Q. Simplify $Y = \overline{\overline{AB} + \bar{A} + AB}$

Ans $Y = (\overline{\overline{AB}}) \cdot (\overline{\bar{A}}) \cdot (\overline{AB})$

$Y = AB \cdot A \cdot (\bar{A} + \bar{B})$

$Y = ABA \cdot (\bar{A} + \bar{B})$ $\quad [\because AA = A]$

$Y = AAB \cdot [\bar{A} + \bar{B}]$

$Y = (AB)(\bar{A} + \bar{B}) \implies AB\bar{A} + AB\bar{B}$

$Y = A\bar{A}B + AB\bar{B}$ $\quad$ [where $A\bar{A} = B\bar{B} = 0$

$Y = 0 + 0$

$\boxed{Y = 0}$

$\therefore \boxed{Y = \overline{\overline{AB} + \bar{A} + AB} = 0}$

Q. find the complement of $AB \cdot (\bar{B}C + AC)$

Ans: $\overline{AB \cdot (\bar{B}C + AC)}$

$\implies \overline{AB} + (\overline{\bar{B}C + AC})$

$\implies (\bar{A} + \bar{B}) + [(\overline{\bar{B}C}) \cdot (\overline{AC})]$

$(\bar{A} + \bar{B}) + [(\bar{\bar{B}} + \bar{C}) \cdot (\bar{A} + \bar{C})]$

$\bar{A} + \bar{B} + (B + \bar{C}) \cdot (\bar{A} + \bar{C})$ Ans

Q. $\bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}B\bar{C}$

Ans $\bar{A}\bar{C}(\bar{B}+B) + \bar{A}B\bar{C}$ $\quad [\because B+\bar{B}=1]$

$\bar{A}\bar{C} + \bar{A}B\bar{C}$

$\bar{A}\bar{C}[1+B]$ $\quad [\because 1+B=1]$

$= \underline{\bar{A}\bar{C}}$ Ans

Q. Reduce the Expression, $A+B(\overline{\bar{C}+DE})$

Ans $A+B(\overline{\bar{C}+DE})$

$= A+B(\bar{\bar{C}}\cdot\overline{DE})$

$= A+B(C\cdot\overline{DE})$ [De-Morgan's Theorem]

$= A+B[C(\bar{D}+\bar{E})]$ [De-Morgan's Theorem]

$= A+B[C\bar{D}+C\bar{E}]$

$= \underline{A+BC\bar{D}+BC\bar{E}}$

Q find the minterm of $A\bar{B}\bar{C}D$ (29)

Ans → convert $A\bar{B}\bar{C}D$ it Binary

→ $A\bar{B}\bar{C}D \Longrightarrow (1001) \longrightarrow (9)_{10}$

So, its minterm is $\underline{m_9}$ Ans

Q. Complement of Boolean algebra Expression $AB(BC+AC)$ is ....

Ans

$$\overline{AB(BC+AC)} \Longrightarrow \overline{AB} + \overline{(BC+AC)}$$

$$(\overline{AB}) + ((\overline{BC}) \cdot (\overline{AC})$$

$$(\overline{AB}) + [[\bar{B}+\bar{C}] \cdot [\bar{A}+\bar{C}]]$$

$$\overline{AB} + [\bar{B}\bar{A} + \bar{B}\bar{C} + \bar{C}\bar{A} + \bar{C}\bar{C}]$$

$$(\bar{A}+\bar{B}) + [\bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{C} + \bar{C}\bar{C}] \quad [\because \bar{C}\bar{C} = \bar{C}]$$

$$[\bar{A}+\bar{B} + \bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{C} + \bar{C}]$$

$$\bar{A}+\bar{B} + \bar{A}\bar{B} + \bar{B}\bar{C} + [\bar{A}+1]\bar{C} \quad \left[\begin{array}{l}\text{where} \\ \bar{A}+1 = 1\end{array}\right]$$

$$\Rightarrow \bar{A}+\bar{B} + \bar{A}\bar{B} + \bar{B}\bar{C} + \bar{C}$$

$$[\bar{A} + \bar{A}\bar{B}] + [\bar{B} + \bar{B}\bar{C}] + \bar{C} \Longrightarrow \bar{A}[1+\bar{B}] + \bar{B}[1+\bar{C}] + \bar{C}$$

$$\Longrightarrow \bar{A} + \bar{B} + \bar{C} \quad \left(\because \text{where } (1+\bar{B} = 1,\ 1+\bar{C} = 1)\right)$$

Ans

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$Y = (AB)(\bar{A} + \bar{B}) \Rightarrow ,\ AB\bar{A} + AB\bar{B}$

$Y = A\bar{A}B + AB\bar{B}$ [where $A\bar{A} = B\bar{B} = 0$

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$\Rightarrow \overline{AB} + (\overline{\bar{B}C + AC})$

$\Rightarrow (\bar{A} + \bar{B}) + [(\overline{\bar{B}C}) \cdot (\overline{AC})]$

$(\bar{A} + \bar{B}) + [(\bar{\bar{B}} + \bar{C}) \cdot (\bar{A} + \bar{C})]$

$\bar{A} + \bar{B} + (B + \bar{C}) \cdot (\bar{A} + \bar{C})$ Ans

Q. Prove the following Identities using Boolean Algebra (2-10)

Ans

$$\overline{\overline{A\,\overline{(A\cdot B)}}\cdot\overline{B\,\overline{(A\cdot B)}}} = A \oplus B$$

A

$$\overline{\overline{A\,\overline{(A\cdot B)}}} + \overline{\overline{B\,\overline{(A\cdot B)}}} \qquad \left[\because\ \overline{\overline{A}} = A\right]$$

$$A\left[\overline{A\cdot B}\right] + B\left[\overline{A\cdot B}\right]$$

$$\left[\overline{A\cdot B}\right]\left[A+B\right] \Rightarrow \left[\bar{A}+\bar{B}\right]\left[A+B\right]$$

$$= \bar{A}A + \bar{A}B + \bar{B}A + \bar{B}B$$

$$= \bar{A}B + A\bar{B}$$

$$= A \oplus B \quad \text{Ans}$$

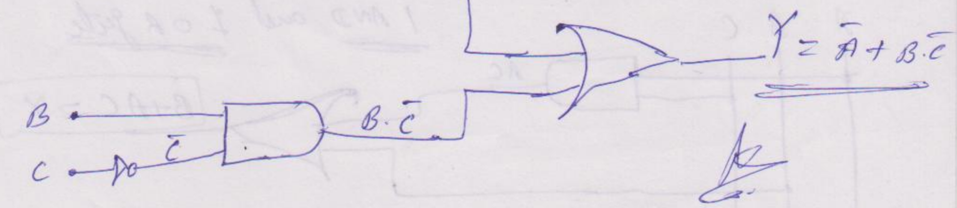
Q. Draw a logic circuit for the function

$$Y = B\cdot(\bar{A}+\bar{C}) + \bar{A}\cdot\bar{B}$$

Ans $Y = B\cdot\bar{A} + B\cdot\bar{C} + \bar{A}\cdot\bar{B} \Rightarrow \bar{A}\left[B+\bar{B}\right] + B\cdot\bar{C}$

$$\boxed{Y = \bar{A} + B\cdot\bar{C}}$$

Logic circuit is



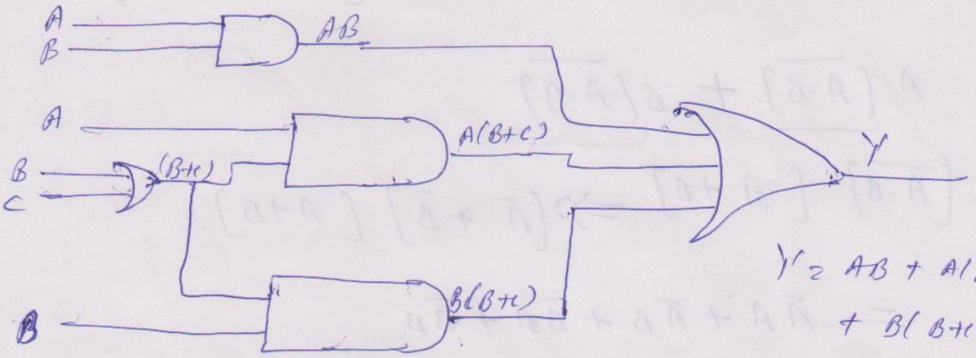
Ans

CQ-(a) Draw a logic circuit to implement the function

$$Y = AB + A(B+C) + B(B+C)$$

(b) Simplify the function and draw logic circuit for the simplified function

Ans (a) It Require 3 AND gate and 2 OR gates



$Y = AB + A(B+C)$
$+ B(B+C)$

(b) $Y = AB + A(B+C) + B(B+C)$

$Y = AB + AB + AC + BB + BC$ $\left[\because AB + AB = AB, \ B \cdot B = B\right]$

$= AB + AC + B + BC$

$= AB + AC + B[1+C]$ $\left[\because 1 + C = 1\right]$

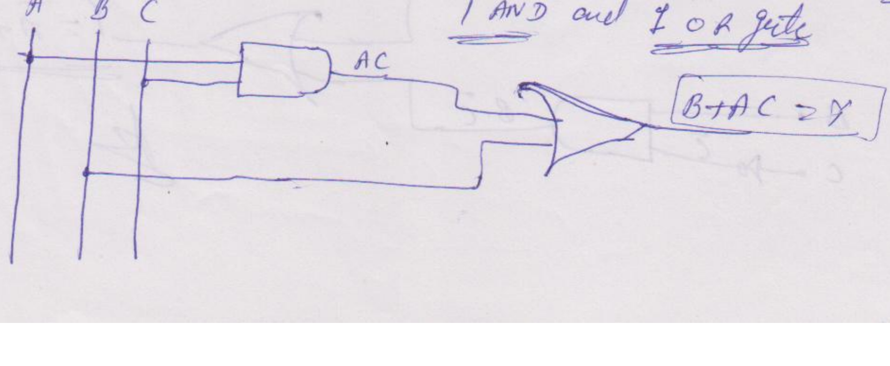
$= AB + AC + B \cdot 1$

$= (A+1)B + AC$ $\left[\because A+1 = 1\right]$

$= B + AC$

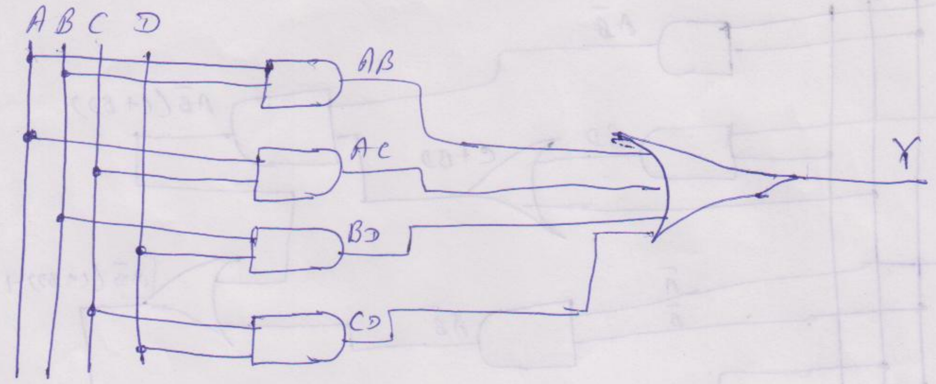
$\boxed{Y = B + AC}$

Show the logic circuit, and It Require 1 AND and 1 OR gate



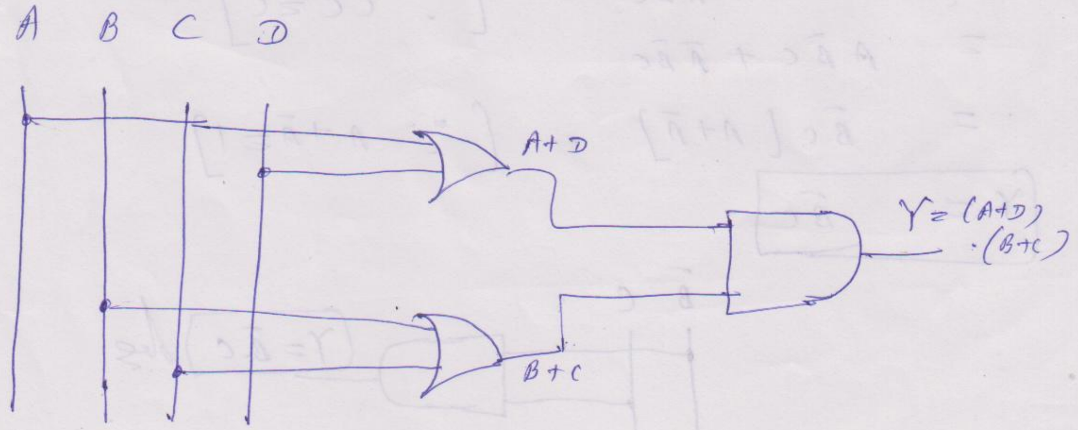
Q. (a) Draw a logic circuit for the boolean eq
$$Y = AB + AC + BD + CD$$
(b) Simplify the expression and draw logic circuit for the simplified expression

Ans (a) It required 4 AND gate and one OR gate



(b)
$$Y = AB + AC + BD + CD$$
$$Y = A(B+C) + D(B+C)$$
$$\boxed{Y = (A+D)(B+C)}$$ Ans

It requires 2 OR and 1 AND gates

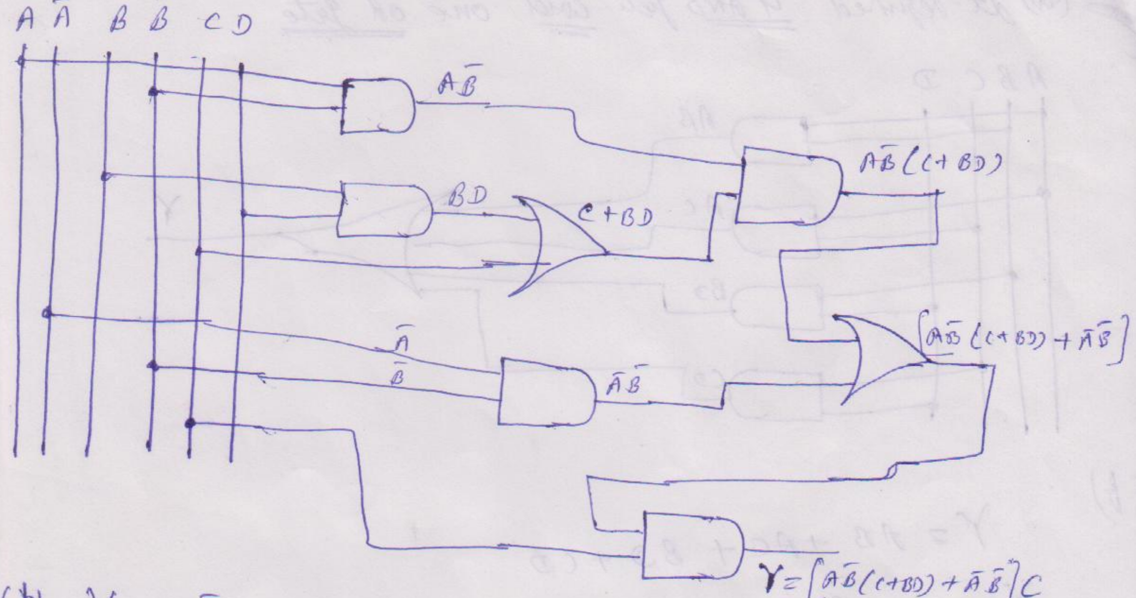


Q- (a) Draw logic circuit for the expression

$$Y = [A\bar{B}(C+BD) + \bar{A}\bar{B}]C$$

(b) Simplify the expression and draw logic for the simplified expression

Ans



(b) $Y = A\bar{B}(C+BD) + \bar{A}\bar{B}]C$

$= [A\bar{B}C + A\bar{B}BD + \bar{A}\bar{B}]C \quad [\because B\bar{B} = 0$

$= [A\bar{B}C + 0 + \bar{A}\bar{B}]C$

$= A\bar{B}CC + \bar{A}\bar{B}C \quad [\because CC = C]$

$= A\bar{B}C + \bar{A}\bar{B}C$

$= \bar{B}C[A + \bar{A}] \quad [\because A + \bar{A} = 1]$

$\boxed{Y = \bar{B}C}$