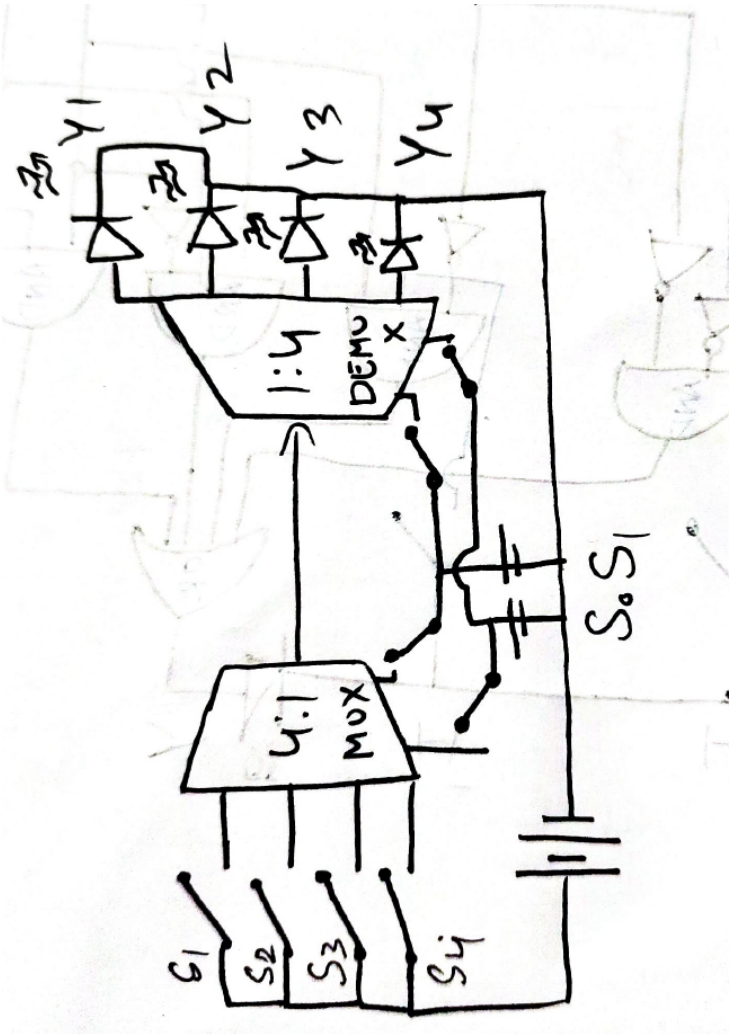

Figure 6: Combined Schematic

3.4 LAB photo

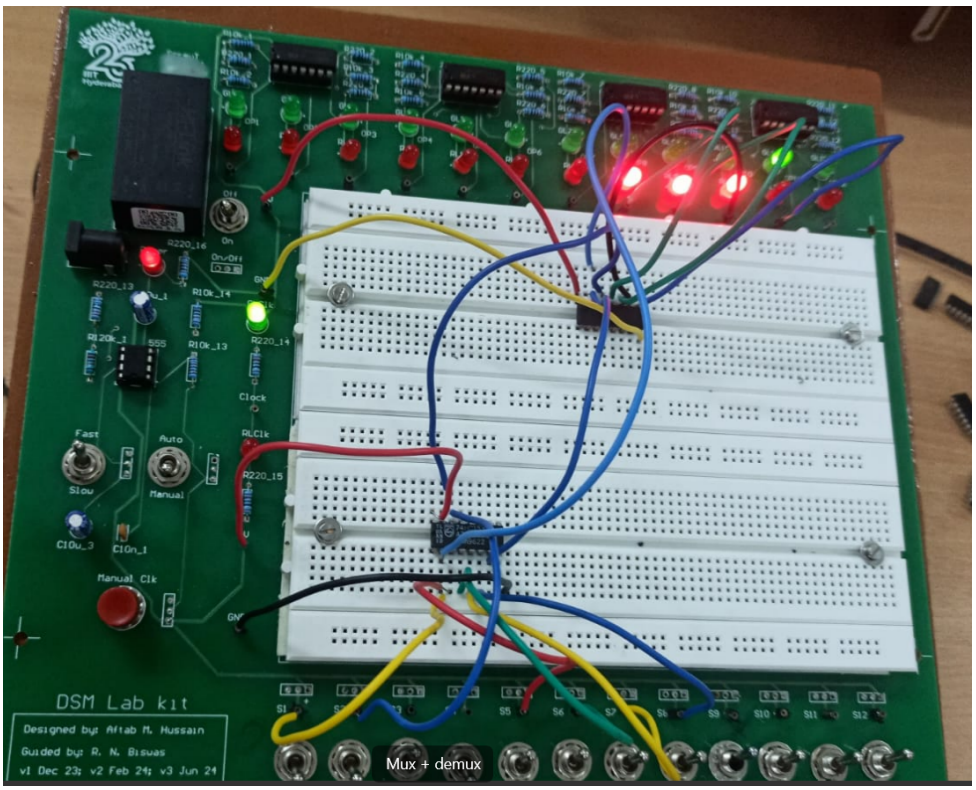

Figure 7: Combined MUX and DeMUX

3.5 Procedure

1. Place the ICs on the breadboard
2. Connect the Ground and the Vcc to the ICs
3. Connect the same select lines for MUX and DeMUX
4. Connect the MUX output to the input of the DeMUX

3.6 Observation

Our circuit was found to follow this Truth Table

S_1	S_0	I_0	I_1	I_2	I_3	Y	O_0	O_1	O_2	O_3
0	0	I_0	0	0	0	I_0	I_0	0	0	0
0	1	0	I_1	0	0	I_1	0	I_1	0	0
1	0	0	0	I_2	0	I_2	0	0	I_2	0
1	1	0	0	0	I_3	I_3	0	0	0	I_3

3.7 TinkerCAD

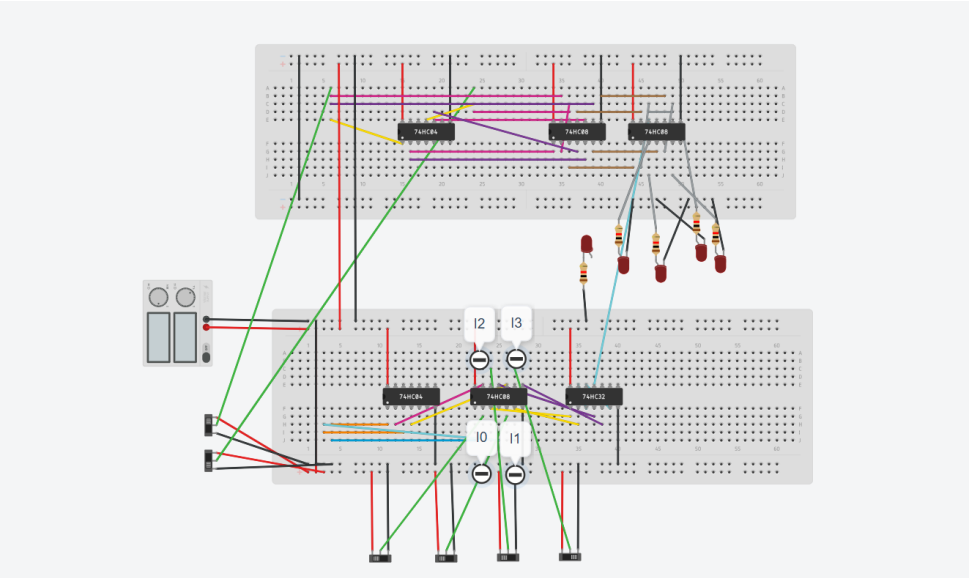

Figure 8: Combined MUX and DeMUX

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3.8 Conclusion

We can conclude that the MUX and DEMUX do the COmplement operation of each other.