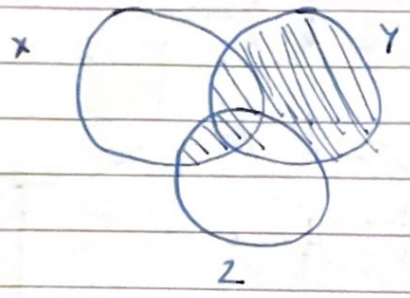
ARYAN RAO
LAB SECTION: 11 __/__/____
ID: 264954748

HOMEWORK 2

P1. A. IMAGE 'A' BEST DESCRIBES $Y\bar{Z} + XZ$



B.

B. $(Y\bar{Z} + \bar{Y}Z).\bar{X}$

C. $X + Y\bar{Z}$

D. $\bar{X}\bar{Y} + ZY$

P2. A. $(A + \bar{B}).(C + \bar{B}) =$

B. $(A + \bar{B}).(C + \bar{B})$

Using Distributive property,

$(x + y).(x + z) = x + y.z$

$\Rightarrow \bar{B} + AC$

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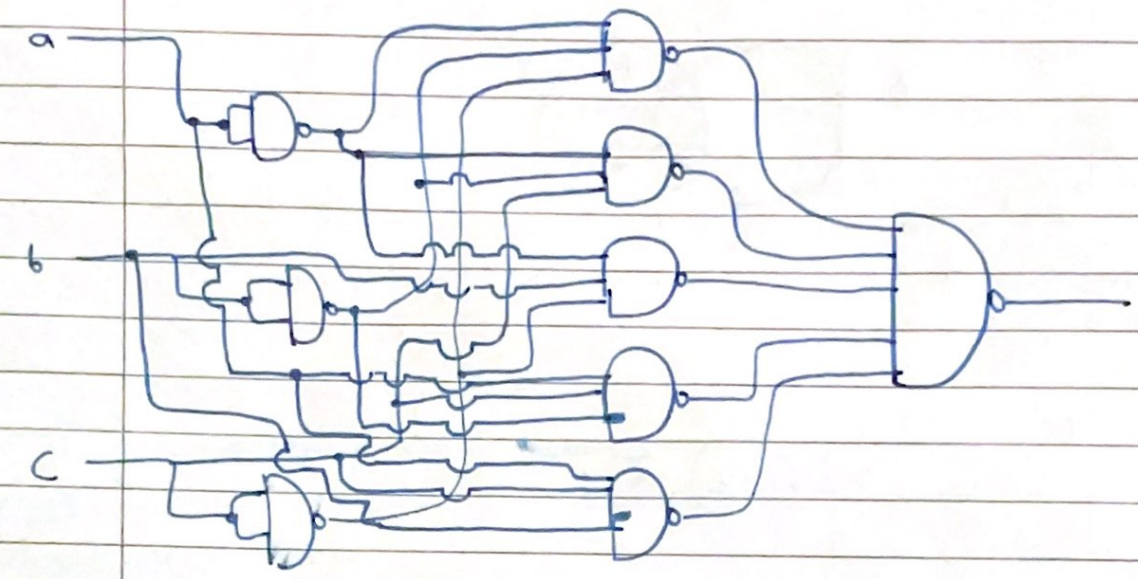
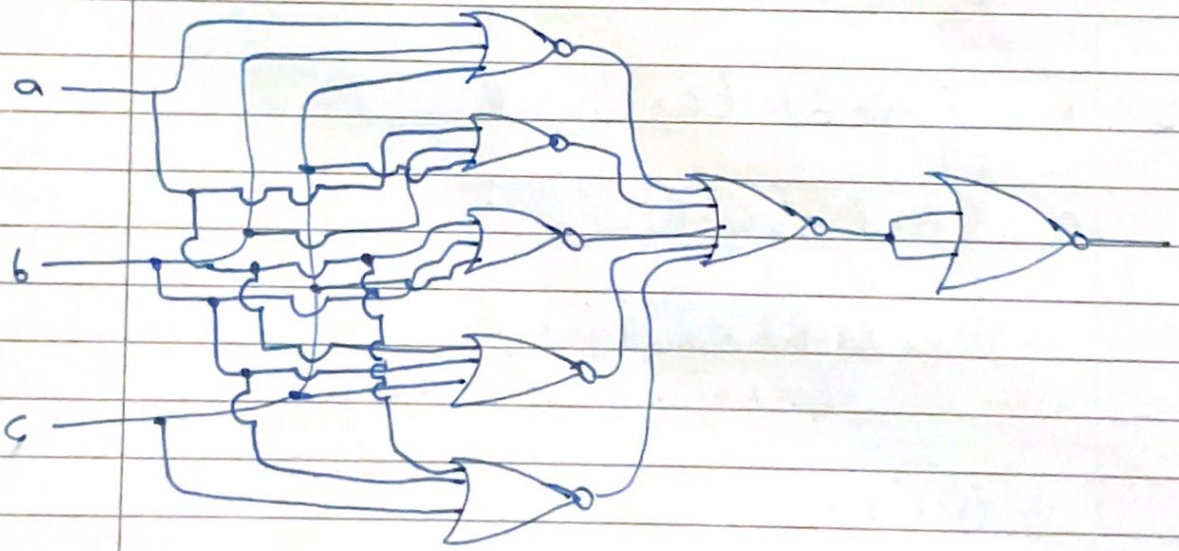
P3. A. $\bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}c + \bar{a}b\bar{c} + a\bar{b}c + abc$

B.



C.



P4. A. $\bar{f} = \overline{xz + \bar{w}y + \bar{x}\bar{x}}$

$= (\bar{x} + \bar{z})(\bar{\bar{w}} + \bar{y})\,\bar{\bar{x}}\bar{x}$

$= (\bar{x} + \bar{z})(w + \bar{y})\,x\bar{x}$

$= (w + \bar{y})\,x\bar{x} + (w + y)x\bar{z}$

$= 0 + (w + \bar{y})x\bar{z}$

$= (w + \bar{y})(x\bar{z})$

$= x\bar{z}w + z\bar{y}\bar{z}$

B. $\bar{f} = \overline{(a+b)(\bar{a}\bar{b} + c)(a + \bar{b}c)}$

$= \bar{a}\bar{\bar{b}} + \bar{a}\bar{b} + c + \bar{a}\bar{\bar{b}}\bar{c}$

$= \bar{a}.\bar{b} + \bar{a}\bar{b}.\bar{c} + a + \bar{b}\bar{c}$

$= \bar{a}.\bar{b} + a.\bar{b}.\bar{c} + a + \bar{b}\bar{c}$

$= \bar{a}.\bar{b} + a.\bar{b}.\bar{c} + a + \bar{b} + \bar{c}$

$= \bar{a}.\bar{b} + a + \bar{b} + \bar{c}$

$= a + \bar{b} + \bar{c}$

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P5/ A. $x_1 x_2 \bar{x}_3 + \bar{x}_1 \bar{x}_2 x_3 + \bar{x}_1 \bar{x}_2 \bar{x}_3$

B. $x_1 x_2 x_3 + x_1 \bar{x}_2 x_3 + x_1 \bar{x}_2 \bar{x}_3 + \bar{x}_1 x_2 \bar{x}_3$

P6. A. $(x_1 + x_2 + x_3)(\bar{x}_1 + \bar{x}_2 + x_3)(\bar{x}_1 + \bar{x}_2 + \bar{x}_3)$

B. $(x_1 + x_2 + x_3)(x_1 + x_2 + \bar{x}_3)(\bar{x}_1 + x_2 + x_3)(\bar{x}_1 + \bar{x}_2 + \bar{x}_3)$

P7. A. $B + BCD + \bar{B}CD + (AB + \bar{A}B) + \bar{B}C$

$\Rightarrow B + BCD + \bar{B}CD + B + \bar{B}C$

(Combining Property)

$\Rightarrow B + BCD + \bar{B}CD + \bar{B}C$

$(B + B = B)$

$\Rightarrow B + CD(B + \bar{B}) + \bar{B}C$

$\Rightarrow B + \bar{B}C + CD \quad (B + \bar{B} = 1)$

$\Rightarrow B + C + CD$ (Absorption Law) $[\bar{A}B + A = B + A]$

$\Rightarrow B + C$ (Absorption Law) $[A + AB = A]$

B. $B\bar{C}(C + A\bar{C}) + (\bar{A} + \bar{C})(\bar{A}B + \bar{A}C)$

$\Rightarrow B\bar{C}(C + A) + (\bar{A} + \bar{C})(\bar{A}B + \bar{A}C)$ (Absorption Law)

$\Rightarrow B\bar{C}C + B\bar{C}A + (\bar{A} + \bar{C})(\bar{A}B + \bar{A}C)$ (Distribution)

$\Rightarrow B\bar{C}A + (\bar{A} + \bar{C})(\bar{A}B + \bar{A}C)$ [Complement Law, $A\bar{A} = 0$, $A + 0 = A$]

$\Rightarrow B\bar{C}A + \bar{A}\bar{A}B + \bar{A}\bar{A}C + \bar{C}(\bar{A}B + \bar{A}C)$ (Distribution)

$\Rightarrow B\bar{C}A + \bar{A}B + \bar{A}C + \bar{C}(\bar{A}B + \bar{A}C)$ (Idempotent Law)

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

[Distributive Law, $AB + AC = A(B + C)$]

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$\Rightarrow B(\bar{C} + \bar{A}) + \bar{A}C + (\bar{A}B + \bar{A}C)\bar{C}$ (Absorption Law)

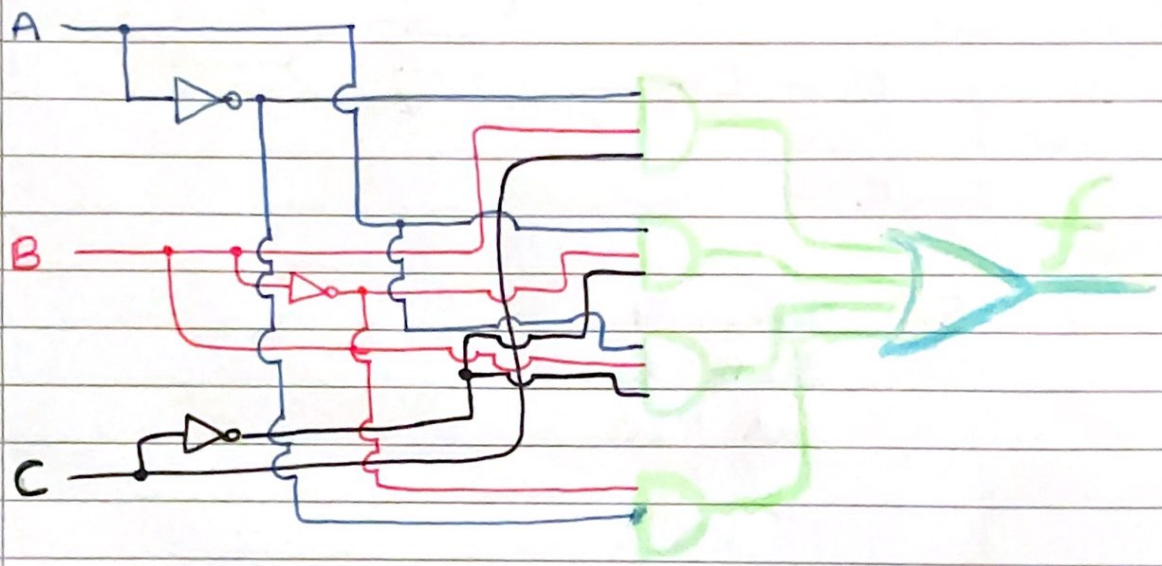
$\Rightarrow B\bar{C} + B\bar{A} + \bar{A}C + \bar{C}\bar{A}B + \bar{C}\bar{A}C$ (Distribution)

$\Rightarrow B\bar{C} + B\bar{A} + \bar{A}C + \bar{C}\bar{A}B$ (Idempotent, $A\bar{A} = 0$, $A + 0 = 0$)

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

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

P8. A.



B. 4gates : 8
Inputs : 18

Total Cost : 26

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C. $(\bar{A}BC + A\bar{B}C + AB\bar{C} + \bar{A}\bar{B})$

$\Rightarrow \bar{A}BC + A(\bar{B}+\bar{C}) + AB\bar{C} + \bar{A}\bar{B})$ (Demorgan)

$\Rightarrow \bar{A}BC + A(\bar{B}+\bar{C}) + AB\bar{C} + \bar{A}+\bar{B}\}$ (Demorgan)

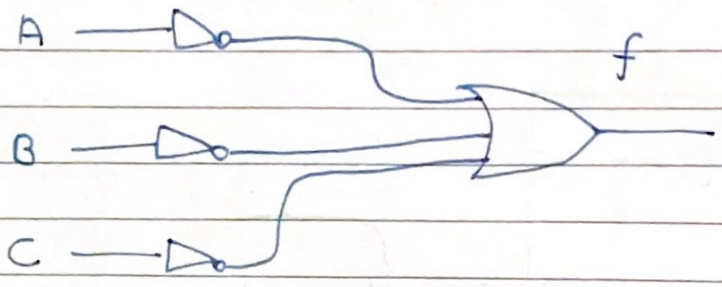
$\Rightarrow (A(\bar{B}+\bar{C}) + AB\bar{C} + \bar{A}+\bar{B})$ $(A + AB = A)$

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

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

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

D.



E. Gates : 4
Inputs : 6
Cost : 10