# RAJSHAHI UNIVERSITY OF ENGINEERING AND TECHNOLOGY

**LAB REPORT - 02**

COURSE NAME: SESSIONAL BASED ON CSE 2103
COURSE CODE: CSE 2104

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## 3.1) Experiment Name: Verify the Basic NOR gate (up to 5 Inputs) for all input combinations.

## Objectives:

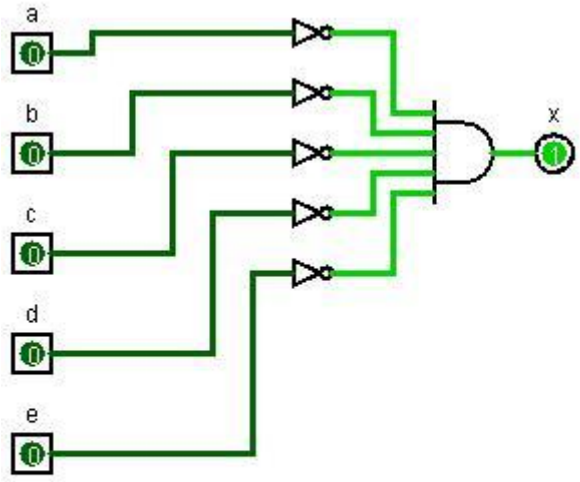
- To study and understand the NOR gate.
- To implement the logic circuit operation using NOT & OR gate.
- To write the Boolean expression for NOR gate.
- To draw the diagram of NOR gate.
- To generate the truth-table of NOR gate.

**Theory:** The circuit which produces an output signal only when there are no signals on any of the input connections is called **NOR** gate.The output of a NOR gate is true if all of its inputs are false or zero.On the otherhand,If one of more of the inputs are true,then the output is false.Suppose Z is output and A,B are two inputs then we express the NOR gate as: $\mathbf{Z = \overline{A + B}}$

## Experimental Analysis:

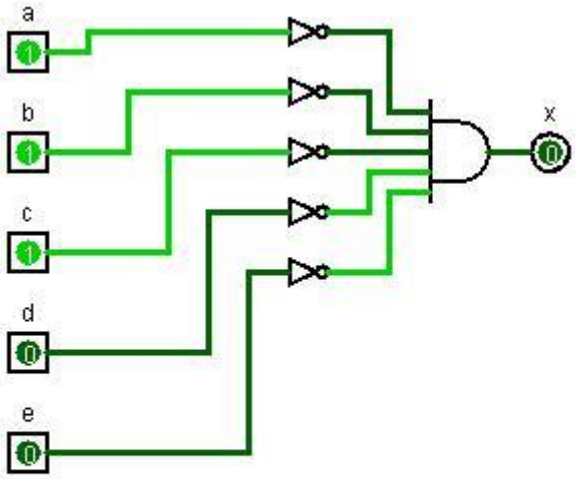
- **Circuit Diagram:**

  When all the input signals are 0,the output is 1.




Exp: 3.1.2

On the other hand,when one or more input signals is 1,the output is 0.




Exp: 3.1.2

- **Truth Table:**

| a | b | c | d | e | x |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 |

**Conclusion:** In this experiment,we discussed about NOR gate operation by giving five inputs.From the truth table,we came to know that a high output(1) results if all of the five inputs of the gate are low(0) & if one or more input is high (1),a low output(0) results.

## 3.2) Experiment Name: Verify the Basic NAND gate (up to 5 Inputs) for all input combinations.

## Objectives:

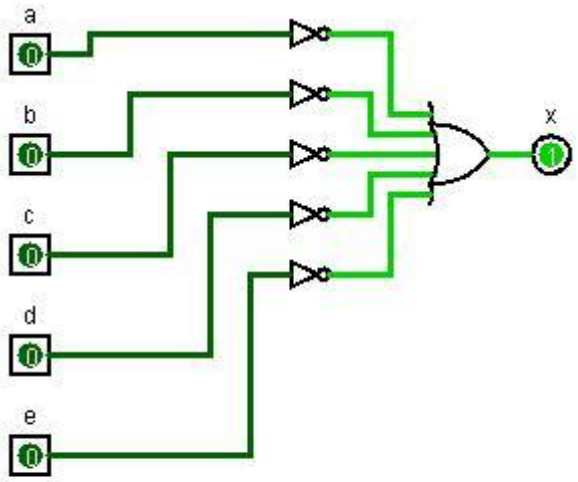
- To study and understand the NAND gate.
- To implement the logic circuit operation using AND & NOT gate.
- To write the Boolean expression for NAND gate.
- To draw the diagram of NAND gate.
- To generate the truth-table of NAND gate.

**Theory:** A NAND gate is a logic gate which produces an output which is false only if all its inputs are true.It's output is complement to the output of an AND gate.Suppose Z is output and A,B are the two inputs,then we can represent the NAND gate as : $\mathbf{Z = \overline{AB}}$

## Experimental Analysis:

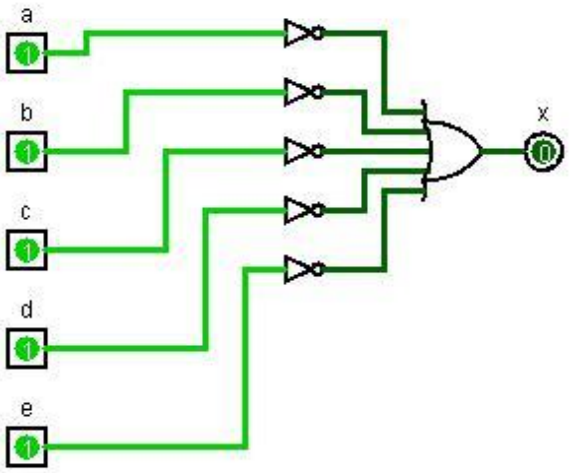
- **Circuit Diagram:**

When all the inputs are 0,the output is 1.




Exp: 3.2.2

When all the inputs are 1,the output is 0.




Exp: 3.2.2

- **Truth Table:**

| a | b | c | d | e | x |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 |

**Conclusion:** In this experiment,we discussed about NAND gate operation by giving five inputs.From the truth table,we came to know that a low output results only if all the five inputs of the gate are high and if any input is low,a high output results.

## 3.3) Experiment Name: Verify the Basic X-OR gate for all input combinations.

## Objectives:

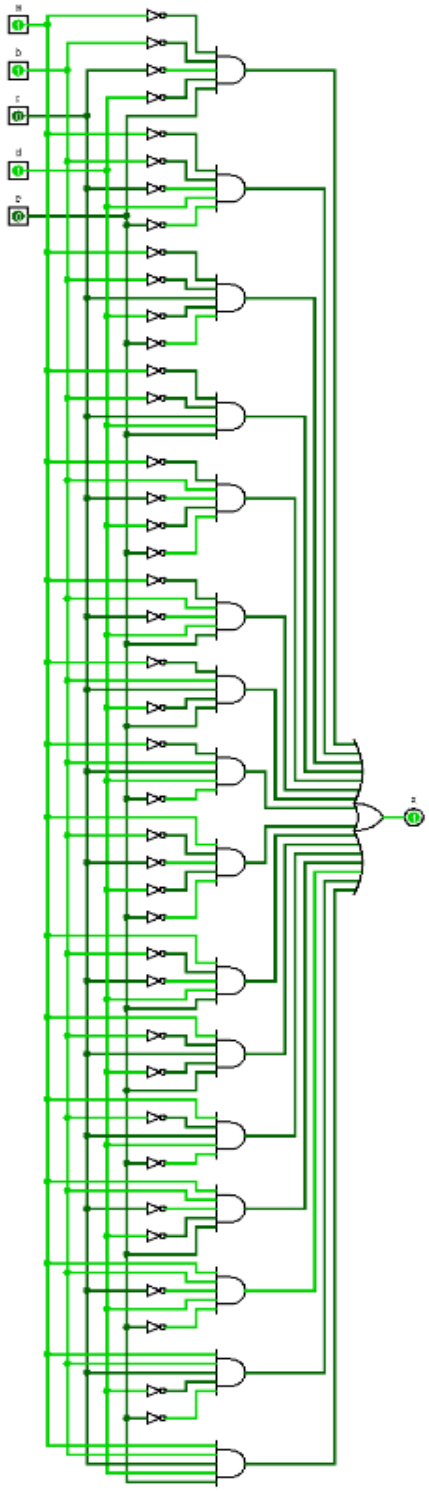
- To study and understand the X-OR gate.
- To implement the logic circuit operation using AND,OR and NOT gate.
- To write the Boolean expression for X-OR gate.
- To draw the diagram of X-OR gate.
- To generate the truth-table of X-OR gate.

**Theory:** X-OR gate is a digital logic gate that gives a true output when the number of true inputs is odd.It is the combination of AND,OR and NOT gate.Suppose Z is output and A,B are the two inputs,then we can represent the X-OR gate as: $\mathbf{Z = A\bar{B} + \bar{A}B}$

## Experimental Analysis:

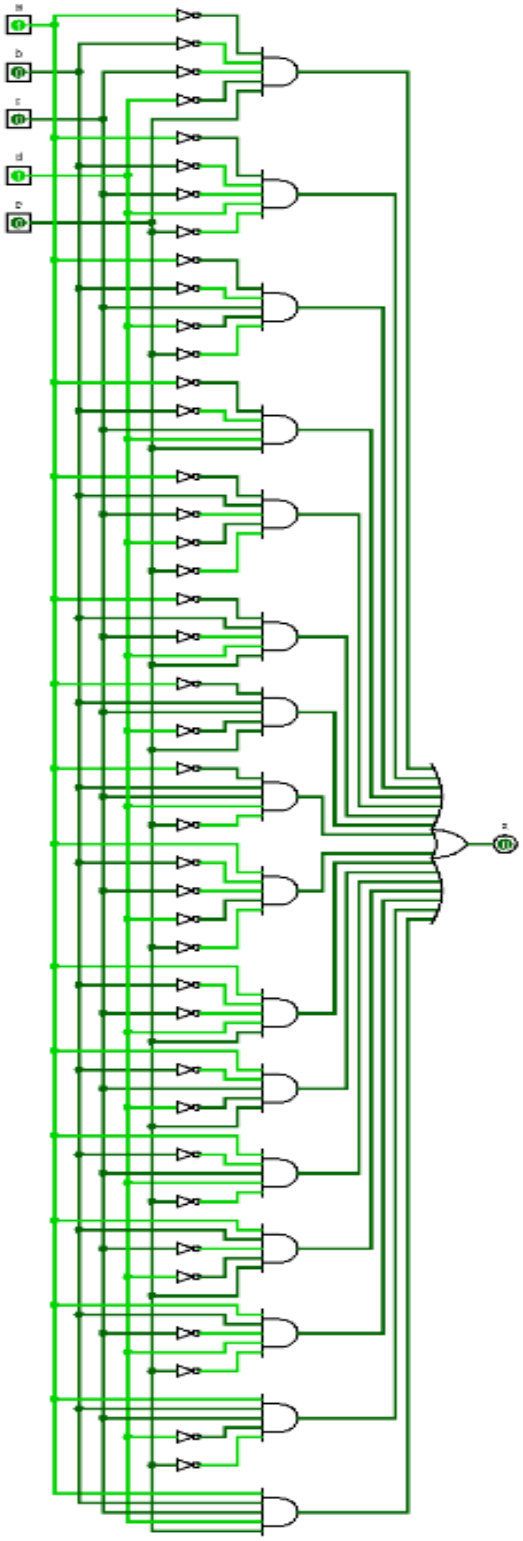
- **Circuit Diagram:**

When odd number of inputs are 1,the output is 1.



Exp: 3.3.2

When even number of  inputs are 1,the output is 0.



Exp: 3.3.2

- **Truth Table:**

| a | b | c | d | e | x |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |

**Conclusion:** In this experiment,we discussed about X-OR gate operation by giving five inputs.From the truth table,we came to know that a true output results if odd number of the inputs to the gate is true.On the other hand,if even number of inputs are true,a false output results.

**3.4) Experiment Name:** Verify the Basic X-NOR gate (up to 5 Inputs) for all input combinations.

## Objectives:

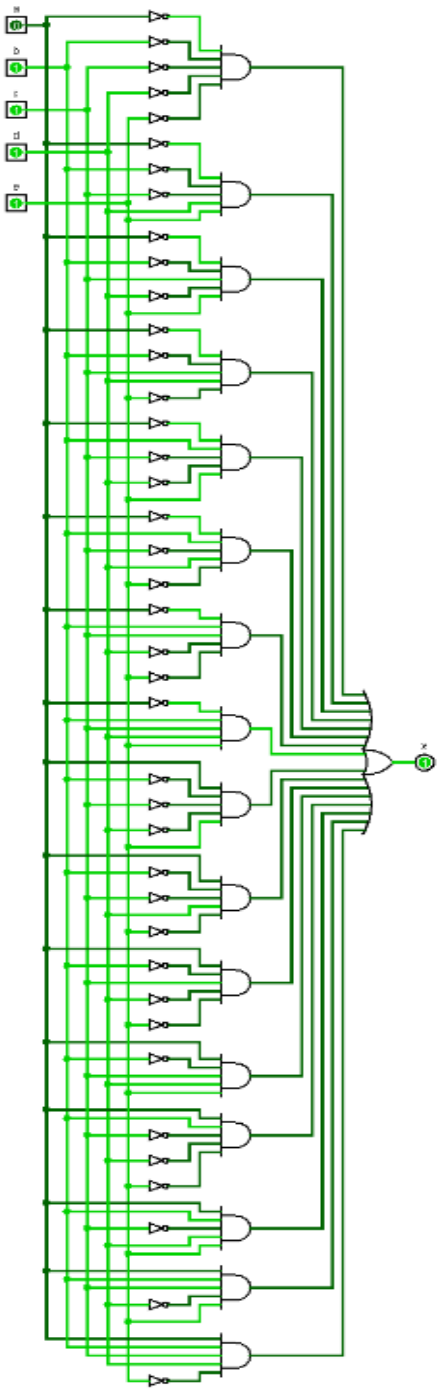
- To study and understand the X-NOR gate.
- To implement the logic circuit operation using AND,OR and NOT gate.
- To write the Boolean expression for X-NOR gate.
- To draw the diagram of X-NOR gate.
- To generate the truth-table of X-NOR gate.

**Theory:** X-NOR gate is a digital logic gate that gives a true output when the number of true inputs is even.It is the combination of AND,OR and NOT gate.Suppose Z is output and A,B are the two inputs,then we can represent the X-OR gate as: $\mathbf{Z = \sim(A\bar{B} + \bar{A}B)}$

## Experimental Analysis:

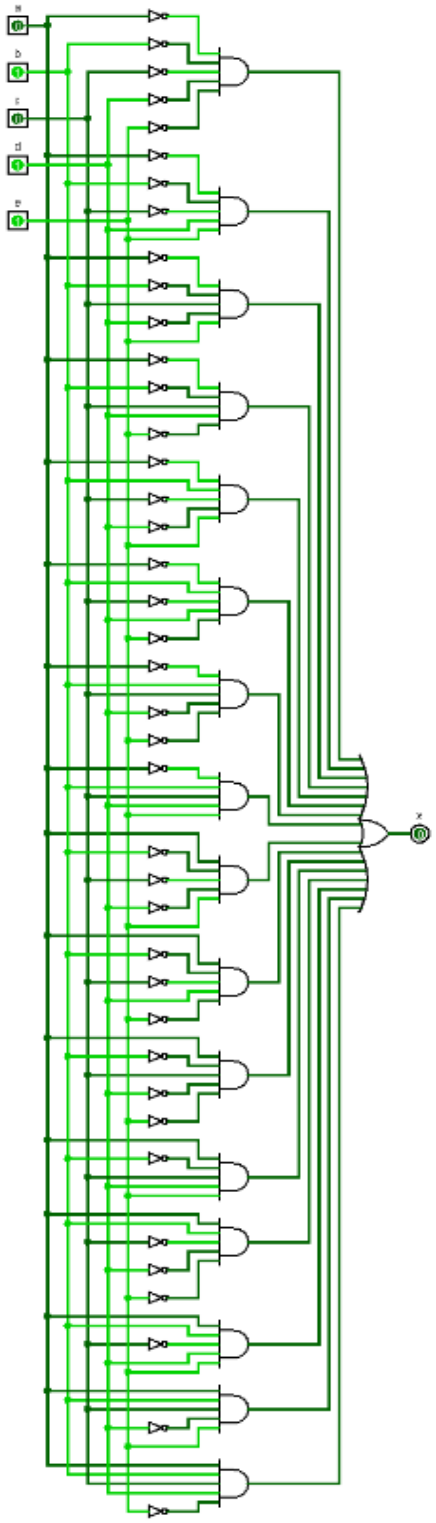
- **Circuit Diagram:**

When even number of inputs are 1,the output is 1.



Exp: 3.4.2

When odd number of  inputs are 1,the output is 0.



Exp: 3.4.2

- **Truth Table:**

| a | b | c | d | e | x |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 |

**Conclusion:** In this experiment,we discussed about X-NOR gate operation by giving five inputs.From the truth table,we came to know that a true output results if even number of the inputs to the gate is true.On the other hand,if odd number of inputs are true,a false output results.