Logic Gates: Explanation, Conversion & Formulas

Logic Gates Concepts & Formulas

1. AND Gate:

   - Symbol: A * B

   - Output is 1 only when both inputs are 1.

   Truth Table:

   A B | A AND B

   0 0 | 0

   0 1 | 0

   1 0 | 0

   1 1 | 1

2. OR Gate:

   - Symbol: A + B

   - Output is 1 when any input is 1.

3. NOT Gate:

   - Symbol: A' or A'

   - Output is opposite of input.

4. NAND Gate:

   - Formula: (A * B)'

   - Opposite of AND gate.

5. NOR Gate:

   - Formula: (A + B)'

   - Opposite of OR gate.

6. XOR Gate (Exclusive OR):

   - Formula: A XOR B = A'B + AB'

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- Output is 1 when inputs are different.

7. XNOR Gate (Exclusive NOR):

- Formula: A XOR B' = AB + A'B'
- Output is 1 when inputs are same.

Gate Conversion Using NAND:

- NOT: A NAND A = A'
- AND: (A NAND B)' = A * B
- OR: A OR B = (A' * B')'

Gate Conversion Using NOR:

- NOT: A NOR A = A'
- OR: (A NOR B)' = A + B
- AND: A AND B = (A' + B')'

Boolean Algebra Laws:

- Identity: A + 0 = A, A * 1 = A
- Null: A + 1 = 1, A * 0 = 0
- Inverse: A + A' = 1, A * A' = 0
- De Morgan's: (AB)' = A' + B', (A + B)' = A' * B'