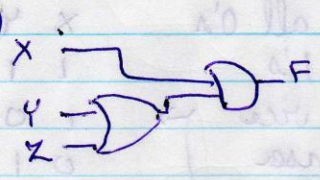
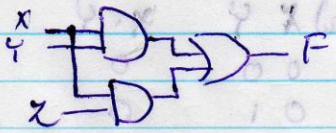
HW 3 solutions

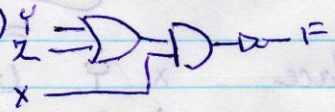
2.2 a.)



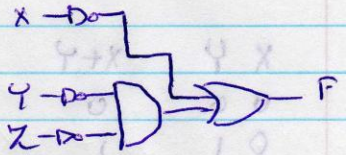
b.)



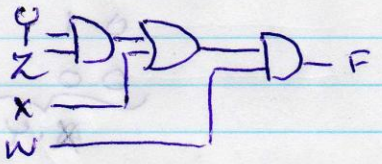
c.)



d.)

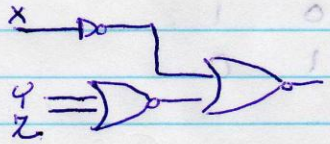


e.)

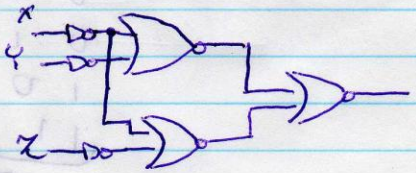


2.3 a.) $\overline{(\bar{X} + (\bar{Y} + Z))} = \overline{\bar{X} + (\bar{Y}Z)} = \overline{\bar{X} + (Y \text{ NOR } Z)}$

$= \bar{X} \text{ NOR } (Y \text{ NOR } Z)$



b.) $\overline{(\bar{X} + \bar{Y})} + \overline{(\bar{X} + \bar{Z})} = (\bar{X} \text{ NOR } \bar{Y}) \text{ NOR } (\bar{X} \text{ NOR } \bar{Z})$



2.7 a)

X	Y	X·Y
0	0	0
0	1	0
1	0	0
1	1	1

replace all 0's by 1's and vice versa →

X	Y	$(X \cdot Y)^D$
1	1	1
1	0	1
0	1	1
0	0	0

$= X + Y$

X	Y	X+Y
0	0	0
0	1	1
1	0	1
1	1	1

replace

X	Y	$(X+Y)^D$
1	1	1
1	0	0
0	1	0
0	0	0

$X \cdot Y$

b)

X	Y	$\overline{XY}$
0	0	1
0	1	1
1	0	1
1	1	0

replace

X	Y	$(\overline{XY})^D$
1	1	0
1	0	0
0	1	0
0	0	1

$\overline{X+Y}$

X	Y	$\overline{X+Y}$
0	0	1
0	1	0
1	0	0
1	1	0

replace

X	Y	$(\overline{X+Y})^D$
0	0	0
0	1	1
1	0	1
1	1	1

$\overline{XY}$

c)

X	Y	X XOR Y
0	0	0
0	1	1
1	0	1
1	1	0

replace

X	Y	(X XOR Y)^D
1	1	1
1	0	0
0	1	0
0	0	1

X XNOR Y

2.7 c.)

X	Y	X XNOR Y
0	0	1
0	1	0
1	0	0
1	1	1

replace

X	Y	$(X \text{ XNOR } Y)'$
1	1	0
1	0	1
0	1	1
0	0	0

X XOR Y

d.) XOR + XNOR = 1

XOR · XNOR = 0

X	Y	(X XOR Y)(X XNOR Y)	XOR + XNOR	XOR · XNOR
0	0	0	1	0
0	1	1	1	0
1	0	1	1	0
1	1	0	1	0

-OR-

$\overline{(X\bar{Y} + \bar{X}Y)} \leftarrow \bar{X}+\bar{Y} \cdot \bar{X}+\bar{Y} = (\bar{X}+Y)(X+\bar{Y})$

$= \bar{X}X + \bar{X}\bar{Y} + XY + Y\bar{Y}$

$= \bar{X}\bar{Y} + XY$