

## LOGIC GATES

- Logic gates are fundamental building blocks of digital systems.
- The name 'logic gate' is derived from the ability of such a device to make decisions, in the sense that it produces one output level when some combination of input levels are present.
- 3 basic types of gates →  
AND, OR and NOT
- Interconnection of gates to perform a variety of logical operations is called Logic design.
- Inputs and outputs of logic gates can occur only in two levels. These two levels are termed as 'HIGH' & 'LOW' or TRUE & FALSE or ON & OFF or 1 & 0.

- A table which lists all the possible combination of input variables & the corresponding outputs is called a 'truth table'.
- We will use 'level logic', a logic in which the voltage levels represents logic 1 & logic 0. Level logic may be positive logic or negative logic.

+ve logic  $\rightarrow$  higher of the two voltage levels represents the logic 1, & lower of the two voltage levels represents the logic 0.

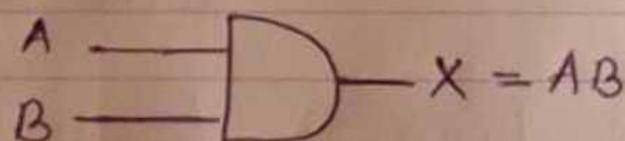
-ve logic  $\rightarrow$  lower of the two voltage levels represents the logic 1 & higher of the two voltage levels represents logic 0.

NB In Transistor-transistor logic (TTL, the most widely used logic family), the voltage levels are +5V & 0V. In our syllabus, logic 1 corresponds to +5V & logic 0 to 0V.

## THE AND GATE:-

- An AND Gate has two or more inputs but only one output.
- The o/p assumes the logic 1 state only when each one of its i/p's is at logic 1 state. The o/p assumes the logic 0 state if one of its i/p's is at logic 0 state.

Logic Symbol (2 input AND gate)



Truth Table

Inputs		Outputs
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

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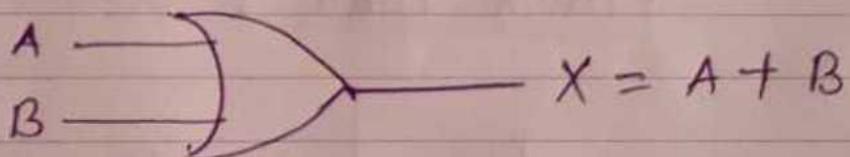
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✓ Home Work :- 3 input AND gate.

## THE OR GATE:-

- Two or more inputs & only one output.
- The o/p assumes logic 1 state, if one of its input is in the logic 1 state. It's o/p assumes the logic 0 state when each of its inputs in the logic 0 state.

logic symbol



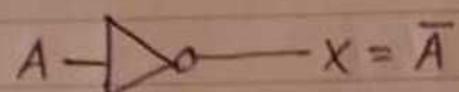
Truth Table

Inputs		O/P *
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

## THE NOT GATE (Inverter)

- Has one i/p & one o/p.
- Device whose o/p is always the complement of its i/p.

Logic Symbol :-



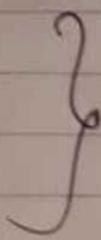
Truth Table :-

I/P	O/P
A	B
0	1
1	0

## THE UNIVERSAL GATES

2 types - • NAND

• NOR

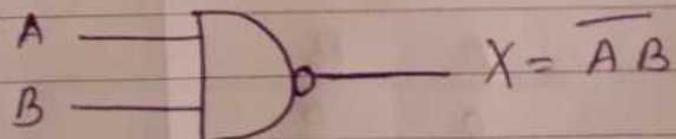
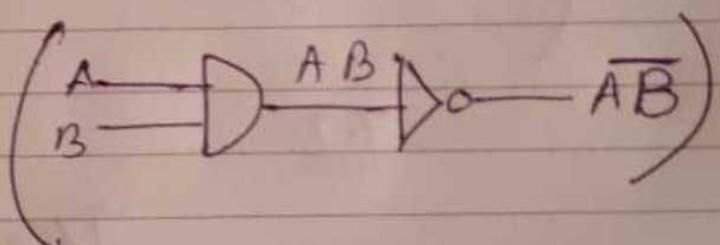


universal building blocks  
as they can realize logic  
cts single handedly.

### THE NAND GATE :-

- NAND means NOT AND i.e. the AND o/p is NOTed.

logic symbol:-



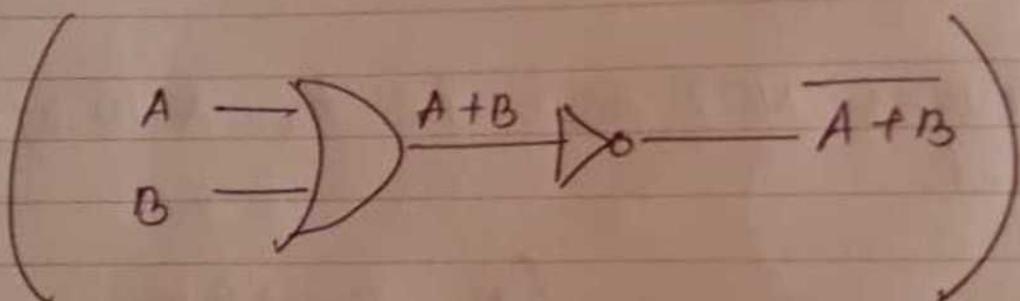
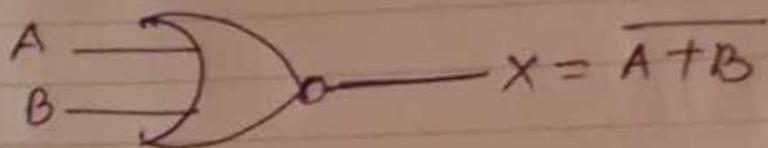
### Truth Table :-

I/Ps		O/P
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

## THE NOR GATE:-

\* NOR means NOT OR i.e. the 'OR' O/P is NOTed.

logic symbol



T.T.

I/Ps		O/P X
A	B	
0	0	1
0	1	0
1	0	0
1	1	0