

آزمایشگاه معماری

نام و نام خانوادگی: رحمت اله انصاری

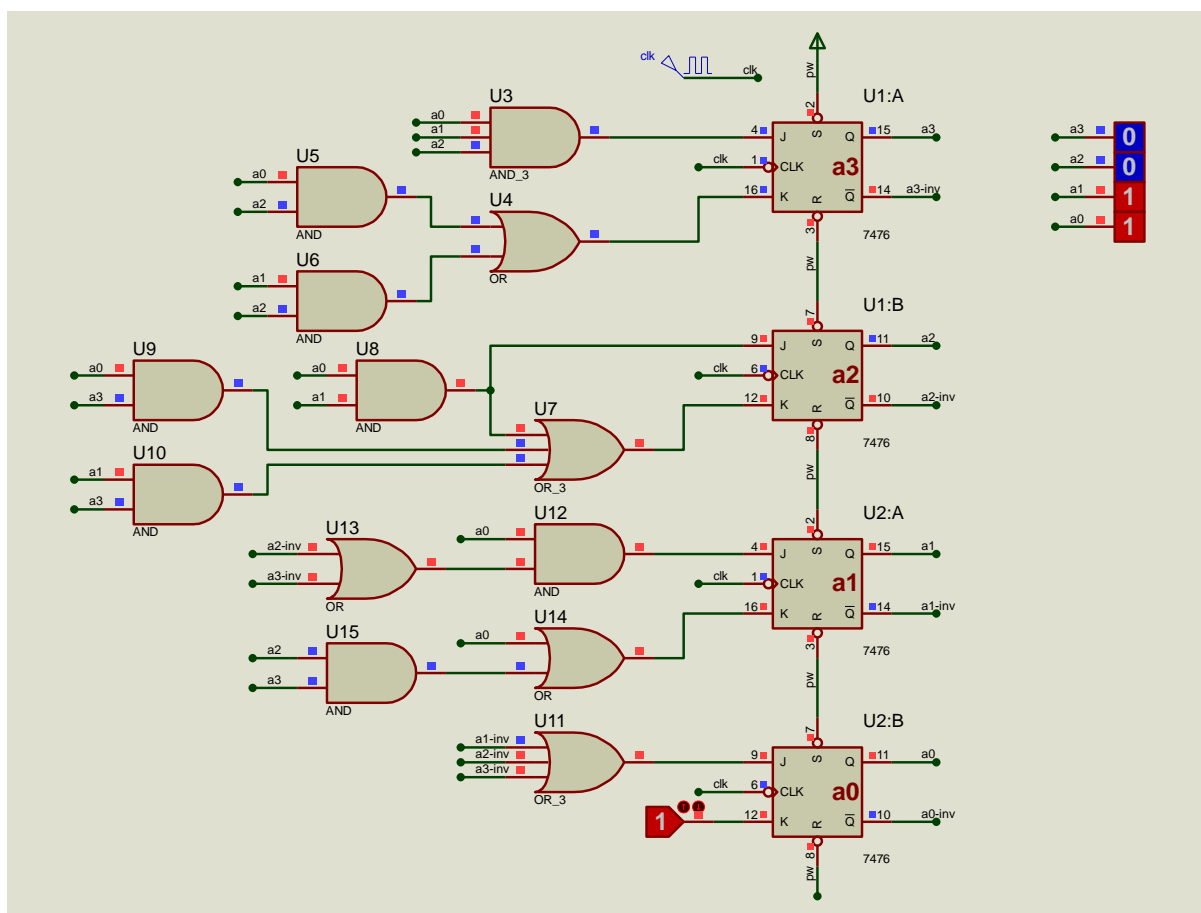
شماره دانشجویی: 9912377331

تمرین اول Counter

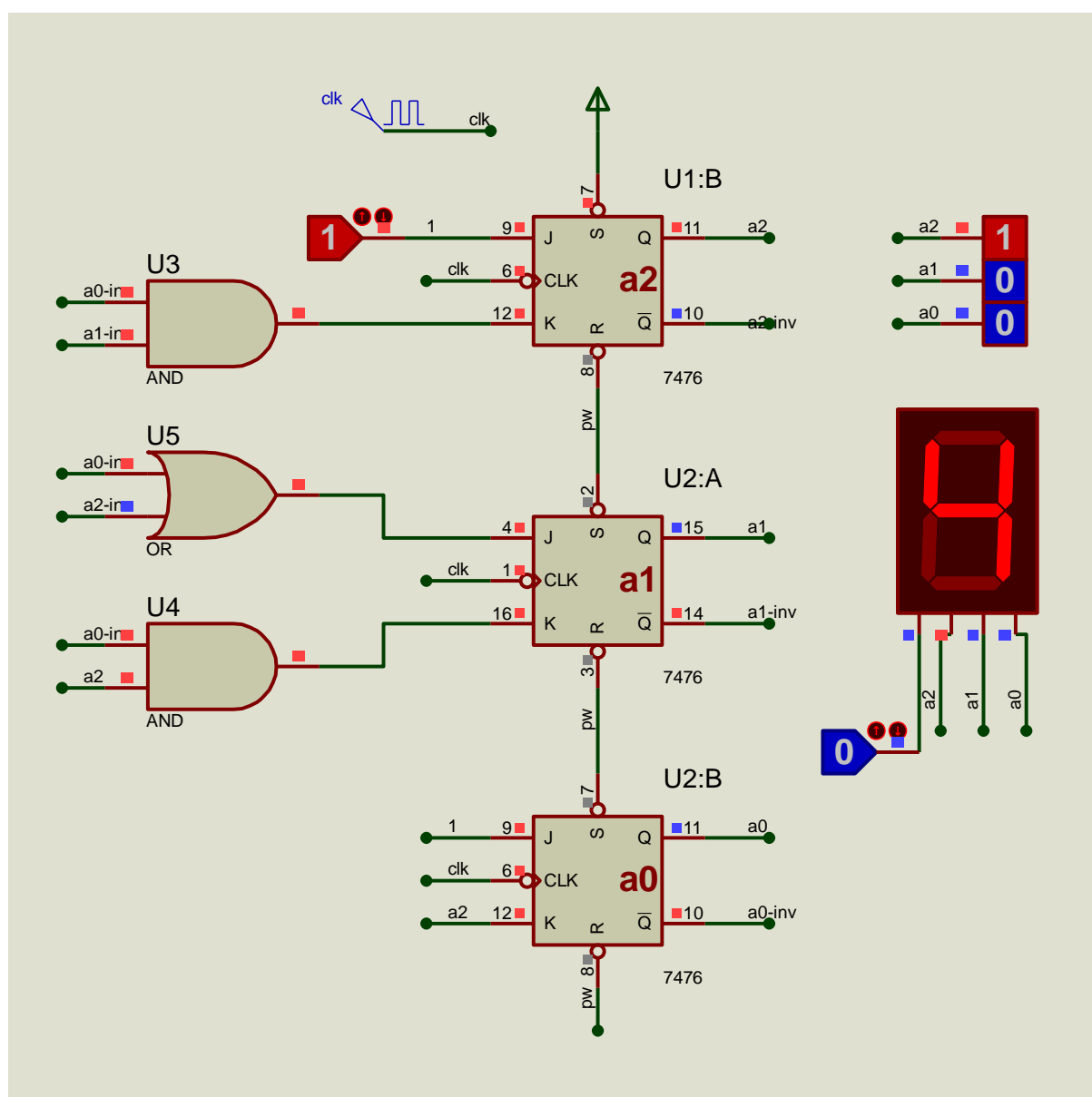
تاریخ: 1400.12.07

نکته: در صورتی که نوشته دست نویسی موجود باشد در انتهای این فایل ضمیمه شده است.

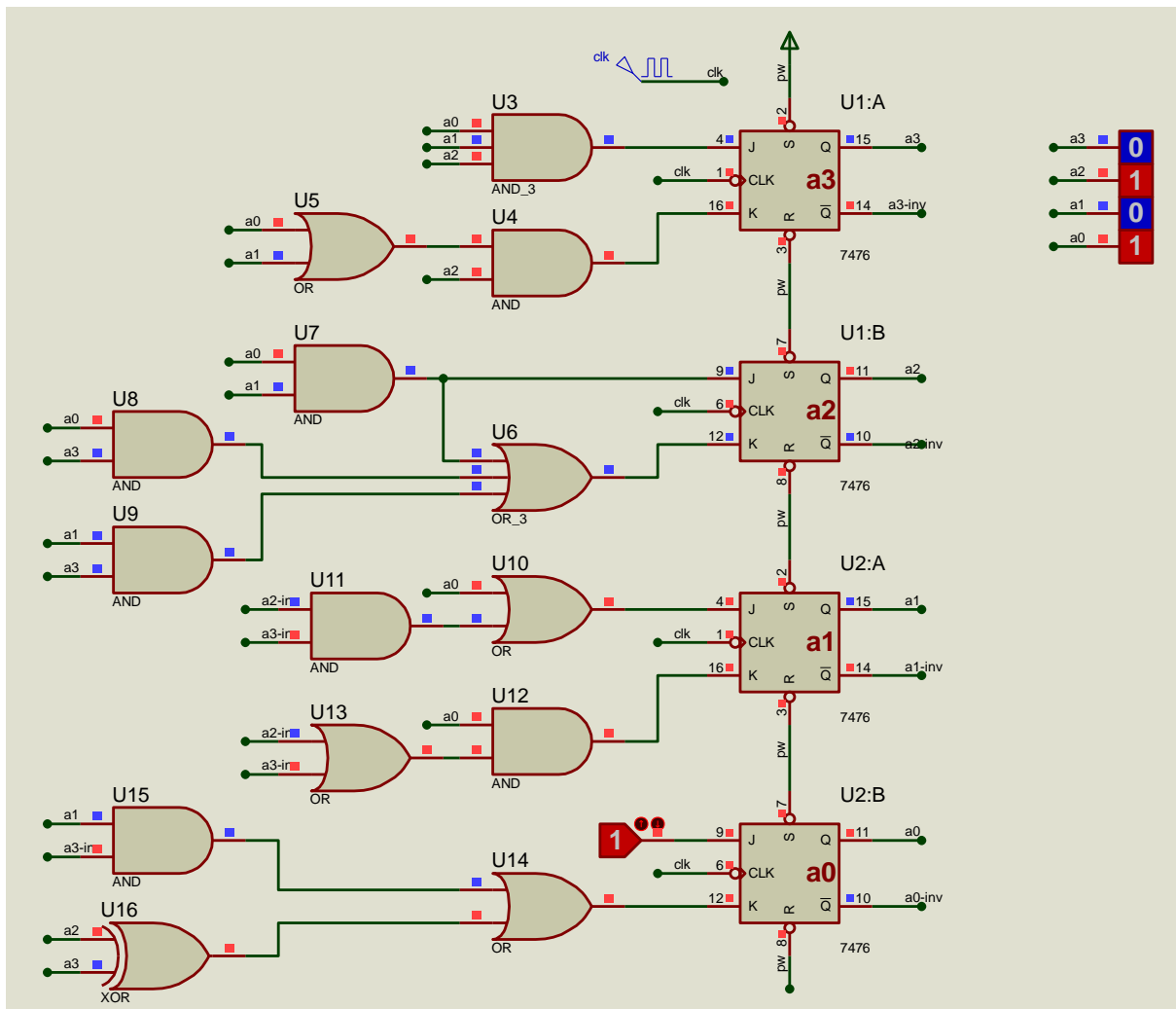
1. شمارنده صعودی 0 تا 13 با JK flip flop



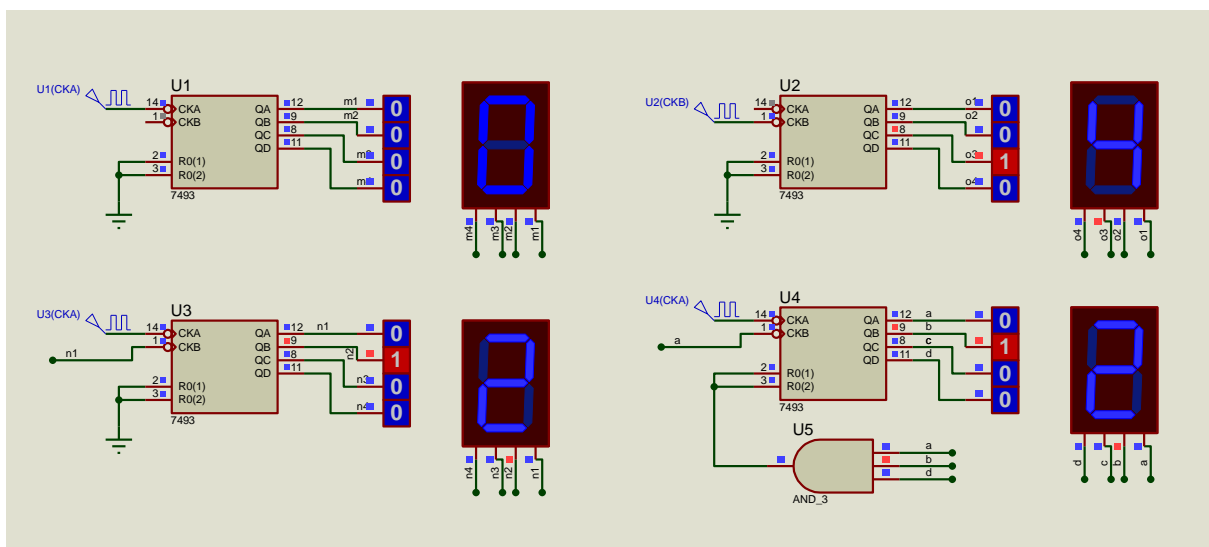
2. شمارنده نزولی 7 تا 3 با JK flip flop



3. شمارنده 3 تا 13 با JK flip flop



4. مدهای شمارشی تراشه 7493 و شمارنده 0 تا 10



NS				Flop Flop								B 0 0						
Num	a ₃	a ₂	a ₁	a ₀	Num	a ₃	a ₂	a ₁	a ₀	J ₃	K ₃	J ₂	K ₂	J ₁	K ₁	J ₀	K ₀	
0	0	0	0	0	1	0	0	0	1	0	X	0	X	0	X	1	X	
1	0	0	0	1	2	0	0	1	0	0	X	0	X	1	X	X	1	$Ja_3 = a_0 a_1 a_2$
2	0	0	1	0	3	0	0	1	1	0	X	0	X	X	0	1	X	$Ka_3 = a_0 a_2 + a_1 a_2$
3	0	0	1	1	4	0	1	0	0	0	X	1	X	X	1	X	1	
4	0	1	0	0	5	0	1	0	1	0	X	X	0	0	X	1	X	$Ja_2 = a_0 a_1$
5	0	1	0	1	6	0	1	1	0	0	X	X	0	1	X	X	1	
6	0	1	1	0	7	0	1	1	1	0	X	X	0	X	0	1	X	$Ka_2 = a_0 a_1 + a_0 a_3 + a_1 a_3$
7	0	1	1	1	8	1	0	0	0	1	X	X	1	X	1	X	1	
8	1	0	0	0	9	1	0	0	1	X	0	0	X	0	X	1	X	$Ja_1 = a_0 a'_3 + a_0 a'_2$
9	1	0	0	1	10	1	0	1	0	X	0	0	X	1	X	X	1	
10	1	0	1	0	11	1	0	1	1	X	0	0	X	X	0	1	X	$Ka_1 = a_0 + a_2 a_3$
11	1	0	1	1	12	1	1	0	0	X	0	1	X	X	1	X	1	
12	1	1	0	0	13	1	1	0	1	X	0	X	0	0	X	1	X	$Ja_0 = a'_1 + a'_2 + a'_3$
13	1	1	0	1	14	0	0	0	0	X	1	X	1	0	X	X	1	
14	1	1	1	0	15	0	0	0	0	X	1	X	1	X	1	0	X	$Ka_0 = 1$
15	1	1	1	1	16	0	0	0	0	X	1	X	1	X	1	X	1	

$$J a_3 = a_0 a_1 a_2$$

$$K a_3 = a_0 a_2 + a_1 a_2$$

$$J a_2 = a_0 a_1$$

$$K a_2 = a_0 a_1 + a_0 a_3 + a_1 a_3$$

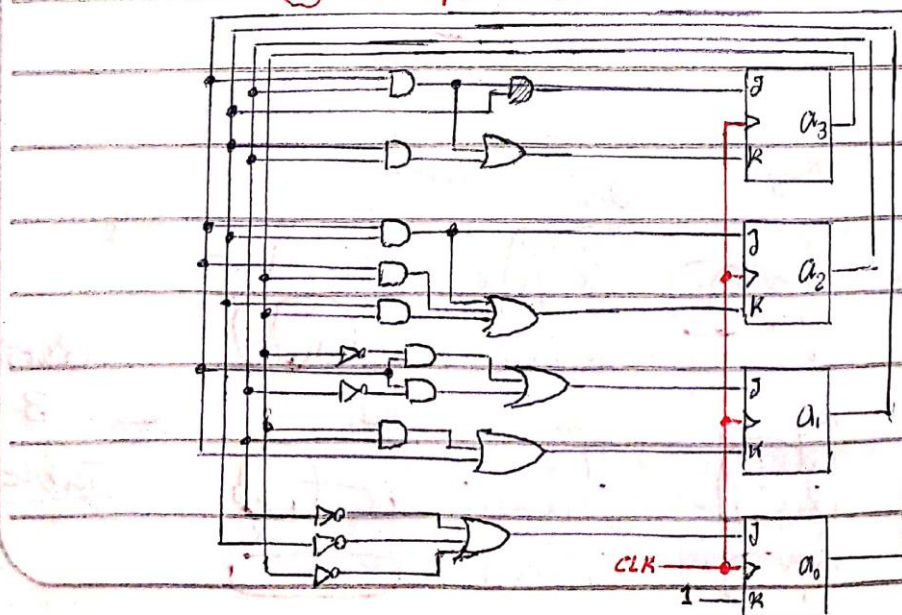
$$J a_1 = a_0 a_3 + a_0 a_2$$

$$K a_1 = a_0 + a_2 a_3$$

$$J a_0 = a_1 + a_2 + a_3$$

$$K a_0 = 1$$

J a ₃				K a ₃				J a ₂				K a ₂			
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0



PS				NS				Flip Flop			
Num	a_2	a_1	a_0	Num	a_2	a_1	a_0	J a_2	K a_2	J a_1	K a_1
0	0	0	0	7	1	1	1	1	X	1	X
1	0	0	1	7	1	1	1	1	X	1	X
2	0	1	0	7	1	1	1	1	X	0	1
3	0	1	1	7	1	1	1	1	X	0	1
4	1	0	0	3	0	1	1	X	1	1	X
5	1	0	1	4	1	0	0	X	0	0	X
6	1	1	0	5	1	0	1	X	0	1	1
7	1	1	1	6	1	1	0	X	0	1	1

3 flip flops are 0

$Ja_2 = 1$ $Ka_2 = a_0' a_1'$

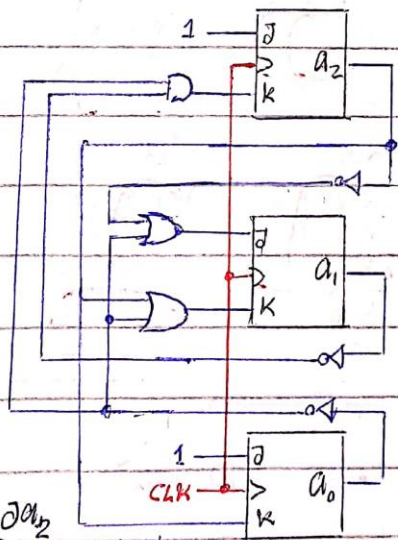
$Ja_1 = a_0' + a_2'$

$Ka_1 = a_0' a_2$

$Ja_0 = 1$ $Ka_0 = a_2$

Ja_2	a_1	Ka_2	Ja_1
1 1 1 1	X X X X	1 0 0 0	1 1 X X
X X X X			1 0 X X

Ka_1	a_0	Ja_0	Ka_0
X X 0 0	1 X X 1	X 0 0 X	X 1 1 X
X X 0 1	1 X X 1	X 1 1 X	



Ja_3	a_1	Ka_3	Ja_2	Ka_2
0 0 0 0	X X X X	X X X X	0 0 1 0	X X X X
0 0 1 0	X X X X	X X X X	X X X X	0 0 1 0
X X X X			X X X X	X X X X
X X X X			X X X X	

Ja_1	a_0	Ka_1	Ja_0	Ka_0
1 1 X X	X X 1 0	1 X X 1	X 0 1 X	X 1 X X
0 1 X X	X X 1 0	X X 1 0	X 1 X X	X 0 X X
0 1 X X	X X 1 0	X X 1 0	X 1 X X	X 1 X X
0 1 X X	X X 1 0	X X 1 0	X 1 X X	

Question
3
Tables

PS				NS				Flip Flops										
Num	a_3	a_2	a_1	a_0	Num	a_3	a_2	a_1	a_0	J _{a3}	K _{a3}	J _{a2}	K _{a2}	J _{a1}	K _{a1}	J _{a0}	K _{a0}	
0	0	0	0	0	3	0	0	1	1	0	X	0	X	1	X	1	X	$J a_3 = a_0 a_1 a_2$
1	0	0	0	1	3	0	0	1	1	0	X	0	X	1	X	X	0	
2	0	0	1	0	3	0	0	1	1	0	X	0	X	X	0	1	X	$K a_3 = a_0 a_2 + a_1 a_2$
3	0	0	1	1	4	0	1	0	0	0	X	1	X	X	1	X	1	
4	0	1	0	0	5	0	1	0	1	0	X	X	0	0	X	1	X	$J a_2 = a_0 a_1$
5	0	1	0	1	6	0	1	1	0	0	X	X	0	1	X	X	1	
6	0	1	1	0	7	0	1	1	1	0	X	X	0	X	0	1	X	$K a_2 = a_0 a_1 + a_0 a_3 + a_1 a_3$
7	0	1	1	1	8	1	0	0	0	1	X	X	1	X	1	X	1	
8	1	0	0	0	9	1	0	0	1	X	0	0	X	0	X	1	X	$J a_1 = a_0 + a_2' a_3'$
9	1	0	0	1	10	1	0	1	0	X	0	0	X	1	X	X	1	
10	1	0	1	0	11	1	0	1	1	X	0	0	X	X	0	1	X	$K a_1 = a_0 a_3' + a_0 a_2'$
11	1	0	1	1	12	1	1	0	0	X	0	1	X	X	1	X	1	
12	1	1	0	0	13	1	1	0	1	X	0	X	0	0	X	1	X	$J a_0 = 1$
13	1	1	0	1	3	0	0	1	1	X	1	X	1	1	X	X	0	
14	1	1	1	0	3	0	0	1	1	X	1	X	1	X	0	1	X	$K a_0 = a_1 a_3' + a_2 a_3' + a_2' a_3$
15	1	1	1	1	3	0	0	1	1	X	1	X	1	X	0	X	0	$a_2 \oplus a_3$

13 2's complement

