

## Experiment - 1

**AIM :** Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, XOR and XNOR gates.

**Apparatus :-** Bread Board, logic gates / IC's, wires.

**Theory :-**

Logic gates are electronic components which perform logic functions on one or more input to produce a single output. There are 7 logic gates. A Truth table is a combination of various input along with its output.

1. **AND gate :-** This gate produces output as 1 when all input are 1 otherwise the output is 0. This gate can have minimum 2 input but single output is forward.

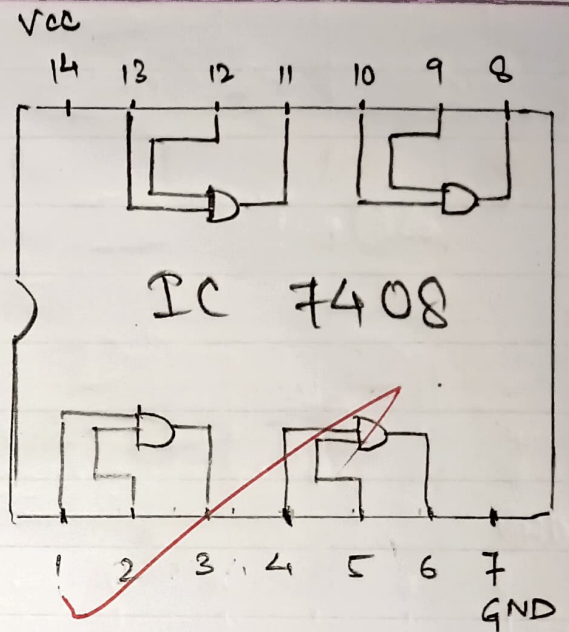
2. **OR gate :-** This gate produces output as 1 when any of the input is 1 otherwise the output is 0. It has a minimum of 2 inputs and 1 output.

3. **NOT gate :-** This gate produces the complement of its input. This gate is also called inverts. It has one input and one output. The output is 1 if the input is 0 and vice versa.

4. **NAND gate :-** It is actually a series of AND gate with NOT gate. The output is 1 when and or all the input is 1, otherwise output is 0. It is an universal gate.

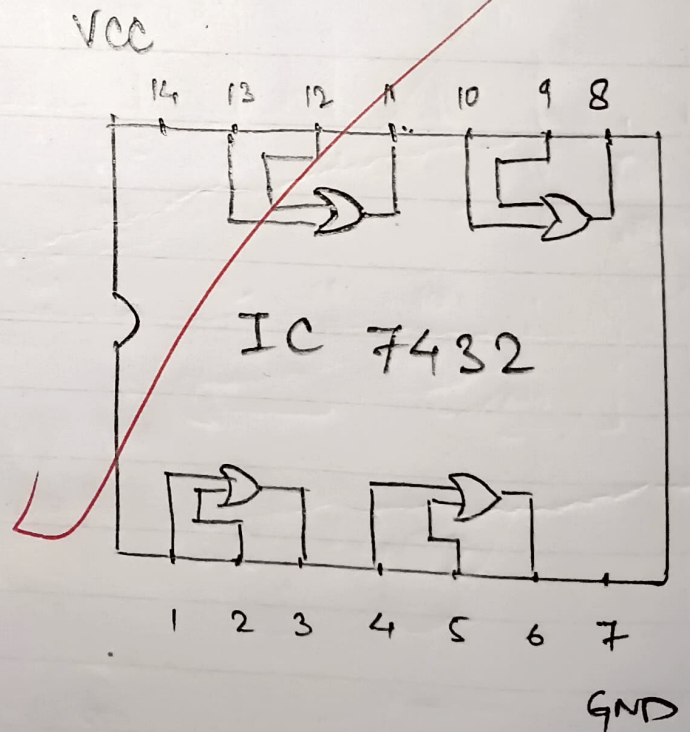
## 1. AND Gate

A	B	$Y = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1



## 2. OR Gate

A	B	$Y = A + B$
0	0	0
0	1	1
1	0	1
1	1	1





5. NOR gate :- It is actually a series of OR gate followed by a NOT gate. The output is 0 when any or all input are 1, otherwise output is 1. This is a universal gate.

6. XOR gate :- This gate produces an output 1, where input are different otherwise output is 0. It has two input and one output.

7. XNOR gate :- This gate produces an output 1, when input are same otherwise output is 0. It has two inputs and one output.

#### PROCEDURE :-

1. Connect the kit to power supply.
2. Connect the input of any one logic gate to the logic sources and its output to logic indicator.
3. Apply various input combination and observe the output.
4. Verify the truth table for each input/output combination.
5. Repeat the process for all logic gates.
6. Switch off the supply.

#### Basic law of Boolean algebra

$$1. \quad A+B = B+A \quad (\text{commutative law})$$

$$A \cdot B = B \cdot A$$

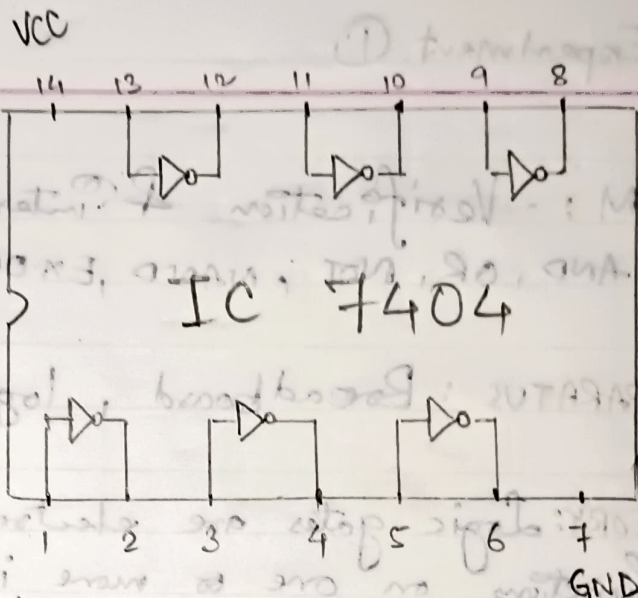
$$2. \quad (A+B)+C = A+(B+C) \quad (\text{associative law})$$

$$(A \cdot B) \cdot C = A \cdot (B \cdot C)$$

$$3. \quad A \cdot (B+C) = A \cdot B + A \cdot C \quad (\text{Distributive law})$$

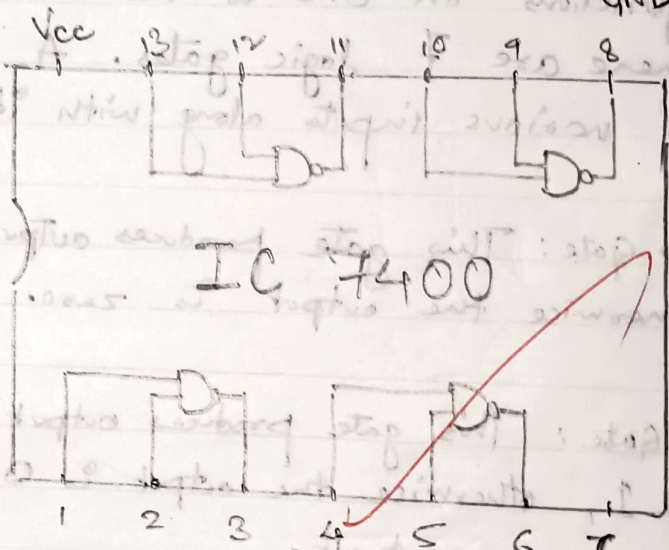
3. NOT

A	$\bar{A}$
0	1
1	0



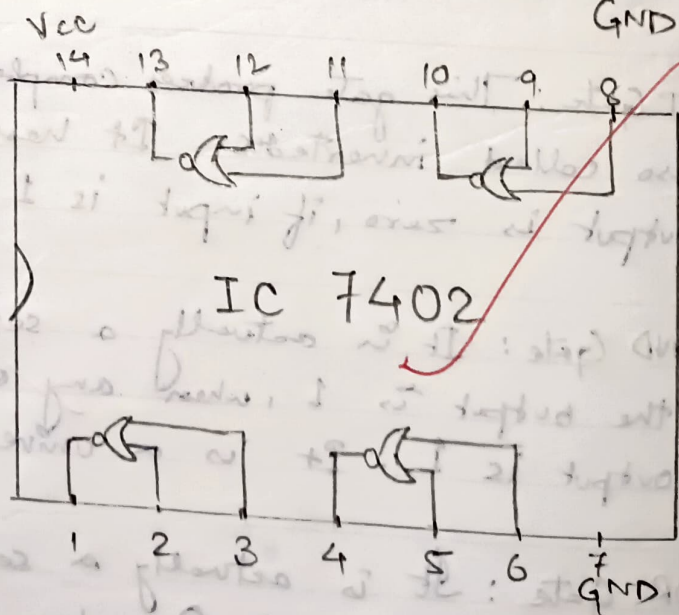
4. NAND

A	B	$\overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0



\* 5. NOR

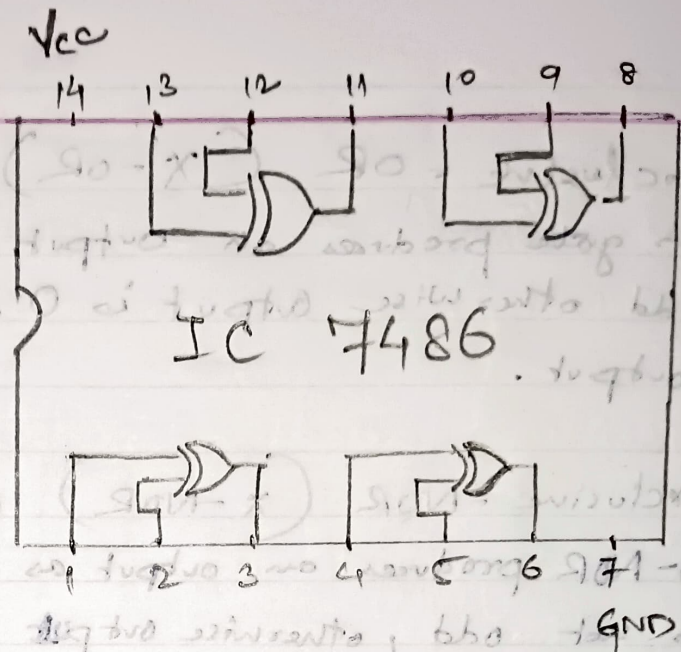
A	B	$\overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0





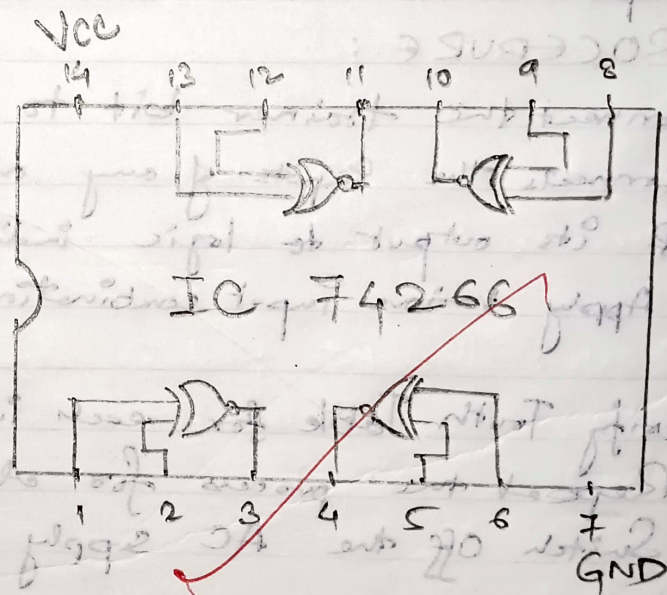
## 6. XOR

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



## \* 7. XNOR

A	B	$A \odot B$
0	0	1
0	1	0
1	0	0
1	1	1



$$4. A + A \cdot B = A$$

$$5. \overline{A+B} = \overline{A} \cdot \overline{B}$$

$$\overline{A \cdot B} = \overline{A} + \overline{B}$$

(De Morgan's law)

Result :-

Truth table of various gates are verified.

Ag  
26/2/11