INTERNATIONAL INSTITUTE OF
INFORMATION TECHNOLOGY

HYDERABAD

Lab Report-2

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Course: Digital Systems and Microcontrollers Lab

Contents

1 Experiment-1

1.1 Objective

To identify logic gates and use different ICs to verify the truth tables drawn

1.2 Equipment required

1. IC 7432 – OR Gate
2. IC 7402 – NOR Gates
3. IC 7408 – AND Gate
4. IC 7486 – XOR Gate
5. IC 7400 – NAND Gate
6. IC 7404 – NOT Gate
7. Connecting Wires
8. Resistor
9. Digital Test Kit
    - Input Switches
    - Breadboard
    - Output LEDs
    - Power Supply

1.3 Circuits

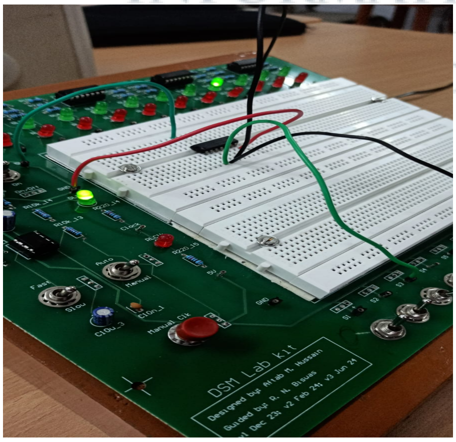


Figure 3: OR CD4001

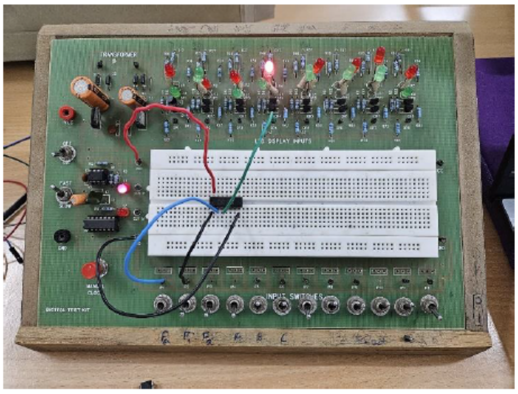


Figure 4: XOR

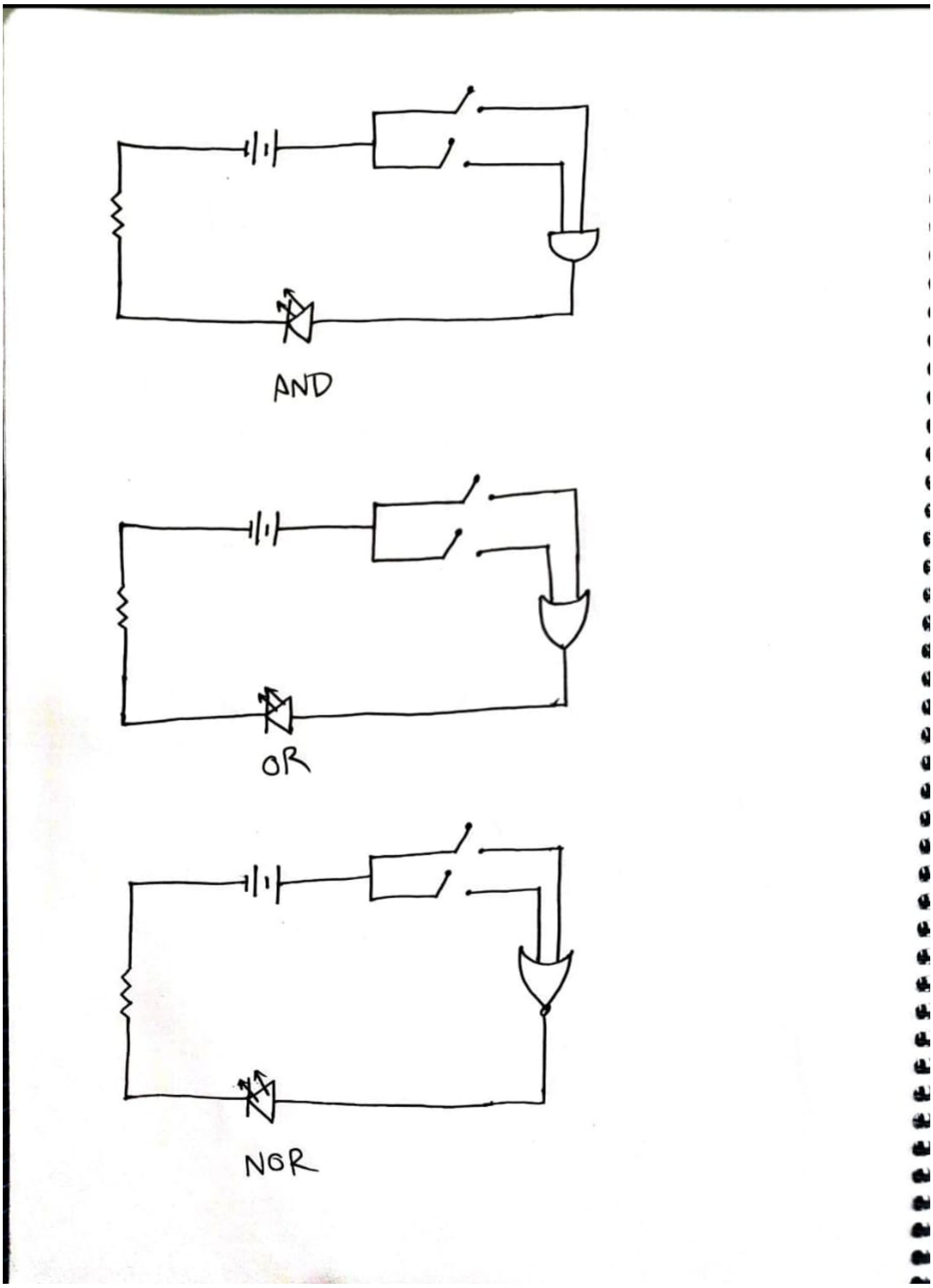


Figure 1

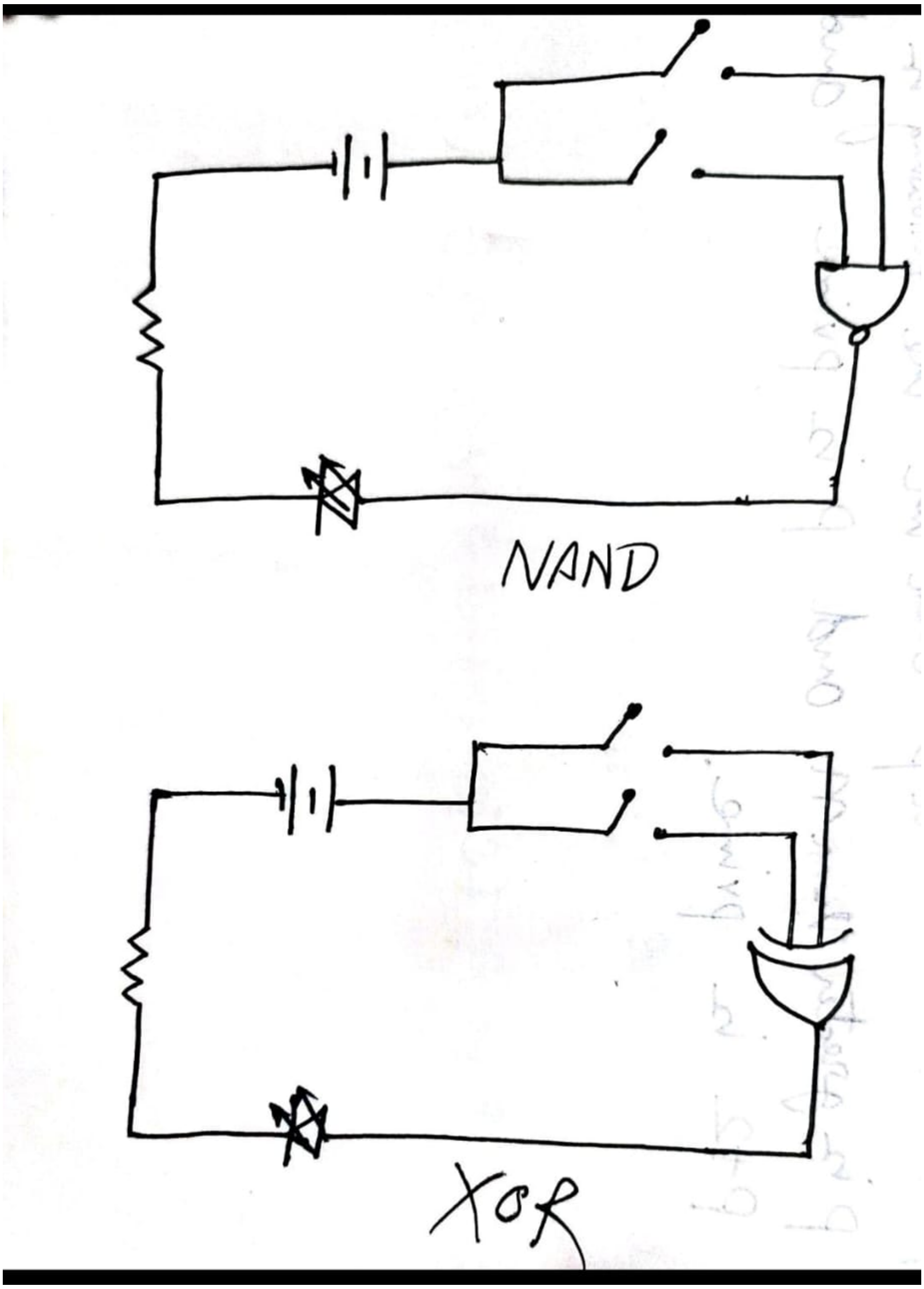
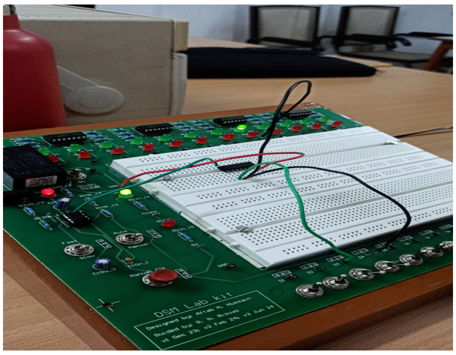
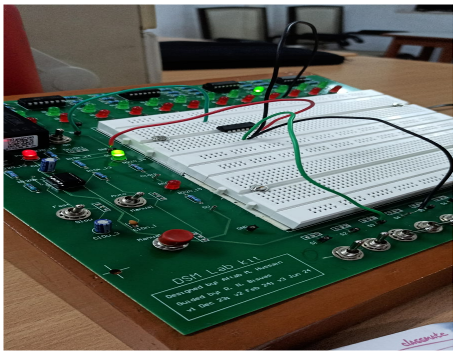


Figure 2



: NAND CD4011



: AND SN7408

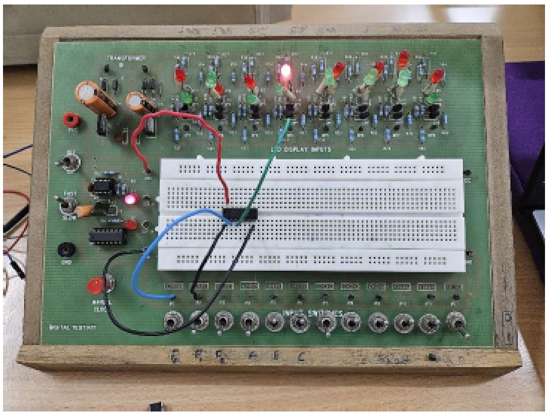


Figure 5: NOR

1.4 Procedure

1. Connect the IC's VCC and GND pins to the corresponding power and ground pins of the digital test kit.
2. Wire two digital pins from the Digital Test Kit to the IC's input pins.
3. Link the Output Pin to the Output LEDs

1.5 Truth Tables

Table 1: OR Gate

A	B	$A + B$
0	0	0
0	1	1
1	0	1
1	1	1

Table 2: AND Gate

A	B	$A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

Table 3: NAND Gate

A	B	$(A \cdot B)'$
0	0	1
0	1	1
1	0	1
1	1	0

Table 4: NOR Gate

A	B	$(A + B)'$
0	0	1
0	1	0
1	0	0
1	1	0

Table 5: XOR Gate

A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

1.6 TinkerCAD

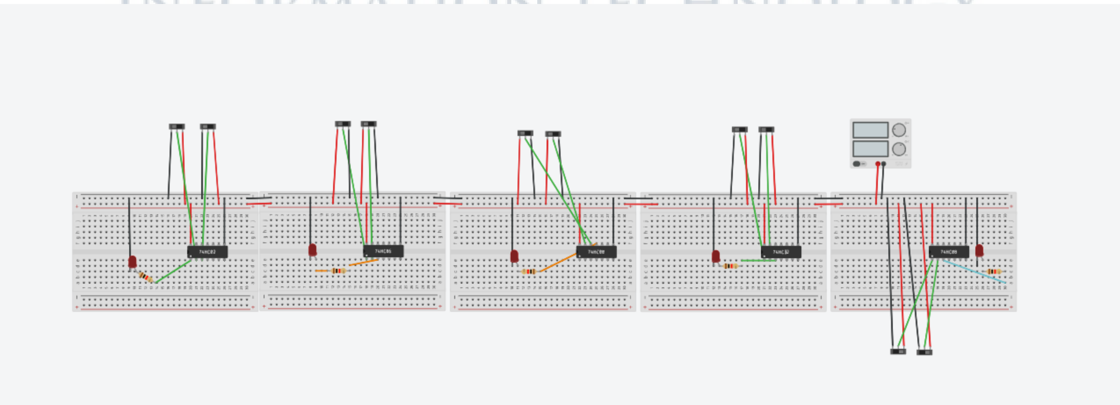


Figure 6: 1)NOR 2)XOR 3)NAND 4)OR 5)AND)

TinkerCAD

1.7 Conclusion

We have therefore determined the logic gates and verified the truth table with the observation values for each gate

2 Experiment-2

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2.1 Objective

Verify The De Morgan Laws

$$(A \cdot B)' = A' + B'$$
$$(A + B)' = A' \cdot B'$$

2.2 Equipment Required

1. Breadboard
2. Connecting Wires
3. IC 7432 – OR Gate
4. IC 7404 – NOT Gate
5. IC 7408 – AND Gate
6. Output LEDs
7. Resistors
8. Digital Test Kit

2.3 Circuit Diagram

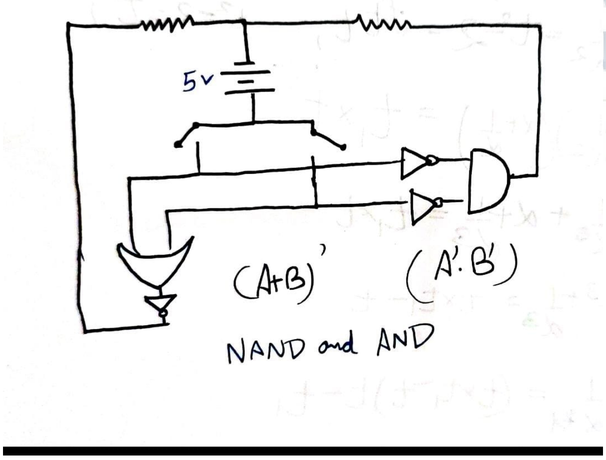

Figure 7: De Morgan's Law

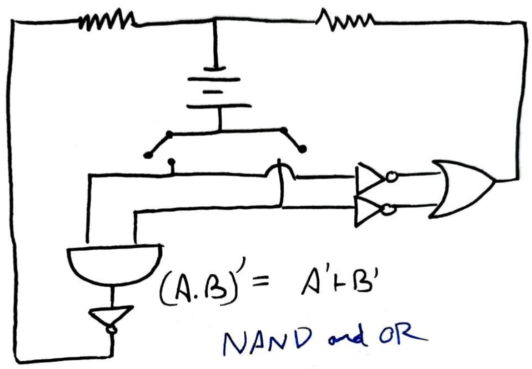

Figure 8: Circuit

2.4 Part 1 - Demonstrating De Morgan's Law: $(A + B)' = (A' \cdot B')$

2.4.1 Initial Connections and LED Setup

1. Start by connecting the VCC and GND pins of the three ICs to the corresponding VCC and GND ports on the Digital Test Kit.

2. Select two digital pins from the Digital Test Kit and connect them to any two input pins on the IC 7432 (OR gate).
3. Connect the output pin of the IC 7432 to an input pin of IC 7404 (NOT gate).
4. Connect two additional digital pins from the Digital Test Kit to two input pins on the IC 7404.
5. Connect the output pin of the IC 7404 to the anode of an LED. The cathode of the LED should be connected to one terminal of a resistor, and the other terminal of the resistor to the GND of the Digital Test Kit.

2.4.2 Completing the Logic Circuit

1. Connect the output pins from IC 7404 to the input pins of IC 7408 (AND gate).
2. Connect the output pin from IC 7408 to the anode of a second LED. The cathode of this LED should be connected to one terminal of a resistor, with the other terminal of the resistor connected to the GND of the Digital Test Kit.

2.5 Part 2 - Demonstrating De Morgan's Law: $(A \cdot B)' = (A' + B')$

2.5.1 Circuit Setup and LED Wiring

1. Connect the VCC and GND pins of the three ICs to the Digital Test Kit's respective VCC and GND ports.
2. Connect two digital pins from the Digital Test Kit to the input pins on the IC 7408 (AND gate).
3. Wire the output pin from the IC 7408 to an input pin on the IC 7404 (NOT gate).
4. Connect the output of the IC 7404 to the anode of an LED. The cathode of the LED should be connected to one terminal of a resistor, and the other terminal of the resistor should be connected to the GND of the Digital Test Kit.

2.5.2 Finishing the Circuit

1. Connect the output pins from IC 7404 to the input pins of the IC 7432 (OR gate).
2. Wire the output pin of the IC 7432 to the anode of a second LED. The cathode should be connected through a resistor to the GND of the Digital Test Kit to complete the circuit.

2.6 Truth Tables

Table 6: $(A+B)' = (A' \cdot B')$

A	B	$A+B$	$(A+B)'$	A'	B'	$A' \cdot B'$
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

Table 7: $(A \cdot B)' = (A' + B')$

A	B	$A \cdot B$	$(A \cdot B)'$	A'	B'	$A' + B'$
0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0

2.7 TinkerCAD

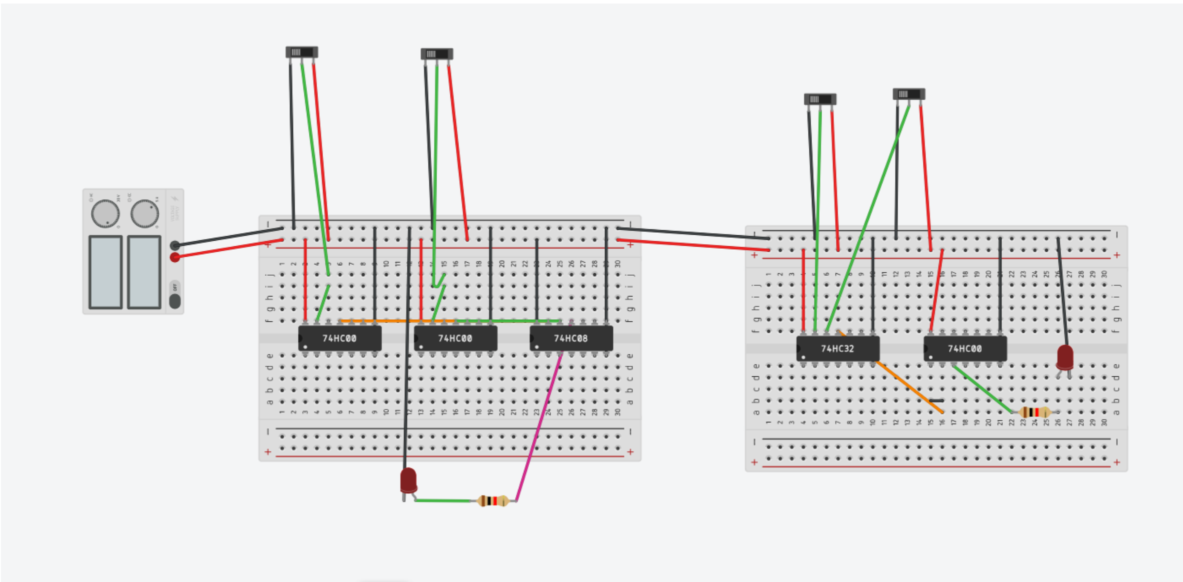

Figure 9: A'.B'= (A+B)'

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2.8 Conclusion

From the above truth tables we can conclude that:

[1]$(A+B)' = (A' \cdot B')$ $(A \cdot B)' = (A' + B')$

Hence, De Morgan's Theorem is proved.