# DIGITAL SYSTEMS AND MICROCONTROLLERS - LAB REPORT 2

21/8/25

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# Experiment 1

## Objective:

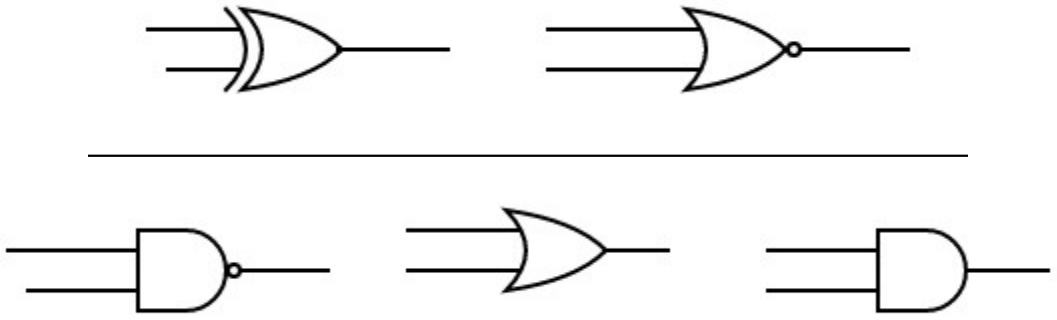
To identify the logic gates present in each IC using a Digital Test Kit.

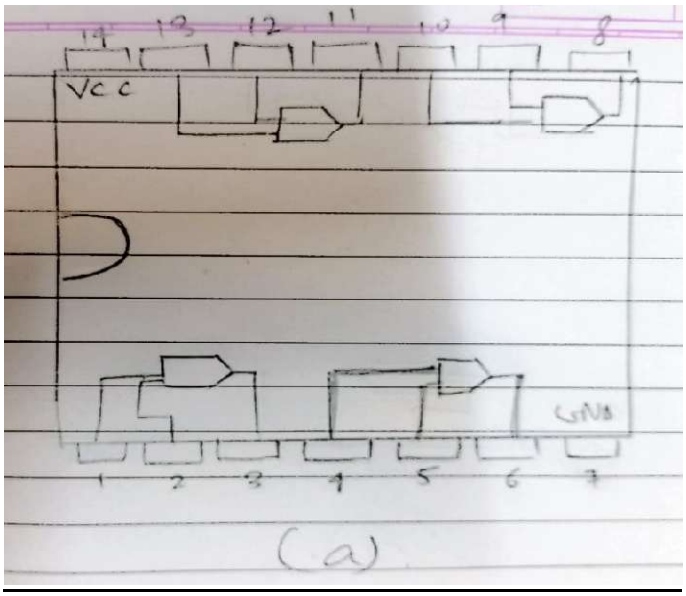
## Electronic components used:

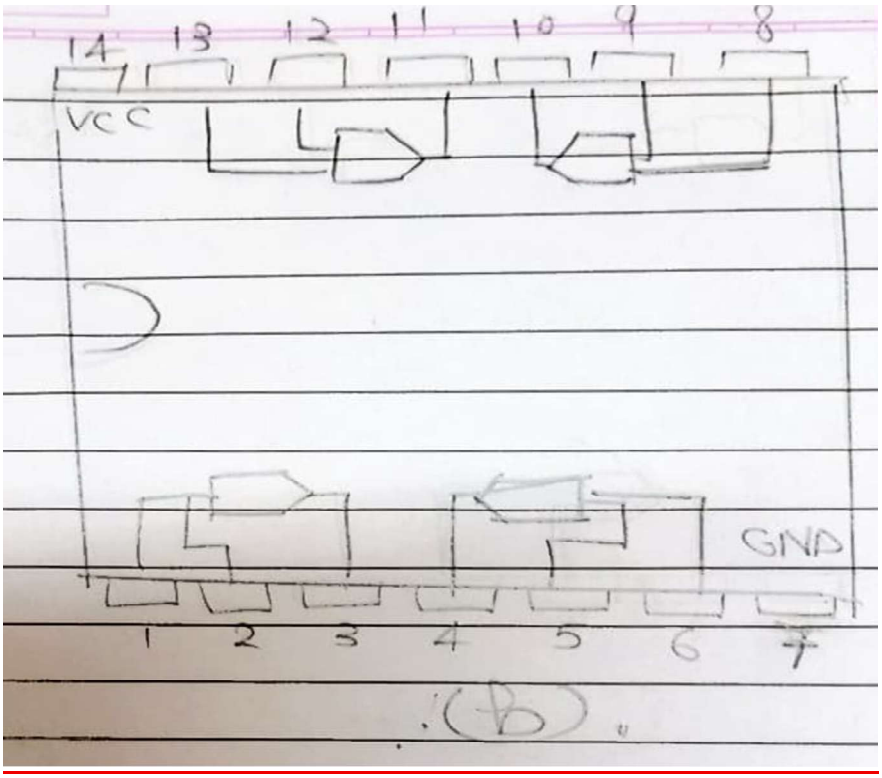
1. Digital Test Kit
2. Connecting Wires
3. IC: 7408 AND, 7432 OR, 7404 NOT, 7486 XOR, 7402 NOR, 7400 NAND

***Components 1-5 are a part of the Digital Test Kit.***

## Reference circuit:

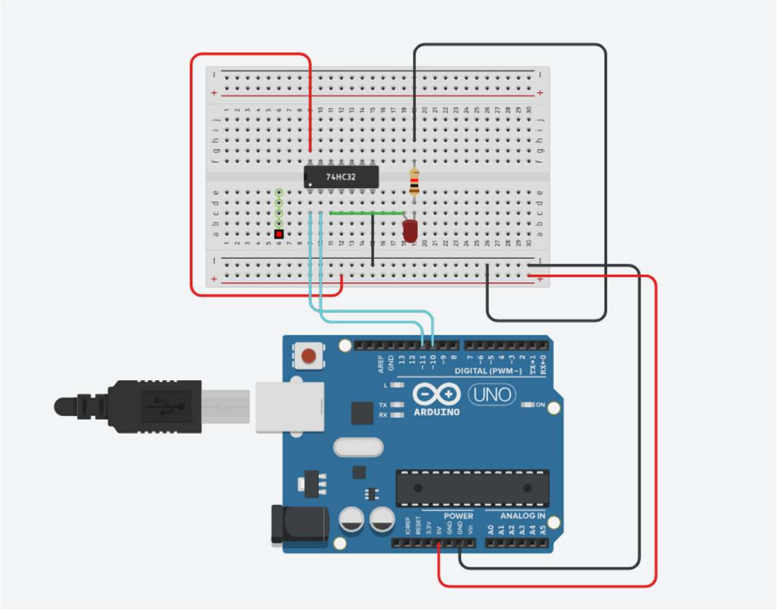




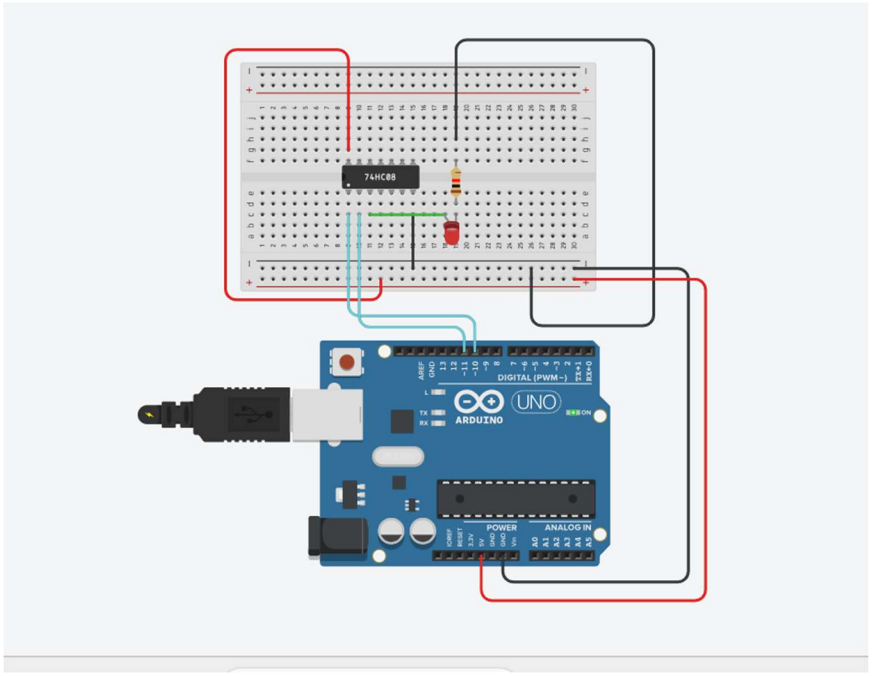



## Tinkercad Reference circuit:

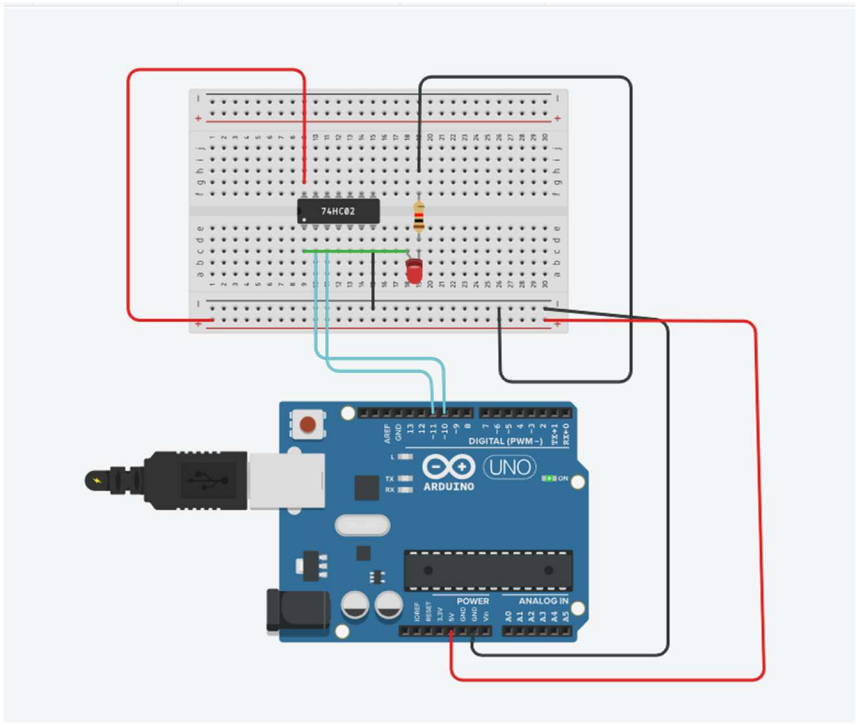
## OR Gate



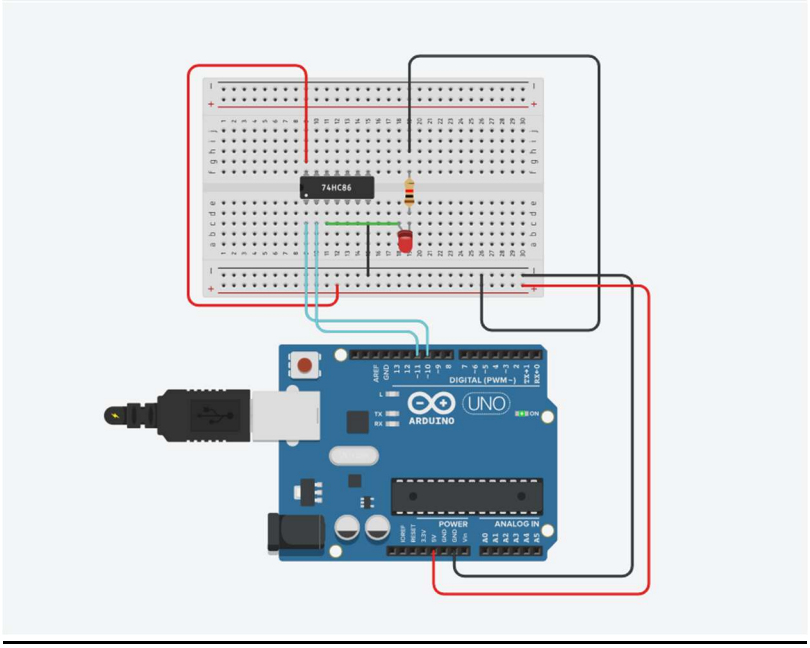
# AND Gate



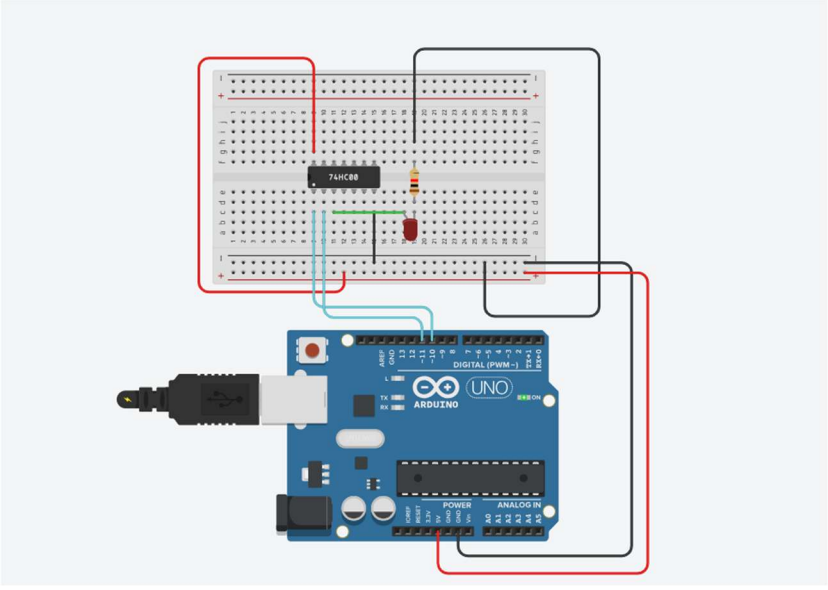

# NOR Gate



# XOR Gate




# NAND Gate



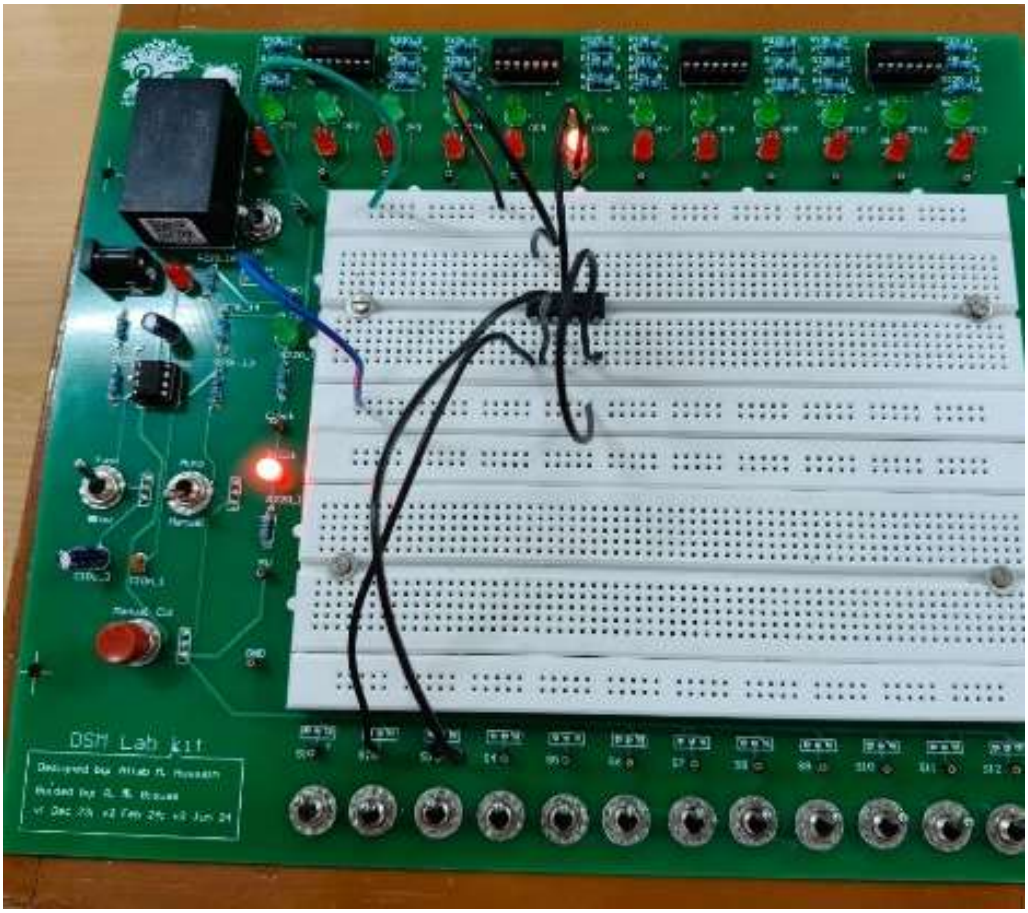

## Procedure:

1. Switch on the VCC supply and check if all the input pins and LEDs are working properly: Red LED glows when switched on (1) and green LED when switched off (0).

2. Connect the VCC (14) and GND (7) pins of the IC to the VCC and GND lines of the Digital Test Kit respectively.
3. Connect the two input pin of IC to the input pins of the switches; and the output pin to the LEDs.
4. Flick the switches ON and OFF and Note the observations.

# Observation:

| A | B | A . B | A+B | (A.B)' | (A+B)' | A⊕B |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 |



# AND Gate

## Conclusion:

We have used the truth tables to identify the:
AND
OR
NAND
NOR
XOR
Gates of the ICs

Link to TinkerCAD simulation:

1. AND: https://www.tinkercad.com/things/3F0zQaYwJgQ-lab2exp1and?sharecode=undefined

2. OR: https://www.tinkercad.com/things/iIxeKmMTz7Y-lab2exp1or?sharecode=YUxjlCyvMce_Sn--0ODRRogDKdMmJF_EEnlpYxmmbNk

3. NORhttps://www.tinkercad.com/things/lRJiNldwxew-lab2exp1nor?sharecode=owC4SrJVe2eb2NQ7G1vy7P0-Myw0FyX4mZOpXZ4ClZ4

4.
5. NAND: https://www.tinkercad.com/things/jDLVhX0GG0G-lab2exp1nand?sharecode=FDTCESb3RKM9dNBA1NRbeOMx65-kXjuMDff0i1gAv-M

6. XOR: https://www.tinkercad.com/things/4GL6huZnVRY-lab2exp1xor?sharecode=UGzmhq66SOKAiUU5t_U4ngBHdvzkeSkJWt1Gf8wzaOY

****The TinkerCAD link does not work properly sometimes. If there's an issue with the same, please tell me and I can send you the login details of my Tinkercad Account.

# Experiment 2

## Objective:

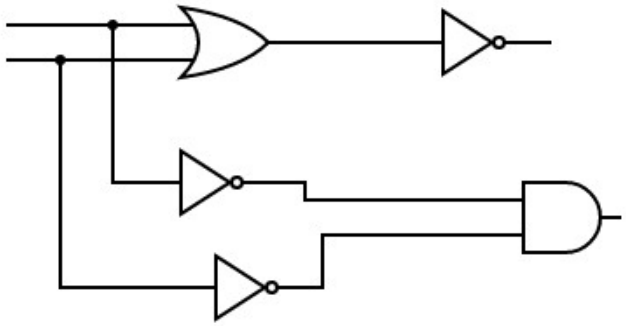
To verify De' Morgan's theorem:

1. (A+B)' = A'.B'
2. (A.B)' = A'+B'

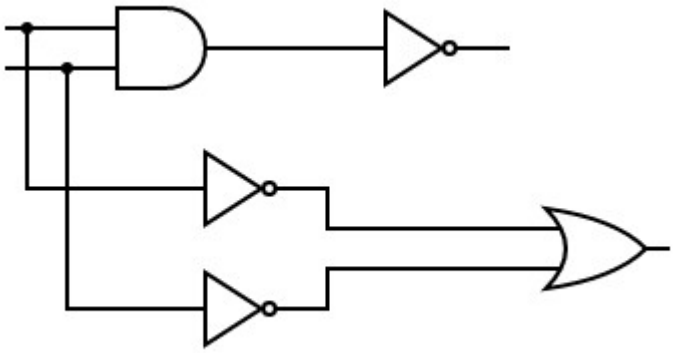
## Electronic components used:

1. Digital Test Kit
2. Connecting Wires
3. IC: 7408 AND, 7432 OR, 7404 NOT

## Reference circuit:

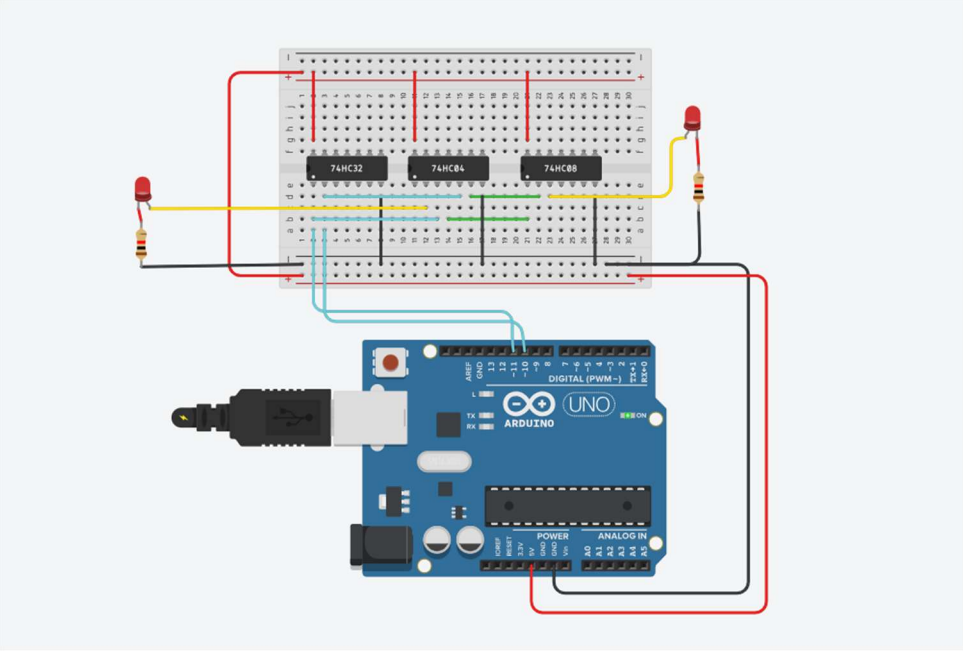


1. (A+B)' = A'.B'



2. (A.B)' = A'+B'

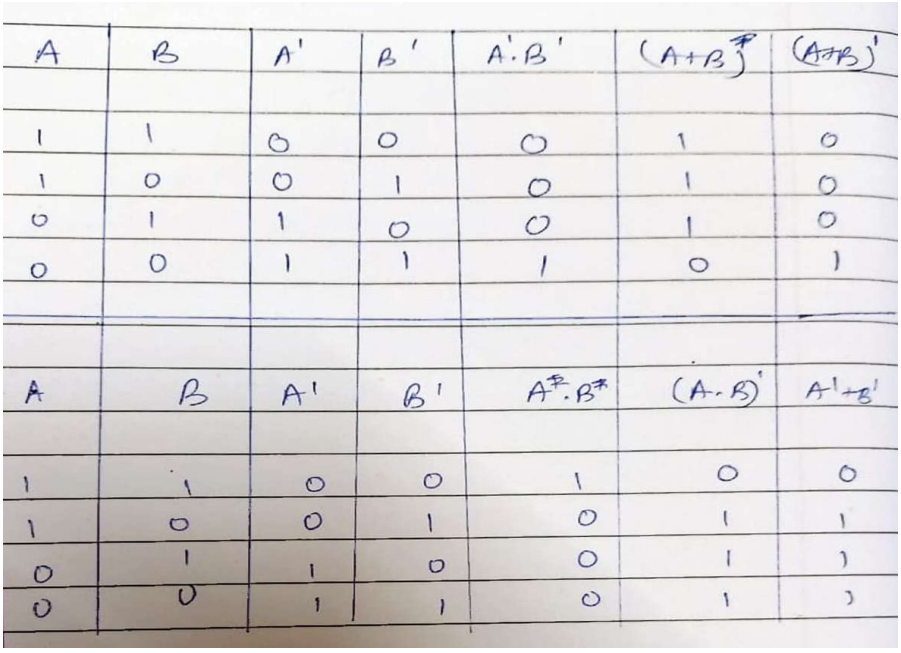
# Tinkercad Reference circuit:




# Procedure:

1. Connect the VCC (14) and GND (7) pins of the IC to the VCC and GND lines of the Digital Test Kit respectively.
2. Use:
   (A+B)' = 1 OR Gate and 1 NAND Gate
   A'. B' = 1 AND Gate and 2 NAND Gates
3. Flick the switch ON and OFF and Note the observations.
4. Repeat the same steps for the second De' Morgan's theorem.

# Observation:



| A | B | A' | B' | A'.B' | (A+B)' | (A.B)' |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 |

| A | B | A' | B' | A'.B' | (A.B)' | A'+B' |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |

# Conclusion:

The truth tables of the LHS and RHS of De' Morgans theorem are equivalent for each theorem. Hence, we can prove the same.

3. (A+B)' = A'.B'
4. (A.B)' = A'+B'

Link to TinkerCAD simulation:
https://www.tinkercad.com/things/cGiYDtnYgmm-lab2exp2?sharecode=k--MfoqpxLxKvjzclQ-ZiiSYZ7JW4bizkFDkdooHBT4

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