Al-Mustaqbal University College
Department of Intelligent medical systems
First Stage
Subject: Digital Techniques
Lecturer: Dr. Ameer Al-khaykan
Lecture: (7&8)

Intruduction:-

Algebra Boolean :

which is the algebra of Boolean variables. And Boolean variables is the type of variables that are Dealing with it in Circuits Logic, where we get to know some of the basic concepts that we need in Our study of the following parts of the headquarters

Unit objectives:

_Writing logical expressions and dealing with them.
_Create and use truth tables.
_Understand the theories of Boolean algebra.
_ Simplify Boolean expressions using theorems.

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Who is the world:-

English mathematician **George Boole** (1815-1864) who is credited with laying the mathematical foundations of logic used to describe binary number systems and the functioning of basic logic gates, and thus the basis for modern computational logic.

From the name, Boolean algebra is one of the branches of algebra in mathematics, but unlike regular algebra, it assumes the presence of mathematical variables within what is known as **"truth values"** , which are: True value, False value. Thus, all numbers and numbers that are dealt with in ordinary algebra, are transformed in Boolean algebra into combinations of true and false states. For ease of handling, a value of "1" is assigned to the correct case, and a value of "0" to the false case. Thus, the basis of Boolean algebra is to treat all given data with two reference values: 0 and 1.

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Another difference that distinguishes Boolean algebra from ordinary algebra is the mathematical operations, while in ordinary algebra the basic operations are addition, subtraction, multiplication, and division, the basic operations in Boolean algebra are: Conjunction, Disjunction, and Negation . So, the basis of Boolean algebra are two so-called truth values, and three other mathematical operation

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Baisc Rules of Boolean Algebra

Name	AND form	OR form
Identity law	$1A = A$	$0 + A = A$
Null law	$0A = 0$	$1 + A = 1$
Idempotent law	$AA = A$	$A + A = A$
Inverse law	$A\overline{A} = 0$	$A + \overline{A} = 1$
Commutative law	$AB = BA$	$A + B = B + A$
Associative law	$(AB)C = A(BC)$	$(A + B) + C = A + (B + C)$
Distributive law	$A + BC = (A + B)(A + C)$	$A(B + C) = AB + AC$
Absorption law	$A(A + B) = A$	$A + AB = A$
De Morgan's law	$\overline{AB} = \overline{A} + \overline{B}$	$\overline{A + B} = \overline{A}\,\overline{B}$

EX: F=X'.Y+X'.Y'

F=X'(Y+Y')

F=X'.1

F=X'

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EX: $F = X'.Y' + X.Y' + X.Y$

$F = Y'(X'+X) + X.Y$

$F = Y'.1 + (X.Y)$

$F = Y' + (X.Y)$

$F = (Y'+X).(Y'+Y)$

$F = (Y'+X).1$

$F = (Y'+X)$

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