

# HW4 Solutions

2.17 a)  $f = xY + x\bar{Y}$   
 $= x(Y + \bar{Y})$  distributive  
 $= x \cdot 1$  complementary

- OR simplification 9. 2 literals

b)  $f = (x+Y)(x+\bar{Y})$   
 $= x$  by simplification 9D.  
 2 literals

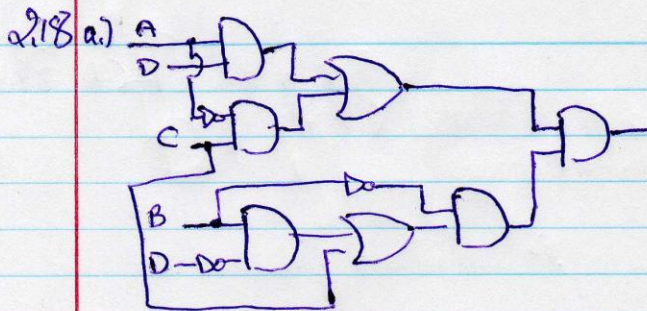
c)  $\bar{x}Z + \bar{x}YZ + xYZ$   
 $= \bar{x}Z + YZ(\bar{x}+x)$  dist.  
 $= Z(\bar{x}+Y)$  comp. & dist.  
 $= Z$   
 4 literals

d)  $f = (x+Y)(\bar{x}+Y+\bar{Z})(\bar{x}+Y+Z)$   
 $(x+Y)[(\bar{x}+Y)+Z][(\bar{x}+Y)+\bar{Z}]$   
 $(x+Y)(\bar{x}+Y)$  by simp 9D  
 $= Y$   
 4 literals

e)  $x + \overbrace{YZ(x+\bar{x})}^{1 \text{ by comp}} + \bar{x}Y + \underbrace{W}_{\text{by 9D}}$   
 dist.

$= \underbrace{x + \bar{x}Y}_{x+Y \text{ by 11D}} + YZ + W = \underbrace{Y + YZ}_Y \text{ by 10} + x + W$   
 $= x + Y + W$  2 literals



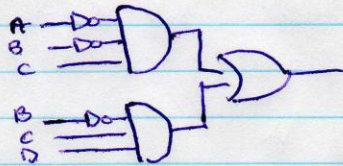


b)

$$(AD + \bar{A}C)(\bar{B}C + \overbrace{\bar{B}\bar{B}\bar{D}}^{0 \text{ 5D. comp.}})$$

$$(AD + \bar{A}C)\bar{B}C = A\bar{B}CD + \bar{A}\bar{B}C$$

$$= \bar{B}C(\underbrace{AD + \bar{A}}_{\bar{A} + D \text{ by 11D}}) = \bar{A}\bar{B}C + \bar{B}CD$$



2.19 a)

$$f = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + AB\bar{C}\bar{D} + ABC\bar{D}$$

b)

$$f = (A+B+\bar{C}+D)(A+B+\bar{C}+\bar{D})(A+\bar{B}+C+D)(A+\bar{B}+C+\bar{D})(\bar{A}+\bar{B}+C+D)(\bar{A}+\bar{B}+C+\bar{D})(\bar{A}+\bar{B}+C+D)(\bar{A}+\bar{B}+C+\bar{D})$$

c)

$$\bar{f} = \sum m(2, 3, 4, 5, 6, 11, 12, 13, 14)$$

$$\bar{f} = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}B\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + AB\bar{C}\bar{D} + ABC\bar{D}$$

d)

$$\bar{f} = \prod M(0, 1, 7, 8, 9, 10, 15)$$

$$= (A+B+C+D)(A+B+C+\bar{D})(A+B+\bar{C}+D)(A+B+\bar{C}+\bar{D})(\bar{A}+\bar{B}+C+D)(\bar{A}+\bar{B}+C+\bar{D})(\bar{A}+\bar{B}+C+\bar{D})$$



2.26 a)

		yz			
	wx	00	01	11	10
00		1	x	x	1
01					
11					
10		1	1		

$$f = \bar{w}\bar{x} + \bar{x}\bar{y}$$

b.)

		yz			
	wx	00	01	11	10
00		x	1		
01			x	1	
11			1	x	
10				1	x

$$f = xz + \bar{w}\bar{y}z + wyz$$

c)

		cd			
	ab	00	01	11	10
00		x	1	x	1
01					x
11			1	1	1
10				1	x

$$f = \bar{a}\bar{b} + ac + abd$$

d.)

		cd			
	ab	00	01	11	10
00		1	1	1	0
01		x	0	1	0
11		x	1	1	1
10		0	0	x	0

$$f = cd + ab + \bar{a}\bar{b}\bar{c}$$