Indian Institute of Information Technology, Allahabad

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

Course Name: Fundamental of Electrical and Electronics

EXPERIMENT NO: 5

Objective: Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR Exclusive OR (EX-OR) Gates.

Materials/ Component Required: Logic gate ICs 7400, 7402, 7404, 7408, 7432, 7486, wires

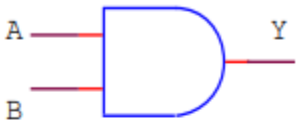
Theory: Logic gates are electronic circuits which perform logical functions on one or more inputs to produce one output. There are seven logic gates. When all the input combinations of a logic gate are written in a series and their corrresponding outputs written along them, then this input/ output combination is called **Truth Table**. Various gates and their working is explained here.

Pin Description of ICs:

(a) AND Gate

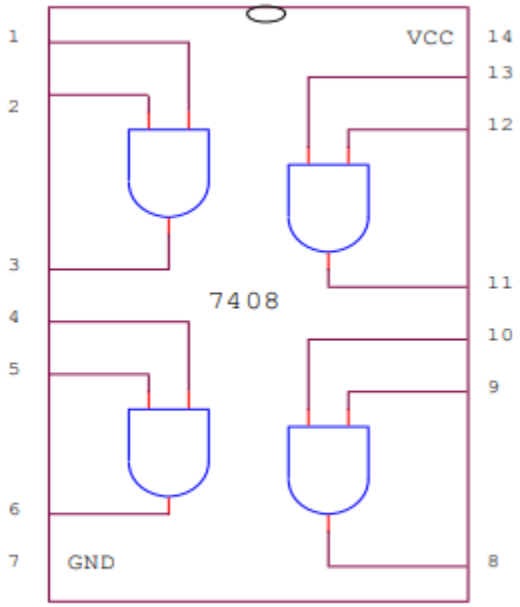
AND gate produces an output as 1, when all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when any input is 0.

AND GATE (7408)



Truth Table

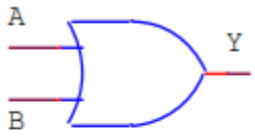
A	B	Y=A.B
0	0	0
0	1	0
1	0	0
1	1	1



(b) OR Gate

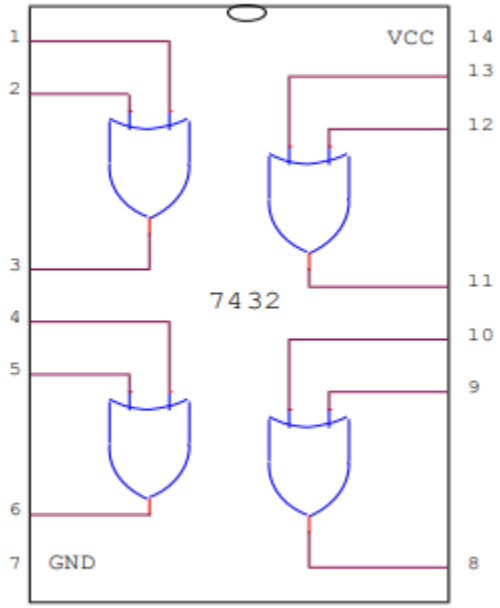
OR gate produces an output as 1, when any or all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when all input are 0.

OR GATE (7432)



Truth Table

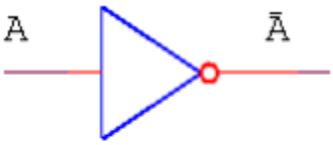
A	B	Y=A+B
0	0	0
0	1	1
1	0	1
1	1	1



(c) NOT Gate

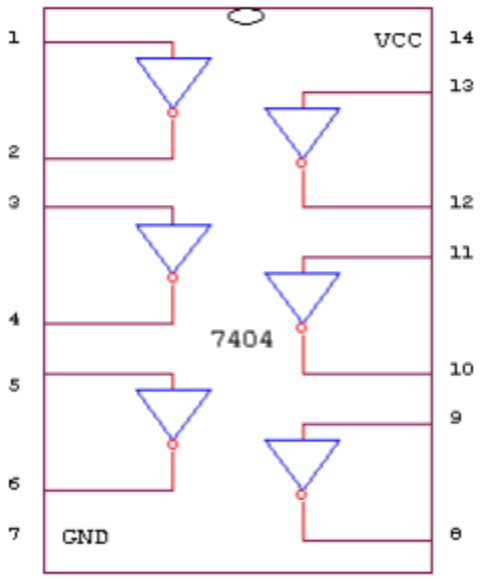
NOT gate produces the complement of its input. This gate is also called an INVERTER. It always has one input and one output. Its output is 0 when input is 1 and output is 1 when input is 0.

NOT GATE (7404)



Truth Table

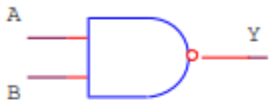
A	Y=Ā
0	1
1	0

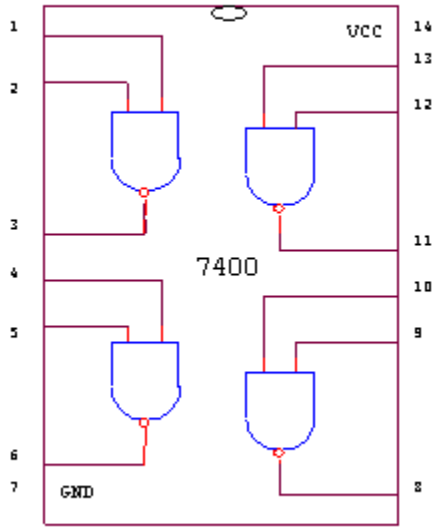


(d) NAND Gate

NAND gate is actually a series of AND gate with NOT gate. If we connect the output of an AND gate to the input of a NOT gate, this combination will work as NOT-AND or NAND gate. Its output is 1 when any or all inputs are 0, otherwise output is 1.

NAND GATE (7400)





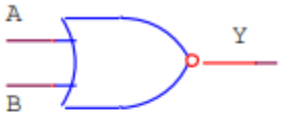
Truth Table

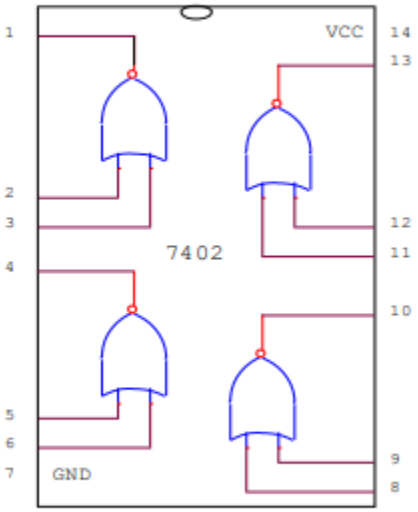
A	B	$Y = \overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

(e) NOR Gate

NOR gate is actually a series of OR gate with NOT gate. If we connect the output of an OR gate to the input of a NOT gate, this combination will work as NOT-OR or NOR gate. Its output is 0 when any or all inputs are 1, otherwise output is 1.

NOR GATE (7402)





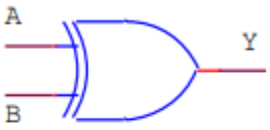
Truth Table

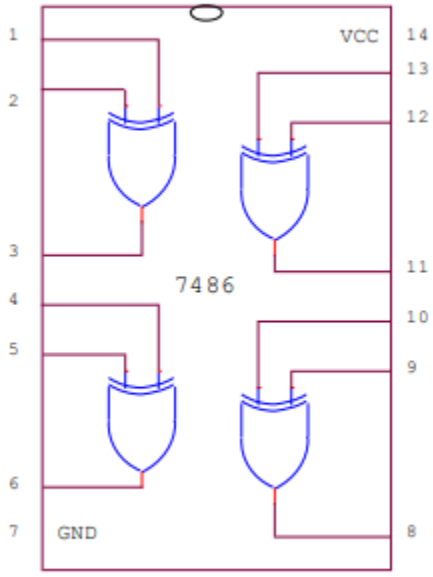
A	B	$Y = \overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

(f) Ex-OR Gate

X-OR gate produces an output as 1, when number of 1's at its inputs is odd, otherwise output is 0. It has two inputs and one output.

EX-OR GATE (7486)





Truth Table

A	B	Y=A⊕B
0	0	0
0	1	1
1	0	1
1	1	0

Result: Corresponding truth tables of logic gates are verified.

Precautions:

a) Supply should not exceed 5V.
b) Connections should be tight and inspect.
c) Use L.E.D. with proper sign convention and check it before connecting in circuit.