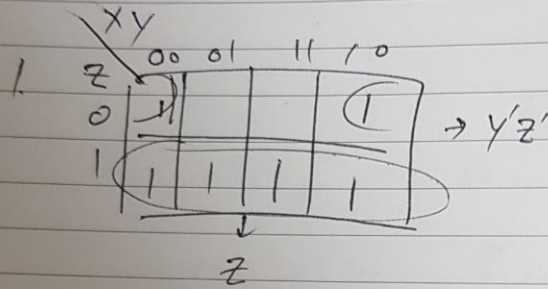


논리 회로 중간과사

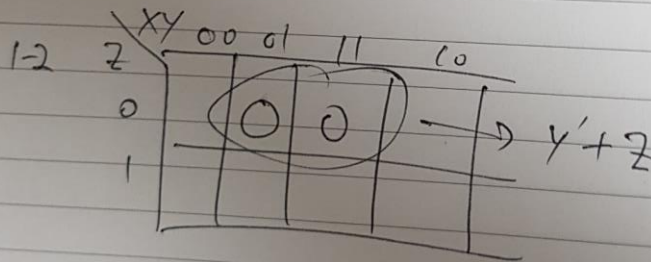
정성호

20/8/09/4

컴퓨터과학과

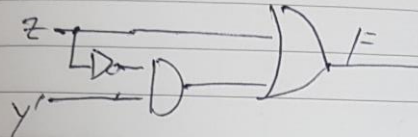


1-1  $f(x,y,z) = z + y'z'$  Minimal SOP

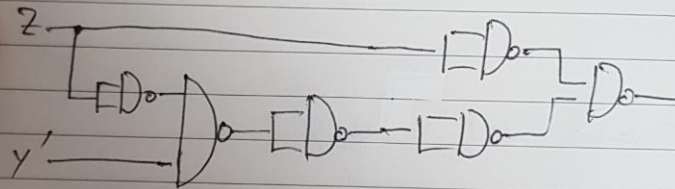


1-2  $f(x,y,z) = y' + z$  Minimal POS

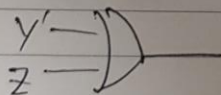
1-3  $F = z + y'z'$



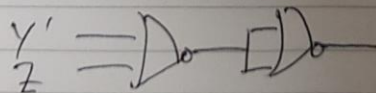
NAND 3 782



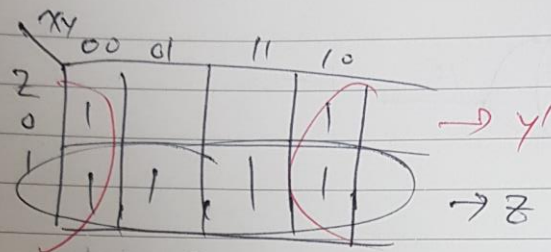
1-4  $F(x, y, z) = y' + z$



NOR 3 782



2.  $F(x, y, z) = \sum(0, 1, 3, 4, 5, 7)$

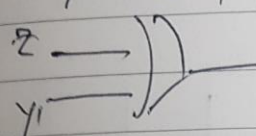


2-1. prime implicants:  $z, y'$

2-2. Essential p.i :  $z, y'$

2-3  $\sum(0, 1, 3, 4, 5, 7)$  minimal cost cover  
 $= z + y'$

2-4.  $F = z + y'$



Cost = input + gate  
 $= 2 + 1 = 3$

3.  $F(A, B, C) = A + B'C$

$= (A + B') (A + C)$

Distributive  
 $(x + y)z = (x + y)(x + z)$



장 f

4

	$x_1 x_2$	00	01	11	10
$x_3 x_4$	00		1	1	
	01	1			1
	11		1	1	
	10	1			1

$$x_5 = 0$$

	$x_1 x_2$	00	01	11	10
$x_3 x_4$	00	1			
	01		1	1	1
	11				
	10	1	1	1	1

$$x_5 = 1$$

4-1

$x_3 x_4$ \ $x_1 x_2$	00	01	11	10
00		1		1
01				
11			1	1
10				

$$x_5 = 0$$

$x_3 x_4$ \ $x_1 x_2$	00	01	11	10
00				
01				
11				
10				

$$x_5 = 1$$

+

$x_3 x_4$ \ $x_1 x_2$	00	01	11	10
00				
01	1			1
11				
10	1			1

$x_3 x_4$ \ $x_1 x_2$	00	01	11	10
00				
01	1	1	1	1
11				
10	1	1	1	1

4-2

$x_3 x_4$

	00	01	11	10
00				
01	1	1	1	1
11				
10	1	1	1	1

$x_5 = 20$

1	1	1	1	
1	1	1	1	

$x_5 = 21$

$$k = x_3' x_4 + x_3 x_4'$$

P.W/D

$x_1 x_2$

$x_3 x_4$	00	01	11	10
00	1			
01	1	1		
11	1			
10	1			

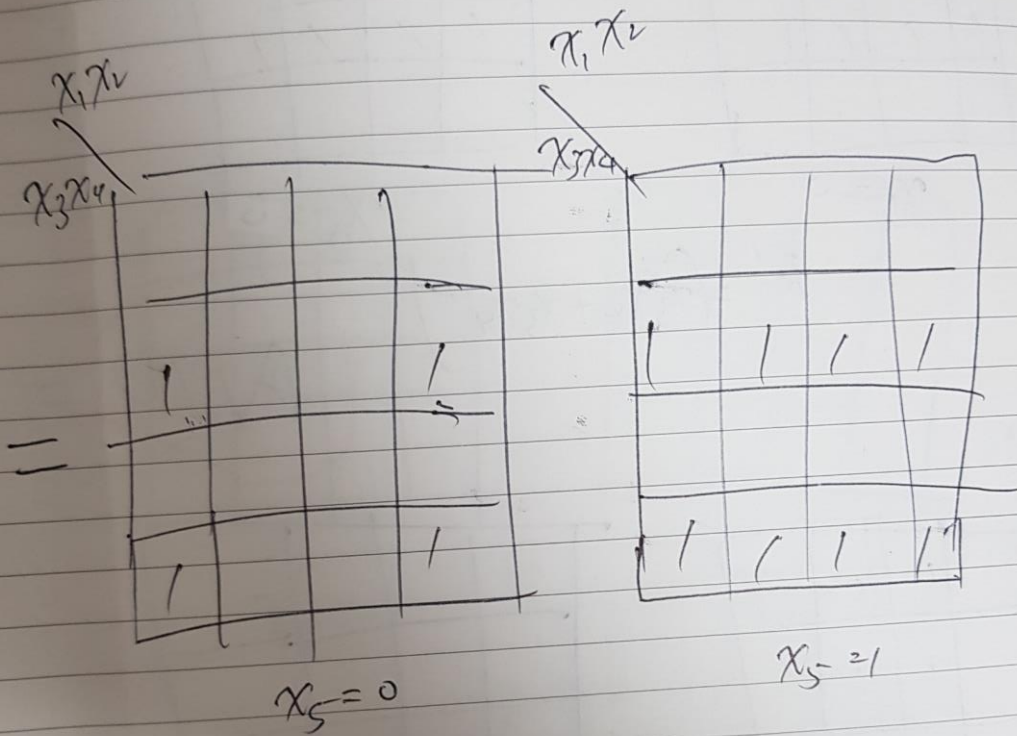
$x_5 = 20$

$x_3 x_4$

$x_3 x_4$	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1

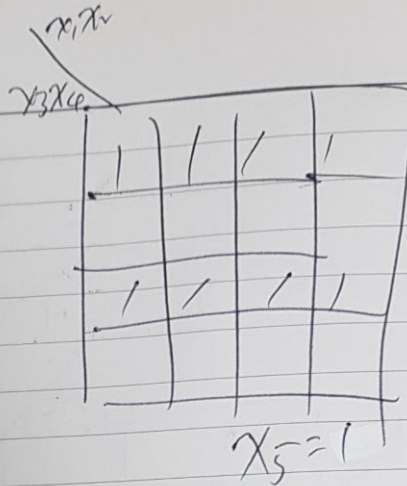
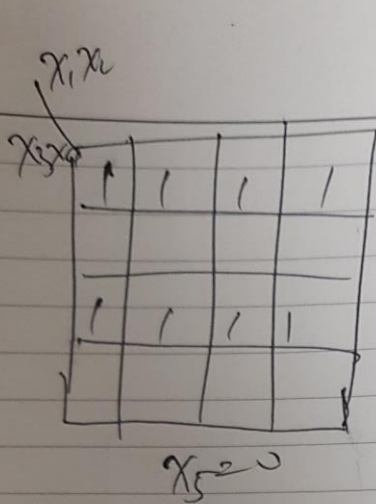
$x_5 = 21$

$$g = x_2' + x_5$$



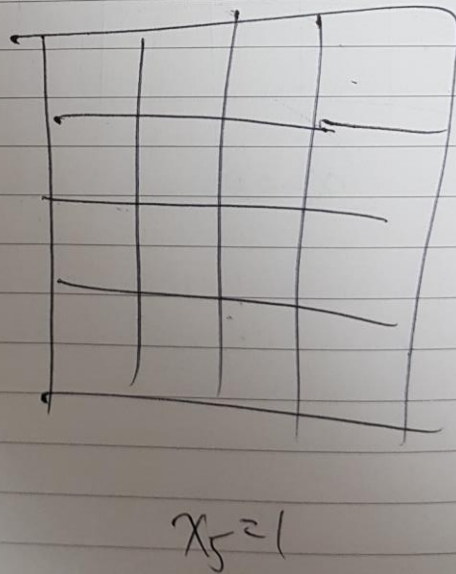
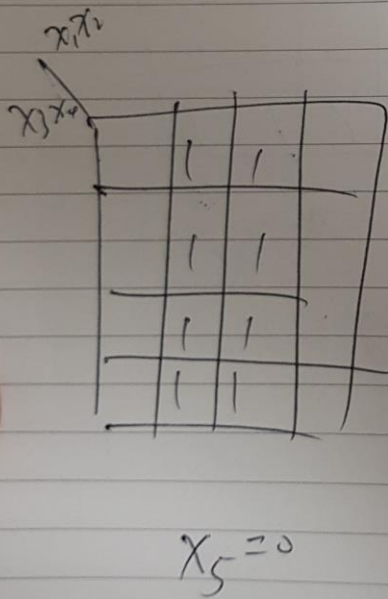
kg



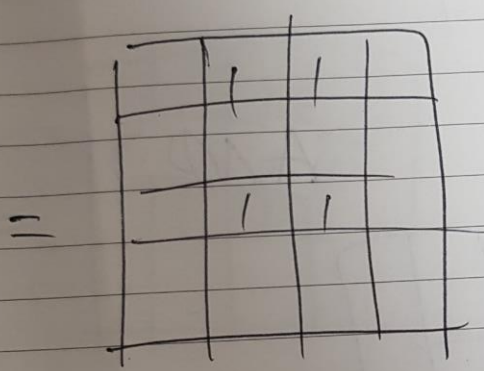


$$k' = (x_3' x_4' + x_3 x_4)'$$

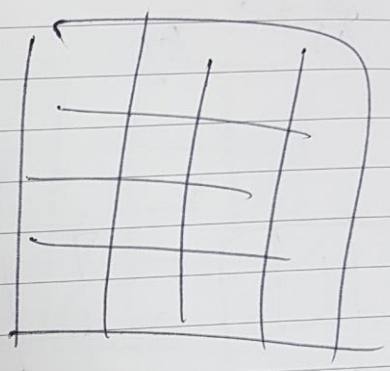
AND



$$g' = (x_2' + x_5)'$$

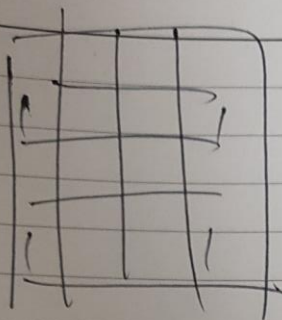


$$x_5 = 0$$

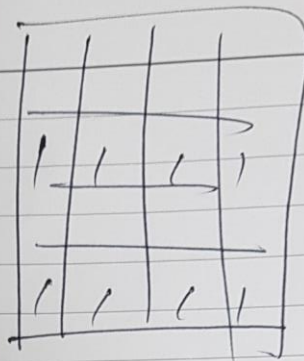


$$x_5 = 1$$

$k'g'$

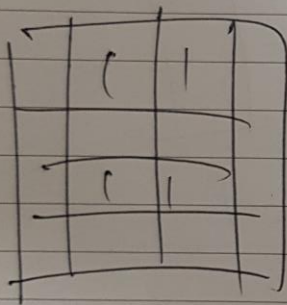


$x_{5^{20}}$  kg

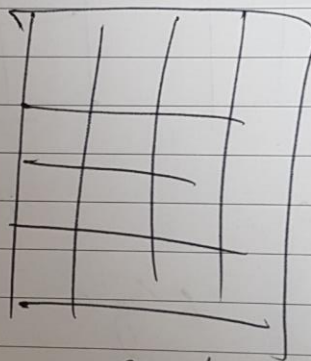


$x_{5^{21}}$

0/2

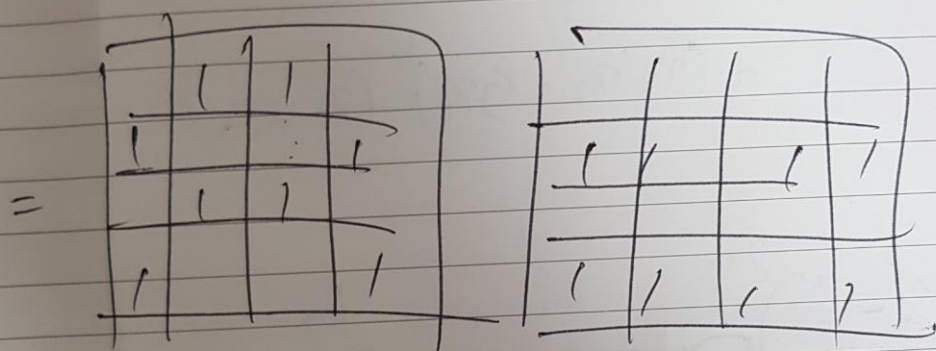


$x_{5^{20}}$



$x_{5^{21}}$

kg'



$$x_5 = 0$$

$$x_5 = 1$$

$$f = kg + k'g'$$

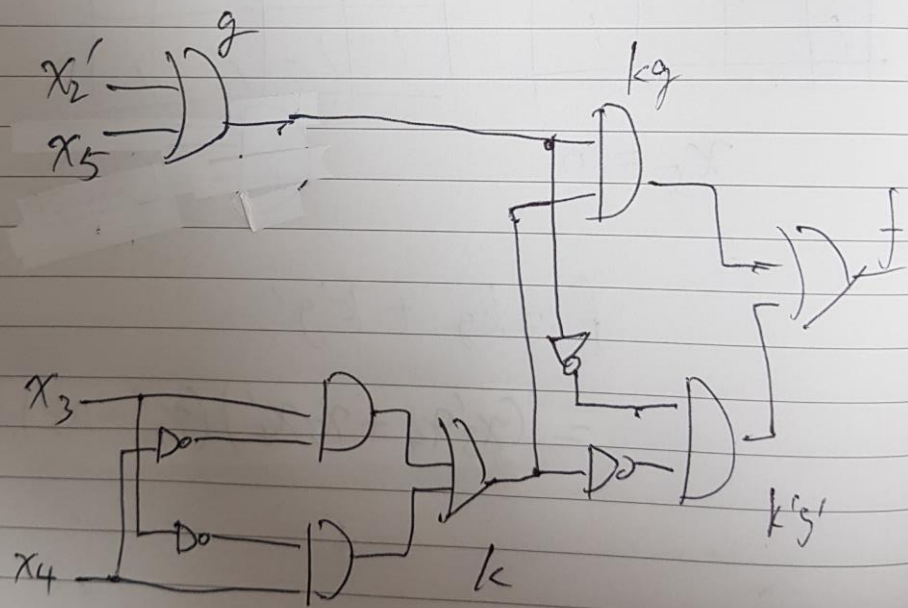


4-3

$$f = kg + k'g'$$

$$= (x_3'x_4 + x_3x_4')(x_2' + x_5)$$

$$+ (x_3'x_4 + x_3x_4')'(x_2' + x_5)'$$



2 input gerate



4-4

$$\text{Cost} = 7 + (2 \times 7) = 7 + 14 = 21$$

$\cancel{x_1 x_2}$   
 $\cancel{x_3 x_4}$   
 $5-1$

0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

$\rightarrow x_1' + x_3 + x_4$   
 $\rightarrow (x_1' + x_3')$

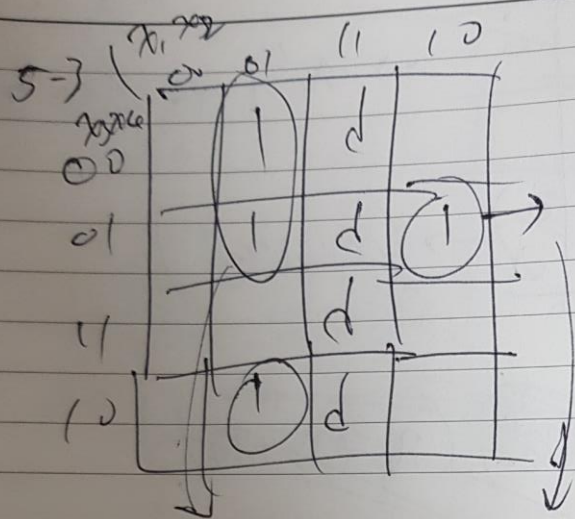
$\downarrow$   
 $pos: (x_1 + x_2) (x_1' + x_3') (x_1' + x_3 + x_4)$

5.  $x_3 x_4$

$x_1 x_2$	00	01	11	10
00	0	1	d	0
01	0	1	d	1
11	0	0	d	0
10	0	1	d	0

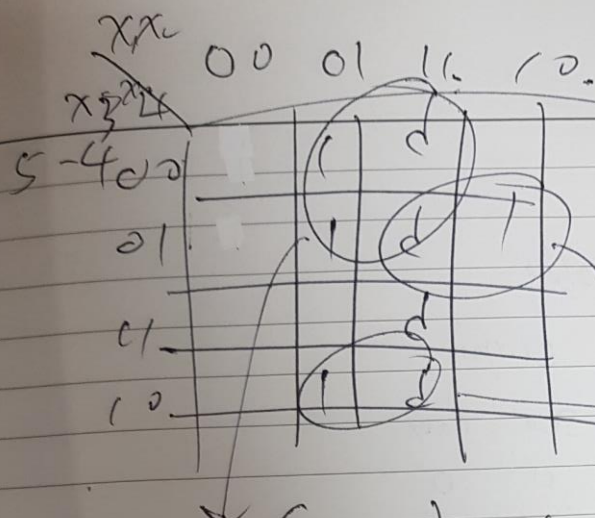
52 pos:  $(x_1 + x_2)(x_1 + x_3' + x_4)(x_2 + x_3' + x_4)$   
 $(x_1' + x_2 + x_4)$





$$\text{SOP: } (x_1' x_2 x_3') + (x_1 x_2' x_3' x_4)$$

$$+ (x_1' x_2 x_3 x_4')$$



$$\text{SOP: } (x_2 x_3') + (x_1 x_3' x_4) + (x_2 x_3 x_4')$$

6.

1) HA Truth table

Input		Output	
X	Y	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

FA Truth table

X	Y	C <sub>in</sub>	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	1
1	1	1	1	1

6-2

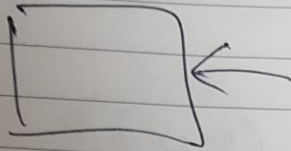
$$\begin{aligned}
 2) \quad & \text{HA} \quad S = x \oplus y \\
 & \text{POS} \quad = xy + xy' \\
 & \quad \quad = (x+y)' + (x+y')' \\
 & \quad \quad = ((x+y)(x+y'))'
 \end{aligned}$$

$$\begin{aligned}
 C &= xy \\
 &= (x+y)'
 \end{aligned}$$

$$\begin{aligned}
 \text{FA} \quad S &= x \oplus y \oplus C \\
 \text{POS} \quad &= C'xy + C'xy' + Cx'y' + Cxy \\
 &= (C' + x + y)' + (C' + x + y')' \\
 &\quad + (C + x' + y')' \\
 &\quad + (C + x + y)' \\
 &= \left\{ (C' + x + y)' (C' + x + y')' \right. \\
 &\quad \left. (C + x' + y')' (C + x + y)' \right\}'
 \end{aligned}$$



7.



1 block 을 Carry look ahead  
방식

block 에 ripple carry  
방식 으로  
구현 가능

8.  $C_8 = g_7 + p_7 g_6 + \dots + \text{3개 product} + 4m + 5m$   
 $+ 6m + 7m + 8m + \text{9개 product}$

fan-in 5 or 3

5개 product (=  $p_7 p_6 p_5 p_4 p_3$ ) or 3

6개 ~ 9개 product를 factoring.

2개  $C_8 = g_7 + \dots + (p_7 p_6 p_5 p_4 p_3) (\dots g)$

5개 input 이상의 product 이

존재하지 않는다.