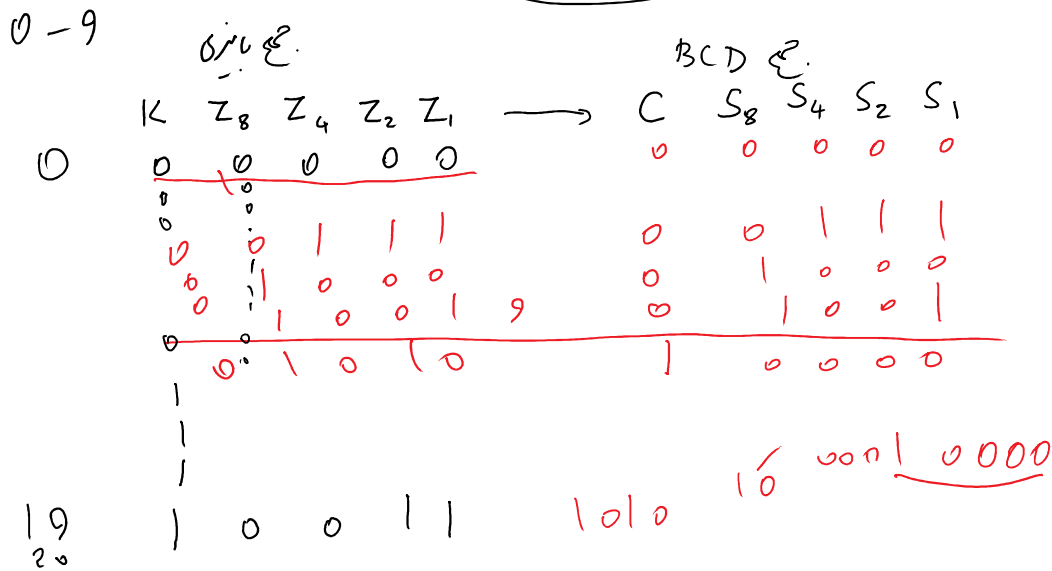
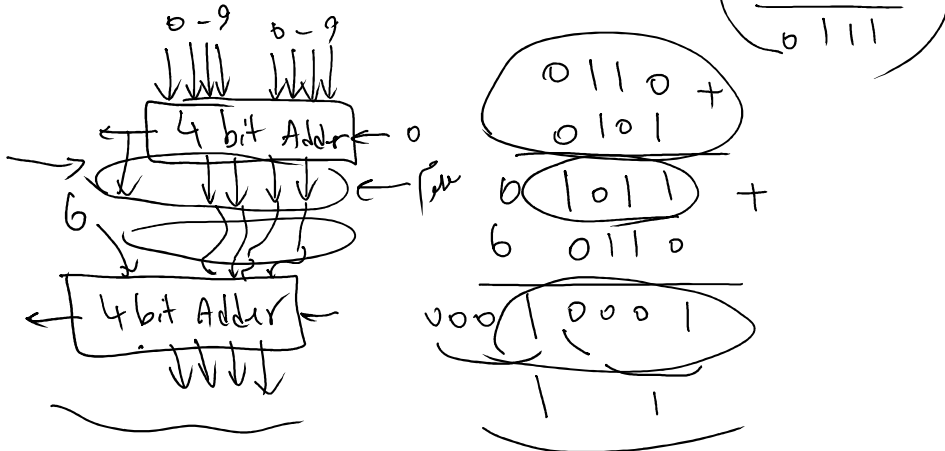
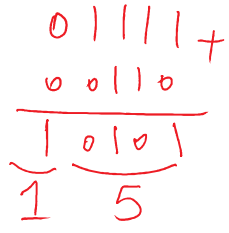


BCD Adder



Derivation of BCD Adder

	Binary Sum					BCD Sum					Decimal
	K	Z_8	Z_4	Z_2	Z_1	C	S_8	S_4	S_2	S_1	
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	1	1
2	0	0	0	1	0	0	0	0	1	0	2
3	0	0	0	1	1	0	0	0	1	1	3
4	0	0	1	0	0	0	0	1	0	0	4
5	0	0	1	0	1	0	0	1	0	1	5
6	0	0	1	1	0	0	0	1	1	0	6
7	0	0	1	1	1	0	0	1	1	1	7
8	0	1	0	0	0	0	1	0	0	0	8
9	0	1	0	0	1	0	1	0	0	1	9
10	0	1	0	1	0	1	0	0	0	0	10
11	0	1	0	1	1	1	0	0	0	1	11
12	0	1	1	0	0	1	0	0	1	0	12
13	0	1	1	0	1	1	0	0	1	1	13
14	0	1	1	1	0	1	0	1	0	0	14
15	0	1	1	1	1	1	0	1	0	1	15
16	1	0	0	0	0	1	0	1	1	0	16
17	1	0	0	0	1	1	0	1	1	1	17
18	1	0	0	1	0	1	1	0	0	0	18
19	1	0	0	1	1	1	1	0	0	1	19



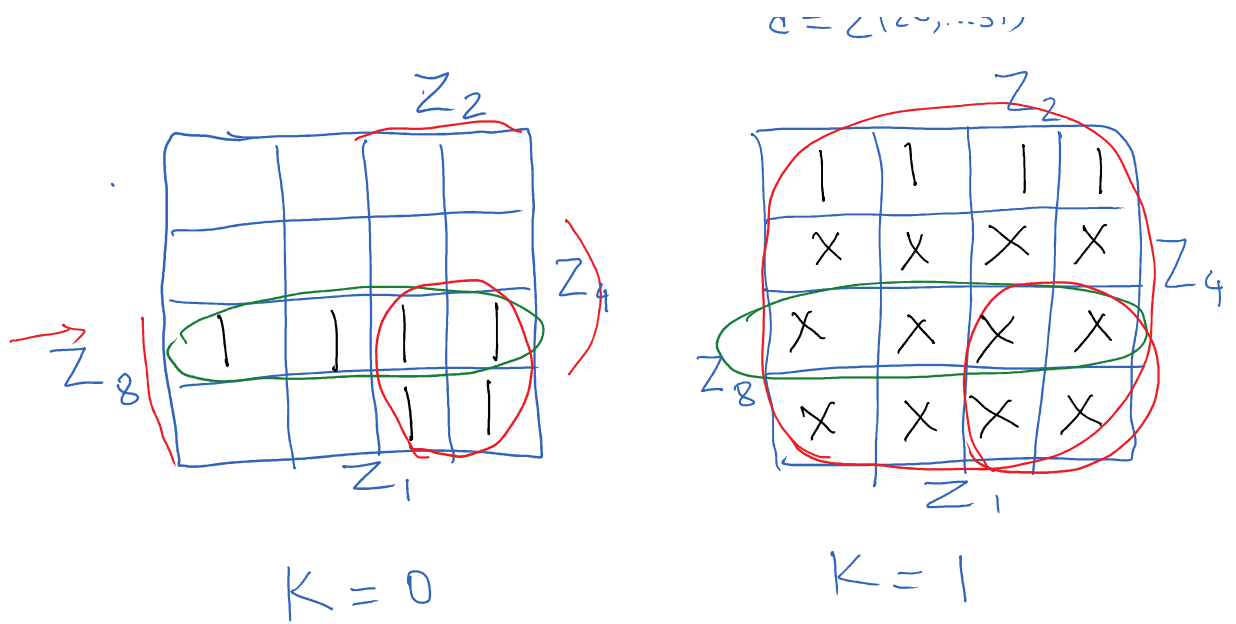
$$C = K + Z_8 Z_4 + Z_8 Z_2$$

$$C = \sum (10, 11, 12, 13, 14, 15, 16, 17, 18, 19)$$

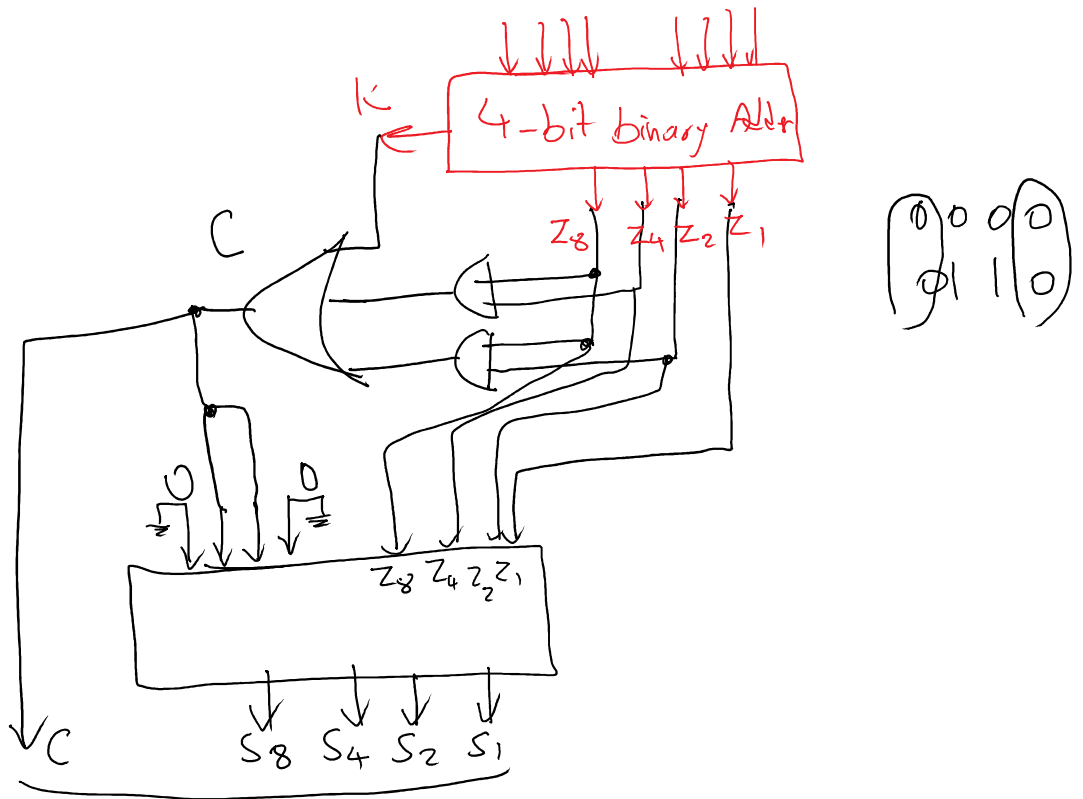
$$d = \sum (20, \dots, 31)$$

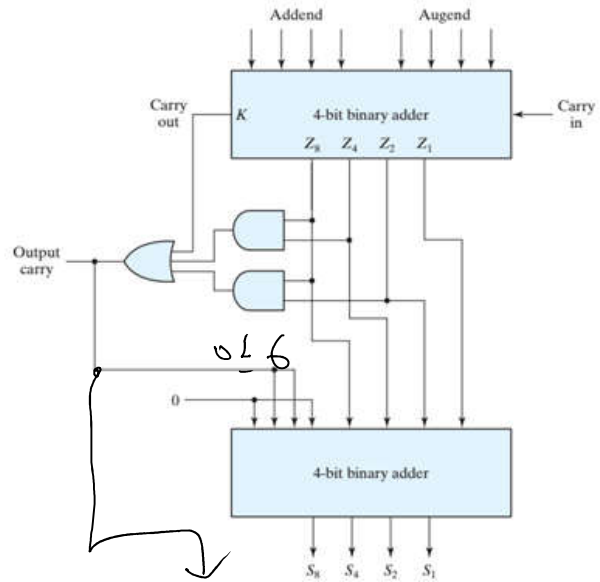
Z_2

Z_2



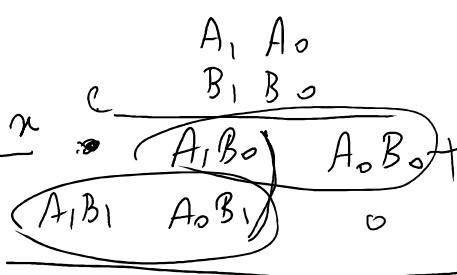
$$C = K + Z_8 Z_4 + Z_8 Z_2$$



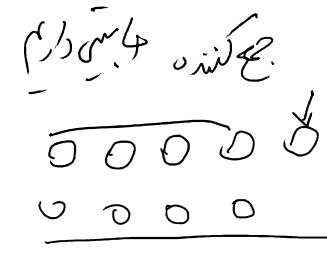
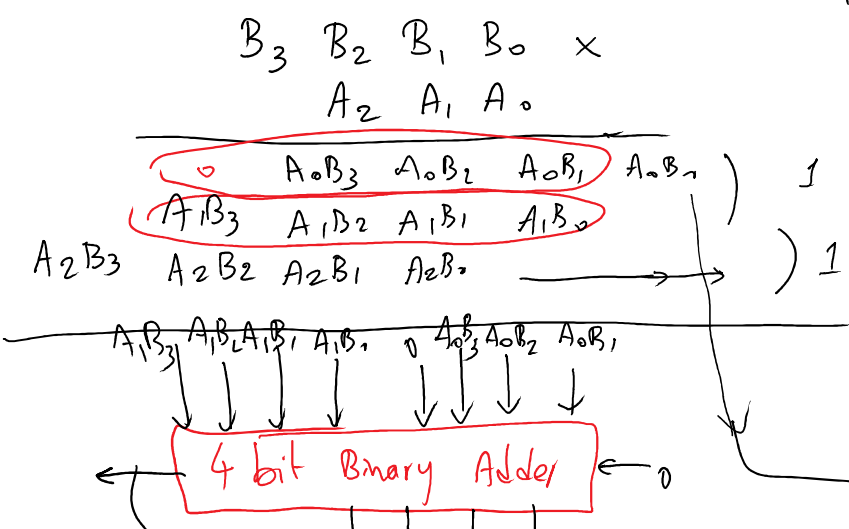
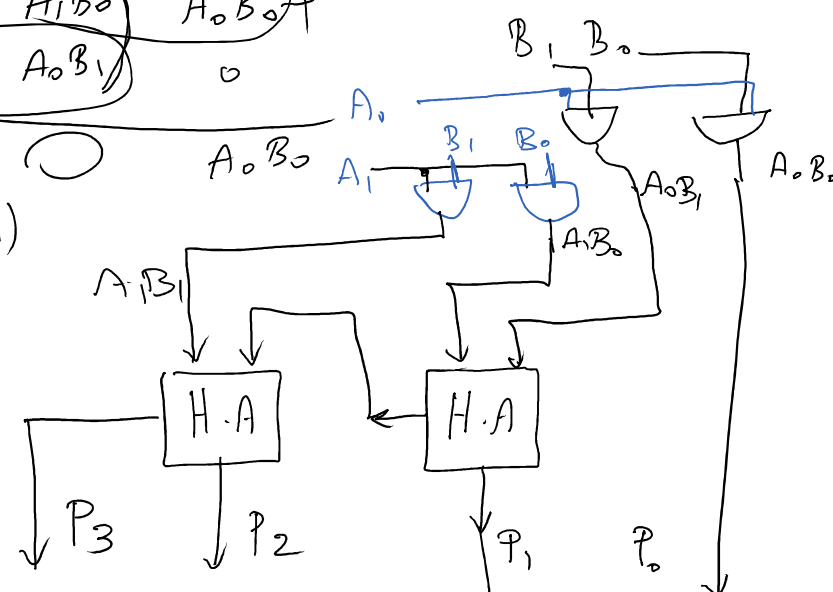


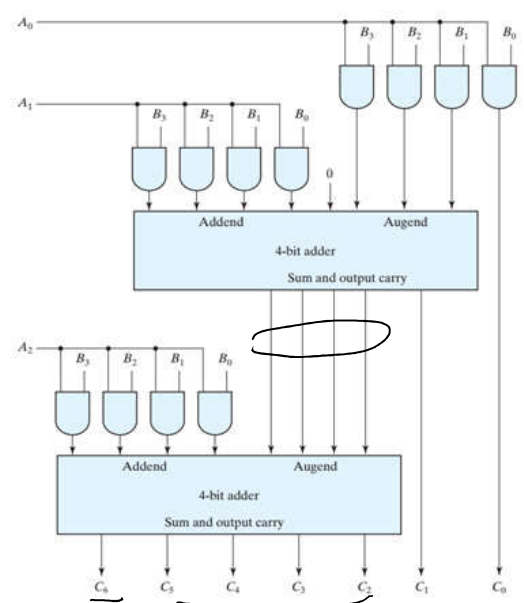
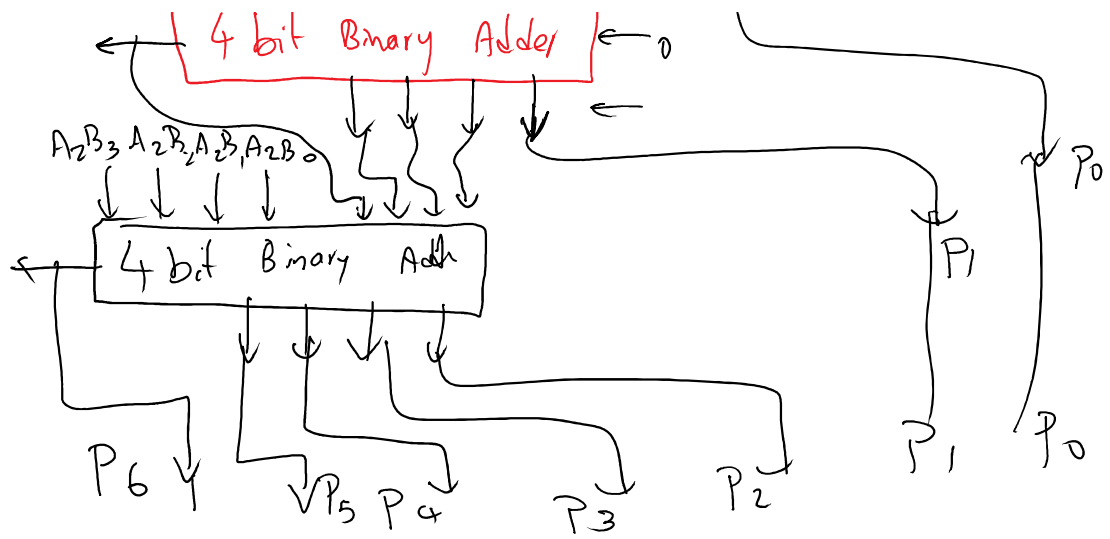
$$\begin{array}{r} 0 \\ x \ 1 \ 1 \ 0 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 1 \ x \\ \otimes \\ \otimes \\ \hline x \end{array}$$



$$m \times n = (m+n)$$





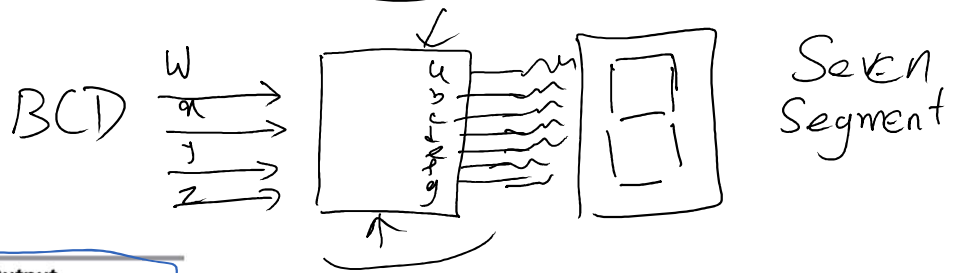
4bit x 3bit = 7bit

BCD	a	b	c	d	e	f	g
0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0
2	0	0	1	0	0	0	0
3	0	0	1	1	0	0	0
4	0	1	0	0	0	0	0
5	0	1	0	1	0	0	0
6	0	1	1	0	0	0	0
7	0	1	1	1	0	0	0
8	1	0	0	0	0	0	0
9	1	0	0	1	0	0	0

$a = \sum$ $b = \sum$ $c = \sum$

$$\frac{9 \quad | \quad 0 \quad 0 \quad | \quad |}{13 \quad | \quad 15}$$

$$a = \Sigma \quad b = \Sigma \quad c = \Sigma$$



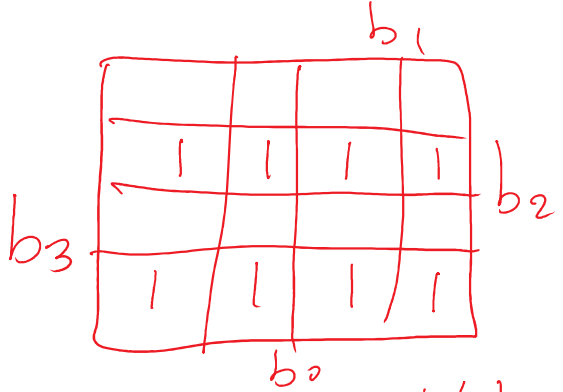
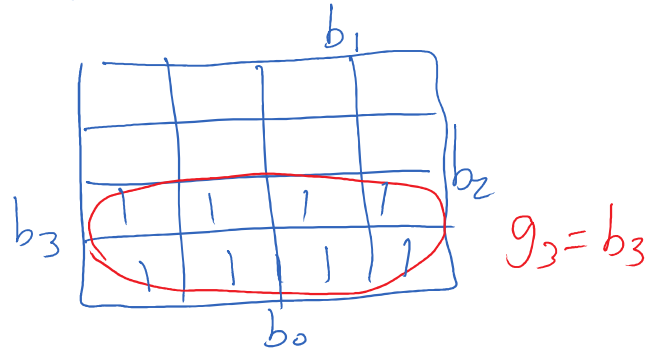
Minterm	Input				Output			
	b_3	b_2	b_1	b_0	g_3	g_2	g_1	g_0
m_0	0	0	0	0	0	0	0	0
m_1	0	0	0	1	0	0	0	1
m_2	0	0	1	0	0	0	1	1
m_3	0	0	1	1	0	0	1	0
m_4	0	1	0	0	0	1	1	0
m_5	0	1	0	1	0	1	1	1
m_6	0	1	1	0	0	1	0	1
m_7	0	1	1	1	0	1	0	0
m_8	1	0	0	0	1	1	0	0
m_9	1	0	0	1	1	1	0	1
m_{10}	1	0	1	0	1	1	1	1
m_{11}	1	0	1	1	1	1	1	0
m_{12}	1	1	0	0	1	0	1	0
m_{13}	1	1	0	1	1	0	1	1
m_{14}	1	1	1	0	1	0	0	1
m_{15}	1	1	1	1	1	0	0	0

$$g_3 = \Sigma (8, 9, 10, 11, 12, 13, 14, 15)$$

$$g_2 = \Sigma (4, 5, 6, 7, 8, 9, 10, 11)$$

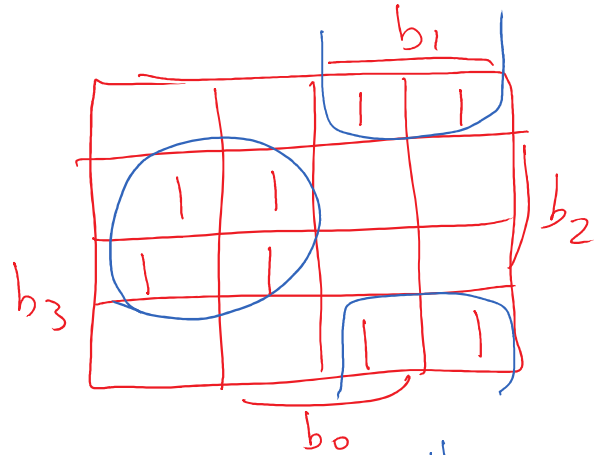
$$g_1 = \Sigma (2, 3, 4, 5, 10, 11, 12, 13)$$

$$g_0 = \Sigma (1, 2, 5, 6, 9, 10, 13, 14)$$



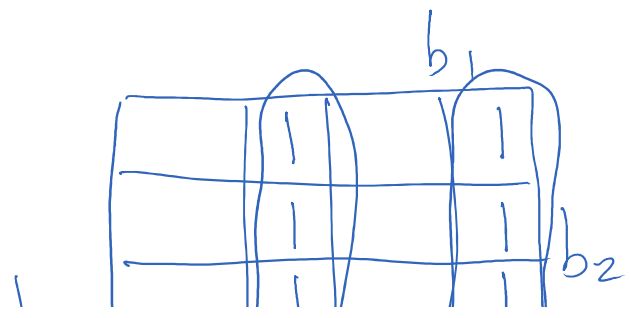
$$g_2 = b_3 b_2' + b_3' b_2$$

$$= b_3 \oplus b_2$$



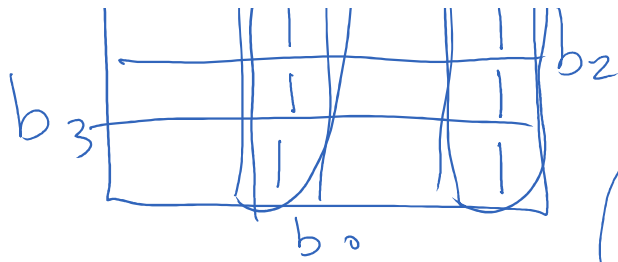
$$g_1 = b_2 b_1' + b_2' b_1$$

$$= b_2 \oplus b_1$$

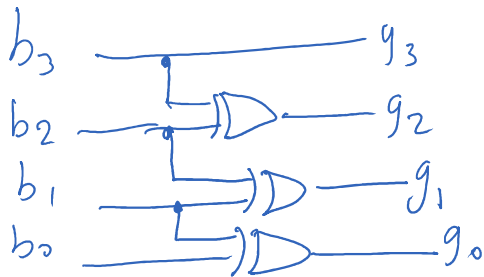
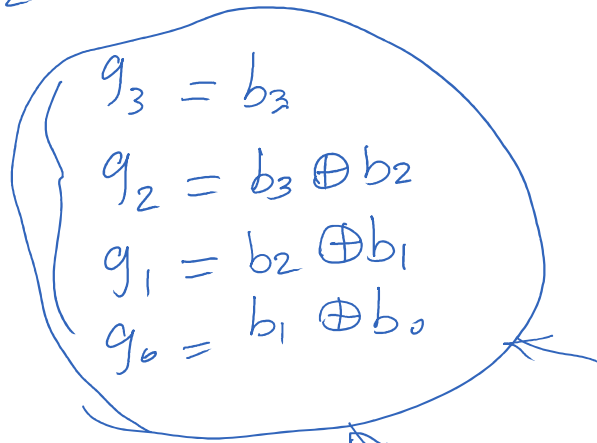


$$g_0 = b_1 b_0' + b_1' b_0$$

$$= b_1 \oplus b_0$$



$$= b_1 \oplus b_0$$



$$b_3 = g_3$$

$$b_2 = ?$$

$$b_1 = .$$

$$b_0 = .$$