1.

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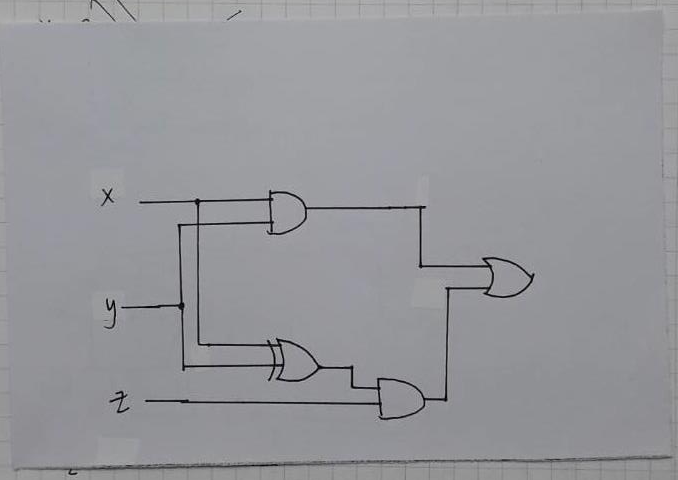
(a) $x'yz + xy'z + xyz + xyz'$

$= z(x'y + xy') + xy(z + z')$

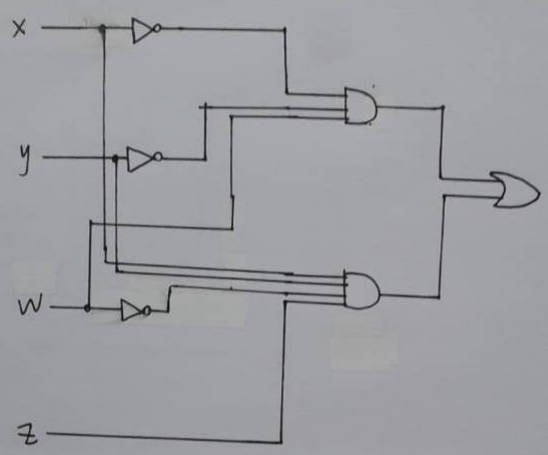
$= z(x+y)(x'+y') + xy$



(b) $(x'y' + xw')(x'w + yz)$

$= x'y'x'w + x'y'yz + xw'x'w + xw'yz$

$= x'y'w + xw'yz$



2.

(a) $\Big((x'+w)y + wyz + x'z(x+y)\Big)'$

$= [(x'+w)y]' \cdot [wyz]' \cdot [x'z(x+y)]'$

$= [(x'+w)' + y'] \cdot [w'+y'+z'] \cdot [x+z' + (x+y)']$

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

(b) $\left[x(y'+z)+y'z(x+w)\right]'$

$= \left[x(y'+z)\right]' \cdot \left[y'z(x+w)\right]'$

$= \left[x'+(y'+z)'\right] \cdot \left[(y+z')+(x+w)'\right]$

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

(c) $\left[x(y+y'(z+w))\right]'$

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

$= x'+y' \cdot \left[y'(z+w)\right]'$

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

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

(d) $\left(xy+y(x+z)\right)'$

$= (xy')' \cdot (y(x+z))'$

$= (x'+y) \cdot (y'+(x+z)')$

$= (x'+y) \cdot (y'+x'z')$

3. $A = 11010101$

$B = 01110001$

(a) $A \cdot B = 01010001$

(b)

$A \odot B = A \cdot B + (A+B)'$

$A \cdot B = 01010001$

$A' \cdot B' = 00001010$

$A \odot B = 01011011$

(c) NOT $A \Rightarrow A' = 00101010$

4. $F = x'yz' + w'y + wyz'$

w	x	y	z	F.	
0	0	0	0	0	m_0
0	0	0	1	0	m_1
0	0	1	0	1	m_2
0	0	1	1	0	m_3
0	1	0	0	0	m_4
0	1	0	1	0	m_5
0	1	1	0	1	m_6
0	1	1	1	0	m_7
1	0	0	0	0	m_8
1	0	0	1	0	m_9
1	0	1	0	1	m_{10}
1	0	1	1	0	m_{11}
1	1	0	0	0	m_{12}
1	1	0	1	0	m_{13}
1	1	1	0	1	m_{14}
1	1	1	1	0	m_{15}

$F = \Sigma(2, 6, 10, 14)$.

$= w'x'yz' + w'xyz' + wx'yz + wxyz'$

$F' = w'x'y'z' + w'x'y'z + w'x'yz + w'xy'z'$
$+ w'xy'z + w'xyz + wx'y'z' + wx'y'z$
$+ wx'yz + wxy'z' + wxy'z + wxyz.$

$F = (F')'$

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

$(w+x'+y+z')(w+x'+y'+z')(w'+x+y+z)(w'+x+y+z')$

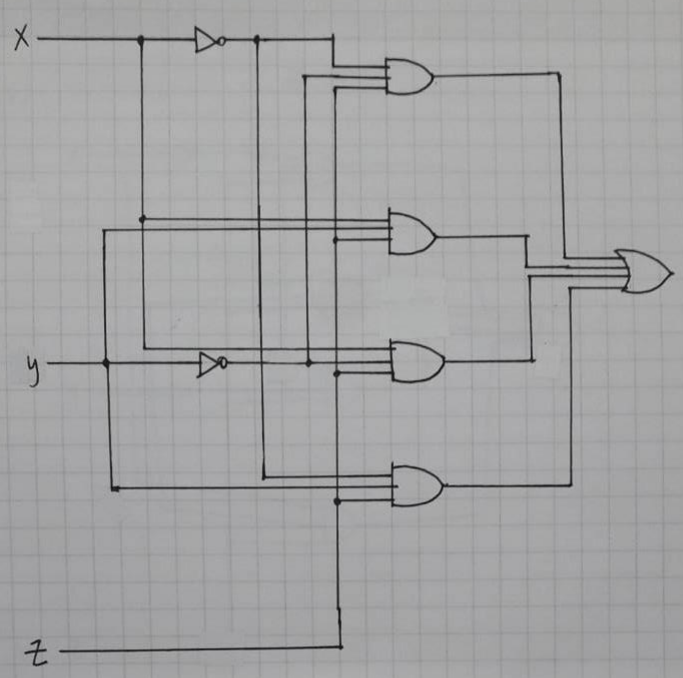
$(w'+x+y'+z')(w'+x'+y+z)(w'+x'+y+z')$

$(w'+x'+y'+z')$

5. $F = x'y'z + xy'z + xyz + x'yz$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

(b)



(c) $x'y'z + xy'z + xyz + x'yz$

$= xz(y'+y) + x'z(y'+y)$

$= xz + x'z$

$= z(x+x')$

$= z$

(d)

z	G
0	0
1	1

(e) $F = x'y'z + xy'z + xyz + x'yz$

3 AND , 1 OR . 7 gates

$G = z$

1 AND. 1 gate