109550118 孫宜君 HW3 #46. #48~50

46.

(a)

$8K = 2^3 \times 2^{10} = 2^{13}$

Decoder: one 13×2^{13} decoder

AND gates: 2^{13} (8192)

inputs: 13

∴ A single 13×2^{13} line decoder ⇒ 8192 AND gates with 13 inputs in each.

(b)

$8K \times 4 = 32K \text{ bits} = 2^{15} \text{ bits} = 2^7 \times 2^8$

$= \underbrace{2^7}_{\text{row selection}} \times (\underbrace{2^6}_{\text{column selection}} \times 4)$

Decoder: one 7×2^7 decoder & 6×2^6 decoder

#AND gates & # input: 2^7 7-inputs AND gates & 2^6 6-inputs AND gates.

48(a)

(i).

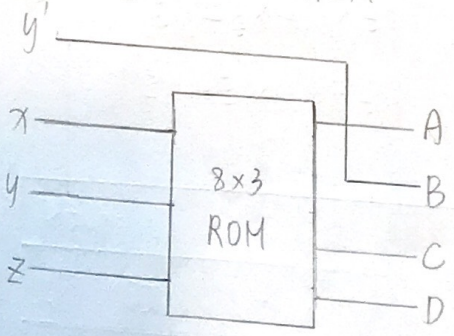
x	y	z	A	B	C	D
0	0	0	1	1	0	0
0	0	1	1	1	0	1
0	1	0	0	0	1	1
0	1	1	1	0	0	0
1	0	0	0	1	0	1
1	0	1	0	1	1	1
1	1	0	1	0	0	1
1	1	1	1	0	0	1

(ii)

$2^3 \times 4 = 8 \times 4$ ROM

(iii)

$B = y'$ ∴ 8×3 ROM



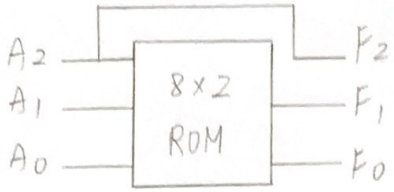
48(b)

(i)

A_2	A_1	A_0	F_2	F_1	F_0
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	1
0	1	1	0	1	0
1	0	0	1	1	0
1	0	1	1	1	1
1	1	0	1	0	1
1	1	1	1	0	0

(ii) $2^3 \times 3 = 8 \times 3$ ROM

(iii) $F_2 = A_2$ ∴ 8×2 ROM



49(a)

(i) A(X,Y,Z)

X \ YZ	00	01	11	10
0	1 (0)	0 (1)	1 (3)	1 (2)
1	0 (4)	1 (5)	0 (7)	1 (6)

$A = x'y + x'z' + yz' + xy'z$

$A' = xy'z' + x'y'z + xyz$

B'(X,Y,Z)

X \ YZ	00	01	11	10
0	0 (0)	1 (1)	0 (3)	0 (2)
1	1 (4)	1 (5)	1 (7)	0 (6)

$B = xy' + xz + y'z$

$B' = x'y + x'z' + yz'$

(ii) $A = x'y + x'z' + yz' + xy'z$ (4) $B = xy' + xz + y'z$

$A' = xy'z' + xy'z + xyz$ $B' = x'y + x'z' + yz'$

∴ $3 \times 4 \times 2$ PLA

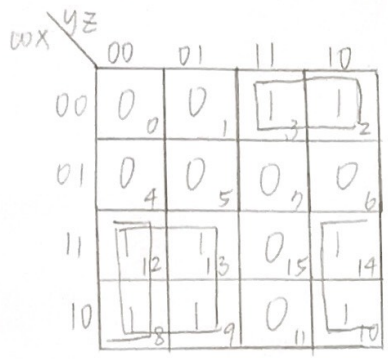
(iii) PLA Programming table:

	Inputs			Outputs	
Product terms	x	y	z	T A	C B
$x'y$	0	1	–	1	1
$x'z$	0	–	1	1	1
yz'	–	1	0	1	1
$xy'z$	1	0	1	1	–

49(b)

(i)

A(W, X, Y, Z)



$A = wy' + wz' + w'x'y$

$A' = w'x + w'y' + wyz$

B(W, X, Y, Z)

$B = w'y' + w'z' + x'y'z'$

$B' = wx + yz + wz + wy$

(ii)

A - B ⇒ (6) A' - B ⇒ (5)

A - B' ⇒ (7) A' - B' ⇒ (7)

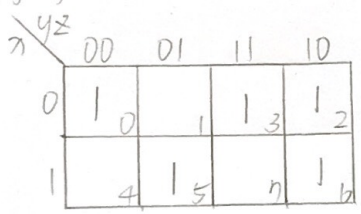
∴ 4 × 5 × 2

(iii)

					Outputs	
	Inputs				C	T
Product terms	W	X	Y	Z	A	B
w'x	0	1	–	–	1	–
w'y'	0	–	0	–	1	1
wyz	1	–	1	1	1	–
w'z'	0	–	–	0	–	1
x'y'z'	–	0	0	0	–	1

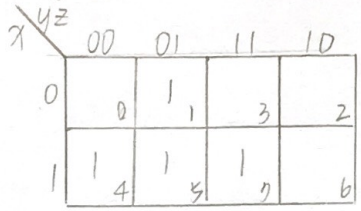
50(a)

(i) A(x,y,z)



$A = x'z' + x'y + yz' + xy'z$

B(x,y,z)



$B = xy' + xz + y'z$

(ii & iii)

Let $C = xy'z + x'y \Rightarrow A = x'z' + yz' + C$

Product terms	AND Inputs				Outputs
	x	y	z	C	
1	0	–	0	–	$A = x'z'$
2	–	1	0	–	$+ yz'$
3	–	–	–	1	$+ C$
4	1	0	–	–	$B = xy'$
5	1	–	1	–	$+ xz$
6	–	0	1	–	$+ y'z$
7	1	0	1	–	$C = xy'z$
8	0	1	–	–	$+ x'y$
9	–	–	–	–	

50(b)

(i)

A(w,x,y,z)

wx \ yz	00	01	11	10
00	0	1	1 (3)	1 (2)
01	4	5	7	6
11	1 (12)	1 (13)	15	1 (14)
10	1 (8)	1 (9)	11	1 (10)

$A = wy' + wz' + w'x'y$

B(w,x,y,z)

wx \ yz	00	01	11	10
00	1	1		1
01	1	1		1
11				
10	1			

$B = w'y' + w'z' + x'yz'$

(ii)

Product terms	AND Inputs				Outputs
	w	x	y	z	
1	1	-	0	-	$A = wy'$
2	1	-	-	0	$+ wz'$
3	0	0	1	-	$+ w'x'y$
4	0	-	0	-	$B = w'y'$
5	0	-	-	0	$+ w'z'$
6	-	0	0	0	$+ x'y'z'$