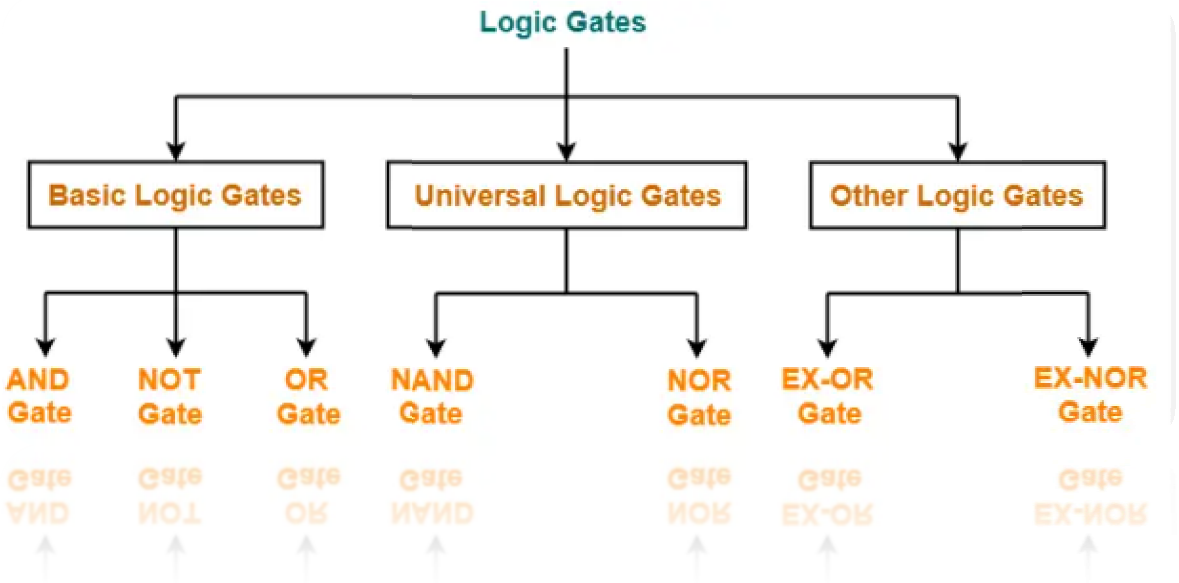
Practical no: 3

Aim : To derive AND,OR and NOT gates using universal gates by forming circuits on Bread Board.

Apparatus: Bread Board, Switches, LED resistor, Output pins, Input pins, resistor, battery.

Theory:

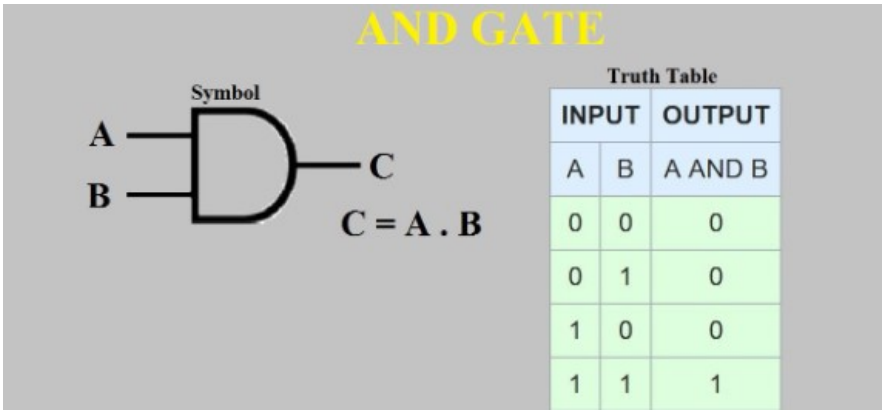
Universal Gate: A universal gate is a gate which can implement any Boolean function without need to use any other gate type. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used in all IC digital logic families.



1)AND GATE :

The AND gate is a basic digital logic gate that implements logical conjunction (∧) from mathematical logic – AND gate behaves according to the truth table. A HIGH output (1) results only if all the inputs to the AND gate are HIGH (1). If not all inputs to the AND gate are HIGH, LOW output results.

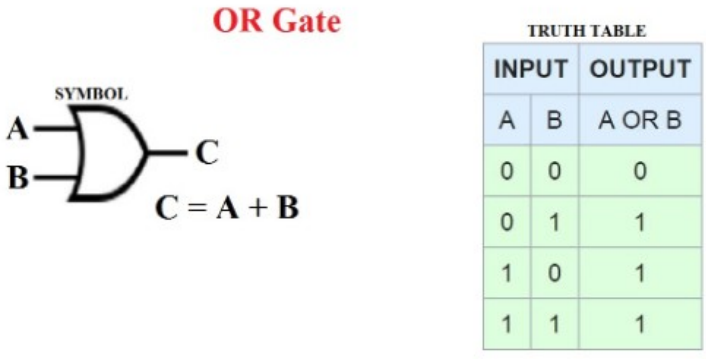
Symbol of AND gate and truth table:



2) OR GATE:

An OR gate is a digital logic gate with two or more inputs and one output that performs logical disjunction. The output of an OR gate is true when one or more of its inputs are true. If all of an OR gate's inputs are false, then the output of the OR gate is false.

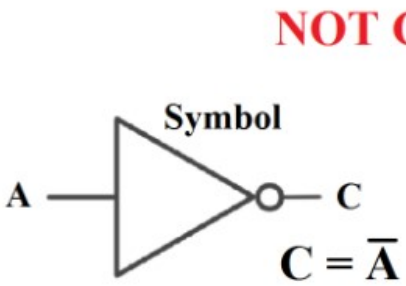
Symbol and truth table of OR Gate:



3) NOT GATE :

NOT gate is a logic gate that inverts the binary input which means that in order to get a high output (1) we require a low input (0) and for a low output a High input (1) is needed. It inverts the input or we can say it negates the output hence due to this inversion of output it is also called Inverter.

Symbol and truth table of NOT Gate:



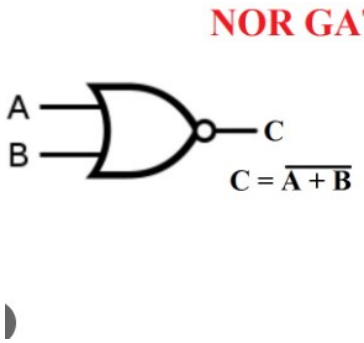
Truth Table

INPUT	OUTPUT
A	NOT A
0	1
1	0

4) NOR GATE:

The NOR gate is a digital logic gate that implements logical NOR - it behaves according to the truth table to the right. A HIGH output (1) results if both the inputs to the gate are LOW (0); if one or both input is HIGH (1), a LOW output (0) results.

Symbol and Truth table of NOR Gate:



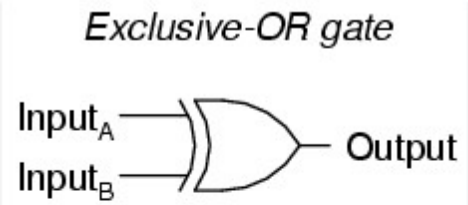
TRUTH TABLE

INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

5) Ex-OR Gate:

XOR gate (sometimes called EOR, EXOR, and pronounced as Exclusive OR) is a digital logic gate that results in true (either 1 or HIGH) output when the number of true inputs is an odd count. An XOR gate implements an exclusive OR, i.e., a true output result if one, and only one, of the gate inputs, is true.

Symbol and Truth Table of EX-OR Gate:

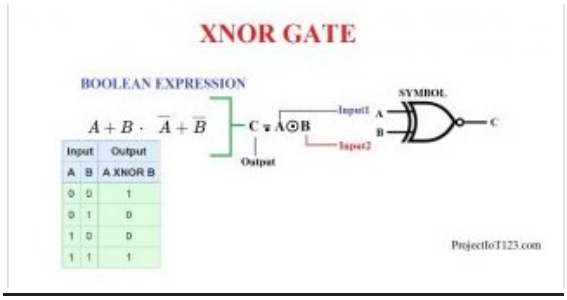


A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

6)EX-NOR:

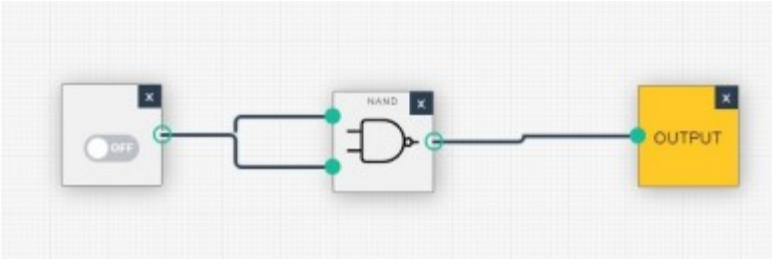
The exclusive NOR gate is the combination of the exclusive OR gate and the NOT gate. Thus, the operation of the XNOR gate is reciprocal of the XOR gate. The exclusive NOR gate gives the output as 1 when both inputs are identical. I.e.,

Symbol and Truth Table of EX-NOR Gate:

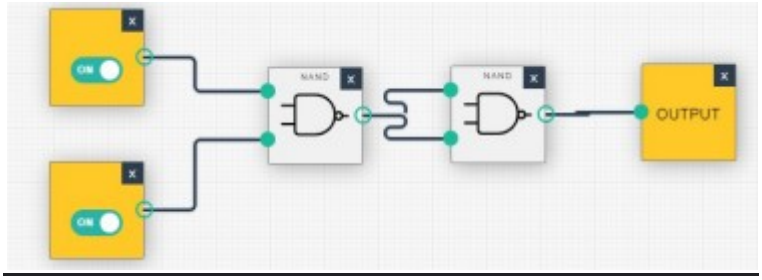


Universal Gate as NAND Gate:

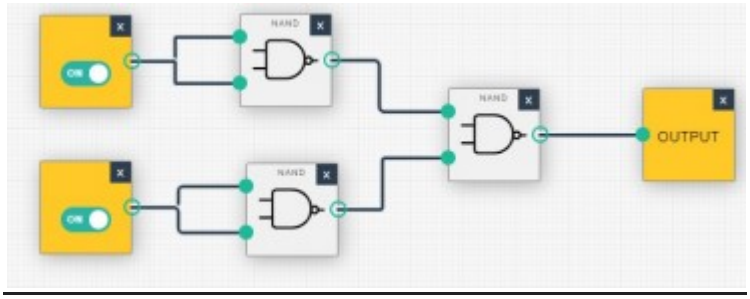
1.NOT Gate:



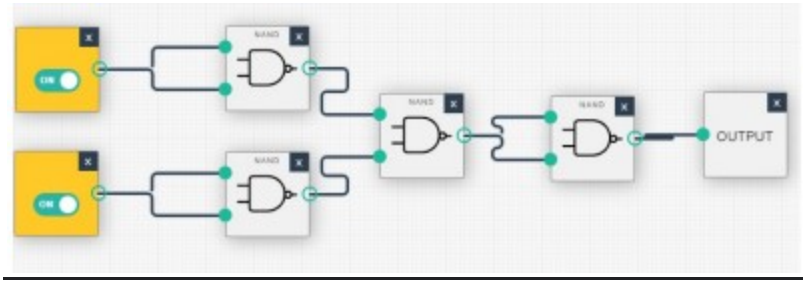
2.AND Gate:



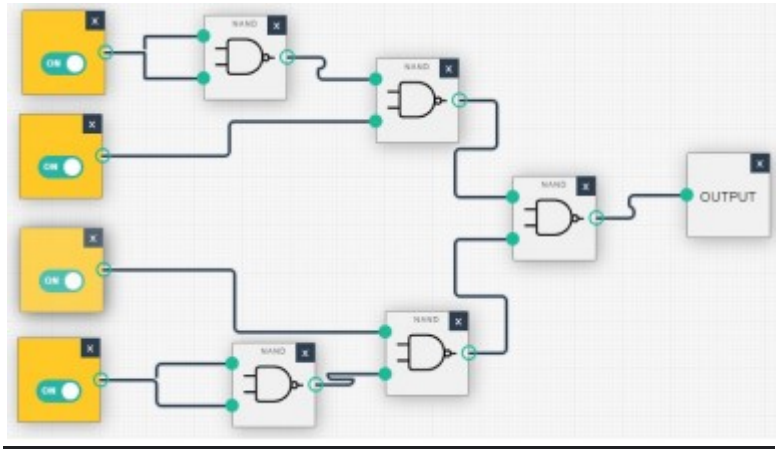
3. OR Gate:



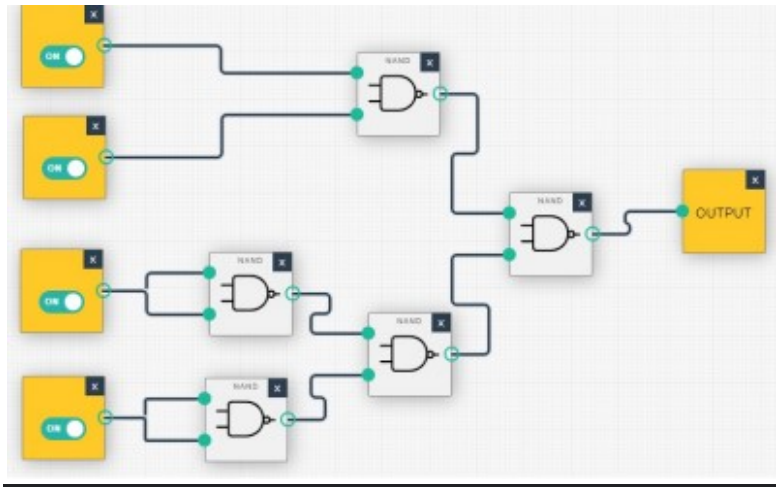
4.NOR Gate:



5. EX-OR Gate:

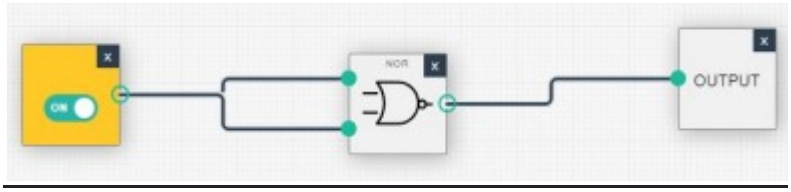


6.EX-NOR Gate:

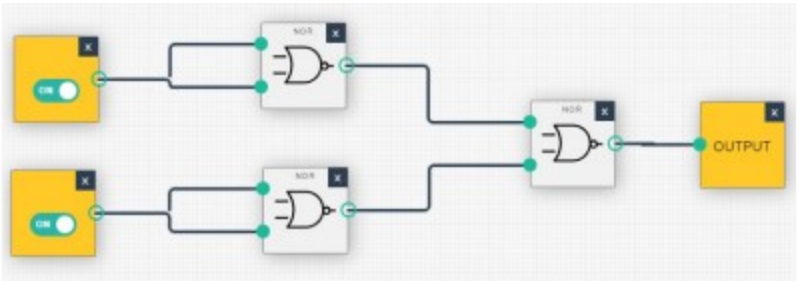


NOR Gate As a Universal Gate:

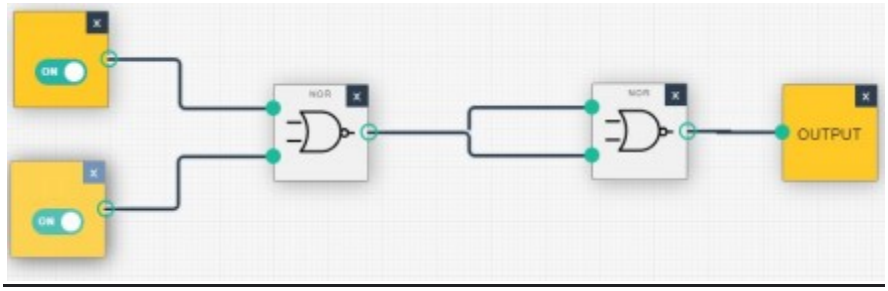
1.NOT Gate:



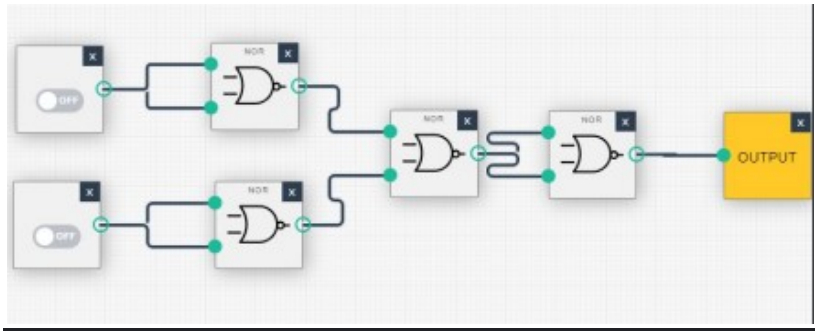
2.AND Gate:



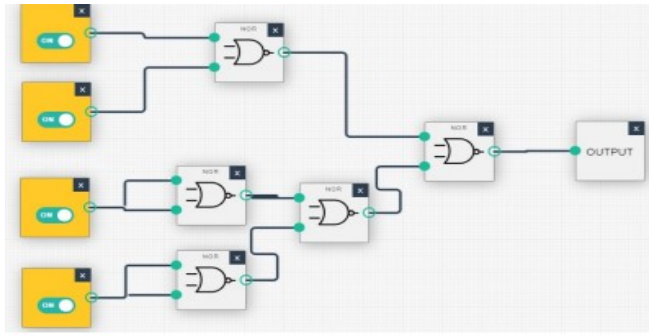
3. OR Gate:



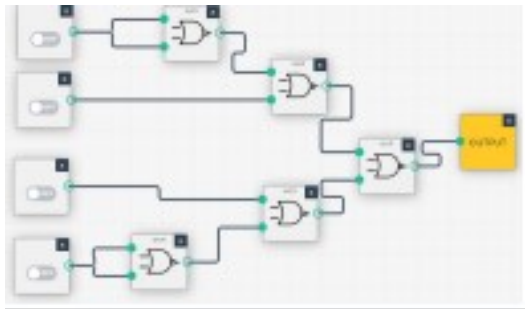
4.NAND Gate:



5.EX-OR Gate:



6.EX-NOR:



Conclusion: In this practical we concluded that how to use universal gates(NAND and NOR) using other gates.