B.Sc Comp Sc
m II

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Boolean Algebra

A class of elements B together with two binary operations + and · is a Boolean Algebra if and only if the following four postulates hold:

P_1: Both operation + and · are Commutative i.e for any two elements a and b of B

$$a+b = b+a$$
$$a \cdot b = b \cdot a$$

Commutative Law

P_2: Each of the operations + and · are distributive over the other i.e for any three elements a, b and c in B,

$$a+b \cdot c = (a+b) \cdot (a+c)$$
and
$$a \cdot (b+c) = a \cdot b + a \cdot c$$

Distributive Law

P_3: There exist in B distinct identity elements 0 & 1 ($0 \neq 1$) for the operation + and · respectively such that for any element a in B

$$a+0 = 0+a = a$$
$$a \cdot 1 = 1 \cdot a = a$$

Identity Law

P_4: for every element a in B there exist an element a' (Complement of a) in B such that

$$a+a' = 1 \text{ and } a \cdot a' = 0$$

Complement Law

A Boolean algebra will be designated by a triplet (B, +, ·)