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Course: Logic Design   USN: 4AM8EC042.

Topic: Boolean equations for digital Circuits.   Sem & Sec: IV Sem EA'sec

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Report:-

Boolean equations for digital Circuits.

Combinational Circuits : Conversion of MUX and Decoders to logic gates.

→ Cost of the Circuit.

→ Simple realization of a Circuit.

"It is defined with set of elements, a set of operators, & a NO. of axioms or postulates"

set of elements = (0, 1)

Two binary operators - OR & AND

$$(+) \qquad (\cdot)$$

unary operator   - NOT

Axioms or postulates of Boolean algebra are a set of logical expressions upon which we can build a set of useful theorems.

"AND operation"   "OR operation"   "NOT operation"

→ $0 \cdot 0 = 0$ → $0 + 0 = 0$ → $\bar{0}$ or $0' = 1$.

→ $0 \cdot 1 = 0$.   → $0 + 1 = 1$ → $\bar{1} = 0$.

→ $1 \cdot 0 = 0$ → $1 + 0 = 1$

→ $1 \cdot 1 = 1$.   → $1 + 1 = 1$

* In Boolean Algebra   In ordinary algebra.

$A + A = A$ * $A \cdot A = A$ $A + A = 2A$ $A \cdot A = A^2$.

$1 + 1 = 1$.   * $1 \cdot 1 = 1$ $1 + 1 = 2$ $1 \cdot 1 = 1$

* In Binary NO. Sim:-

$1 + 1 = 10$. $1 \cdot 1 = 1$.

Axioms and postulates :-

→ $x + 0 = x$ → $x + \bar{x} = 1$.   → $x \cdot 1 = x$

→ $x + 1 = 1$ → $\overline{(\bar{x})}$ or $(x')' = x$.   → $x \cdot x = x$

→ $x + x = x$.   → $x \cdot 0 = 0$.   → $x \cdot \bar{x} = 0$.

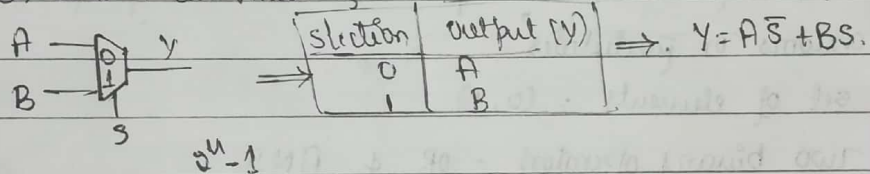1* Commulative law:-

2* Associative law:-

3* Distributive law:-

Theorems of Boolian algebra:

1* Absorption Theorem:* $x + xy = x$.

→ $x(1+y) = x$.

* $x + \bar{x}y = x + y$.

MUX To Logic gates :

1* NAND, NOR → universal gates

A ──┐ ┌─ Y
B ──┘ │
      S

Slection	output (y)
0	A
1	B

⟹ $Y = A\bar{S} + BS$.

$2^n - 1$

Inverter design :- $Y = 1.\bar{A} + 0.A. \Rightarrow Y = \bar{A}$.

Design of 7 Segment decoder with Common anode display.

BCD to 7 Segment decoder.

A → ┐
B → │ BCD to
C → │ 7-Segment
D → │ decoder.
    └→ a, b, c, d, e, f, g

$a = A + C + BD + \bar{B}\bar{D}$

$b = \bar{B} + CD + \bar{D}$

$c = B + \bar{C} + D$

$d = A + \bar{B}\bar{D} + C\bar{D} + \bar{B}C + B\bar{C}D$.

$e = \bar{B}\bar{D} + C\bar{D}$

$f = A + \bar{C}\bar{D} + B\bar{D} + B\bar{C}$

$g = A + B\bar{C} + \bar{B}C + C\bar{D}$

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