COMP 249 LC QUIZ ANSWERS

1. $x'y'z + w'xz + wxyz' + wxz + w'xyz = y'z + xz + wxy$

$\rightarrow = x'y'z + xz(w+w') + wxyz' + w'xyz$

$= x'y'z + xz(1+w'y) + wxyz'$

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

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

$= xz + y'z + wxyz'$

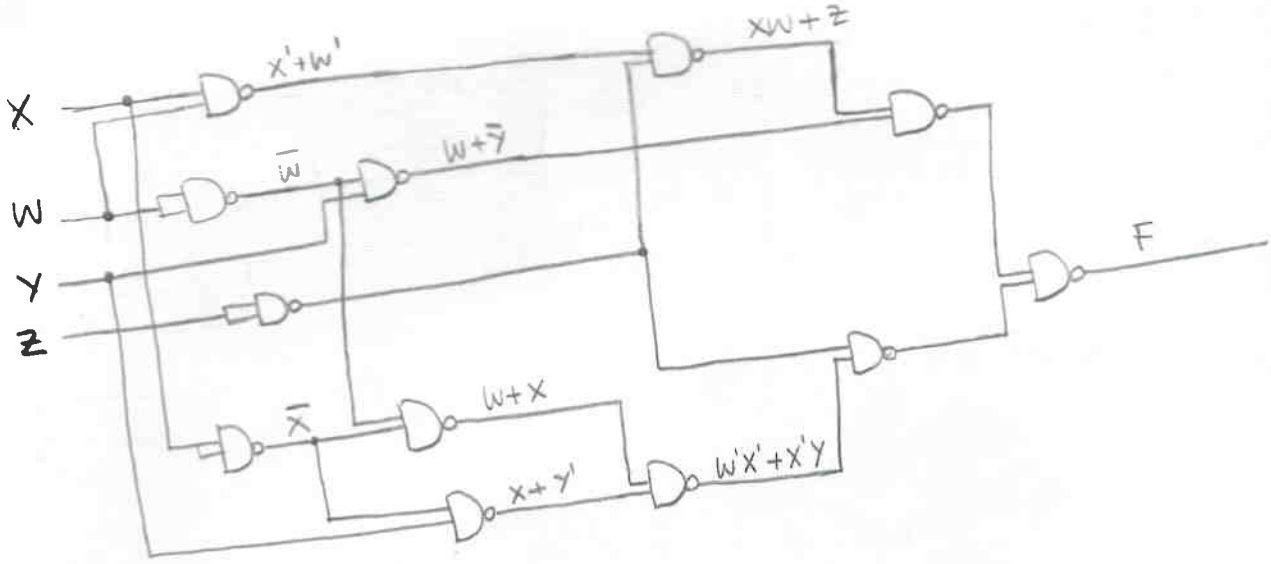
$= x(z+wyz') + y'z$

$= x(z+wy) + y'z \quad = xz + y'z + wxy$ ✓

(30 points)

2. $f = z(x'y + w'x') + (w+y')(xw+z)$

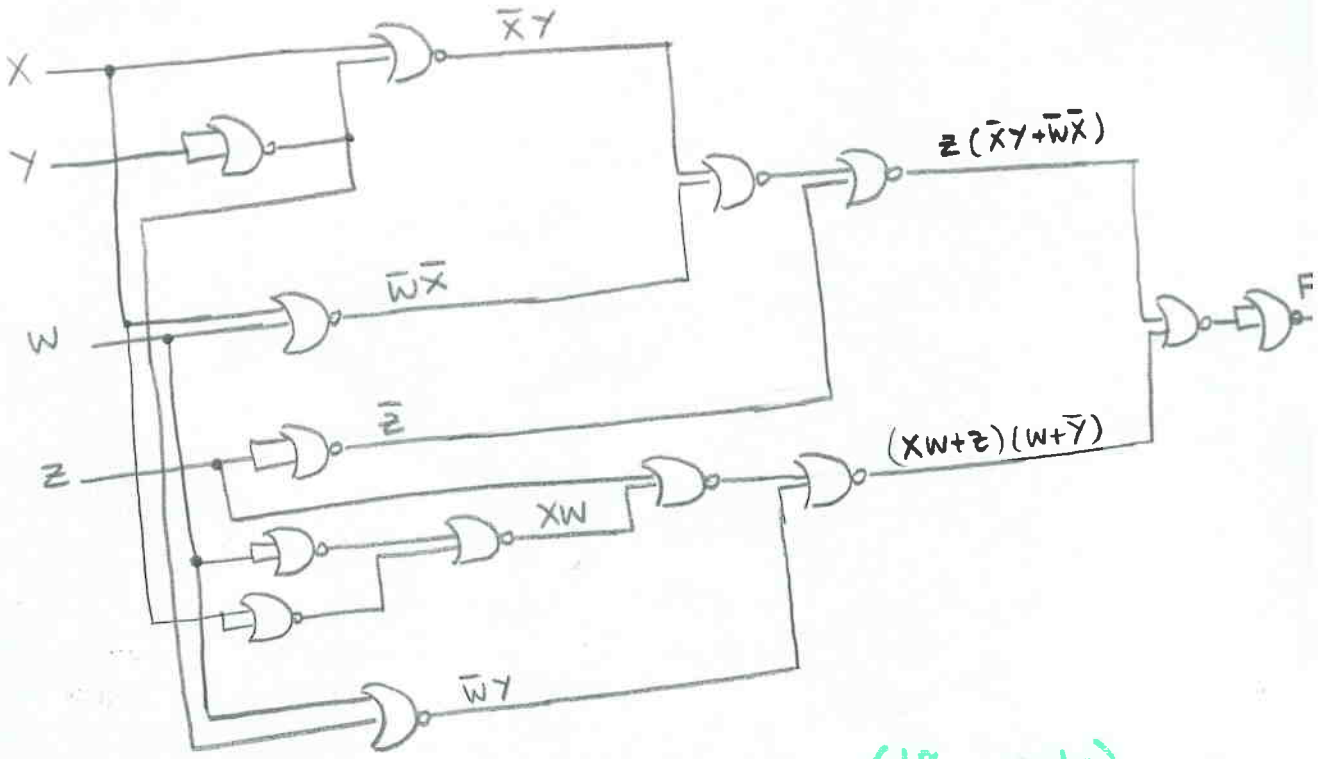
a.



– using only NAND gates –

(17 points)

b. $f = z(x'y + w'x') + (w+y')(xw+z)$



(18 points)

3. $f(a,b,c,d) = \Sigma m(0,2,4,5,6,7,8,9,10,14) + \Sigma d(3,13)$

(35 points)

List 1:

m_i	a	b	c	d	
0	0	0	0	0	✓
2	0	0	1	0	✓
4	0	1	0	0	✓
8	1	0	0	0	✓
3	0	0	1	1	✓
5	0	1	0	1	✓
6	0	1	1	0	✓
9	1	0	0	1	✓
10	1	0	1	0	✓
7	0	1	1	1	✓
13	1	1	0	1	✓
14	1	1	1	0	✓

List 2:

Product Terms	a	b	c	d	
(0,2)	0	0	–	0	✓
(0,4)	0	–	0	0	✓
(0,8)	–	0	0	0	✓
(2,3)	0	0	1	–	✓
(2,6)	0	–	1	0	✓
(2,10)	–	0	1	0	✓
(4,5)	0	1	0	–	✓
(4,6)	0	1	–	0	✓
(8,9)	1	0	0	–	PI6
(8,10)	1	0	–	0	✓
(3,7)	0	–	1	1	✓
(5,7)	0	1	–	1	✓
(5,13)	–	1	0	1	PI7
(6,7)	0	1	1	–	✓
(6,14)	–	1	1	0	✓
(9,13)	1	–	0	1	PI8
(10,14)	1	–	1	0	✓

List 3:

Product Terms	a	b	c	d	
(0,2,4,6)	0	–	–	0	PI1
(0,2,8,10)	–	0	–	0	
(0,4,2,6)	0	–	–	0	PI2
(0,8,2,10)	–	0	–	0	
(2,3,6,7)	0	–	1	–	PI3
(2,6,3,7)	0	–	1	–	
(2,10,6,14)	–	–	1	0	PI4
(2,6,10,14)	–	–	1	0	
(4,5,6,7)	0	1	–	–	PI5
(4,6,5,7)	0	1	–	–	

PI Chart

PI	0	2	4	5	6	7	8	9	10	14
PI1	×	×	×		×					
PI2	×	×					×		×	
PI3		×			×	×				
PI4*		×			×				×	×
PI5			×	×	×	×				
PI6							×	×		
PI7				×						
PI8								×		

Reduced PI Chart

PI	0	4	5	7	8	9
PI1	×	×				
PI2	×				×	
PI4				×		
PI5		×	×	×		
PI6					×	×
PI7			×			
PI8						×

PI1 + PI6 → covers PI2

PI6 → covers PI8

PI5 → covers PI4 + PI7

EPI's : EPI1 + EPI4 + EPI5 + EPI6

$= a'd' + cd' + a'b + ab'c'$