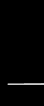


Switching Circuit & Logic Design

Lecture 6 : Switching Algebra



Things to cover

- Fundamental operators
- Fundamental rules
- Theorems → With PROOF

Book : Fundamentals of Digital Circuits, A. Anand Kumar

NOT

A'

\overline{A}

A	A'
0	1
1	0

AND

$A \wedge B$

$A \cdot B$

A and B

A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1

OR

$A \vee B$

$A + B$

$A \text{ or } B$

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1

RULES

Associative Rule : $A + (B + C) = (A + B) + C$
 $A \cdot (B \cdot C) = (A \cdot B) \cdot C$

Idem-potence :

$$A + A = A$$

$$A \cdot A = A$$

Distributive Rule : $A \cdot (B + C) = A \cdot B + A \cdot C$
 $A + B \cdot C = (A + B) \cdot (A + C)$

Absorption Law:

$$A + A \cdot B = A$$

$$A \cdot (A + B) = A$$

Commutative Rule : $A + B = B + A$
 $A \cdot B = B \cdot A$

Identity :

AND Identity : $A \cdot 1 = A$

OR Identity : $A + 0 = A$

Complement :

$$A + A' = 1$$

$$A \cdot A' = 0$$

De Morgan's Laws

- $(A + B)' = A' \cdot B'$

A	A'	B	B'	(A+B)	(A+B)'	A' · B'
0	1	0	1	0	1	1
0	1	1	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	1	0	0

De Morgan's Laws

- $(A \cdot B)' = A' + B'$

A	A'	B	B'	(A.B)	(A.B)'	A' + B'
0	1	0	1	0	1	1
0	1	1	0	0	1	1
1	0	0	1	0	1	1
1	0	1	0	1	0	0

Dual Law

- Change '+' to '.' and '.' to '+'
- Any dual rule will hold true.

Number system revisited

Convert 4433_5 to decimal

Convert $B9F.AE_{16}$ to octal

Convert 756.603_8 to hexadecimal

Find the base of the number system, where $\text{sqrt}(41) = 5$

Number system revisited

Convert 4433_5 to decimal

618_{10}

Convert $B9F.AE_{16}$ to octal

5637.534_8

Convert 756.603_8 to hexadecimal

$1EE.C18_{16}$

Find the base of the number system, where $\text{sqrt}(41) = 5$

6