University of engineering & technology Peshawar

Digital Logic &computer Design-theory

Assignment no#02

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Section: B

Reg No: 19PWCSE1795

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"On my honor, as a student of University of Engineering and Technology Peshawar, I have neither given nor received unauthorized assistance on this academic work"

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Ans: 1:

Truth table.

x	y	z	F_1	Symbole	minterm
0	0	0	0	m_0	$\bar{x}\bar{y}\bar{z}$
0	0	1	0	m_1	$\bar{x}\bar{y}z$
0	1	0	1	m_2	$\bar{x}y\bar{z}$
0	1	1	1	m_3	$\bar{x}yz$
1	0	0	1	m_4	$x\bar{y}\bar{z}$
1	0	1	0	m_5	$x\bar{y}z$
1	1	0	1	m_6	$xy\bar{z}$
1	1	1	0	m_7	xyz

Table 1.1

For F_1:

$$F_1(x,y,z) = \sum m(m_2, m_3, m_4, m_6)$$
$$= \sum m(2, 3, 4, 6)$$
$$= (x'yz' + x'yz + xy'z' + xyz')$$
$$F_1(x,y,z) = x'y(z'+z) + xz'(y'+y)$$

According to boolean law

$z' + z = 1$ & $y' + y = 1$ So

$$\boxed{F_1(x,y,z) = x'y + xz'}$$

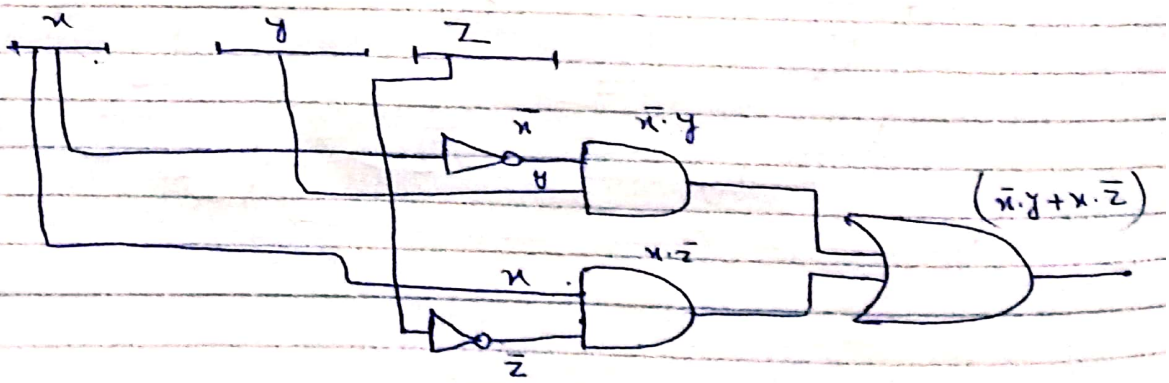


Table for more functions.

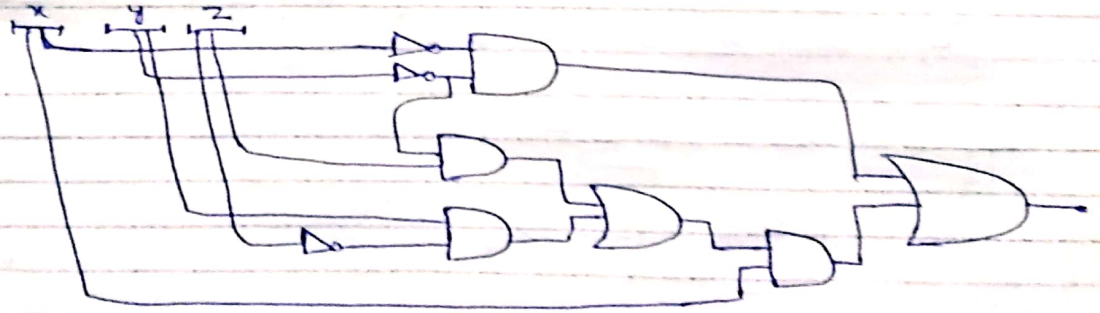
x	y	z	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}
0	0	0	0	1	0	1	0	0	0	0	0
0	0	1	1	1	0	1	0	1	0	1	0
0	1	0	0	0	1	0	1	1	0	0	0
0	1	1	1	0	0	0	1	0	1	1	0
1	0	0	1	0	1	0	0	1	0	0	1
1	0	1	0	1	0	0	0	0	1	1	1
1	1	0	0	1	1	0	0	1	1	0	0
1	1	1	1	0	0	1	1	0	0	1	1

Table 1.2

For F_3:

the minterm for F_3 from table 1.2

$$F_3(x,y,z) = \sum m(0,1,5,6)$$
$$= (\bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + x\bar{y}z + xy\bar{z})$$
$$= \bar{x}\bar{y}(\bar{z}+z) + x\bar{y}z + xy\bar{z})$$
$$\boxed{F_3(x,y,z) = \bar{x}\bar{y}(1) + x(\bar{y}z + y\bar{z})}$$



For F_2:

the mentem for F_2 from table

$F_2(x,y,z) = \Sigma m(1, 3, 4, 7)$

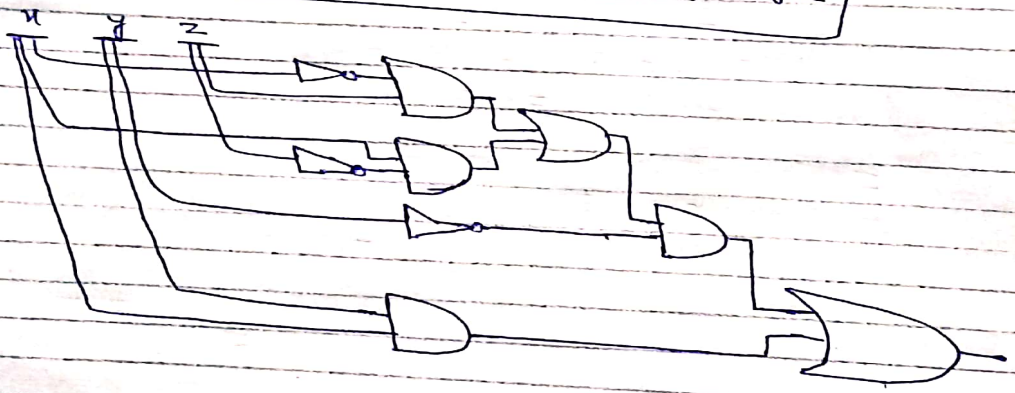
$= (\bar{x}\bar{y}z + \bar{x}yz + x\bar{y}\bar{z} + xyz)$

$= \bar{x}\bar{y}z + \bar{x}yz + xyz + x\bar{y}\bar{z})$

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

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

$F_2(x,y,z) = \bar{y}(\bar{x}z + x\bar{z}) + yz$



F_4:

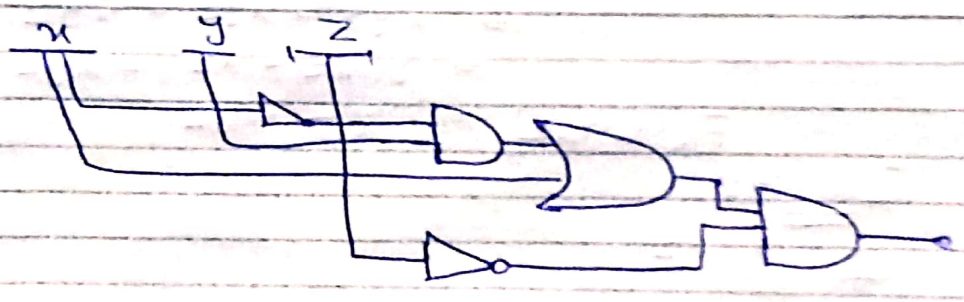
$$F_4(x,y,z) = \sum m(2,4,6)$$
$$= (\bar{x}y\bar{z} + x\bar{y}\bar{z} + xy\bar{z})$$
~~$\bar{z}(y\bar{x} + x\bar{y}) + xy\bar{z}$~~

$$F_4(x,y,z) = \bar{z}(\bar{x}y + x\bar{y} + xy)$$

~~Circuit Diagram~~

$$= \bar{z}(\bar{x}y + x(\bar{y}+y))$$
$$F_4(x,y,z) = \bar{z}(\bar{x}y + x)$$

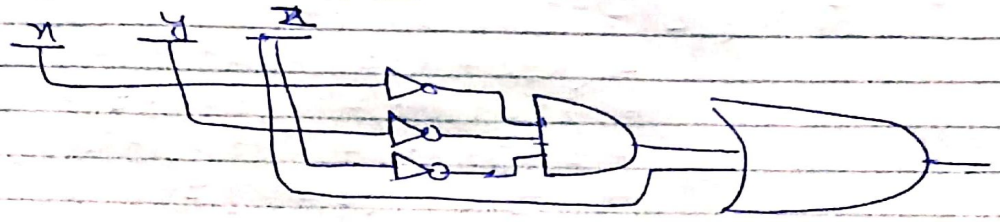
Circuit Diagram:



F_5:

$$F_5(x,y,z) = \sum m(0,1,7)$$
$$= (\bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + xyz)$$
$$= (\bar{x}\bar{y}\bar{z} + z(\bar{x}\bar{y} + xy))$$
$$F_5(x,y,z) = \bar{x}\bar{y}\bar{z} + z$$

Circuit diagrams



F_6:

$$F_6(x,y,z) = \sum m(2,3,7)$$
$$= \bar{x}y\bar{z} + \bar{x}yz + xyz$$
$$= \bar{x}y\bar{z} + xyz + \bar{x}yz$$
$$= y(\bar{x}\bar{z} + xz) + \bar{x}yz$$
$$= y + \bar{x}yz$$
$$F_6(x,y,z) = y(1 + \bar{x}z)$$

As $1 +$ anything $= 1$ so

$$\boxed{F_6(x,y,z) = y}$$

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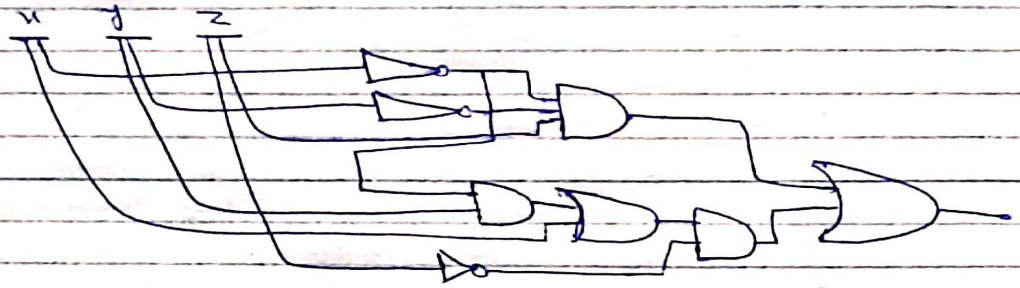
F7:

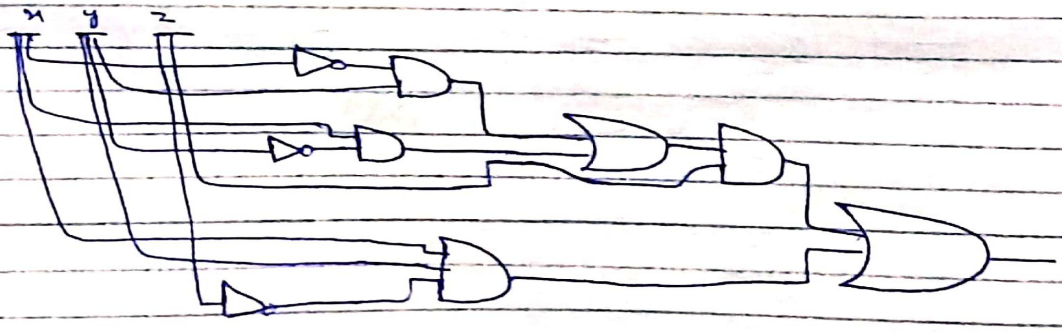
$$F_7(x,y,z) = \sum m(1,2,4,6)$$
$$= (\bar{x}\bar{y}z + \bar{x}y\bar{z} + x\bar{y}\bar{z} + xy\bar{z})$$
$$= \bar{x}\bar{y}z + \bar{z}(\bar{x}y + x\bar{y} + xy)$$
$$= \bar{x}\bar{y}z + \bar{z}(\bar{x}y + x(\bar{y}+y))$$
$$F_7(x,y,z) = \bar{x}\bar{y}z + \bar{z}(\bar{x}y + x)$$

Circuit:



F8:

$$F_8(x,y,z) = \sum m(3,5,6)$$
$$= (\bar{x}yz + x\bar{y}z + xy\bar{z})$$
$$F_8(x,yz) = z(\bar{x}y + x\bar{y}) + xy\bar{z}$$



F9:

$$F_9(x,y,z) = \sum m(1,3,5,7)$$
$$= (\bar{x}\bar{y}z + \bar{x}yz + x\bar{y}z + xyz)$$
$$= \bar{x}\bar{y}z + xyz + \bar{x}yz + x\bar{y}z$$
$$= z(\bar{x}\bar{y} + xy) + \bar{x}yz + x\bar{y}z$$
$$= z + \bar{x}yz + x\bar{y}z$$
$$= z(1 + \bar{x}y + x\bar{y})$$

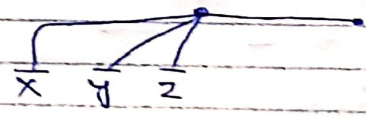
As 1 + anything = 1 so

$$F_9(x,y,z) = z(1 + x\bar{y})$$

again

$$\boxed{F_9(x,y,z) = z}$$ So

Circuit:



F10:

$$F_{10}(x,y,z) = \sum m(4,5,7)$$
$$= (x\bar{y}\bar{z} + x\bar{y}z + xyz)$$
$$= x\bar{y}\bar{z} + xyz + x\bar{y}z$$
$$= x(\bar{y}\bar{z} + yz) + x\bar{y}z$$
$$= x(1) + x\bar{y}z$$
$$= x(1 + \bar{y}z)$$

As 1 + anything = 1 so

$$\boxed{F_{10}(x,y,z) = x}$$

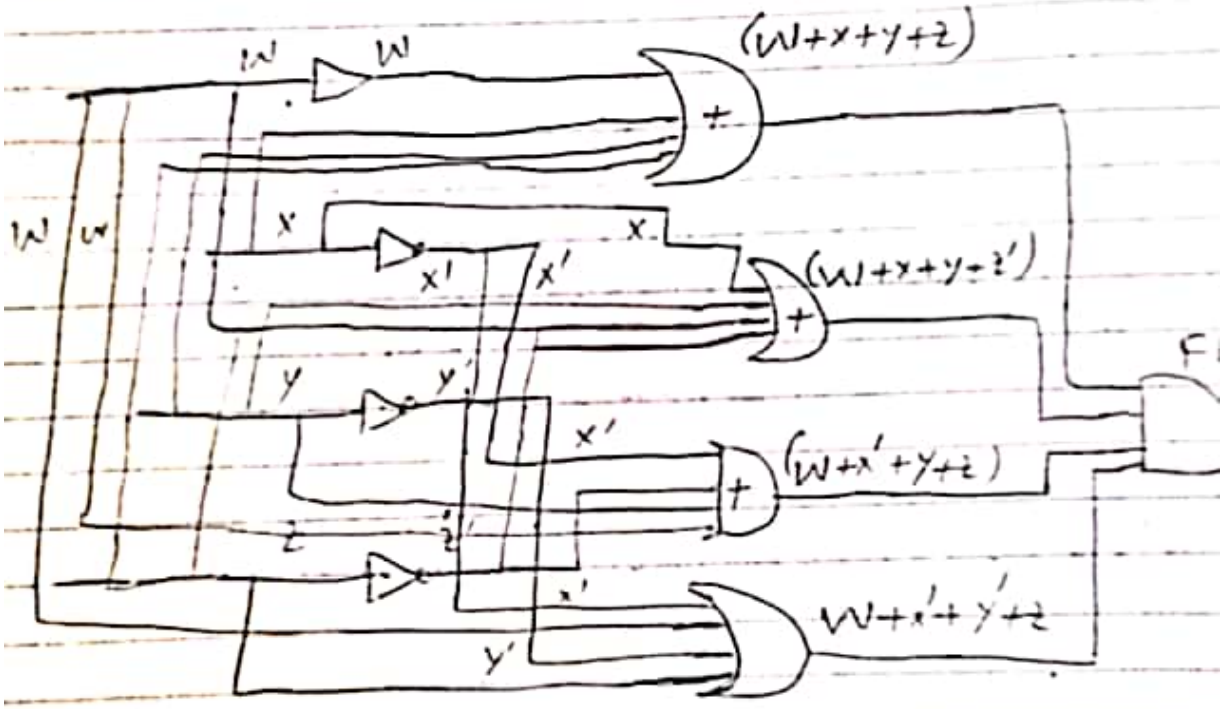
(Q NO 2)

W	X	Y	Z	F1	F2	maxterms:
0	0	0	0	0	0	$W+X+Y+Z$ M_0
0	0	0	1	0	0	$W+X+Y+\acute{Z}$ M_1
0	0	1	0	0	1	$W+X+\acute{Y}+Z$ M_2
0	0	1	1	1	1	$W+X+\acute{Y}+\acute{Z}$ M_3
0	1	0	0	1	1	$W+\acute{X}+Y+Z$ M_4
0	1	0	1	0	0	$W+\acute{X}+Y+\acute{Z}$ M_5
0	1	1	0	0	0	$W+\acute{X}+\acute{Y}+Z$ M_6
0	1	1	1	1	0	$W+\acute{X}+\acute{Y}+\acute{Z}$ M_7
1	0	0	0	1	1	$\acute{W}+X+Y+Z$ M_8
1	0	0	1	1	1	$\acute{W}+X+Y+\acute{Z}$ M_9
1	0	1	0	0	0	$\acute{W}+\acute{X}+Y+Z$ M_{10}
1	0	1	1	0	0	$\acute{W}+\acute{X}+Y+\acute{Z}$ M_{11}
1	1	0	0	0	1	$\acute{W}+\acute{X}+\acute{Y}+Z$ M_{12}
1	1	0	1	1	1	$\acute{W}+\acute{X}+Y+\acute{Z}$ M_{13}
1	1	1	0	1	0	$\acute{W}+\acute{X}+\acute{Y}+Z$ M_{14}
1	1	1	1	1	1	$\acute{W}+\acute{X}+\acute{Y}+\acute{Z}$ M_{15}

$F1(w, x, y, z) = \Pi(M_0, M_1, M_5, M_6)$

$F_1(w, x, y, z) = (w + x + y + z) \cdot (w + x + y + z')$
$\cdot (w + x' + y + z) \cdot (w + x' + y' + z)$

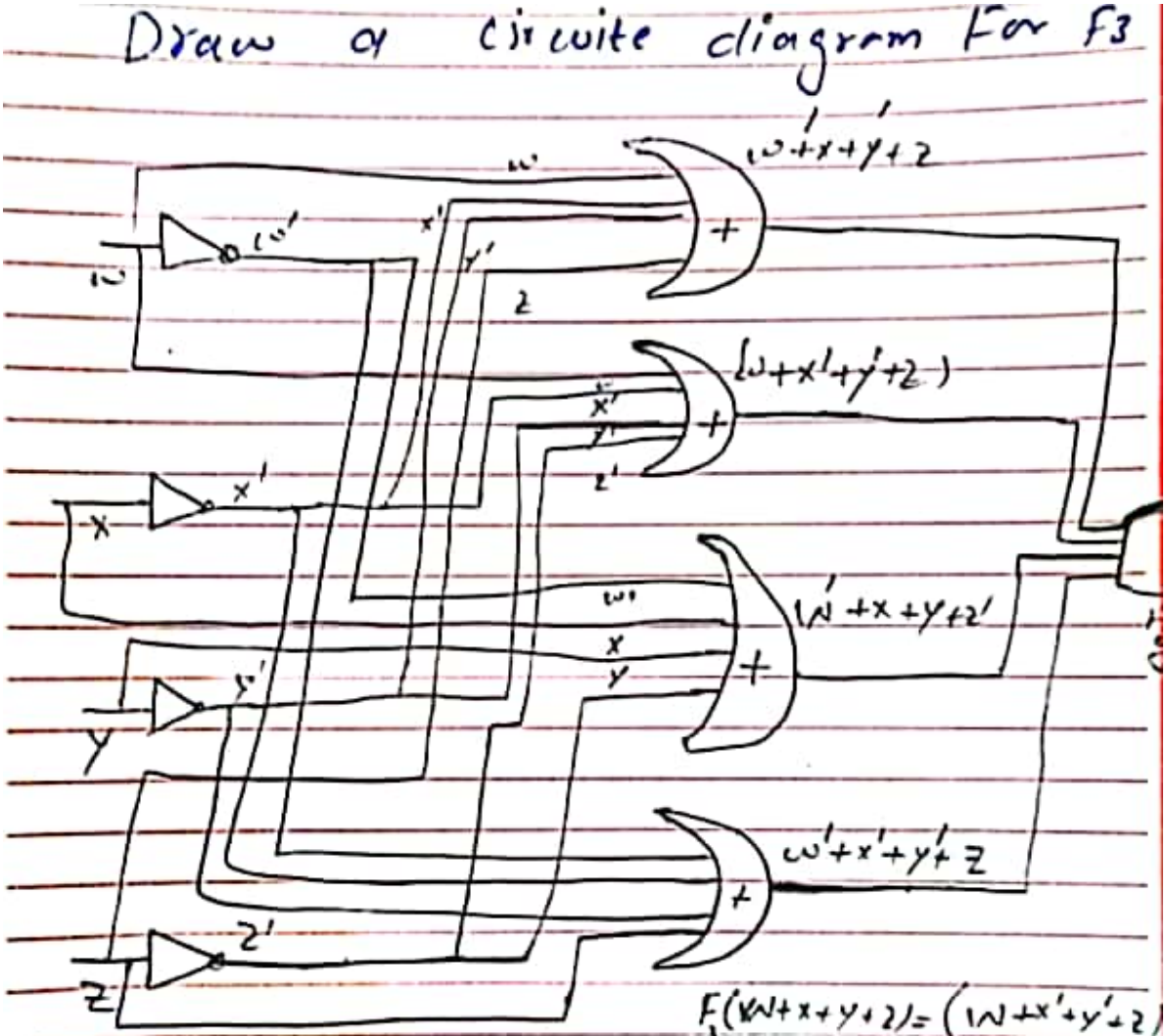
Now Draw a circuite diagram:-



Function F2

$F_2(w, x, y, z) = (A+B+C+D)(w + x + y' + z)(w' + x + y' + z)$
$(w' + x' + y + z)$

Draw a circuite diagram For F3



$F_3(w,x,y,z) = (w'+x+y'+z)$
$(w+x'+y'+z') \cdot (w'+x+y+$
$\cdot (w+x'+y+z)$

$F5(w,x,y,z) = (w+x'+y'+z)(w'+x+y+z)$
$(w'+x+y'+z)(w'+x'+y'+$

Draw a circuite diagram F5