

STLD

Assignment

$$\begin{aligned}
 \text{Q1 (a)} \quad F &= ABC + ABD + \bar{A}\bar{B}C + CD + B\bar{D} \\
 &= (ABC + \bar{A}\bar{B}C) + ABD + CD + B\bar{D} \\
 &= B + B\bar{D} + ABD + CD \\
 &= B + ABD + CD \\
 &= B + CD
 \end{aligned}$$

\therefore Minimum no. of literals boolean expression = $B + CD$

$$\begin{aligned}
 \text{(b)} \quad F &= A(A+B+C)(\bar{A}+B+C)(A+\bar{B}+C)(A+B+\bar{C}) \\
 &= (A+AB+AC)(A+\bar{B}+C)(\bar{A}+B+C)(A+B+\bar{C}) \\
 &= A(I+B+C)(A+\bar{B}+C)(\bar{A}+B+C)(A+B+\bar{C}) \\
 &= (A+A\bar{B}+AC)(A+B+\bar{C})(\bar{A}+B+C) \\
 &= A(I+\bar{B}+C)(A+B+\bar{C})(\bar{A}+B+C) \\
 &= A\bar{A} + AB + AC \\
 &= AB + AC
 \end{aligned}$$

\therefore Required number of minimum number of literals = $AB + AC$

Q2

$$\begin{aligned}
 \text{(a)} \quad \text{RHS} &= \bar{A}\bar{C}D + A\bar{C}D + A\bar{B}\bar{C} + A\bar{B}C + \bar{A}CD \\
 &= (\bar{A} + A)\bar{C}D + (\bar{C} + C)A\bar{B} + \bar{A}CD \\
 &= \bar{C}D + A\bar{B} + \bar{A}CD \\
 &= D(\bar{A} + \bar{C}) + A\bar{B} \\
 &= D(\bar{A} + \bar{C}) + A\bar{B}
 \end{aligned}$$

$$= \bar{C}D + \bar{A}D + A\bar{B} \Rightarrow \text{LHS}$$

\therefore Proved

$$\begin{aligned}
 \text{(b) RHS} &= (A+B+C)(\bar{A}+B+C)(\bar{A}+B+\bar{C}) \\
 &= (AB+AC+\bar{A}B+B+BC+\bar{A}C+BC+C)(\bar{A}+B+\bar{C}) \\
 &= (B+C)(\bar{A}+B+\bar{C}) \\
 &= \bar{A}C + BC + \bar{A}B + B + \bar{B}C \\
 &= B + \bar{A}C = \text{LHS}
 \end{aligned}$$

\therefore Proved

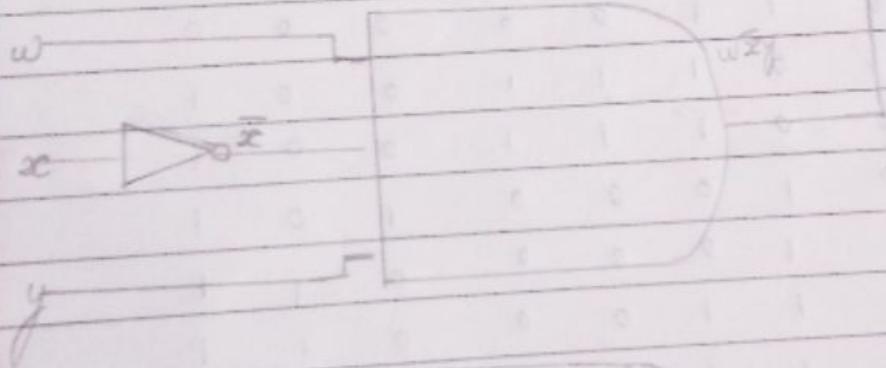
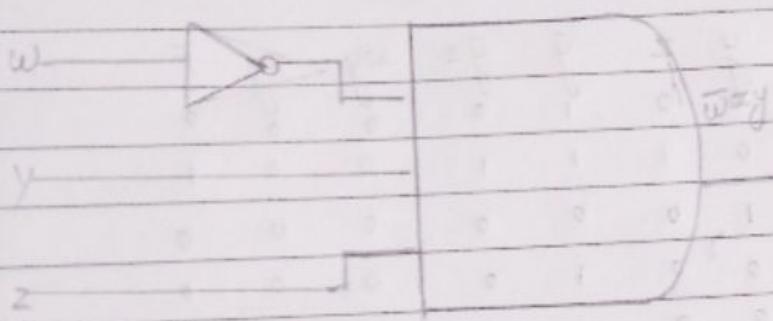
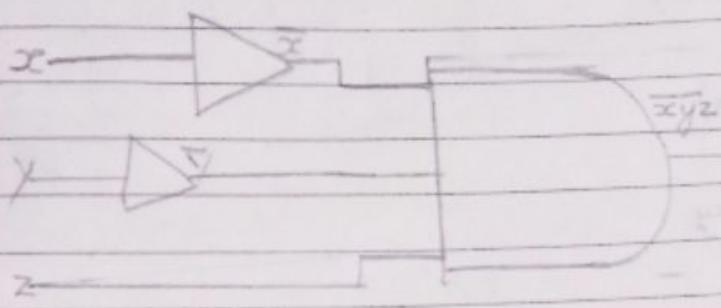
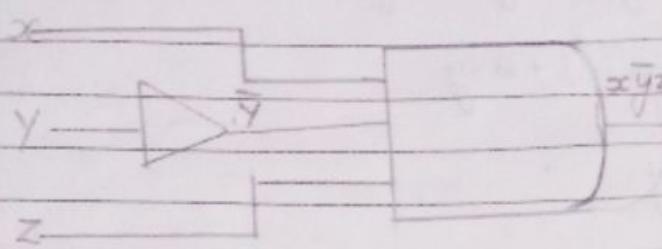
Q3

$$\text{(a) } F = \bar{w}\bar{y}z + \bar{x}\bar{y}z + \bar{w}xy + \bar{w}xz + \bar{w}yz$$

w	x	y	z	\bar{w}	\bar{x}	\bar{y}	\bar{z}	$w\bar{y}z$	$\bar{w}\bar{y}z$	$wxyz$	$\bar{w}xyz$	wxy	$\bar{w}xy$	wxy	$\bar{w}xy$	F
0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	1	
0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	
0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	
1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	
0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	
0	1	0	1	1	0	1	0	1	0	0	0	0	0	0	1	
1	0	0	1	0	1	1	0	0	1	0	0	0	0	0	1	
1	0	1	0	0	1	0	1	0	0	0	1	0	1	0	1	
1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	
0	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	
0	1	1	1	1	0	0	0	0	0	1	0	0	0	0	1	
1	0	1	1	0	1	0	0	0	0	0	1	0	1	0	1	
1	1	0	1	0	0	1	0	1	0	0	0	0	0	1	1	
1	1	1	0	0	0	1	0	0	0	0	0	0	0	1	1	
1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	

(b)

(b)



$$K_{\text{sum}} = \frac{1}{2} R_1 + \frac{1}{2} R_2 + \frac{1}{2} R_3$$

$$\begin{aligned}
 (c) \quad F &= \bar{x}\bar{y} + \bar{x}\bar{y}z + \bar{w}xy + w\bar{x}y + wxy \\
 &= \bar{y}z(x+\bar{x}) + wy(x+\bar{x}) + \bar{w}xy \\
 &= \bar{y}z + wy + \bar{w}xy \\
 &= \bar{y}z + y(w+\bar{w}x) \\
 &= \bar{y}z + y(w+x) \\
 &= \bar{y}z + wy + xy
 \end{aligned}$$

(d)	w	x	y	z	\bar{y}	$\bar{y}z$	wy	xy	F
	0	0	0	0	1	0	0	0	0
	0	0	0	1	1	1	0	0	1
	0	0	1	0	0	0	0	0	0
	0	1	0	0	1	0	0	0	0
	1	0	0	0	1	0	0	0	0
	0	0	1	1	0	0	0	0	0
	0	1	0	1	1	1	0	0	1
	1	0	0	1	1	1	0	0	1
	1	0	1	0	0	0	1	0	1
	0	1	1	0	0	0	0	1	1
	0	1	1	1	0	0	0	1	1
	1	0	1	1	0	0	1	0	1
	1	1	0	1	0	1	0	0	1
	1	1	1	0	0	0	1	1	1
	1	1	0	0	0	0	0	0	0
	1	1	1	1	0	0	1	1	1

Since the column 'F' is identical in both truth table, so the they are exactly same.

(e)

