DeMorgan's Theory

- **DeMorgan's Theorem** is mainly used to solve the various Boolean algebra expressions.
- The Demorgan's theorem defines the uniformity between the gate with the same inverted input and output.
- It is used for implementing the basic gate operation likes NAND gate and NOR gate.
- The Demorgan's theorem mostly used in digital programming and for making digital circuit diagrams.
- There are two DeMorgan's Theorems.

DeMorgan's first Theory

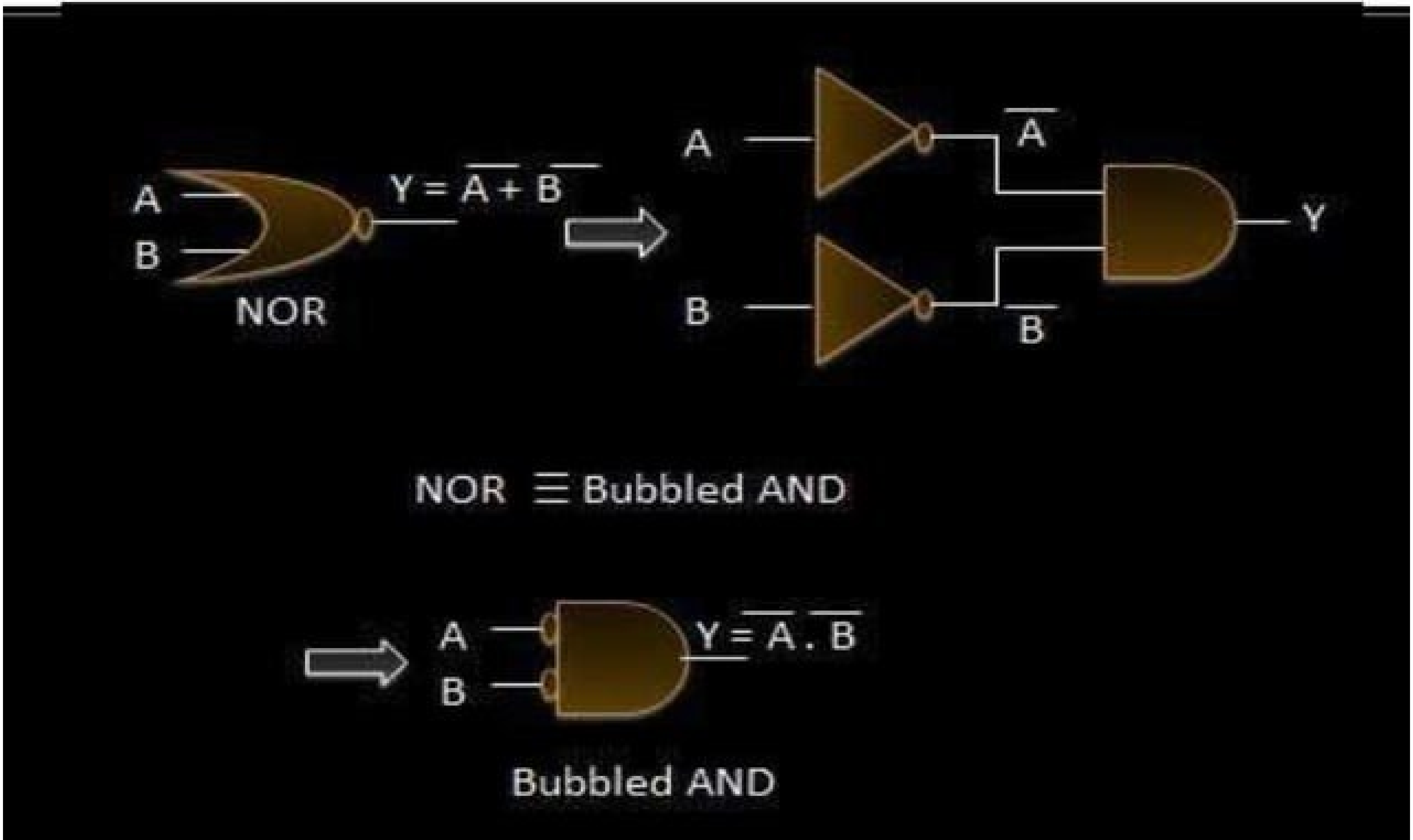
- DeMorgans first theory state that Nor gate and bubble And gate are equivalent. Both the truth table are identical this means that two circuits are logically equivalent.
- the equation:

$$\overline{A + B} = \overline{A} . \overline{B}$$

NOR = Bubbled AND

- The LHS of this theorem represents a NOR gate with inputs A and B, whereas the RHS represents an AND gate with inverted inputs.
- This AND gate is called as Bubbled AND.

DeMorgan's first Theory



DeMorgan‘s first Theory

- Table showing verification of the De Morgan's first theorem –

A	B	$\overline{A+B}$	$\overline{A}$	$\overline{B}$	$\overline{A}.\overline{B}$
0	0	1	1	1	1
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	0

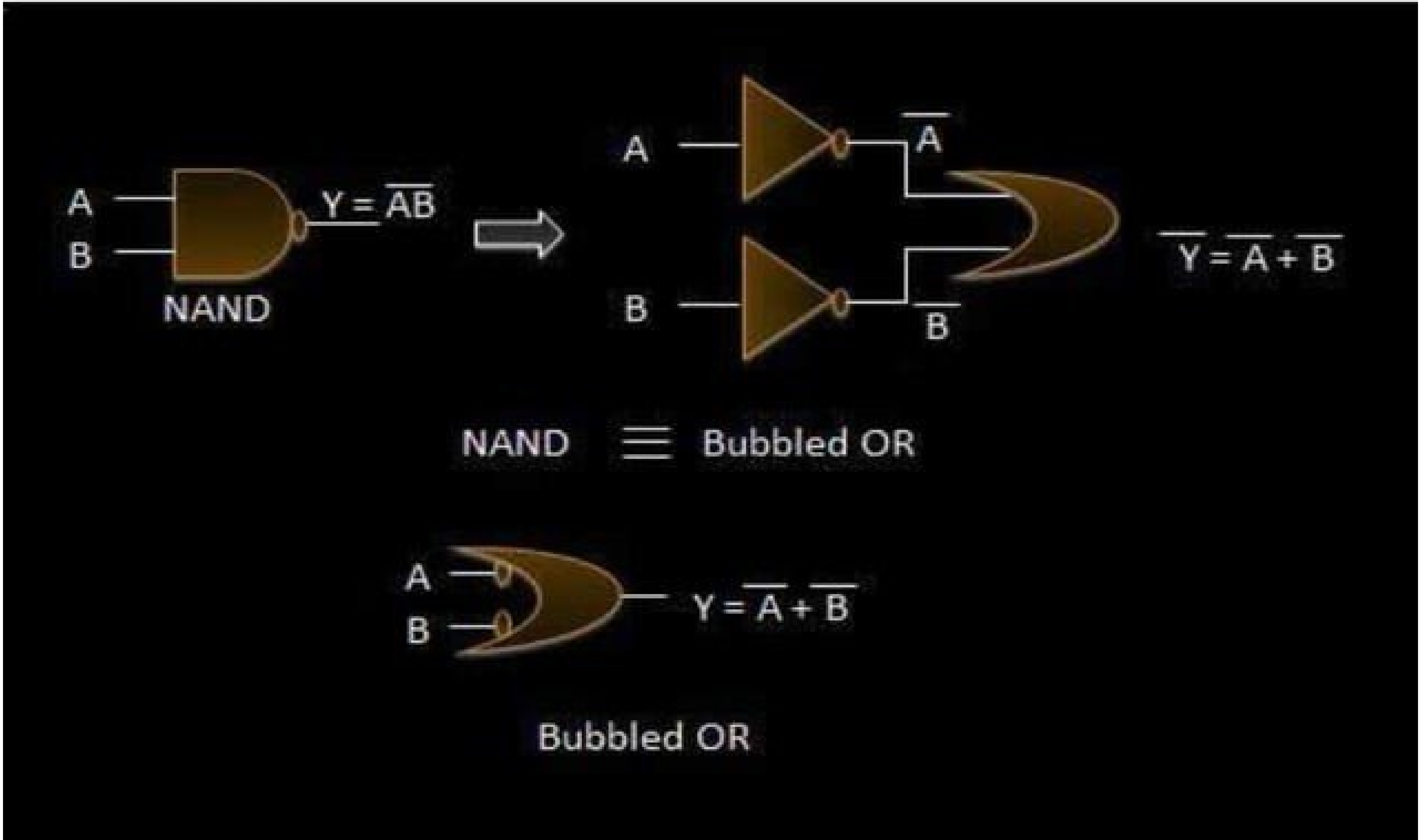
DeMorgan's Second Theory

- DeMorgan's Second Theorem states that the NAND gate is equivalent to a bubbled OR gate.
- The Boolean expression for the NAND gate is given by the equation shown below:

$$\overline{A.B} = \overline{A}+\overline{B}$$

- The left hand side (LHS) of this theorem represents **a NAND gate** with inputs A and B, whereas the right hand side (RHS) of the theorem represents an **OR gate** with inverted inputs.
- This OR gate is called as **Bubbled OR**.

DeMorgan's Second Theory



DeMorgan's second Theory

- Table showing verification of the De Morgan's second theorem –

A	B	$\overline{AB}$	$\overline{A}$	$\overline{B}$	$\overline{A} + \overline{B}$
0	0	1	1	1	1
0	1	1	1	0	1
1	0	1	0	1	1
1	1	0	0	0	0