Digital electronics

Lecture - 4

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Now We have to prove Theorem 2

To prove $\overline{\boldsymbol{A}.\boldsymbol{B}} = \overline{\boldsymbol{A}} + \overline{\boldsymbol{B}}$

(1) when A = 0 , B = 0 , $\overline{\boldsymbol{A}.\boldsymbol{B}} = \overline{\mathbf{0}.\mathbf{0}} = \bar{0} = 1$,

and $\overline{\boldsymbol{A}} + \overline{\boldsymbol{B}} = \overline{\mathbf{0}} + \overline{\mathbf{0}}$ **= 1 + 1 = 1**

Hence $\overline{\boldsymbol{A}.\boldsymbol{B}} = \overline{\boldsymbol{A}} + \overline{\boldsymbol{B}}$

(2) when A = 0 , B = 1 , $\overline{\boldsymbol{A}.\boldsymbol{B}}$ = $\overline{\mathbf{0}.\mathbf{1}}$ $=$ $\bar{0}$ = 1 ,

and $\bar{\boldsymbol{A}}$ **+** $\bar{\boldsymbol{B}}$ **=** $\bar{\mathbf{0}}$ **+** $\bar{\mathbf{1}}$ **= 1 + 0 = 1**

Hence $\overline{\boldsymbol{A}.\boldsymbol{B}}$ **=** $\bar{\boldsymbol{A}}$ **+** $\bar{\boldsymbol{B}}$

(3) when A = 1 , B = 0 , $\overline{\boldsymbol{A}.\boldsymbol{B}}$ = $\overline{\mathbf{1}.\mathbf{0}}$ $=$ $\bar{0}$ = 1 ,

and $\bar{\boldsymbol{A}}$ **+** $\bar{\boldsymbol{B}}$ **=** $\bar{\mathbf{1}}$ **+** $\bar{\mathbf{0}}$ **= 0 + 1 = 1**

Hence $\overline{\boldsymbol{A}.\boldsymbol{B}}$ **=** $\bar{\boldsymbol{A}}$ **+** $\bar{\boldsymbol{B}}$

(4) when A = 1 , B = 1 , $\overline{\boldsymbol{A.B}}$ = $\overline{\mathbf{1.1}}$ = $\overline{1}$ = 0 ,

and $\overline{\boldsymbol{A}}$ **+** $\overline{\boldsymbol{B}}$ **=** $\overline{\mathbf{1}}$ **+** $\overline{\mathbf{1}}$ **= 0 + 0 = 0**

Hence $\overline{\boldsymbol{A.B}}$ **=** $\overline{\boldsymbol{A}}$ **+** $\overline{\boldsymbol{B}}$

As all possible combinations of A and B are exhausted , this theorem is proved .

de Morgan´s first theorem i.e , $\overline{A+B}$ = $\bar{A}$.$\bar{B}$ suggests that a logic system in which a NOT circuit follows on OR gate.

de Morgan´s first theorem i.e , $\overline{A.B}$ = $\bar{A}$ + $\bar{B}$ indicates that a logic system in which a NOT circuit follows an AND gate .