

ECE 462 HW #2 Solutions

① $f = \sum (3, 5, 7, 11, 12, 29, 31) + d(1, 2, 6, 10, 28)$

	V	W	X	Y	Z	
1	0	0	0	0	1	✓
2	0	0	0	1	0	✓
3	0	0	0	1	1	✓
5	0	0	1	0	1	✓
6	0	0	1	1	0	✓
10	0	1	0	1	0	✓
12	0	1	1	0	0	✓
7	0	0	1	1	1	✓
11	0	1	0	1	1	✓
28	1	1	1	0	0	✓
29	1	1	1	0	1	✓
31	1	1	1	1	1	✓

	V	W	X	Y	Z
• (1,3,5,7)	0	0	-	-	1
• (2,3,6,7)	0	0	-	1	-
• (2,3,10,11)	0	-	0	1	-

Prime Implicants:

$wx y' z'$, $vwx y'$, $wx y z$, $v'w'z$, $v'x'y$

	V	W	X	Y	Z	
(1,3)	0	0	0	-	1	✓
(1,5)	0	0	-	0	1	✓
(2,3)	0	0	0	1	-	✓
(2,6)	0	0	-	1	0	✓
(2,10)	0	-	0	1	0	✓
(3,7)	0	0	-	1	1	✓
(3,11)	0	-	0	1	1	✓
(5,7)	0	0	1	-	1	✓
(6,7)	0	0	1	1	-	✓
(10,11)	0	1	0	1	-	✓
• (2,28)	-	1	1	0	0	
• (28,29)	1	1	1	0	-	
• (29,31)	1	1	1	-	1	

(2) 6.1 K

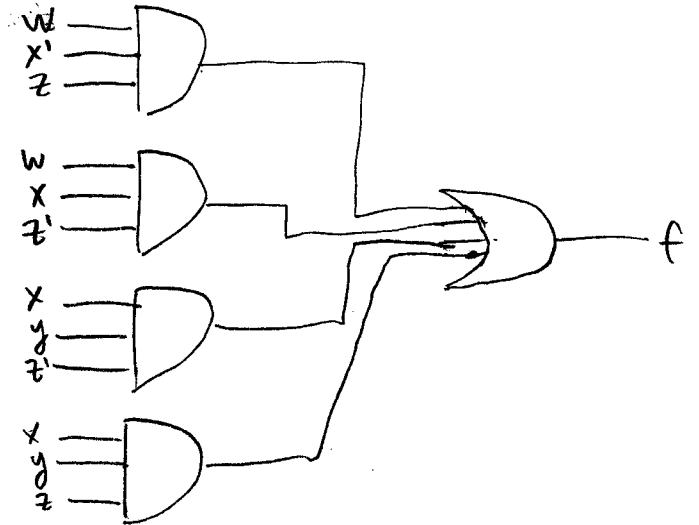
		yz			
	wx	00	01	11	10
00	0	0	0	1	
01	0	0	1	0	
11	1	0	1	1	
10	0	1	1	1	

prime implicants:

$w\bar{y}$, $wx'\bar{z}$, $x'y\bar{z}$, $xy\bar{z}$, wxz'

P.I. Table

	2	7	9	10	11	12	14	15
wy				X	X		X	X
wx'\bar{z}			X		X			
wxz'						X	X	
x'y\bar{z}	X			X				
xy\bar{z}		X						X



Minimum Sum: $f = wx'\bar{z} + wxz' + x'y\bar{z} + xy\bar{z}$

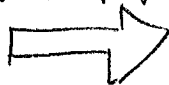
(3) P.I's: $v'wx$, vwx' , $v'wz$, $wx'\bar{z}$, $vx'\bar{z}$

	9	11	12	13	14	15	16	18	24	25	26	27
$v'wx$			X	X	X	X						
vwx'									X	X	X	X
$v'wz$	X	X		X		X						
$wx'\bar{z}$	X	X								X		X
$vx'\bar{z}$							X	X	X		X	

reduced table

	9	11	25	27
vwx'			X	X
$v'wz$	X	X		
$wx'\bar{z}$	X	X	X	X

$wx'\bar{z}$ dominates vwx' & $v'wz$



$wx'\bar{z}$	9	11	25	27
	X	X	X	X

min Sum:

$f = v'wx + vx'\bar{z} + wx'\bar{z}$

(2)

$$(4) \quad f(w, x, y, z) = x'y'z' + xz + w'x'y + wx'$$

$$L = (x'y'z', xz, w'x'y, wx')$$

with respect to w :

$$\text{cons}(w'x'y, wx') = x'y \text{ covers } w'x'y$$

$$L = (x'y'z', xz, x'y, wx')$$

with respect to x :

$$\text{cons}(x'y'z', xz) = \text{none}$$

$$\text{cons}(xz, x'y) = yz$$

$$\text{cons}(xz, x'w) = wz$$

$$L = (x'y'z', xz, x'y, wx', yz, wz)$$

with respect to y :

$$\text{cons}(x'y'z', x'y) = x'z' \text{ covers } x'y'z'$$

$$\text{cons}(x'y'z', yz) = \text{none}$$

$$L = (xz, x'y, wx', yz, wz, x'z')$$

with respect to z :

$$\text{cons}(xz, x'z') = \text{none}$$

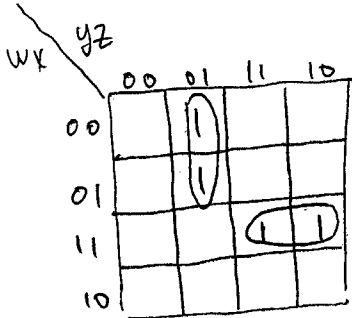
$$\text{cons}(yz, x'z') = x'y \rightarrow \text{already in } L$$

$$\text{cons}(wz, x'z') = wx' \rightarrow \text{already in } L$$

$$\text{P.I.'s} = L = \underline{xz, x'y, wx', yz, wz, x'z'}$$

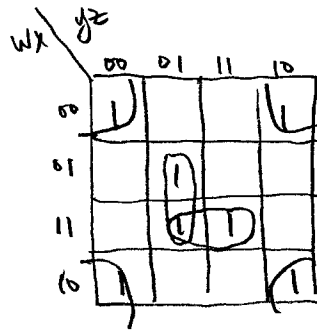
(5) $f_1 = wxy + w'y'z$
 $f_2 = x'z' + wxz + xy'z$
 $f_3 = x'z' + wxyz + w'x'y'$

* mly 1's are shown in K-maps



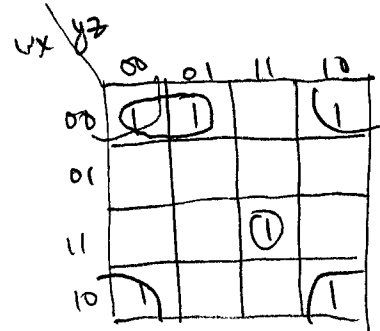
f_1

P.I's: $wxy, w'y'z$



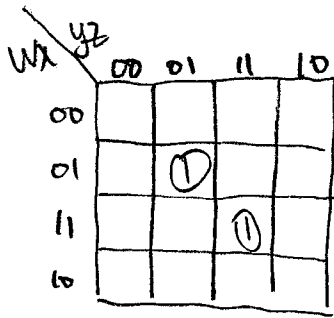
f_2

P.I's: $x'z', wxz, xy'z$



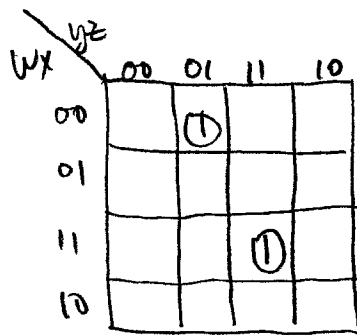
f_3

P.I's: $x'z', wxyz, w'x'y'$



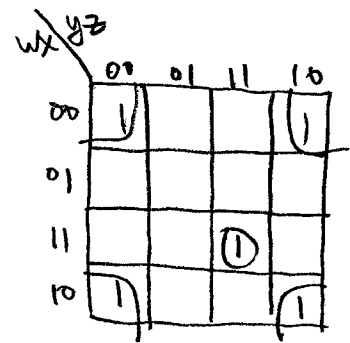
$f_1 \cdot f_2$

P.I's: $w'xy'z, wxyz$



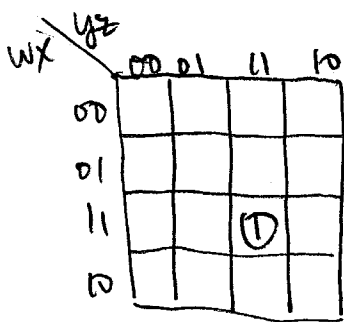
$f_1 \cdot f_3$

P.I's: $wx'y'z, wxyz$



$f_2 \cdot f_3$

P.I's: $x'z', wxyz$



$f_1 \cdot f_2 \cdot f_3$

P.I's: $wxyz$

MOP I's: $wxy, w'y'z, x'z', wxz, xy'z, wxyz, w'x'y', w'xy'z, wx'y'z$

(b)

	w	x	y	z	f ₁	f ₂	f ₃	
0	0	0	0	0	0	1	1	✓
* 1	0	0	0	1	1	0	1	
2	0	0	1	0	0	1	1	✓
8	1	0	0	0	0	1	1	✓
* 5	0	1	0	1	1	1	0	
10	1	0	1	0	0	1	1	✓
13	1	1	0	1	0	1	0	✓
14	1	1	1	0	1	0	0	✓
* 15	1	1	1	1	1	1	1	

	w	x	y	z	f ₁	f ₂	f ₃	
* (0,1)	0	0	0	-	0	0	1	
(0,2)	0	0	-	0	0	1	1	✓
(0,8)	-	0	0	0	0	1	1	✓
* (1,5)	0	-	0	1	1	0	0	
(2,10)	-	0	1	0	0	1	1	✓
(8,10)	1	0	-	0	0	1	1	✓
* (5,13)	-	1	0	1	0	1	0	
* (13,15)	1	1	-	1	0	1	0	
* (14,15)	1	1	1	-	1	0	0	

	w	x	y	z	f ₁	f ₂	f ₃	
* (0,2,8,10)	-	0	-	0	0	1	1	

MOPs: $w'x'y'z$, $w'xy'z$, $wxy'z$, $w'x'y$, $w'y'z$,
 $xy'z$, wxz , wxy , $x'z$