


# Homework 2 - Solution

①

## Problem 1

$$\underbrace{A' + AX'Y + AXZ + AYZ}_{(1)} = \underbrace{A' + X'Y + XZ}_{(2)}$$

	<del>A</del>	<del>X</del>	<del>Y</del>	<del>Z</del>	<del>A'</del>	<del>AX'Y</del>	<del>AXZ</del>	<del>AYZ</del>	<del>X'Y</del>	<del>XZ</del>		
	A	X	Y	Z	A'	AX'Y	AXZ	AYZ	X'Y	XZ	①	②
0	0	0	0	0	1	0	0	0	0	0	1	1
1	0	0	0	1	1	0	0	0	0	0	1	1
2	0	0	1	0	1	0	0	0	1	0	1	1
3	0	0	1	1	1	0	0	0	1	0	1	1
4	0	1	0	0	1	0	0	0	0	0	1	1
5	0	1	0	1	1	0	0	0	0	1	1	1
6	0	1	1	0	1	0	0	0	0	0	1	1
7	0	1	1	1	1	0	0	0	0	1	1	1
8	1	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0
10	1	0	1	0	0	1	0	0	1	0	1	1
11	1	0	1	1	0	1	0	1	1	0	1	1
12	1	1	0	0	0	0	0	0	0	0	0	0
13	1	1	0	1	0	0	1	0	0	1	1	1
14	1	1	1	0	0	0	0	0	0	0	0	0
15	1	1	1	1	0	0	1	1	0	1	1	1

## Problem 2

For the truth table

take column ① of problem 1

$$F = \sum_{A,X,Y,Z} (0,1,2,3,4,5,6,7,10,11,13,15)$$

$$= \prod_{A,X,Y,Z} (8,9,12,14)$$

$$= A'X'Y'Z' + A'X'Y'Z + A'X'YZ' + A'X'YZ + A'XY'Z' \\ + A'XY'Z + A'XYZ' + A'XYZ + \cancel{AX'Y'Z'} \\ + AX'YZ + AX'YZ + XYZ$$

$$= (A + X' + Y' + Z')(A + X' + Y' + Z)(A' + X + Y + Z) \\ (A' + X + Y' + Z)$$

## Problem 3

$$\begin{aligned} \text{a) } F &= \underbrace{X'Y'Z' + X'YZ'}_{X'Z'} + \underbrace{XY'Z' + XYZ'}_{XZ'} \\ &= Z' \end{aligned}$$

$$\begin{aligned} \text{b) } F &= X'Y'Z + X'YZ' + \cancel{X'YZ} + XYZ \\ &= X'Y'Z + X'Y + XYZ \\ &= X'Y'Z + X'Y + YZ \end{aligned}$$

Continue

b)

$$F = X'Y'Z + X'Y + YZ$$

(2)

$$= X'Z + X'Y + YZ$$

$$c) F = X'Y'Z + \underbrace{X'YZ' + X'YZ}_{X'Y} + \underbrace{XYZ' + XYZ}_{XY}$$

$$= X'Y'Z + X'Y + XY$$

$$= X'Z + X'Y + XY$$

$$= X'Z + Y$$

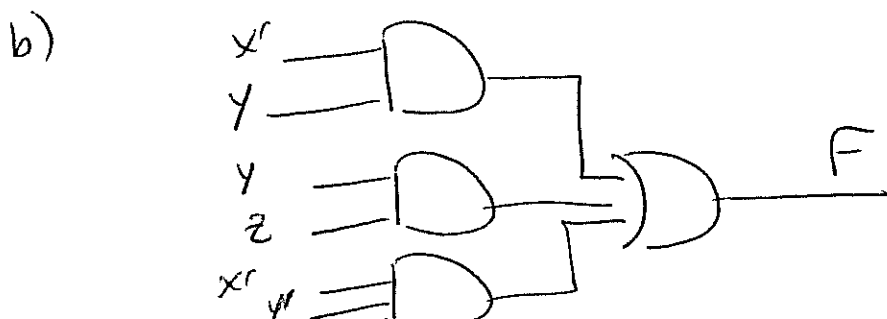
$$d) F = \underbrace{W'X'Y'Z' + W'XY'Z' + W'XY'Z + W'XYZ'}_{W'XY'} + \underbrace{W'XYZ + W^2X'Y'Z' + WXYZ' + WXYZ}_{WXY}$$

$$= W'X'Y'Z' + W'XY' + W'XY + WX'Y'Z' + WXY$$

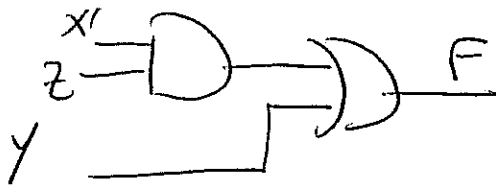
$$= X'Y'Z' + W'XY' + XY$$

$$= X'Y'Z' + XW' + XY$$

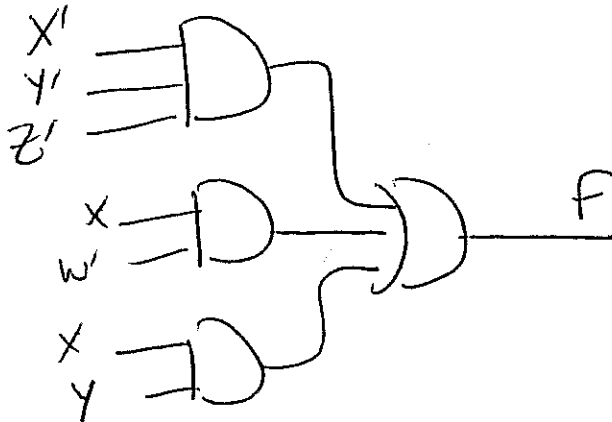
Drawing



c)



d)



### Problem 4

$$\begin{aligned}
 a) \quad & WX(z + Xz') + X(y + y'wz) \\
 &= WX(z + X) + X(y + wz) \\
 &= WXz + WX + Xy + WXz \\
 &= WX + Xy = X(W + y)
 \end{aligned}$$

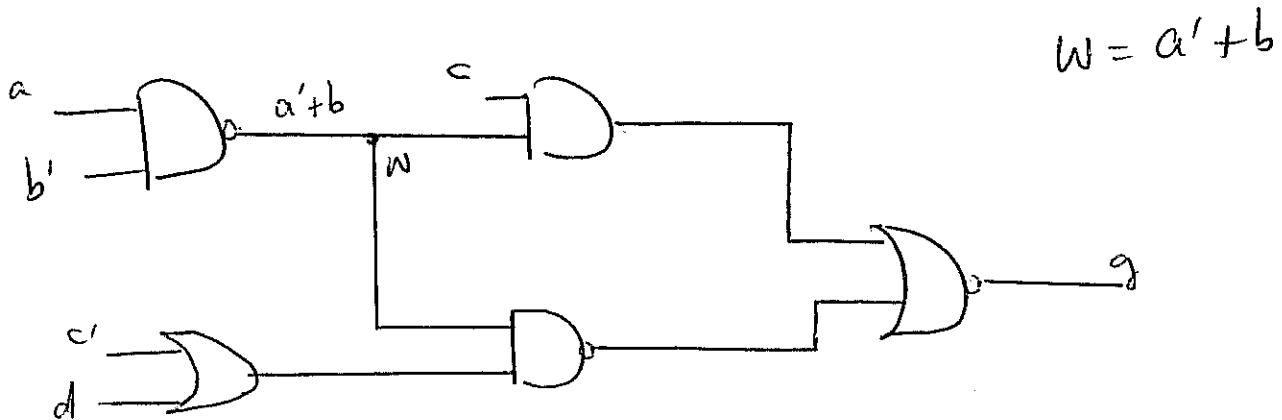
$$\begin{aligned}
 b) \quad & (X'y + Xy')(WX + W'X') + (WY)' \\
 &= \cancel{X'yWX} + \cancel{X'yW'X'} + \cancel{Xy'WX} + \cancel{Xy'W'X'} + W' + Y' \\
 &= X'yW' + Xy'W + W' + Y'
 \end{aligned}$$

$$= X'Y W' + XY'W + W' + Y'$$

$$= W' + Y'$$

(3)

### Problem 5



$$g = [c \cdot w + [w \cdot (c' + d)]']'$$

$$= [c(a' + b) + w' + cd']'$$

$$= [ca' + cb + ab' + ed']'$$

$$= (c \cdot w)' \cdot (w \cdot (c' + d))$$

$$= (c' + ab')(a' + b)(c' + d)$$

$$= (a'c' + c'b + ab'a' + ab'b)(c' + d)$$

$$= c'(a' + b)(c' + d) = c'a' + c'b$$

$$= c'(a' + b)$$