Experiment No. 2
Basic gates using universal gates.
Name: Shravani Sandeep Raut
Roll Number: 48
Date of Performance:
Date of Submission:

Aim - To realize the gates using universal gates.

Objective -

1) To study the realization of basic gates using universal gates.
2) Understanding how to construct any combinational logic function using NAND or NOR gates only.

Theory -

AND, OR, NOT are called basic gates as their logical operation cannot be simplified further. NAND and NOR are called universal gates as using only NAND or only NOR, any logic function can be implemented.

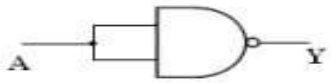
Components required -

1. IC's 7400(NAND) 7402(NOR)
2. Bread Board.
3. Connecting wires.

Circuit Diagram -

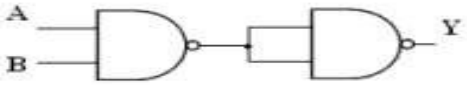
Implementation using NAND gate:

(a) NOT gate: $Y = A'$



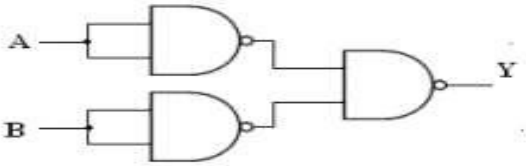
A	Y
0	1
1	0

(b) AND gate: $Y = A \cdot B$



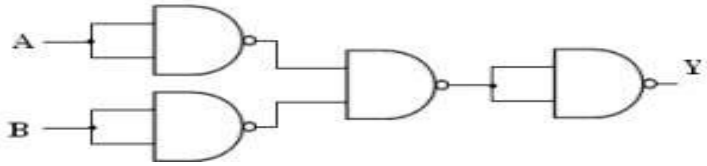
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(c) OR gate: $Y = A + B$



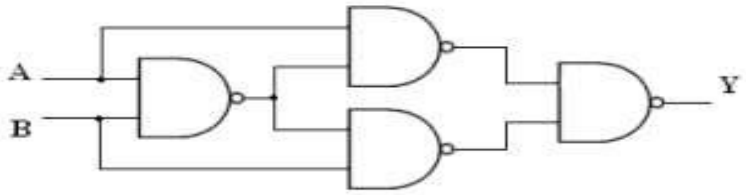
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(d) NOR gate: $Y = (A + B)'$



A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(e) Ex-OR gate: $Y = A \oplus B$



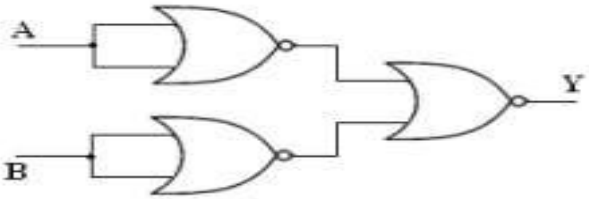
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

Implementation using NOR gate:

(a) NOT gate: $Y = A'$

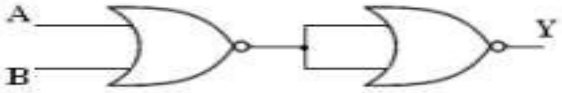
A	Y
0	1
1	0

(b) AND gate: $Y = A \cdot B$



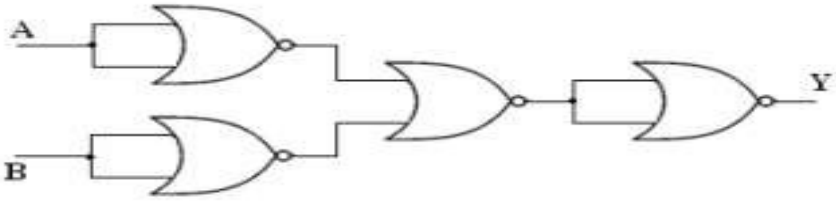
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(c) OR gate: $Y = A + B$



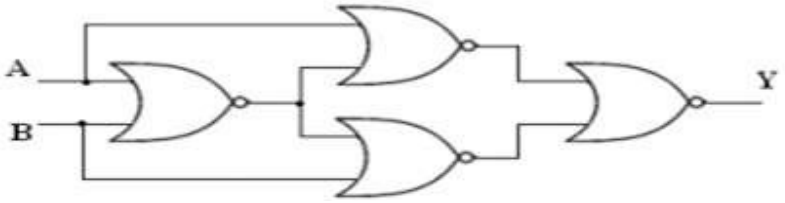
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(d) NAND gate: $Y = (AB)'$



A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(e) Ex-NOR gate: $Y = A \odot B = (A \oplus B)'$



A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

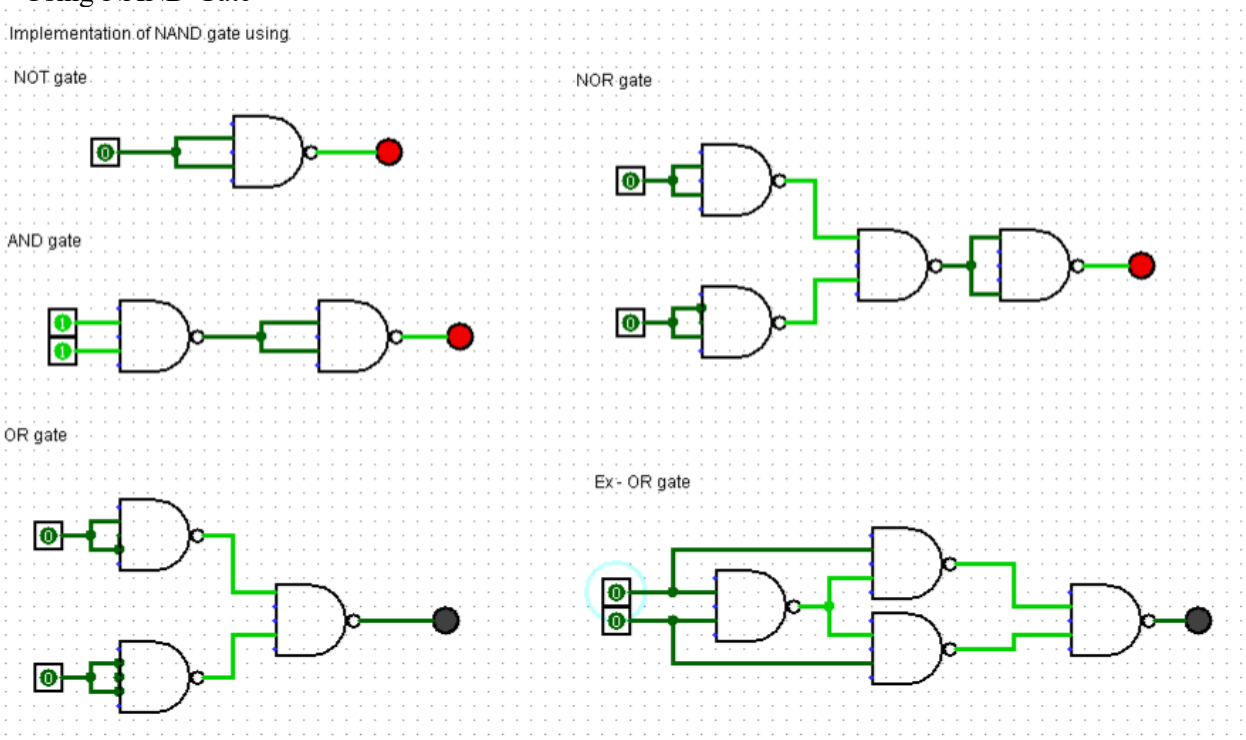
Procedure:

a) Connections are made as per the circuit diagrams.

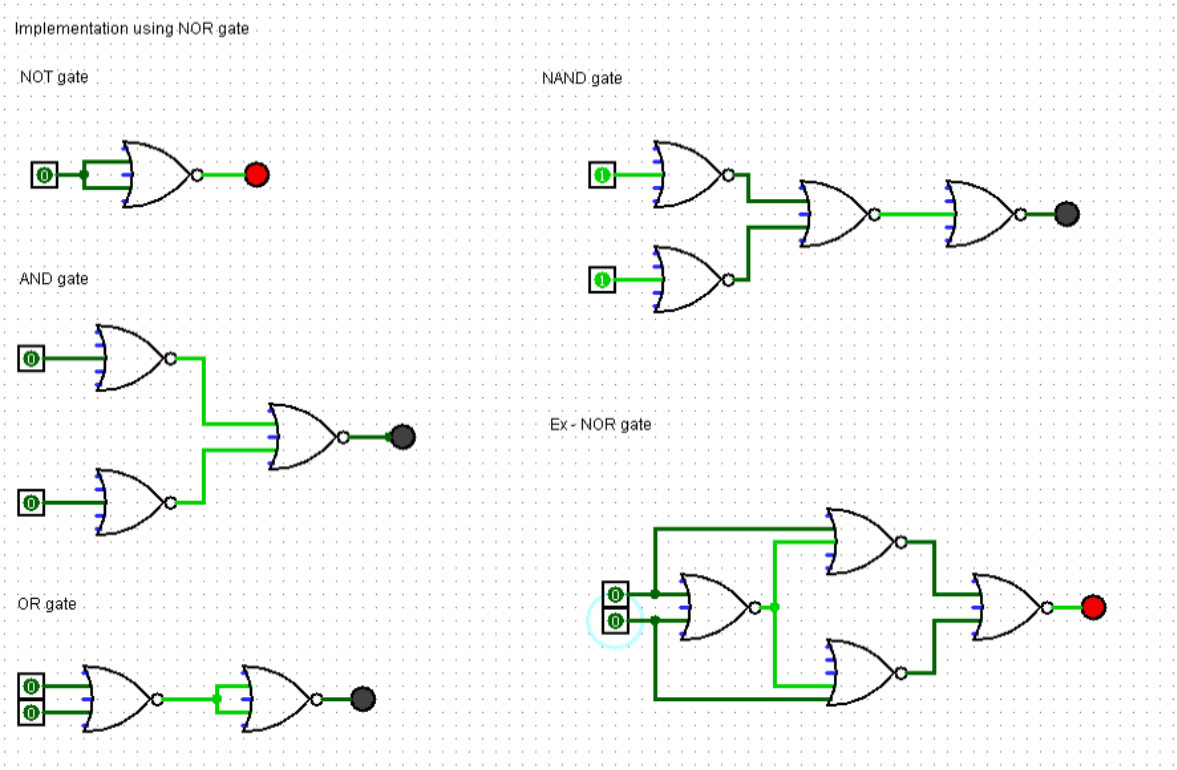
b) By applying the inputs, the outputs are observed and the operations are verified with the help of truth table.

Implementation-

Using NAND Gate-



Using NOR Gate-



Conclusion - In conclusion, the realization of basic logic gates using universal gates, such as NAND and NOR, demonstrates their versatility in digital circuit design. By understanding how to construct any combinational logic function with these gates, we can simplify circuit implementation and enhance design efficiency. This knowledge is fundamental for developing more complex systems while utilizing minimal components, showcasing the power of universal gates in electronics.