

$$F(A, B, C, D) = \sum(0, 2, 3, 5, 6)$$

$$G(A, B, C, D) = \sum(0, 1, 3, 7)$$

CD \ AB	00	01	11	10
00	0	1	0	1
01	0	1	1	1
11	0	0	0	0
10	0	0	0	0

$$F \oplus G = \sum(1, 2, 5, 6, 7)$$

CD \ AB	00	01	11	10
00	1		1	1
01		1		1
11				
10				

CD \ AB	00	01	11	10
00	1	1	1	1
01			1	
11				
10				

$$F \odot G = (F \oplus G)' = \sum(0, 3, 4, 8, 9, 10, 11, 12, 13, 14, 15)$$

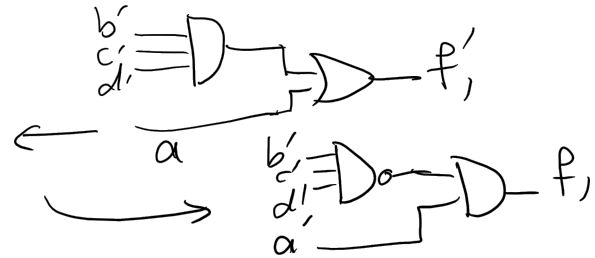
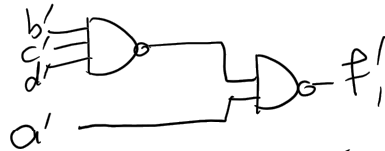
$$f_1(a, b, c, d) = \sum(1, 2, 3, 4, 5, 6, 7) + d(14, 15) \quad : \text{ NAND-AND}$$

$$f_2(a, b, c, d) = \prod(8, 9, 10, 11, 12, 13, 14) + d(0, 1) \quad : \text{ AND-OR-INVERT}$$

برای ساختار NAND-AND بایستی ابتدا ساختار NAND-NAND برای مکمل تابع اول پیاده سازی کنیم.

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

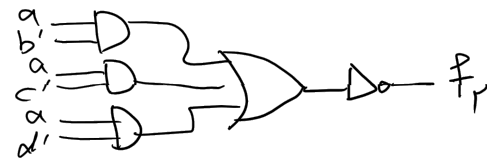
$$f_1' = a + b'c'd'$$



برای ساختار AND-OR NOT باید ابتدا ساختار AND-OR برای مکمل تابع دوم پیاده سازی کنیم.

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

$$f_2' = ab' + ac' + ad'$$



a	b	c	q	r	r1	r0
0	0	0	0	0	0	0
0	0	1	0	0	0	1
0	1	0	0	0	1	0
0	1	1	0	0	1	1
1	0	0	0	1	0	0
1	0	1	1	0	0	0
1	1	0	1	0	0	1
1	1	1	1	0	1	0

bc \ a	00	01	11	10
0				
1				

$$q = ac + ab$$

bc \ a	00	01	11	10
0				
1				

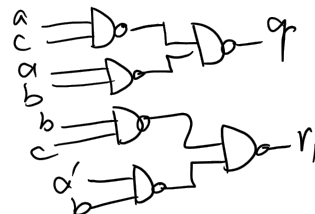
$$r_0 = a'c + abc'$$

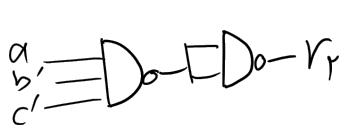
bc \ a	00	01	11	10
0				
1				

$$r_2 = ab'c'$$

bc \ a	00	01	11	10
0				
1				

$$r_1 = bc + a'b$$



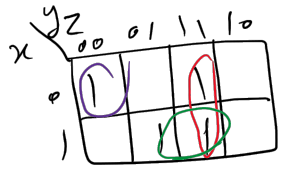


$$A(x, y, z) = \sum(1, 2, 4, 6), \quad B(x, y, z) = \sum(0, 1, 6, 7)$$

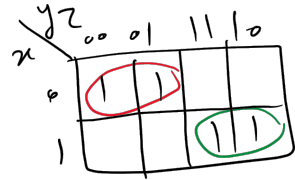
$$C(x, y, z) = \sum(2, 6), \quad D(x, y, z) = \sum(1, 2, 3, 5, 7)$$



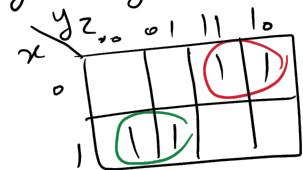
$$A = yz' + x'y'z + xz'$$



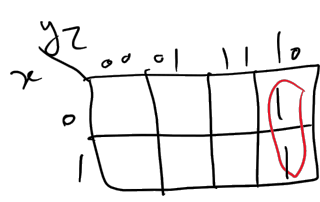
$$A' = yz + xz + x'y'z'$$



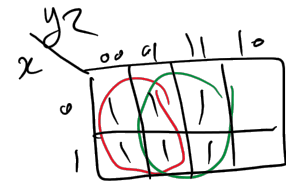
$$B = x'y' + xy$$



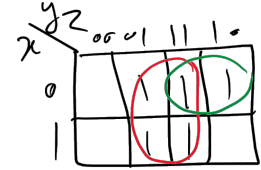
$$B' = xy' + x'y$$



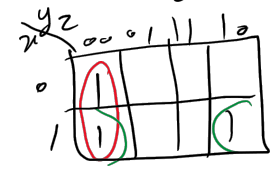
$$C = yz'$$



$$C' = y' + z$$



$$D = z + x'y$$



$$D' = y'z' + xz'$$

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

$$y = \begin{cases} x+3 & : 0 \leq x \leq 5 \\ x-3 & : 6 \leq x \leq 9 \end{cases}$$

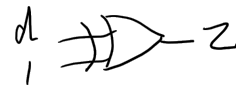
	a	b	c	d	w	x	y	z	
0	0	0	0	0	0	1	0	1	3
1	0	0	1	1	0	1	0	0	4
2	0	0	1	0	1	0	1	1	5
3	0	0	1	0	1	0	1	0	6
4	0	0	1	0	1	0	0	1	7
5	1	0	0	1	1	0	0	0	8
6	1	0	0	1	0	1	0	1	3
7	1	0	0	0	0	1	0	0	4
8	1	0	0	0	1	0	1	1	5
9	1	1	1	1	1	0	1	0	6

الف- چون هیچیک از خروجی ها صفر یا یک و یا برابر یکی از وزودیها نیست، اندازه ROM برابر $2^4 \times 4$ خواهد بود.

	I_0	I_1	I_2	I_3
$a'b'$	0	1	2	3
$a'b$	4	5	6	7
ab	12	13	14	15
ab'	8	9	10	11
w	$a \oplus b$	b	b	a

	I_0	I_1	I_2	I_3
$a'b'$	0	1	2	3
$a'b$	4	5	6	7
ab	12	13	14	15
ab'	8	9	10	11
x	$a \odot b$	a	a	a'

چون z مکمل d است، احتیاجی به MUX نیست.



	I_0	I_1	I_2	I_3
$a'b'$	0	1	2	3
$a'b$	4	5	6	7
ab	12	13	14	15
ab'	8	9	10	11
y	a	b	b	$a \odot b$