Boolean Algebre

Lecture 2

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Introduction

- Boolean Algebra is a branch of mathematics for digital logic
- Founded by George Boole
- Used in computers and digital systems

Basic Symbols

- Variables (A, B, C…..) → Its value is 0 or 1
- AND (·)
- OR (+)
- NOT (’)

Basic Laws

- Identity Law: A+0=A , A·1=A
- Null Law: A+1=1 , A·0=0
- Idempotent Law: A+A=A , A·A=A
- Complement Law: A+A’=1 , A·A’=0
- Commutative Law : A+B=B+A , A.B = B.A
- Associative Law : A+B+C=(A+B)+C , A.B.C=(A.B).C
- Distributive Law: A.(B+C)=A.B+A.C , A+(B.C)=(A+B).(A+C)
- De Morgan’s Theorem : (A+B)`=A`.B` , (A.B)`=A+B`

Example

EX 1:

F = A + AB

We take out a common factor

A (1+B) => 1+B=1

So F =A

EX 2 :

F = AB + AB`

A(B +B`) => B+B`=1

So F =A

Example

EX 3:

F = A (A`+B)

AA` +AB =>A.A`=0

So F=AB

EX 4 :

F= AB+BC(B+C)

AB+B~~B~~C+BC~~C~~

AB +BC +~~BC~~

B(A+C)

So f= B(A+C)

Example

EX 5:

F = AA+AC+AB+BC

A+AC+AB+BC

A(1+C+B)+BC

So F= A+BC

Example

EX 6 :

AB+A(A+C)+B(A+C)

AB +AA+AC+AB+BC

AB+A+AC+BC

A(B+1+C)+BC

So F = A +BC

Example

EX 7:

F = (((CD)` +A`)`  +( (C` D + A`))`

= C`+D`+A . (C+D`) .A

=(C` +D` +A) . (AC+AD`)

=ACC`+ACD` + AAC +AD`C`+A D`D`+ AAD`

=ACD` + AC +AD`C`+ AD`

=AC(D`+1)(AD`C+AD`)

=AC+AD`(C+1)

=AC+AD`

=A(C+D`)

Thank you