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 ^ B　　A . B　　A and B

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

OR

A v B A + B A or B

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

RULES

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

$A . (B . C) = (A . B) . C$

Idem-potence :

$A + A = A$

$A . A = A$

Distributive Rule : $A . (B + C) = A . B + A . C$

$A + B.C = (A + B).(A + C)$

Absorption Law:

$A + A . B = A$

$A . (A + B) = A$

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

$A . B = B . A$

Identity :

AND Identity : $A . 1 = A$

OR Identity : $A + 0 = A$

Complement :

$A + A' = 1$

$A . A' = 0$

De Morgan's Laws

- $(A + B)' = A' . B'$

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

- $(A \,.\, B)' = A' + B'$

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 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 sqrt(41) = 5

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