Jawahar Education Societys Annasaheb Chudaman Patil College of Engineering, Kharghar, Navi Mumbai

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SUBJECT: DIGITAL LOGIC & COMPUTER ORGANIZATION AND ARCHITECTURE LAB

01

AIM: To verify the truth table of various logic gates using ICs

Practical No. 1

- **Aim**: To verify the truth table of various logic gates using ICs.
- **Objectives**: To understand the truth table of various logic gates.
- **Outcomes**: The learner will be able to

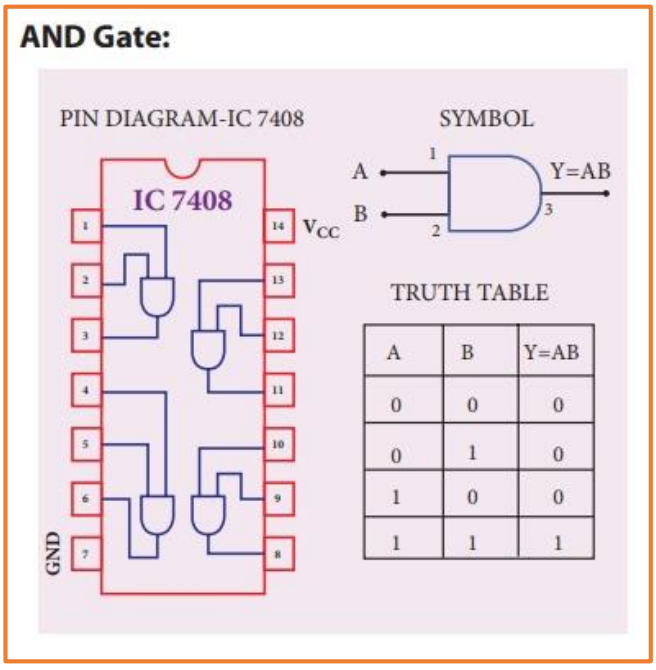
  Verify the truth table of various logic gates.

- **Hardware / Software Required:** Virtual Lab simulator for Computer Organization and Architecture developed by the Department of CSE, IIT Kharagpur.
- **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 corresponding outputs written along them, then this input/ output combination is called Truth Table. Various gates and their working are explained here.

➢ 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.



IC 7408

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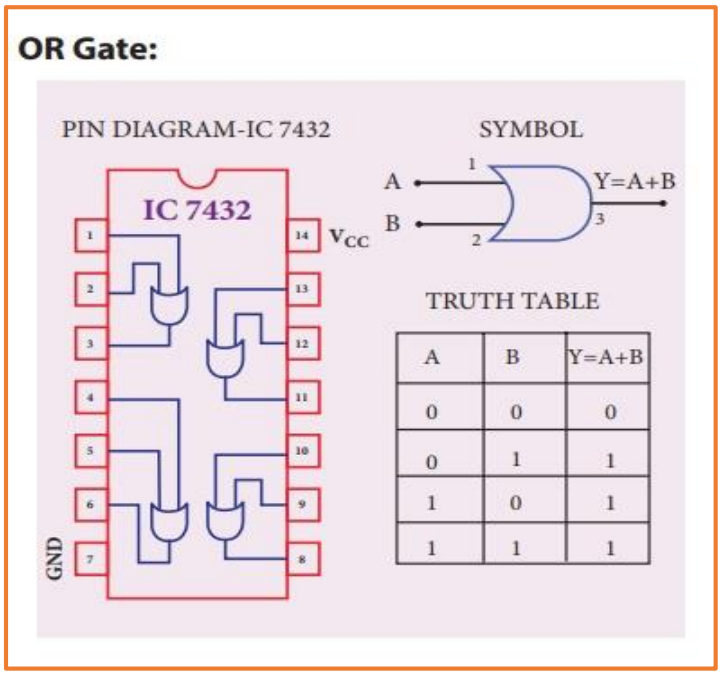
- **OR Gate:**

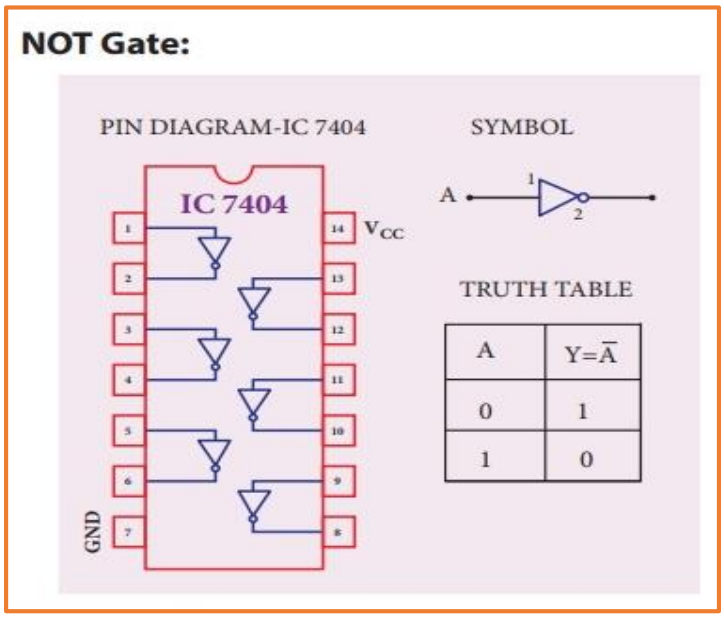
OR Gate OR gate produces an output as 1, when any or all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 input output is 0 when all input are 0.



IC 7432

- **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.



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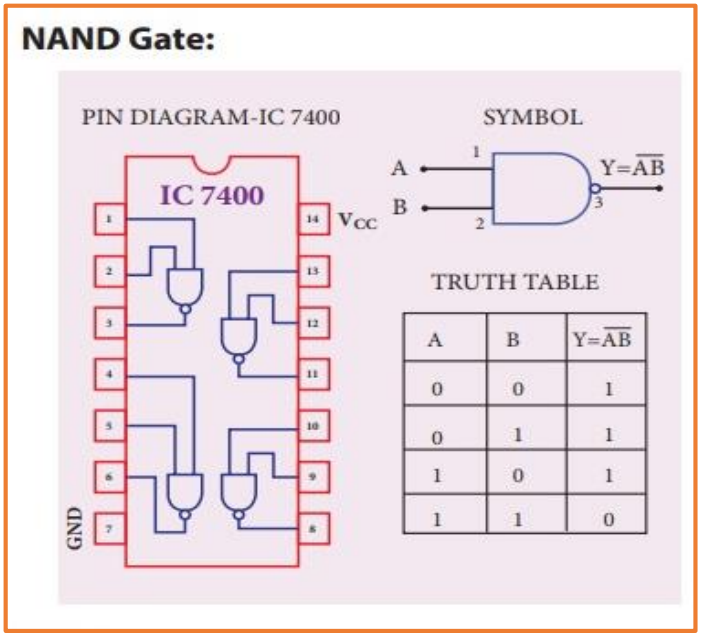
- **NAND Gate:**

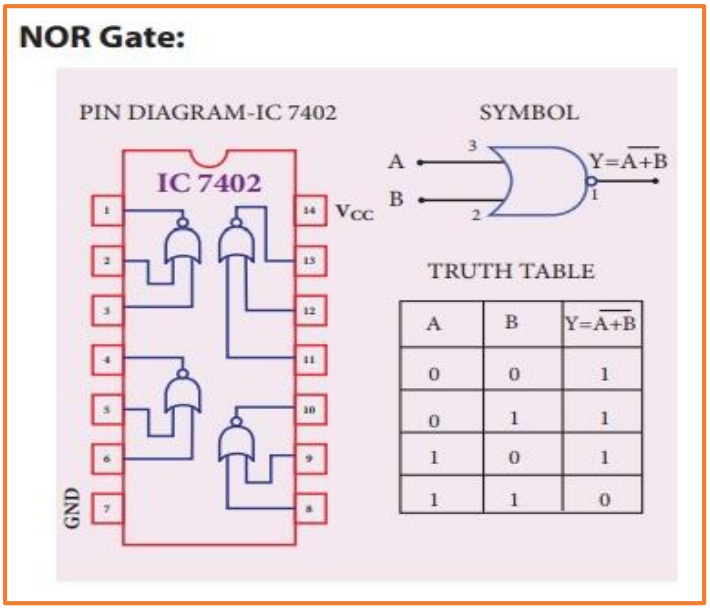
NAND gate is actually a series of AND gate with NO output of an AND gate to the input of a NOT gate. If we connect the gate, this combination will work as NOT-AND or NAND gate. Its output is 1 when any or all inputs are 0, otherwise output is 1.



IC 7400

- **NOR Gate**:

NOR gate is actually a series of OR gate of an OR gate with NOT gate. If we connect the output 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.



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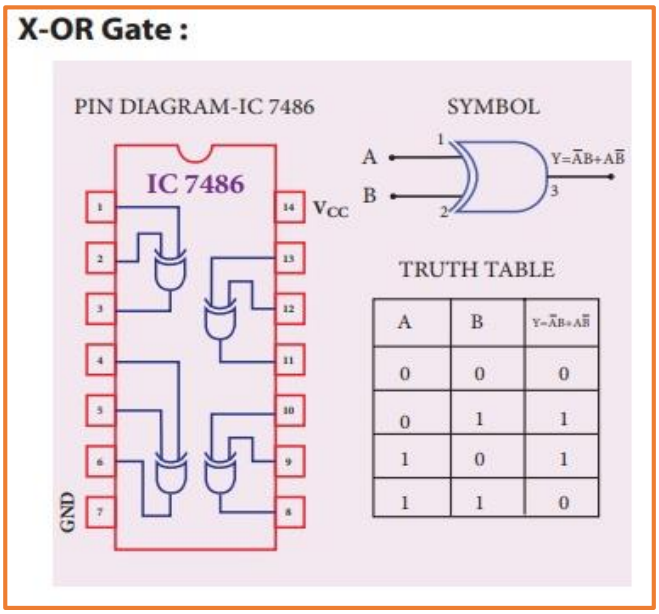
- **Exclusive-Or (X-Or) Gate:**

  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.



IC 7486

● Procedure:

1) Start the simulator as directed. This simulator supports 5-valued logic.
2) To check truth table of various gates we need one AND gate, OR gate, NOT gate, NOR gate, NAND gate, X-OR gate, two 1-bit switches, 1 bit display and wires.
3) Click on the AND gate component (in the Adder drawer in the pallet) and then click on the position of the editor window where you want to add the component (no drag and drop, simple click will serve the purpose), likewise add, two 1 Bit switches, and 1 bit Displays (from Display and Input drawer of the pallet, if it is not down in the drawer).
4) To connect any two components select the Connection menu of Palette, and then click on the Source terminal and click on the target terminal.
5) To see the circuit working, click on the Selection tool in the pallet then give input by double clicking on the bit switch, you will see the output on the output apply various input combinations and observe output for each one.
6) Verify the truth table for each input/ output combination.
7) Repeat the process for all other logic gates.

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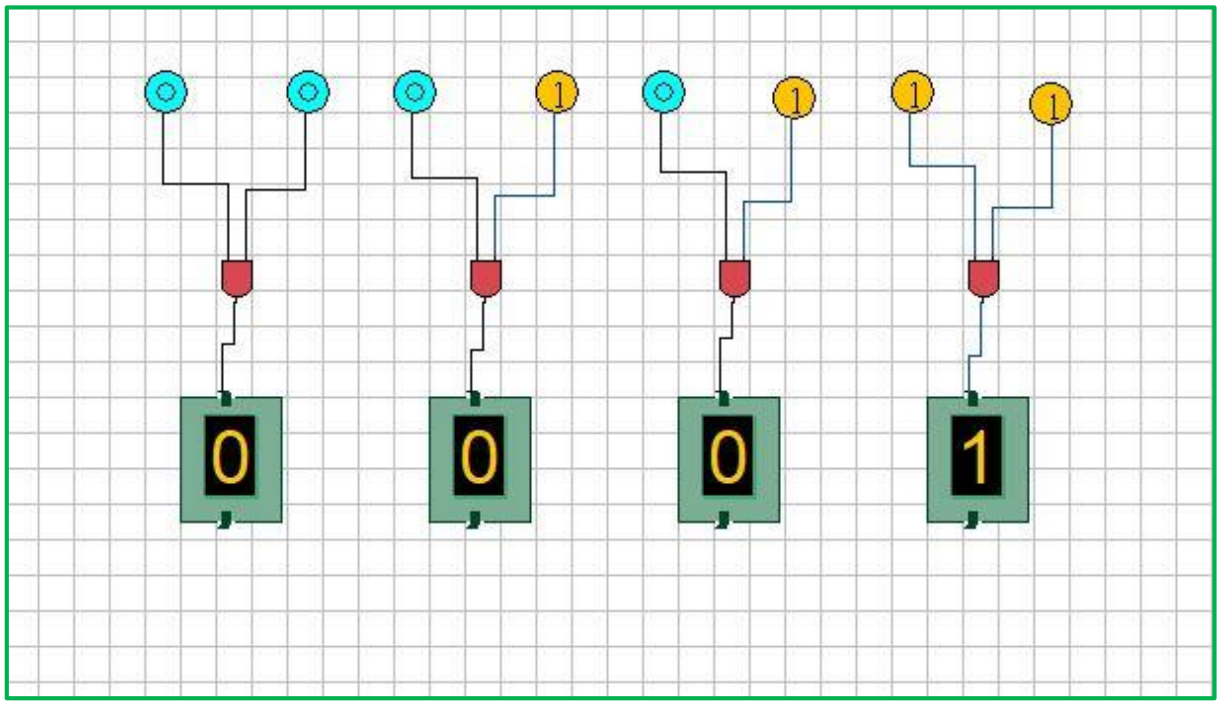
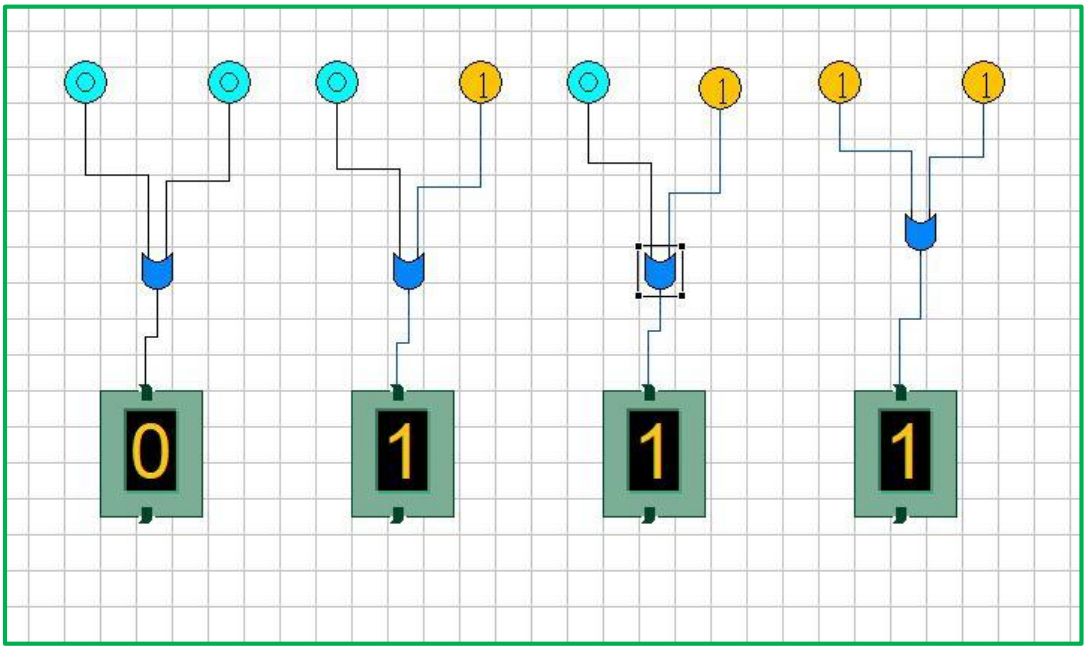
● **Results**:

(Screenshot):

AND GATE:



OR GATE:



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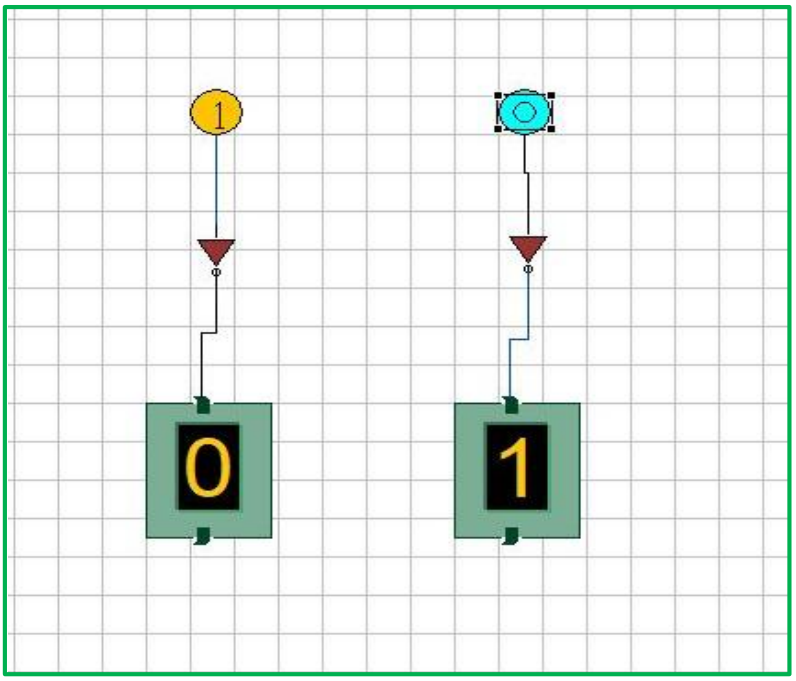
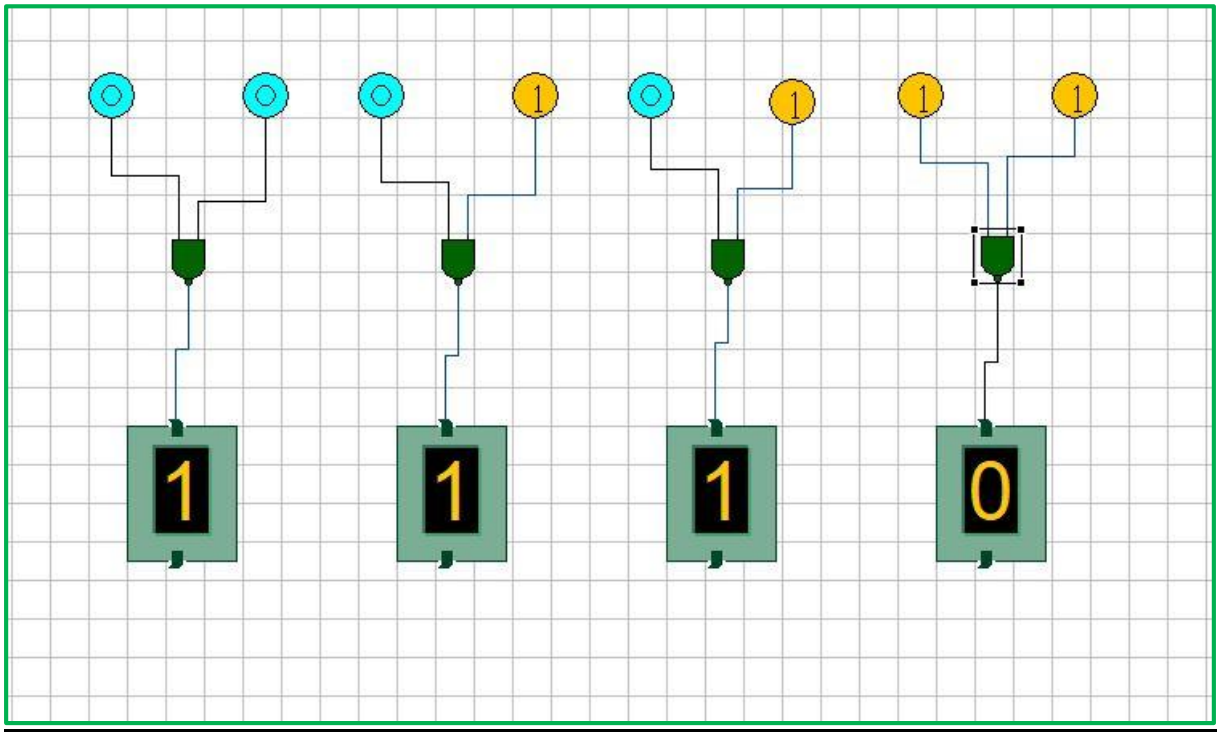
NOT GATE:



NAND GATE:



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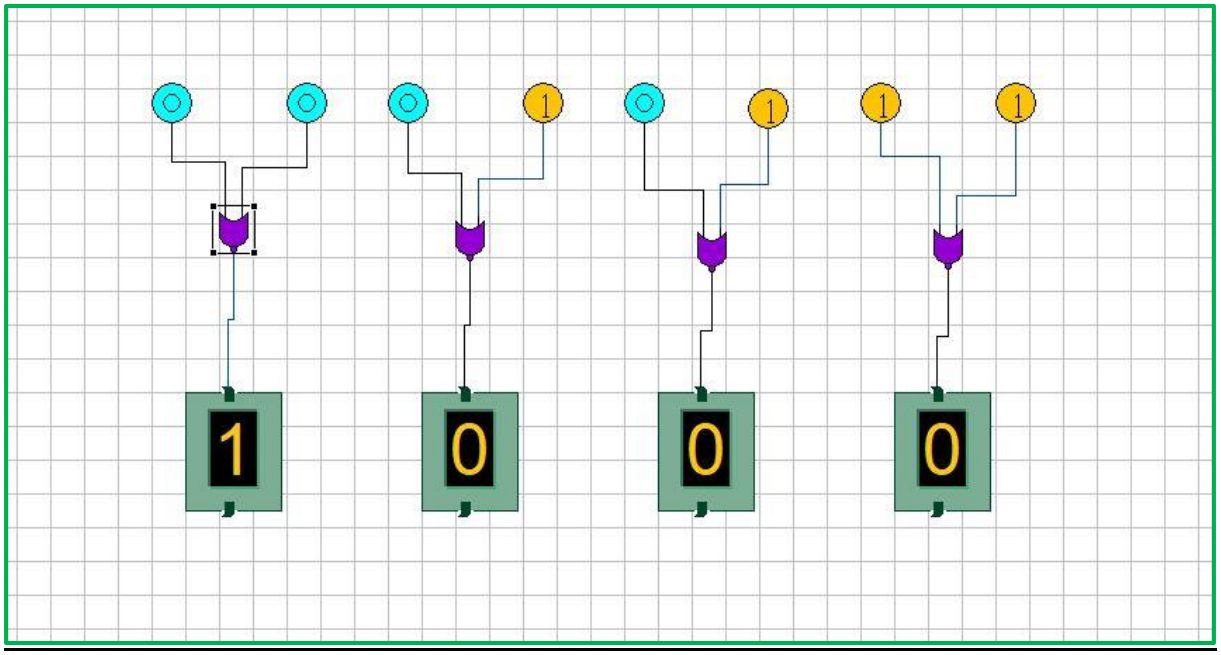
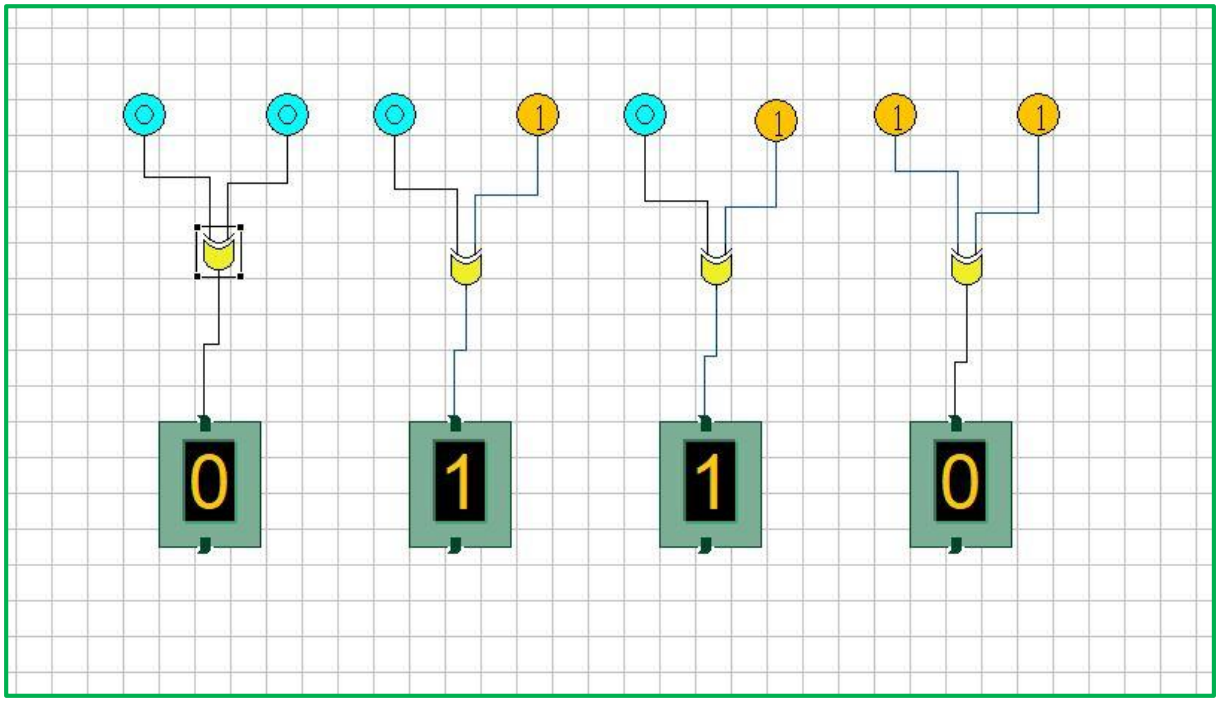
NOR GATE:



X-OR GATE:



● **Conclusion:** The truth table of logic gates **AND, OR, NOT, Ex-OR, NAND and NOR** using integrated circuits is verified.