Boolean Algebra

Friday, 13 January 2023 9:08 AM

$\bar{A} \Rightarrow$ NOT A
$A \cdot B \Rightarrow$ A AND B
$A + B \Rightarrow$ A OR B

LAWS:

1. Commutative: $A + B = B + A$, $A \cdot B = B \cdot A$
2. Associative: $A + (B + C) = (A + B) + C$, $A \cdot (B \cdot C) = (A \cdot B) \cdot C$
3. Distributive: $A \cdot (B + C) = (A \cdot B) + (A \cdot C)$
   $A + (B \cdot C) = (A + B) \cdot (A + C)$
4. Idempotent: $A \cdot A \cdot A \cdot A \ldots = A$
   $X + X + X + \cdots = X$
5. Identity: $1 \cdot A = A$, $0 + A = A$
6. Null: $0 \cdot A = 0$, $1 + A = 1$
7. Inverse: $A \cdot \bar{A} = 0$, $A + \bar{A} = 1$
8. Absorption: $A \cdot (A + B) = A$, $A + (A \cdot B) = A$, $A + (\bar{A} \cdot B) = A + B$
9. Double Complement: $\bar{\bar{A}} = A$, $\overline{\overline{AB}} = AB$, $\overline{\overline{A+B}} = A + B$
10. De-Morgan Theorem: $\overline{A \cdot B} = \bar{A} + \bar{B}$, $\overline{A + B} = \bar{A} \cdot \bar{B}$

Q. $A + B + \bar{A} + \bar{B}$ Associative
$(A + \bar{A}) + (B + \bar{B})$ Inverse
$1 + 1$
$\therefore 1$

Q. $A.B.C + \bar{A}.B.C + A.\bar{B}.C + A.B.\bar{C}$ Distributive
$B.C.(A + \bar{A}) + A.(\bar{B}.C + B.\bar{C})$
$B.C.(1) +$
$BC + A.(\bar{B}.C + B.\bar{C})$

$ABC + \bar{A}BC + A\bar{B}C + AB\bar{C}$ Associative
$ABC + (\bar{A}BC + A\bar{B}C + AB\bar{C})$ Distributive
$(ABC + \bar{A}BC) + (ABC + A\bar{B}C) + (ABC + AB\bar{C})$ Distributive
$BC(A + \bar{A}) + AC(B + \bar{B}) + AB(C + \bar{C})$ Inverse
$BC + AC + AB$.