



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19EC306 – Digital Circuits

II YEAR / III SEMESTER

Unit I- MINIMIZATION TECHNIQUES AND LOGIC GATES

Topic : Boolean postulates and laws



Boolean postulates and laws



Boolean postulates and basic laws that are used in Boolean algebra. These are useful in minimizing Boolean functions.

Boolean Postulates

Consider the binary numbers 0 and 1, Boolean variable x and its complement x' .

Either the Boolean variable or complement of it is known as **literal**. The four possible **logical OR** operations among these literals and binary numbers are shown below.

Similarly, the four possible **logical AND** operations among those literals and binary numbers are shown below.

$$x + 0 = x$$

$$x + 1 = 1$$

$$x + x = x$$

$$x + x' = 1$$

$$x \cdot 1 = x$$

$$x \cdot 0 = 0$$

$$x \cdot x = x$$

$$x \cdot x' = 0$$



These are the simple Boolean postulates. We can verify these postulates easily, by substituting the Boolean variable with '0' or '1'.

Note– The complement of complement of any Boolean variable is equal to the variable itself. i.e., $x'' = x$.

Basic Laws of Boolean Algebra

Following are the three basic laws of Boolean Algebra.

- Commutative law
- Associative law
- Distributive law

Commutative Law

If any logical operation of two Boolean variables give the same result irrespective of the order of those two variables, then that logical operation is said to be **Commutative**. The logical OR & logical AND operations of two Boolean variables x & y are shown below

$$x + y = y + x$$

$$x \cdot y = y \cdot x$$



Distributive Law

If any logical operation can be distributed to all the terms present in the Boolean function, then that logical operation is said to be **Distributive**. The distribution of logical OR & logical AND operations of three Boolean variables x , y & z are shown below.

$$x \cdot (y + z) = x \cdot y + x \cdot z$$

$$x + (y \cdot z) = (x + y) \cdot (x + z)$$

Associative Law

If a logical operation of any two Boolean variables is performed first and then the same operation is performed with the remaining variable gives the same result, then that logical operation is said to be **Associative**. The logical OR & logical AND operations of three Boolean variables x , y & z are shown below.

$$x + (y + z) = (x + y) + z$$

$$x \cdot (y \cdot z) = (x \cdot y) \cdot z$$



Any Query????

Thank you.....