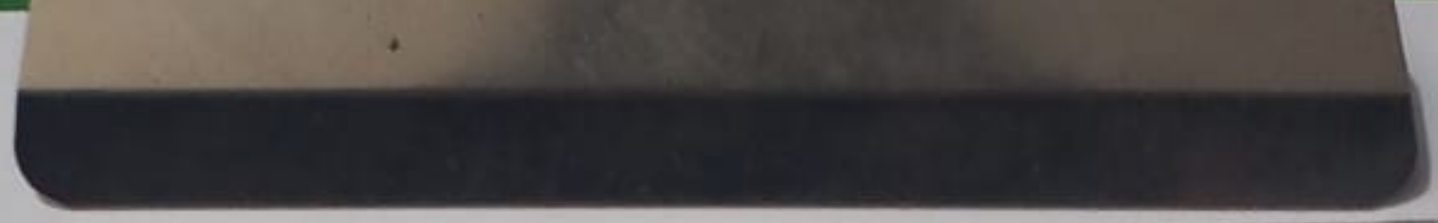

Practical 1. Realize three input AND, OR, NAND and NOR gates with logic diagram and truth table.

(i) AND Gate:

Objectives: After completing this practical:

ⓐ We will be able to identify and explain of function of 3-input AND gate.

ⓑ Draw the symbols for the AND Gate.

ⓒ Develop truth tables for the 3-input AND gate.

Requirements:

(i) Digital Kit and Simulator

(ii) AND gate

(iii) Connecting wires

(iv) Interactive / Sequence generator as input

(v) LED as Output

Theory:

(i) Introduction:

An AND gate outputs a logical "high" (1) only if all inputs are high. For three-input AND gate, the output depents on the logical conjuction of A.B.C.

(iii) Functional Expression:

The output of a three-input AND gate can be expressed as:

$$Y = A \cdot B \cdot C$$

(iii) Circuit Diagram:

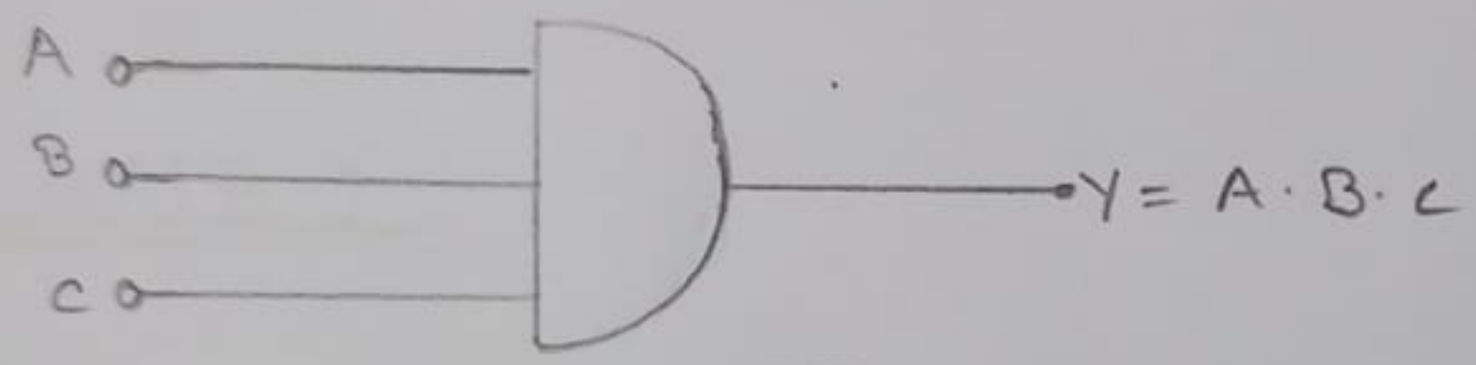

Fig:- AND Gate

(iv) Truth table.

A	B	C	Y (output)
0	0	0	0
0	D	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Conclusion :

In this experiment, we explored the operation of a three-input AND hate. By connecting the inputs, and obesrving the output, we verified that the AND gate produces a high output only when all inputs are high. The truth table and circuit diagram confirm the logical behaviour of the gate.

(ii) OR HATE :

Objectives: The goal of this practical is to:

ⓐ Analyse the function of a three-input OR gate.

ⓑ Draw the OR gate symbol accurately.

ⓒ Develop the truth table to obesrve the output for different input combinations.

Requirements :

(i) Digital Logic Kit and Simulator

(ii) OR gate

(iii) Connecting wires

(iv) Interactive/Sequence generator as input

(v) LED as output.

Theory :

(i) Introduction :

The OR gate produces a high output when any one or more inputs are high (1). It performs a logical 'addition' operation.

(ii) Functional Expression :

The output of a three-input OR gates is given as:

$$Y = A + B + C$$

(iii) Circuit Diagram :

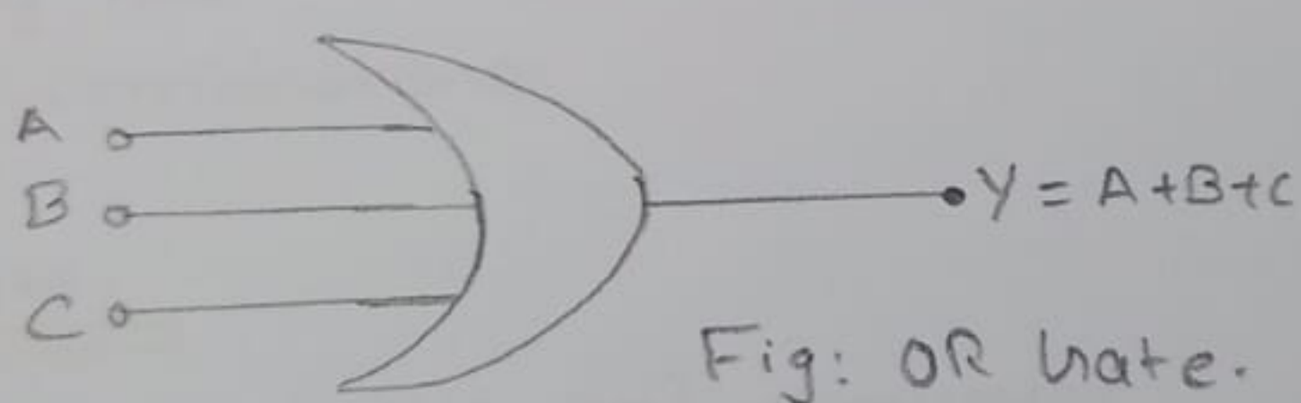

Fig: OR gate.

(iv) Truth Table :

A	B	C	Y (output)
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Conclusion:

Through this practical, we confirmed the behaviour of a three-input OR gate. The circuit and truth table show that the output becomes high when at least one input is high.

(iii) NAND GATE:

Objectives: The aim of this experiment is to:

- Study the operation of the three-INPUT NAND gate.
- Learn the symbolic representation of the NAND gate.
- Verify the truth table for all possible input combinations.

Requirements:

(i) Digital logical kit and Simulator
(ii) NAND gate
(iii) Connecting wires
(iv) Interactive / Sequence generator as input
(v) LED as output.

Theory

(i) Introduction:

The NAND gat combines an AND gate followed by a NOT gate. It outputs low(0) only when all inputs are high(1).

(ii) Functional Expression:

The output of the NAND gate is:

$$Y = \overline{(A \cdot B \cdot C)} = \bar{A} + \bar{B} + \bar{C}$$

(iii) Circuit Diagram:

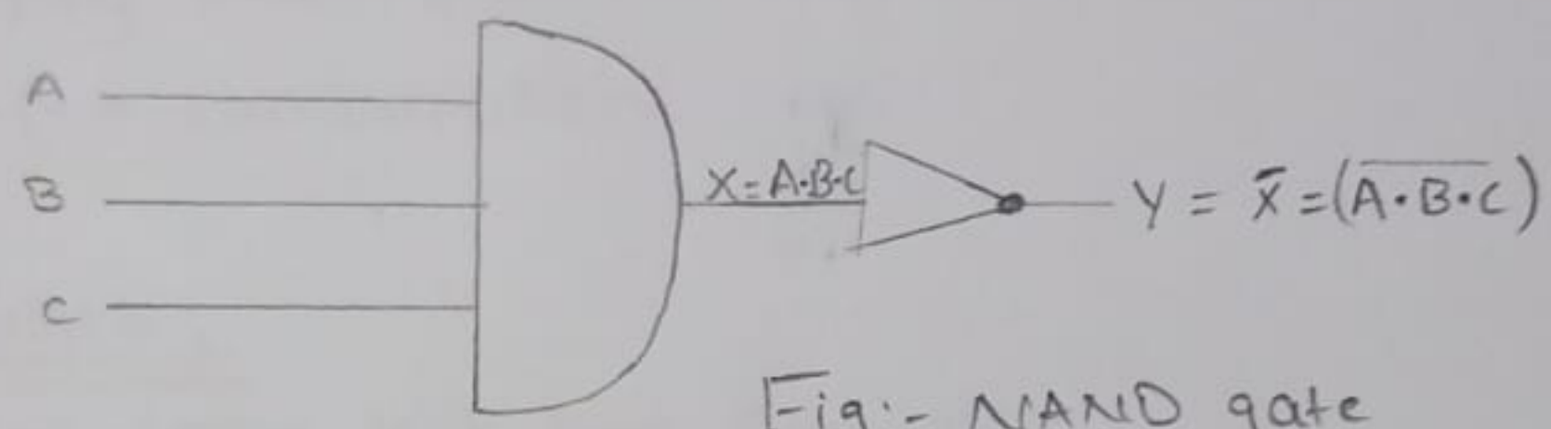

Fig:- NAND gate

(iv) Truth Table:

A	B	C	X = A·B·C	Y = x̄ = (A·B·C)'
0	0	0	0	1
0	0	1	0	1
0	1	0	0	1
0	1	1	0	1
1	0	0	0	1
1	0	1	0	1
1	1	0	0	1
1	1	1	1	0

Conclusion:

We have sucessfully implemented the three-input NAND gate and observed its outputs. The NAND gate operates as an AND gate inverted, and the truth table confirms this behaviour.

(iv) NOR Gate :

Objectives : This practical aims to:

ⓐ Understand the functioning of a three-input NOR gate.

ⓑ Draw the NOR gate symbol and corresponding circuit.

ⓒ Verify the truth table for different input combinations.

Requirements :

(i) Digital Logic Kit and Simulator

(ii) NOR gate

(iii) Connecting wires

(iv) Interactive / Sequence generator as input

(v) LED as output

Theory :

(i) Introduction :

The NOR gate is the combinate of an OR gate followed by a NOT gate. It outputs high (1) only when all inputs are low (0).

(ii) Functional Expressions:

The output of the NOR gate is:

$$Y = (A+B+C)' = \overline{A} \cdot \overline{B} \cdot \overline{C}$$

(iii) Circuit Diagram

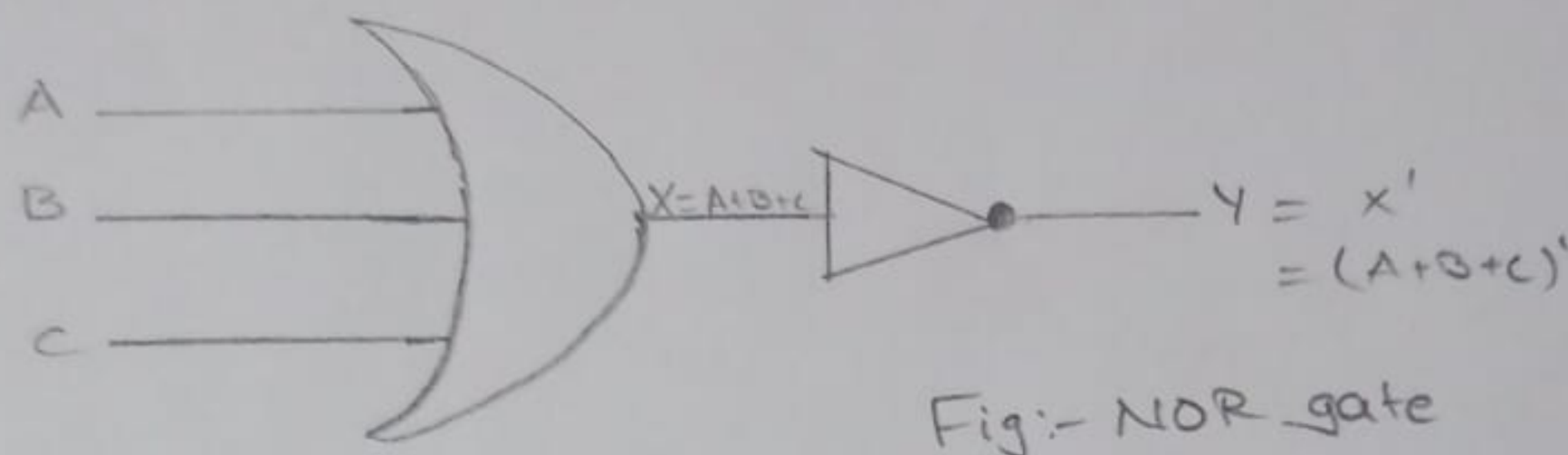

Fig:- NOR gate

(iv) Truth Table:

A	B	C	X = A+B+C	Y = X'
0	0	0	0	1
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	0

Conclusion:

In this pratical, we verified the operation of the three-input NOR gate. The cirwit implementation and truth table confirmed that the NOR gate outputs high only if all inputs are low.