Experiment No. 2
Basic gates using universal gates.
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Date of Performance:
Date of Submission:

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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 is 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.

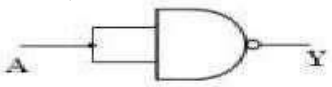
Components required -

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

Circuit Diagram -

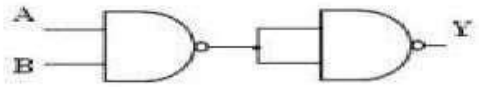
n using NANO gate:

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



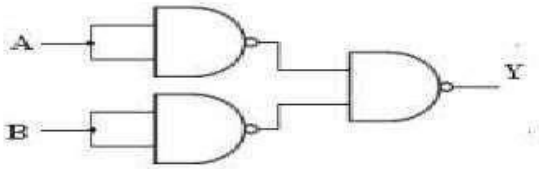
A	Y
0	1
1	0

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



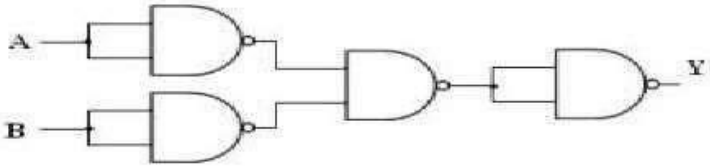
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

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



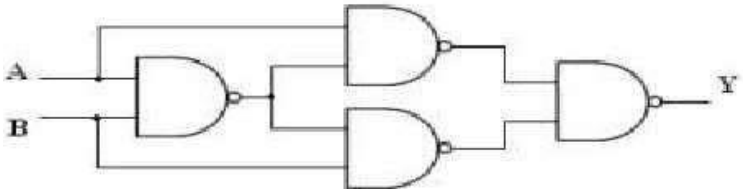
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(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

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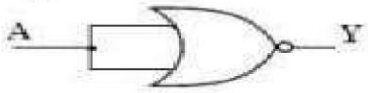
In-implementation using NOR gate:

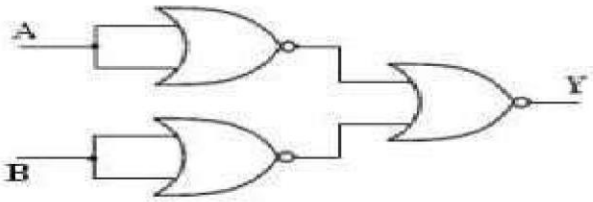
(a) NOT gate: $Y = A'$

(a) gate:



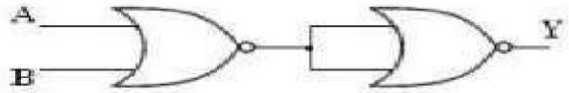
A	Y
0	1
1	0

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



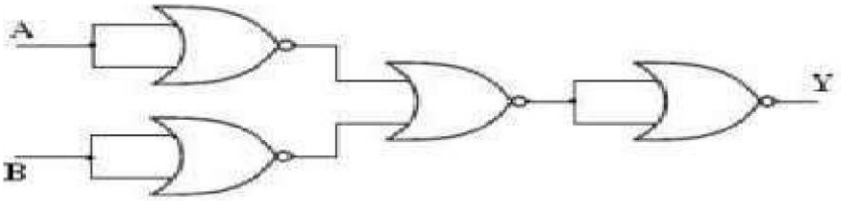
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

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



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

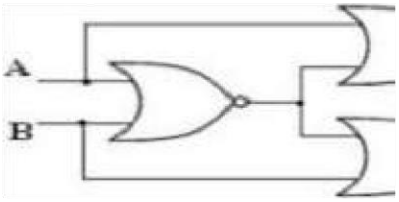
(d) NAND gate: $Y = (AB)'$



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



o	o	1
o	1	o
1	o	o
1	1	1

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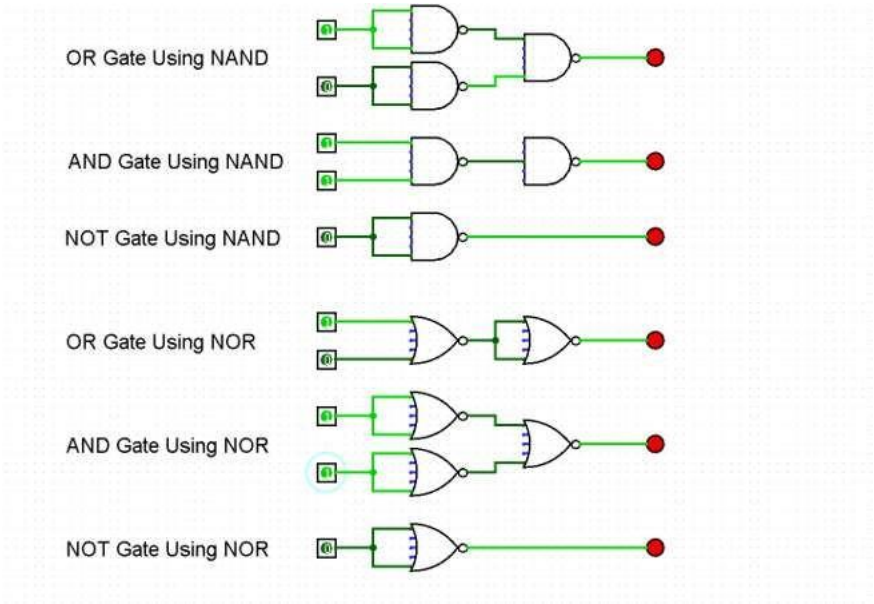
Screenshort:



Procedure: Connections are made as per the circuit diagrams. By applying the inputs, the outputs are observed and the operations are verified with the help of truth table.

Conclusion - The experiment showcased using NAND or NOR gates to simulate AND, OR, and NOT gates, highlighting their versatility in digital logic design. Universal gates simplify circuitry and enable complex logic functions with fewer components.

CSL302:

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