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Digital Logic

Lab 3

Objective:

* Use a circuit to develop truth tables for the logic gates.
* Use the information in the truth tables to discover the logic functions of the gates.

Procedure:

1. Purpose: Go to one of the breadboards. There are four different breadboards to identify.
2. Create a truth table with the four input possibilities (00, 01, 10, and 11) for the gate on the unknown chip. Use the switches to provide 5V (a digital 1) when the switch is pressed or 0V (a digital 0) when the switch is released to the gates’ inputs and record your results in the truth table. Use the information in the truth table to identify the gate type. (Does it implement an AND, OR, NAND, NOR or XOR function?)
3. Repeat step 2 for each of the three remaining unknown chips by removing the chip from the breadboard and placing another chip in the same location. Take care not to bend/break the pins when removing the chip.

Results:

1.

|  |  |  |
| --- | --- | --- |
| a | b | c |
| 0 | 0 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |

NAND gate

2.

|  |  |  |
| --- | --- | --- |
| a | b | c |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

AND gate

3.

|  |  |  |
| --- | --- | --- |
| A | b | c |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

OR gate

4.

|  |  |  |
| --- | --- | --- |
| a | b | c |
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |

XOR gate

Conclusion:

With these results, these logic gates performed as expected and the gates were identifiable. This exercise allowed us to determine the logic gates from inputs and outputs. With a simple activity, we learned and reinforced logic gate functions by applying them.

Appendix: Logic tables reference:

Diagram

Description automatically generated with low confidence