EXP NO:- 2

13-08-2024

OBJECTIVE

study of operation of all logic gates

THEORY

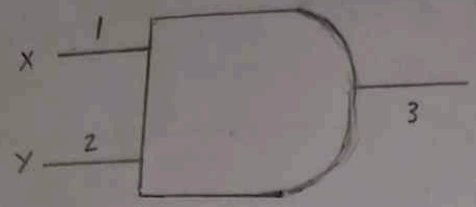
Logic Gates

A logic gate is an idealized or physical device implementing a boolean function, that is, it performs a logical operation on one or more logic inputs & produces a single logic output. Depending on the context, the term may refer to an ideal logic gate, one that has for instance zero rise time & unlimited fan out, or it may refer to a non-ideal physical device.
logic gates are primarily implemented using diodes or transistors acting as electronic switches, but can also be constructed using electromagnetic relays (relay logic), fluidic logic, pneumatic logic optics, molecules, or even mechanical ~~events~~ elements. With amplification, logic gates can be cascaded in the same way that boolean functions can be composed, allowing the construction of a physical model of all of boolean logic, & therefore, all of the algorithms & mathematics that can be described with boolean logic.

And Gate

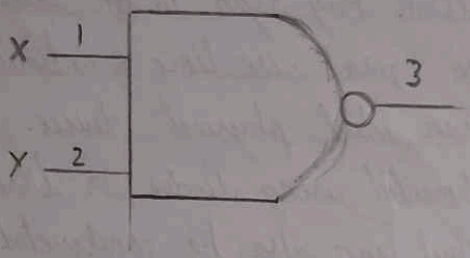
The AND gate is a basic digital logic gate that implements logic conjunction - it behaves according to the truth table to the right. A HIGH output (1) results only if both the inputs to the AND gate are HIGH. If neither or only one input to the AND gate is HIGH, a LOW output results.

AND Gate



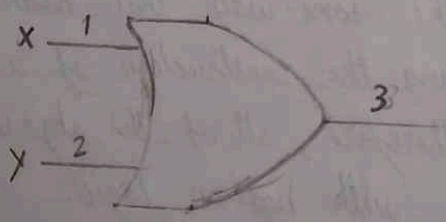
X	Y	Output: Theoretical	Output: Practical
0	0	0	0
0	1	0	0
1	0	0	0
1	1	1	1

NAND Gate



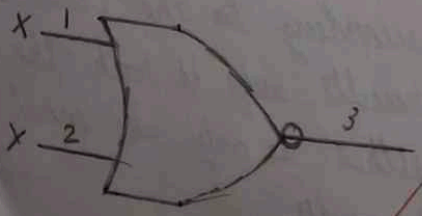
X	Y	Output: Theoretical	Output: Practical
0	0	1	1
0	1	Ø 1	Ø 1
1	0	Ø 1	Ø 1
1	1	0	0

OR Gate



X	Y	Output: Theoretical	Output: Practical
0	0	0	0
0	1	1	1
1	0	1	1
1	1	1	1

NOR Gate



X	Y	Output: Theoretical	Output: Practical
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

NOT Gate (Inverter)

The NOT gate is also known as an inverter; simply because it changes the input to its opposite. The NOT gate accepts only one input & the output is the opposite of the input. In other words, a low voltage input (0) is converted to a high-voltage output (1).

OR Gate

The OR gate is a ~~gate~~ digital logic gate that implements logical disjunction - it behaves according to the truth table to the right. A HIGH output results if one or both the inputs to the gate are HIGH. If neither are HIGH, a low output results.

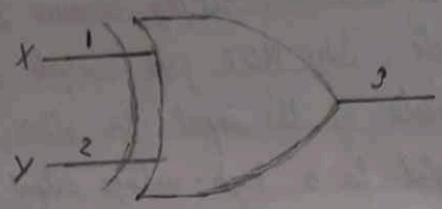
NAND Gate

The Negated AND, NOT AND, or NAND gate is the opposite of the digital AND gate, & behaves in a ~~room~~ manner that corresponds to the opposite of AND gate, as shown in the table on the right. A low (0) output results only if both the inputs to the gate are HIGH (1). If one or both inputs are low, A HIGH output results.

NOR Gate

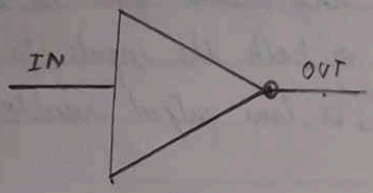
The Negated OR, NOT OR, NOR gate is the opposite of the digital OR gate, & behaves in a manner that corresponds to the opposite of OR gate, as shown in the truth ~~b~~ table on the right. A HIGH output Results only if both the inputs to the gate are ~~low~~ LOW; If one or both inputs are HIGH, a LOW output Results.

XOR Gate



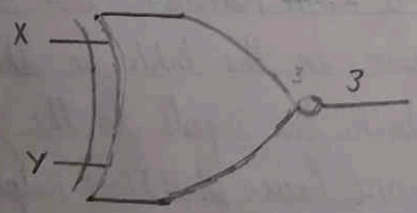
X	Y	Output: Theoretical	Output: Practical
0	0	0	0
0	1	1	1
1	0	1	1
1	1	0	0

NOT Gate



IN	Output: Theoretical	Output: Practical
0	1	1
1	0	0

XNOR



X	Y	XOR	XNOR: Theoretical	XNOR: Practical
0	0	0	1	1
0	1	1	0	0
1	0	1	0	0
1	1	0	1	1

EX-OR Gate

The XOR (sometimes EOR or EX-OR gate) is a digital logic gate that implements an exclusive or; that is, a true output (1) results if one & only one, of the inputs to the gate is true (1). If both inputs are false or both are true, a false output Results.

XNOR Gate

The Negated XOR, XNOR gate is the opposite of the XOR gate, & behaves in a manner that corresponds to the opposite of the XOR gate, as shown in truth table. A High output results only if both the inputs to the gate are law. or HIGH. A LOW output results if only one of the inputs or is high.

EQUIPMENT NEEDED

Components	Quantity
IC 7408 2 input AND Gate	1
IC 7432 2 input OR Gate	1
IC 7400 2 input NAND Gate	1
IC 7402 2 input NOR Gate	1
IC 7486 2 input X-OR Gate	1
IC 7404 NOT Gate	1

PROCEDURE

When Switch is pressed it indicates switch is in high position.
When Switch is unpressed it indicates switch is in low position.

AND Gate

① Place IC 7408 on bread board.
② Connect +5V to pin no. 14 of IC 7408 & GND to pin no. 7
③ Connect inputs X & Y (pins 1 & 2) of AND to the input switches 10 & respectively
④ Connect ~~inputs~~ output of AND Gate i.e pin no. 03 to 00 of 10 output ~~to~~ LED indicator.
⑤ Switch on the kit.
⑥ Set switches S0 & S1 initially to low position.
⑦ Observe output of AND gate on LED L0 of 10 output indicator.
⑧ Observe the output for diffrent input combination as shown in truth table
⑨ Verify Truth Table.

NAND Gate

① Place IC 7400 on ~~board~~ Bread board.
② Connect +5V to pin 14 of IC 7400 & GND to pin 7
③ Connect inputs X & Y (pins 1 & 2) of NAND gate the the input switches 10 & respectively
④ Connect output of NAND gate i.e pin 3 to 00 of 10 output LED indicator
⑤ Switch on the kit
⑥ Set switches S0 & S1 initially to low position
⑦ Observe output of NAND Gate on LED L0 of 10 output LED indicator

⑧ Observe the output for different input combination as shown in truth table.
⑨ Verify truth table.

OR Gate

① Place IC 7432 on bread board
② Connect +5V to Pin 14 of IC 7432 & GND to pin no. 7.
③ Connect inputs X & Y (pin 1 & 2) of OR gate to the input switches 10 & 11 respectively
④ Connect output of OR gate i.e pin 3 to 00 of 10 output LED indicator.
⑤ Switch on the kit.
⑥ Set the input switches S0 & S1 initially to LOW position.
⑦ Observe output of OR gate on LED L0 of 10 output LED indicator.
⑧ Observe the output for different input combination as shown in truth table
⑨ Verify truth table.

NOR Gate

① Place IC 7402 on bread board.
② ~~Place~~ Connect +5V to pin 14 of IC 7402 & GND to pin 7.
③ Connect inputs X & Y (pin 2 & 3) of NOR gate to the input switches 10 & 11, respectively.
④ Connect output of NOR gate i.e pin 1 to 00 of 10 output LED indicator
⑤ Switch on the kit
⑥ Set the input switches S0 & S1 initially to LOW position
⑦ Observe output of NOR gate on LED L0 of 10 output LED indicator
⑧ Observe the output for different input combinations as shown in

truth table.

⑨ Verify truth table

XOR Gate

① Place IC 7486 on bread board

② Connect +5V to pin 14 of IC 7486 & GND to pin 7

③ Connect output of XOR gate i.e pin 3 to O0 of IO output LED indicator

④ Connector inputs X&Y (pin 1&2) of XOR gate to the input switches I0 & I1 respectively

⑤ Switch on the kit

⑥ Set the input switches S0 & S1 initially to LOW position

⑦ Observe output of XOR gate on led L0 & L1 of IO output LED indicator

⑧ Observe the output for different input combination as shown in truth table

⑨ Verify truth table.

NOT gate

① Place IC 7404 on ~~board~~ bread board

② Connect +5V to pin 14 of IC 7404 & GND to pin 7

③ Connect inputs EN (pin 1) of NOT gate to the input switch I0.

④ Connect output of ~~not~~ NOT gate i.e pin 2 to O0 of IO output LED indicator

⑤ Switch on the Kit.

⑥ Set the input switch S0 to low initially.

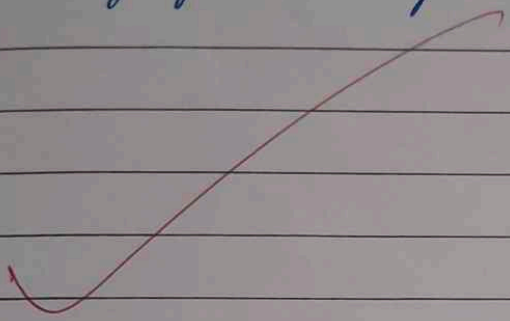
⑦ Observe output of NOT gate on LED L0 of IO bits output LED indicator

⑧ Observe the output for different input combination as shown in truth table.

⑨ Verify truth table

RESULT

Working of all basic gate is studied & truth table verified.



Conclusion :

Working of all basic gate is studied & truth table verified.

Assessment of the Experiment / Assignment :

Timely Submission (07)	Presentation (06)	Understanding (12)	Total (25)	Signature of Teahcer with date
07	06	11	24	26/8/24