LOGIC GATES:-

- Logic gates are fundamental building blocks of digital system. These devices are able to make decisions, in the sense that they produce one output level when some combinations of input levels are present and a different output when other combinations are applied.

- The two levels produced by digital circuitary are referred to variously as HIGH and LOW, TRUE and FALSE, ON and OFF, and simply 0 and 1.

TYPES OF LOGIC GATES:

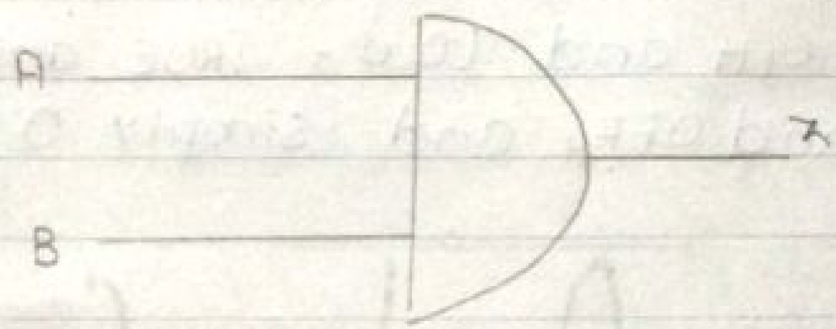
- AND Gate
- OR Gate
- NOT Gate
- NOR Gate
- NAND Gate
- XOR Gate
- XNOR Gate.

⇒ AND GATE:-

An And's gate output is "1" iff an only iff its all inputs are "1". Otherwise the output will be '0'.

⇒ FOR TWO INPUTS

· LOGICAL DIAGRAM:-



· BOOLEAN EXPRESSION:-

$Z = A \cdot B$

· TRUTH TABLE

A	B	$Z = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

FOR THREE INPUTS:-

LOGICAL DIAGRAM:-

BOOLEAN EXPRESSION:-

$Z = A \cdot B \cdot C$

TRUTH TABLE:-

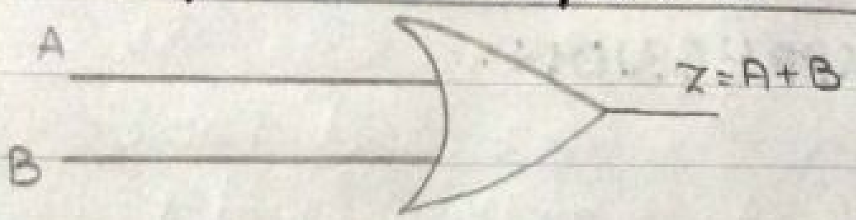
A	B	C	$Z = A \cdot B \cdot C$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

OR GATE:-

An Or's gate output is '0' iff and only iff its all inputs are '0' otherwise the output will be '1'.

FOR TWO INPUTS:-

LOGICAL DIAGRAM:-



BOOLEAN EXPRESSION:-

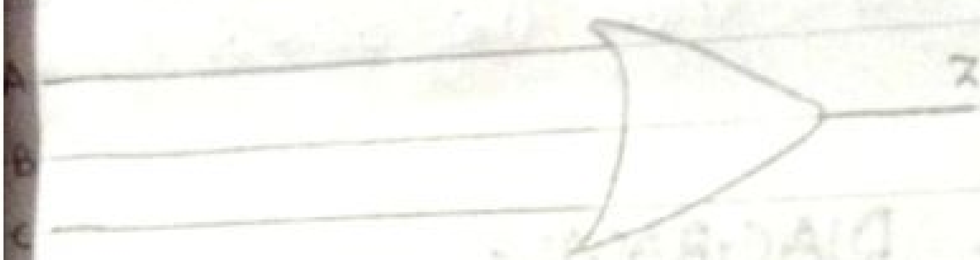
$Z = A + B$

TRUTH TABLE:-

A	B	Z=A+B
0	0	0
0	1	1
1	0	1
1	1	1

· FOR THREE INPUTS:-

LOGICAL DIAGRAM:



BOOLEAN EXPRESSION:-

$Z = A + B + C$

TRUTH TABLE:-

A	B	C	$Z = A+B+C$
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

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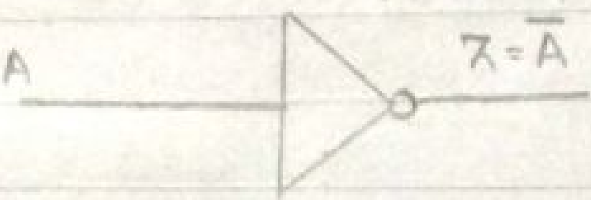
NOT GATE:-

Not gate is simply an inverter. If the input is '1' then the output will be '0'. If the input is '0' then the output will be '1'.

LOGICAL DIAGRAM:-



BOOLEAN EXPRESSION:-

$Z = \overline{A}$

TRUTH TABLE:-

A	$Z = \overline{A}$
0	1
1	0

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⇒ NOR GATE:-

A Nor's gate output is "high" If and only Iff its all inputs are 'zero' otherwise "low"

- **LOGICAL DIAGRAM:-**

- **BOOLEAN EXPRESSION:**

$Z = \overline{A+B}$

- **TRUTH TABLE:-**

A	B	A+B	$Z = \overline{A+B}$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

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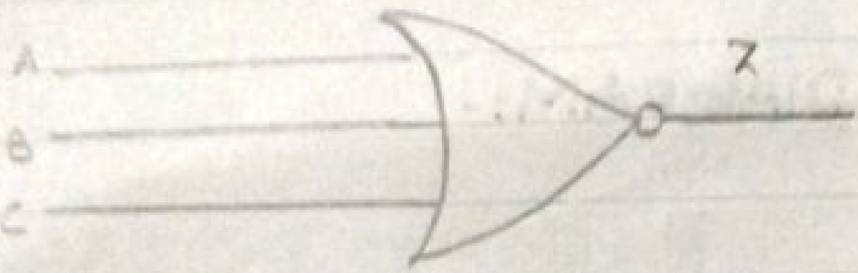
• For Three Inputs:-

• Logical Diagram:-



• Boolean Expression:-

$Z = \overline{A+B+C}$

• Truth Table:-

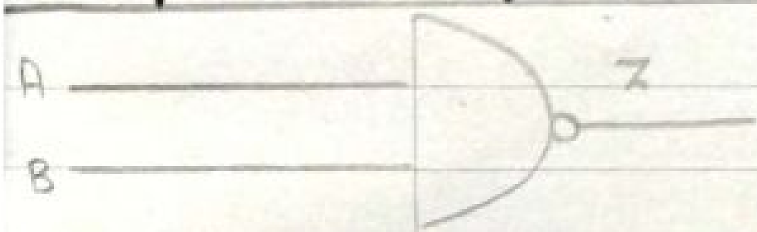
A	B	C	A+B+C	$Z=\overline{A+B+C}$
0	0	0	0	1
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	0

=> NAND GATE:-

A nand's gate output is '0' iff and only iff its on all inputs are '1' otherwise the output will be '1'

FOR TWO INPUTS:-

LOGICAL DIAGRAM:



BOOLEAN EXPRESSION:-

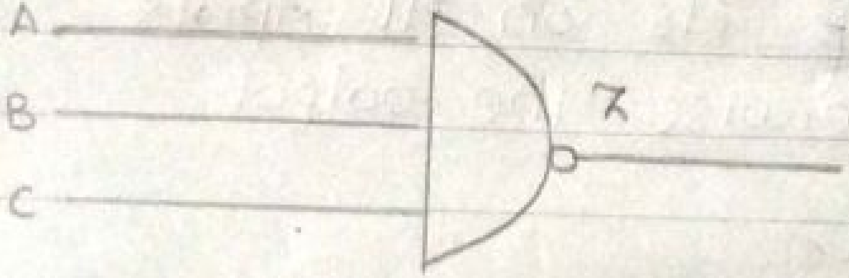
$Z = \overline{A \cdot B}$

• TRUTH TABLE:-

A	B	$A \cdot B$	$\overline{A \cdot B}$
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

FOR THREE INPUTS

LOGICAL DIAGRAM:-



BOOLEAN EXPRESSION:-

$$X = \overline{A \cdot B \cdot C}$$

TRUTH TABLE:-

A	B	C	$A \cdot B \cdot C$	$X = \overline{ABC}$
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

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Ex-OR Gate:-

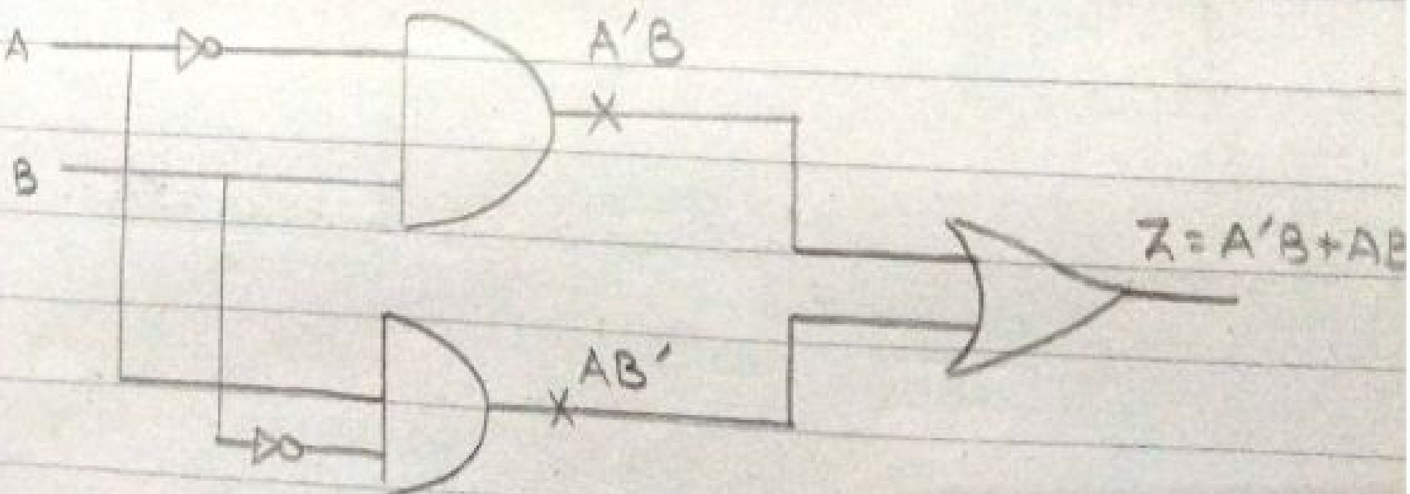
Logical Diagram:-

Boolean Expression:-

$Z = A \oplus B$

Equivalent Circuit:-

$Z = A'B + AB'$



TRUTH TABLE:

A	B	A'	B'	A'B	AB'	Z = A'B + AB'
0	0	1	1	0	0	0
0	1	1	0	1	0	1
1	0	0	1	0	1	1
1	1	0	0	0	0	0

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Ex-NOR Gate:-

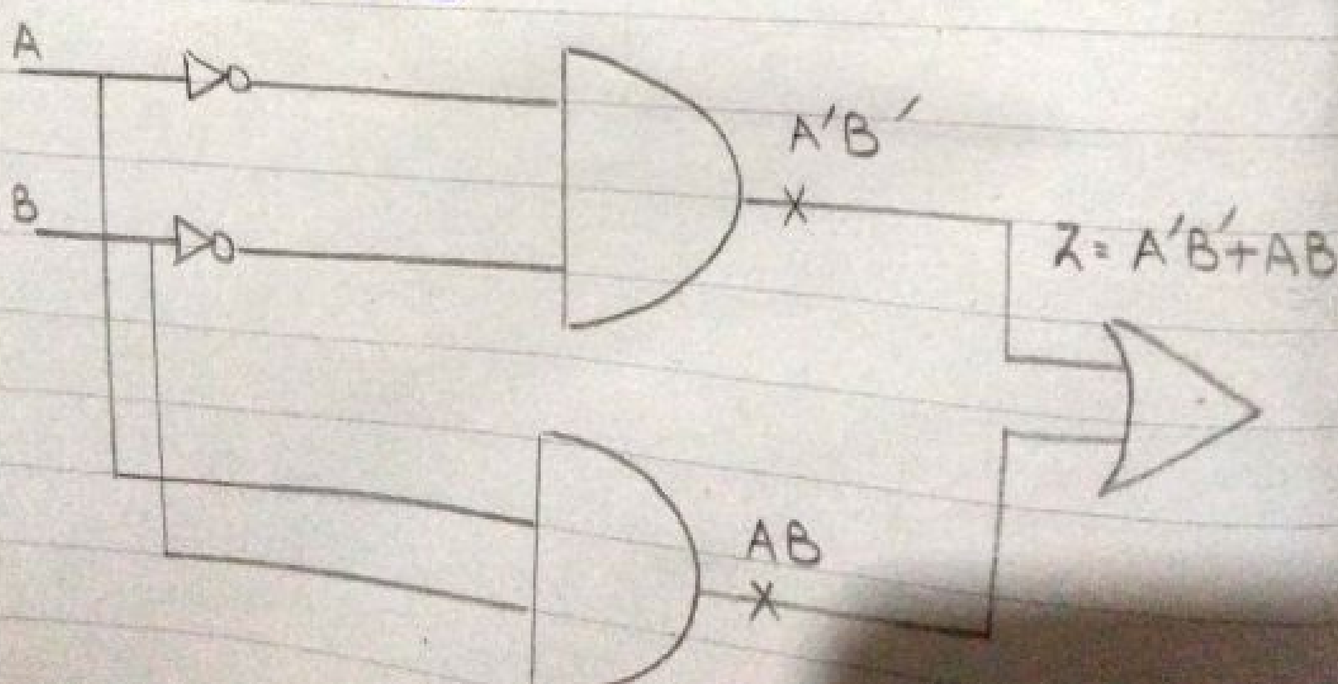
LOGICAL DIAGRAM:-

BOOLEAN EXPRESSION:-

$Z = \overline{A \oplus B}$

EQUIVALENT CIRCUIT:-

$Z = A'B' + AB$



TRUTH TABLE

A	B	A'	B'	A'B'	AB	Z
0	0	1	1	1	0	1
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	1	0	0	0	1	1

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