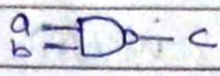
Practice Problem-1

Ans 1 : (a)



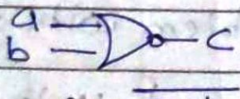
$c = \overline{ab}$

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

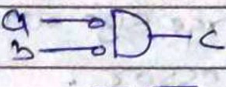
$c = \overline{ab}$ ∴ **Both are equal**

(Using De-Morgan)

(b)

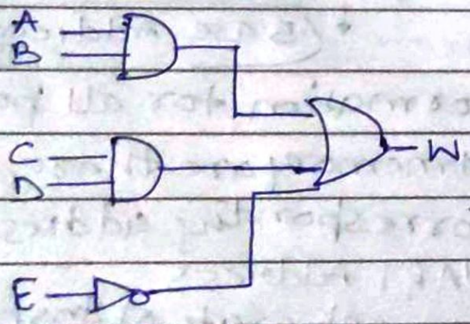


$c = \overline{a+b}$



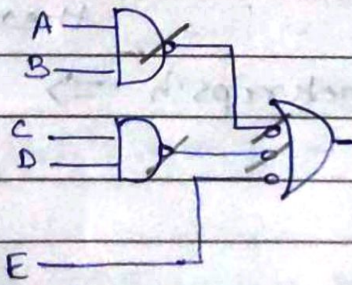
$c = \overline{a} \cdot \overline{b} = \overline{a+b}$ (De-morgan law)

(c) (i)

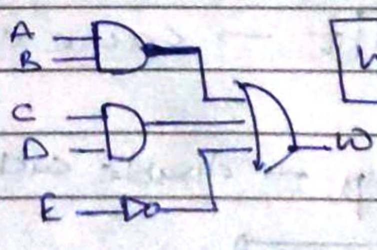


$\boxed{W = AB + CD + \overline{E}}$

(ii)

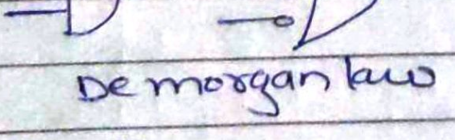


≡ We can cancel out the bubble

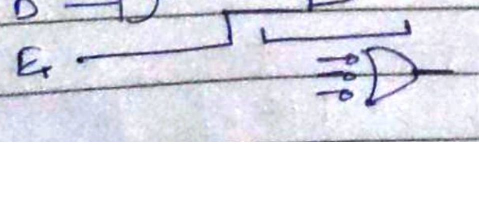


$\boxed{W = AB + CD + \overline{E}}$

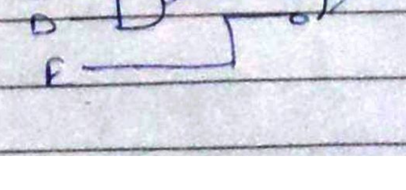
(iii)



De morgan law



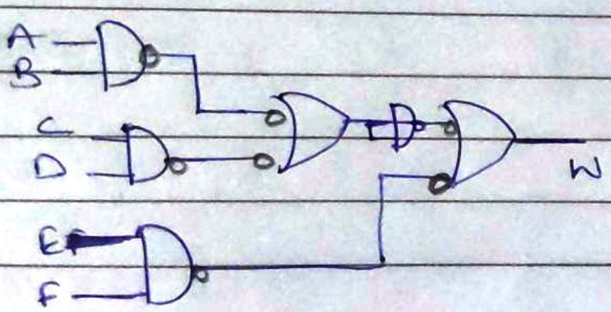
≡

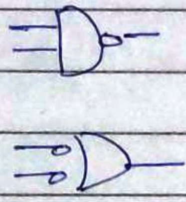


$\boxed{W = AB + CD + \overline{E}}$

∴ equal

Ans 2 : $W = AB + CD + EF$





NAND

NAND

(Due to De-Morgan law)

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Ans 3: $\overline{W}\,\overline{Y} + W\overline{Y} + XY = X + \overline{Y}$

LHS: $(\overline{W} + W)\overline{Y} + XY \Rightarrow \overline{Y} + XY \Rightarrow (\overline{Y} + X)(\overline{Y} + Y)$

$\Rightarrow \overline{Y} + X$ (LHS = RHS)

Proved

Truth Table:

Truth Table:

$x\bar{y}\bar{w} + \bar{x}\bar{y}\bar{w} + x\bar{y}w + \bar{x}\bar{y}w + xyw + xy\bar{w}$

(100) (000) (101) (001) (111) (110)

x \ yz	00	01	11	10
0	1	1		
1	1	1	1	1

$\therefore \boxed{x+\bar{y}}$ Ans

Ans 4 : (a) $Z = AB\cdot[\bar{B}+\bar{C}] \Rightarrow AB[\overline{BC}] \Rightarrow AB\bar{B} + AB\bar{C}$

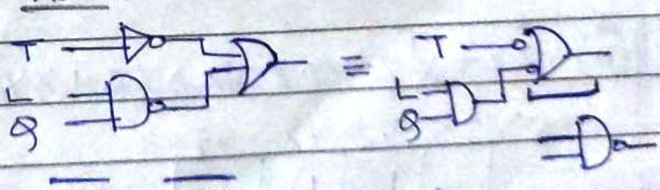
$Z = AB\bar{C}$ Ans

(b) $M = FT + \overline{LQ} + \bar{T} + Q$

$= FT + \bar{L} + \bar{Q} + \bar{T} + Q$

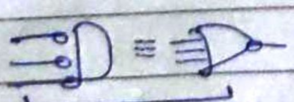
$\Rightarrow (F+\bar{T}) + \bar{L}$ Ans

Note :



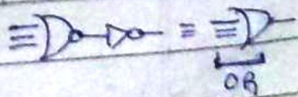
$\bar{T} + \overline{LQ}$

(c)



[De-morgan]

$P = \bar{W}X + \bar{X}Z\bar{Y} + \bar{X}YZ$



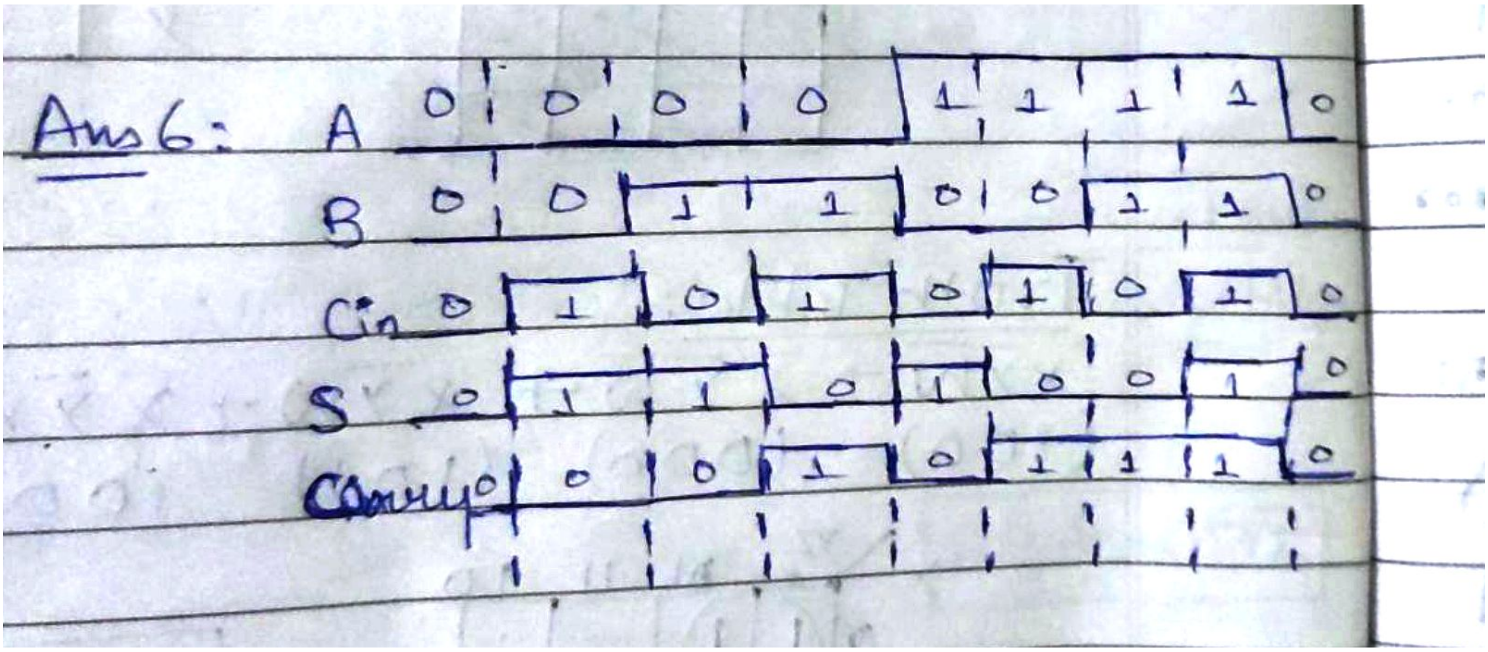
(d) $P = \bar{X}YW + X\bar{W} + \bar{X}\bar{Y}Z$ Ans

(e) $P = (W+X+\bar{Y})(\bar{W}+\bar{X})(X+Y+Z)$ Ans

Ans5: $S = ABC + \overline{A}\overline{B}C + A\overline{B}\overline{C} + \overline{A}B\overline{C}$ $C = AB + BC_{in} + AC_{in}$

A B C_{in}	C	S
0 0 0	0	0
0 0 1	0	1
0 1 0	0	1
0 1 1	1	0
1 0 0	0	1
1 0 1	1	0
1 1 0	1	0
1 1 1	1	1

→ It is acting as a full-Adder
→ S = sum
→ C = carry


Ans 6:
A 0 0 0 0 1 1 1 1 0
B 0 0 1 1 0 0 1 1 0
Cin 0 1 0 1 0 1 0 1 0
S 0 1 1 0 1 0 0 1 0
Carry 0 0 0 1 0 1 1 1 0

Ans 7: (i) $A + AB' + ABC'$

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

A \ BC	$\bar{B}\bar{C}$	$\bar{B}C$	BC	$B\bar{C}$
$\bar{A}$	0	0	0	0
A	1	1	1	1

$\Rightarrow A$ **Ans**

(Proved)

(ii) $XY + X'Z + Y \cdot Z \Rightarrow XYZ + XY\bar{Z} + \bar{X}YZ + \bar{X}\bar{Y}Z + XYZ + \bar{X}YZ$

X \ YZ	$\bar{Y}\bar{Z}$	$\bar{Y}Z$	YZ	$Y\bar{Z}$
$\bar{X}$	0	1 1	1 3	2
X	4	5	1 7	1 6

$\Rightarrow \bar{X}Z + XY$ **Ans**

(Proved)

Ans 8: (i) $A + A\bar{B} + AB\bar{C} \Rightarrow A + AB\bar{C} \Rightarrow A(1 + B\bar{C}) \Rightarrow A$

→ Truth table proof is in Ans 7.

(ii) $XY + YZ + \bar{X}Z \Rightarrow XY + XYZ + \bar{X}YZ + \bar{X}Z \Rightarrow XY + \bar{X}Z$ **Ans**

→ Truth table proof is in Ans 7.

(iii) $X + \bar{X}Y = (X + \bar{X})(X + Y) \Rightarrow X + Y$ **Ans**

X \ Y	0	1
0		1
1	1	1

$X + Y$ (Proved)