$C_4\ C_3\ C_2\ C_1\ C_0$
$=0$ 0 0 1 0
$+$ 0 1 1 0
1 0 0 0

$C_4 \neq C_3$ OV
1 1 0 1
$+$ 1 0 1 0
0 1 1 1

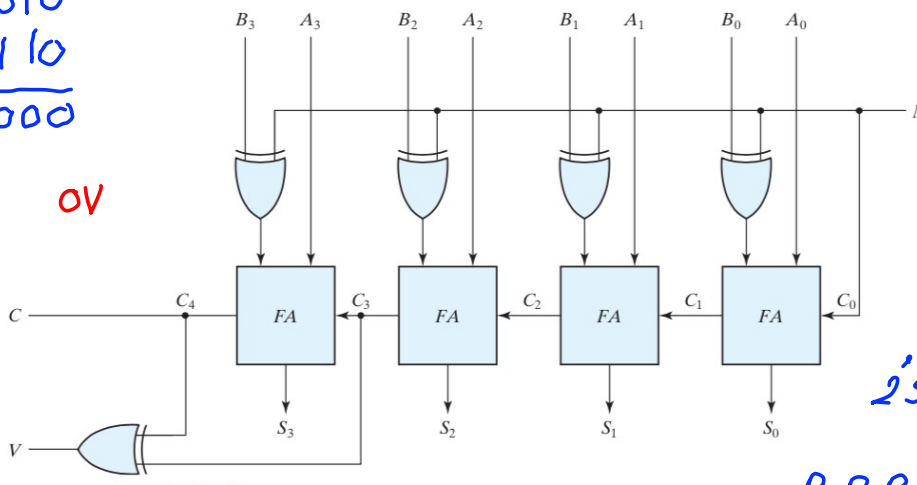


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

$M = \begin{cases} 0: & \text{جمع} \\ 1: & \text{تنزيل} \end{cases}$

$A-B=A+(-B)$

2's comp.

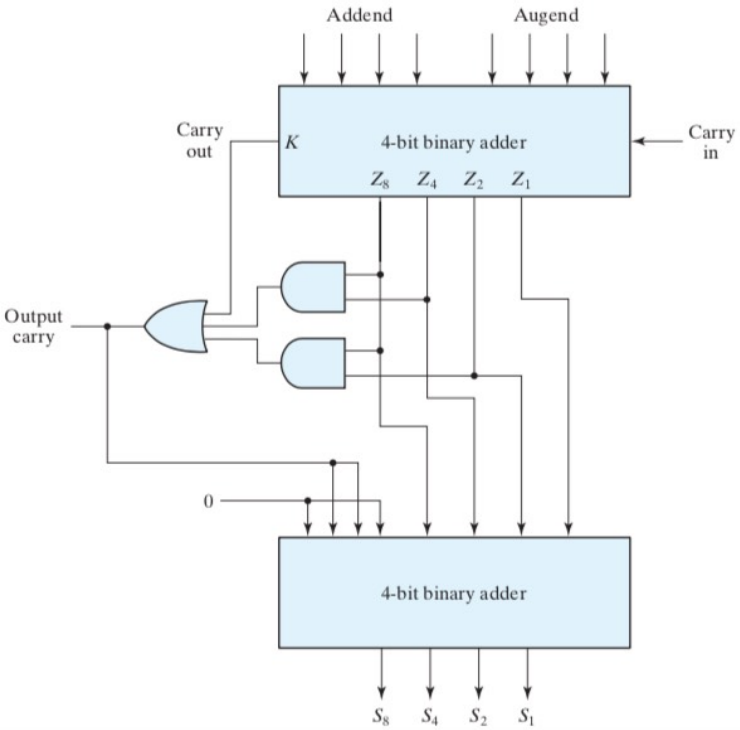
$B_3B_2B_1B_0 \rightarrow \bar{B}_3\bar{B}_2\bar{B}_1\bar{B}_0+1$

$V=\bar{A}_3B_3S_3+A_3\bar{B}_3\bar{S}_3$

BCD Adder

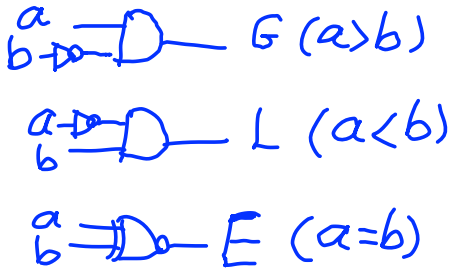
Binary Sum					BCD Sum					Decimal
K	Z_8	Z_4	Z_2	Z_1	C	S_8	S_4	S_2	S_1	
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	2
0	0	0	1	1	0	0	0	1	1	3
0	0	1	0	0	0	0	1	0	0	4
0	0	1	0	1	0	0	1	0	1	5
0	0	1	1	0	0	0	1	1	0	6
0	0	1	1	1	0	0	1	1	1	7
0	1	0	0	0	0	1	0	0	0	8
0	1	0	0	1	0	1	0	0	1	9
0	1	0	1	0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

$C=K+Z8Z4+Z8Z2$



مقایسه کننده (comparator)

مقایسه دو بیت a و b



$E = \overline{G+L}$

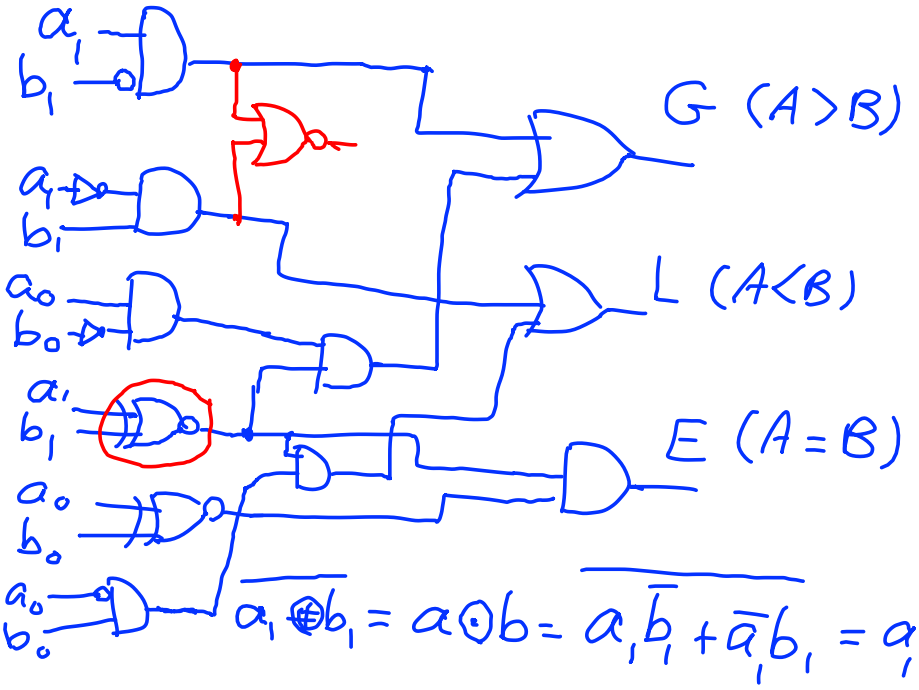
مقایسه کننده دو بیتی

$A = a_1 a_0$

$B = b_1 b_0$

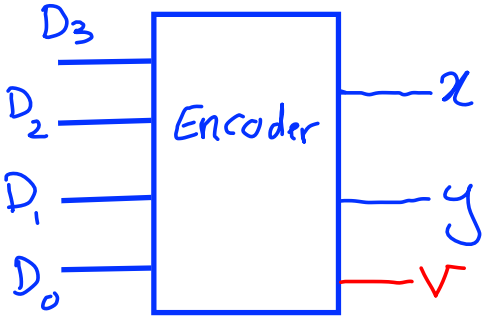
1000

0111



$\overline{a_1 \oplus b_1} = a \odot b = \overline{a_1 \bar{b}_1 + \bar{a}_1 b_1} = a_1 b_1 + \bar{a}_1 \bar{b}_1$

Encoder (کدگذار) Decoder (کدگشا)



$D_3 D_2 D_1 D_0$	x	y	V
1 0 0 0	1	1	1
0 1 0 0	1	0	1
0 0 1 0	0	1	1
0 0 0 1	0	0	1
0 0 0 0	X	X	0

$x = D_3 + D_2$

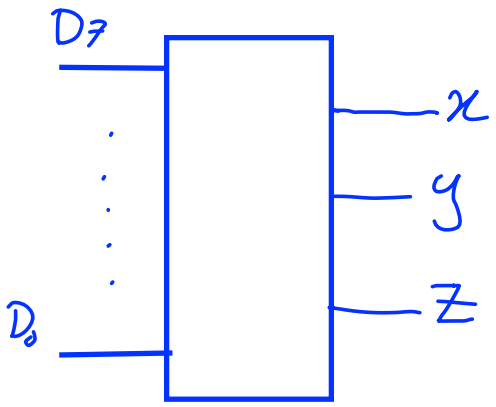
$y = D_3 + D_1$

$V = D_3 + D_2 + D_1 + D_0$

8- Input encoder

۸ حالت مجاز (فقط یک ورودی فعال باشد)

۲۴۸ حالت غیرمجاز



$x = D_7 + D_6 + D_5 + D_4$

$y = D_7 + D_6 + D_3 + D_2$

$z = D_7 + D_5 + D_3 + D_1$

x y z

000

111

D_6, D_1 $x=1$ $y=1$ $z_1=1$ 111

D_6, D_2 $x=1$ $y=1$ $z=0$ 110

Priority Encoder (کدگذار اولویت دار)

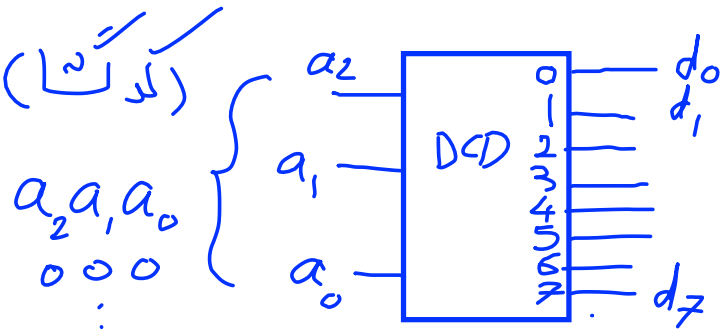
$x = D_7 + D_6 + D_5 + D_4$

$y = D_7 + D_6 + D_3 \cdot (\bar{D}_5 \cdot \bar{D}_4) + D_2 \cdot (\bar{D}_5 \cdot \bar{D}_4)$

$z = D_7 + D_5 \cdot \bar{D}_6 + D_3 \cdot (\bar{D}_6 \cdot \bar{D}_4) + D_1 (\bar{D}_6 \cdot \bar{D}_4 \cdot \bar{D}_2)$

$V = D_7 + \cdots + D_0$

Decoder (کدگشا)



$a_2 a_1 a_0$

000

⋮

111

فقط یک خروجی فعال (=1) می‌شود که متناظر با کد ورودی است

n ورودی، 2^n خروجی

active high

2-to-4 decoder

a_1 a_0	D_0	D_1	D_2	D_3
0 0	1	0	0	0
0 1	0	1	0	0
1 0	0	0	1	0
1 1	0	0	0	1