$c_1 = f(g_1, p_1, g_0, p_0, c_0)$ $z_0 = f(x_0, y_0, c_0, c_1)$

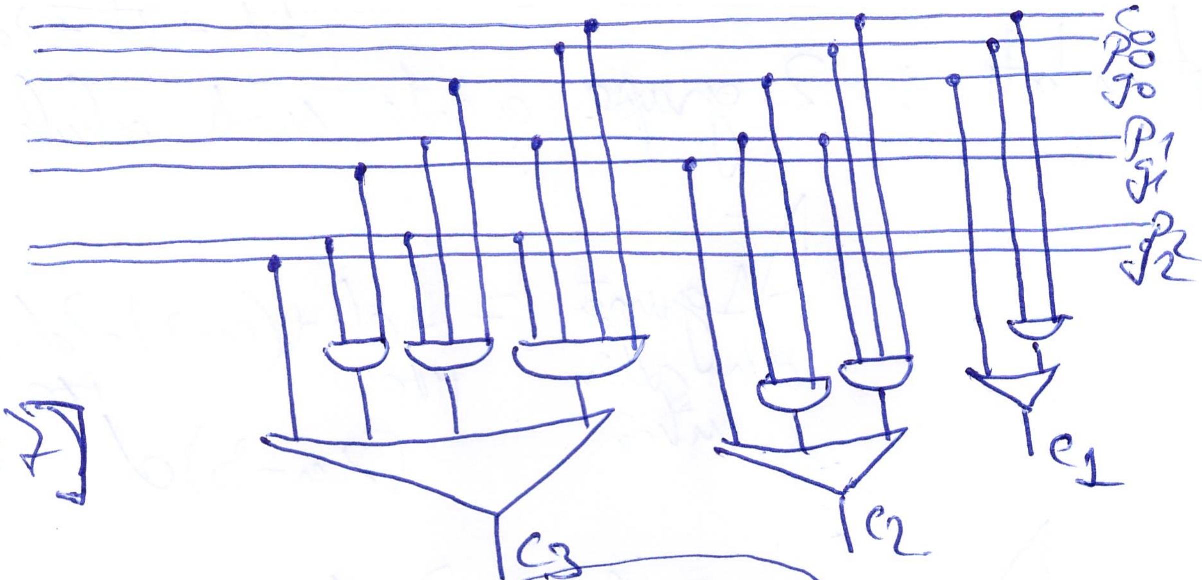
=>

$c_1 = f(x_0, y_0, \overbrace{x_1, y_1}^{\text{Od Od}}, c_0)$

$g_1, p_1 = f(x_1, y_1)$

$g_0, p_0 = f(x_0, y_0)$

Carry Lookahead Circuit:

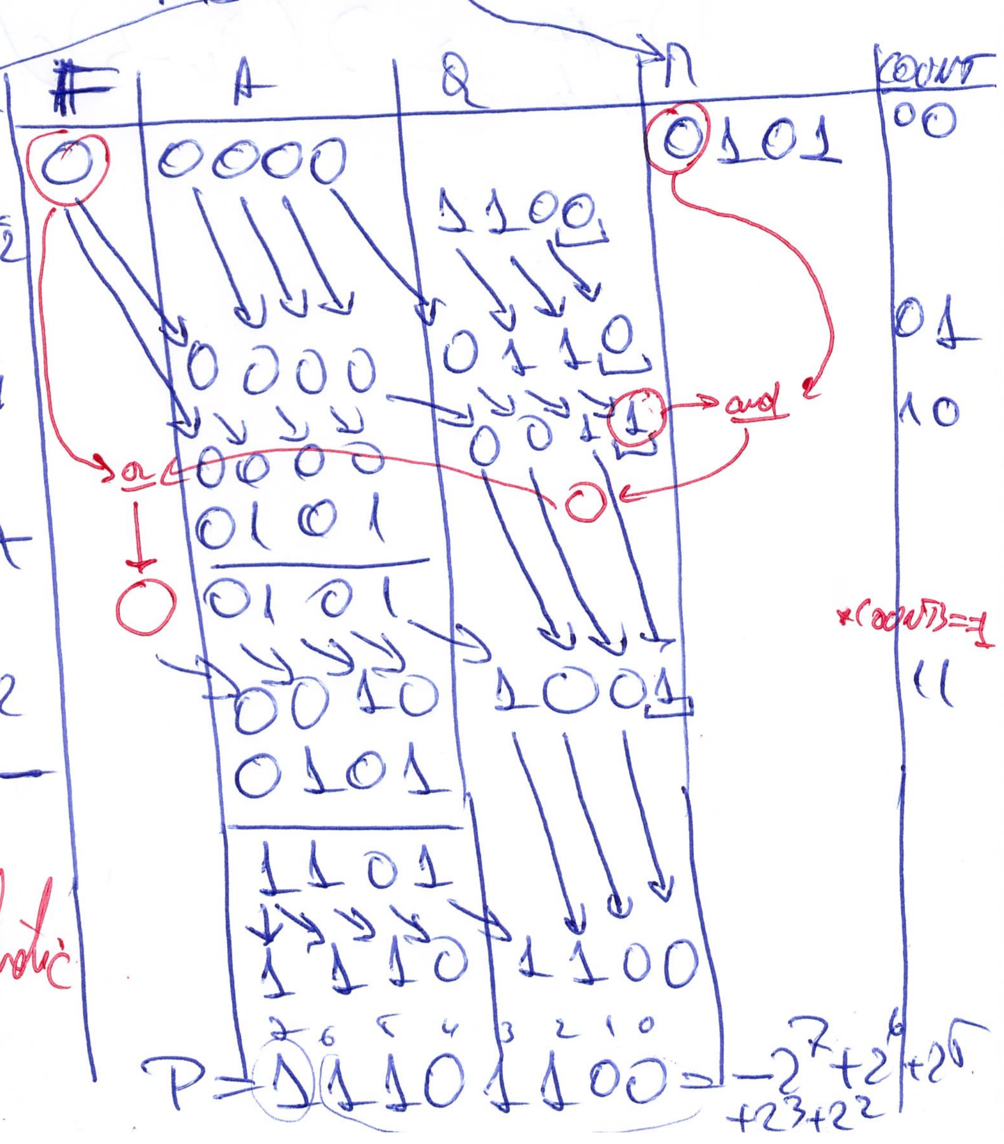


[-8 : +7]

$X = -4 = 1100_2$

$Y = +5 = 0101_2$

$1100_{C2} = -1 \cdot 2^3 + 0100$
$= -8 + 4 = -4$



$P = -128 + 64 + 32 + 12$
$= -64 + 32 + 12 = -32 + 12$
$= -20$

Integer Arithmetic RShift

$P = 11101100 = -2^7 + 2^6 + 2^5 + 2^3 + 2^2$

$D_{PAE_{matr}}$ $\quad D_{Cout_{HAE}} = 1d$

$D_{Cout_{PAE}} = 2d$.

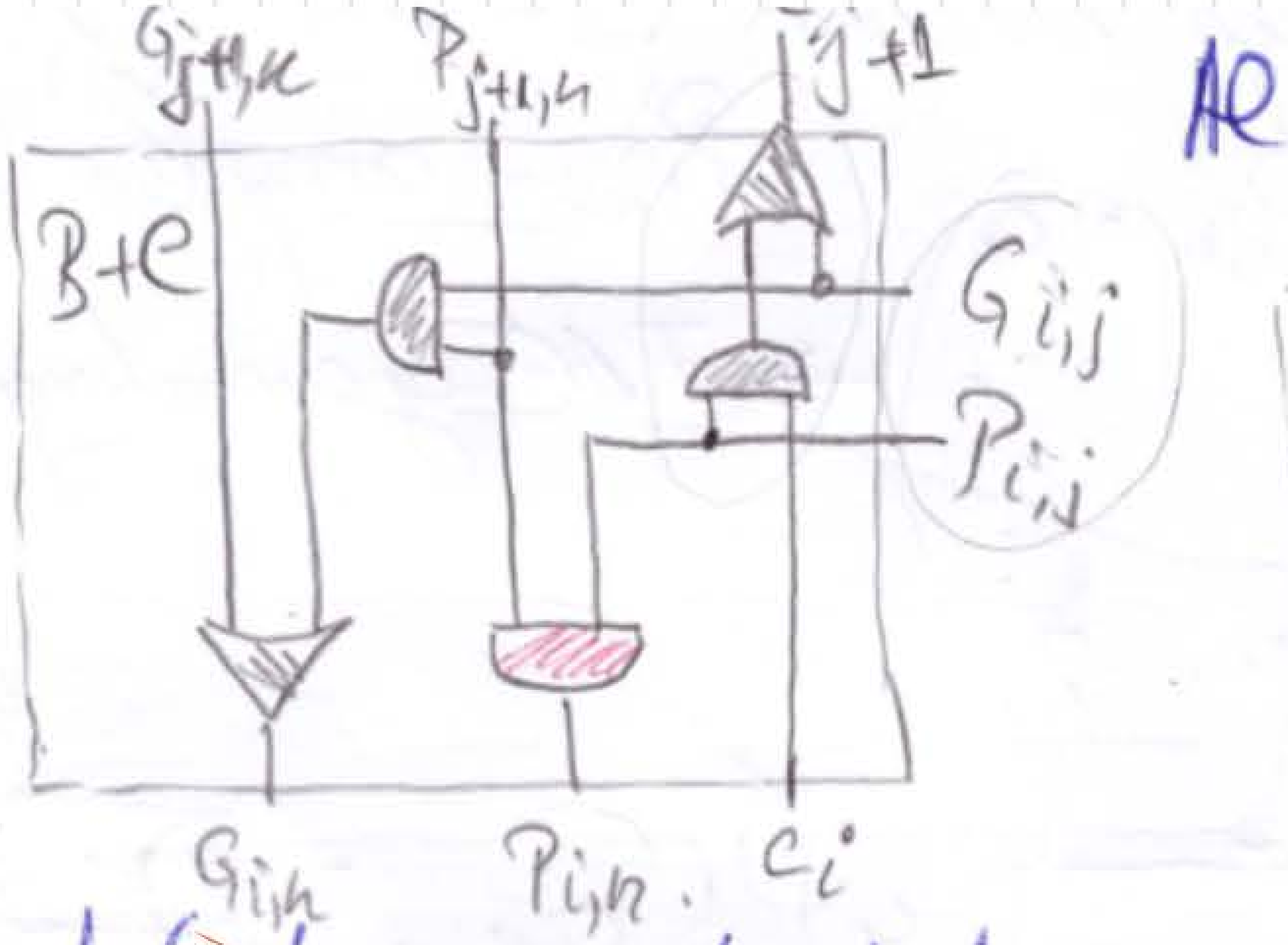
pt $n = 4$ biti. $D_{PAE_{matr}} = 1d + 2d + 2d +$
$1d + 2d + 2d = 10d$.

pt n biti : 2 grupe a câte $n-1$ celule $\begin{cases} (1) \text{ HAE} \\ (n-2) \text{ PAE} \end{cases}$.

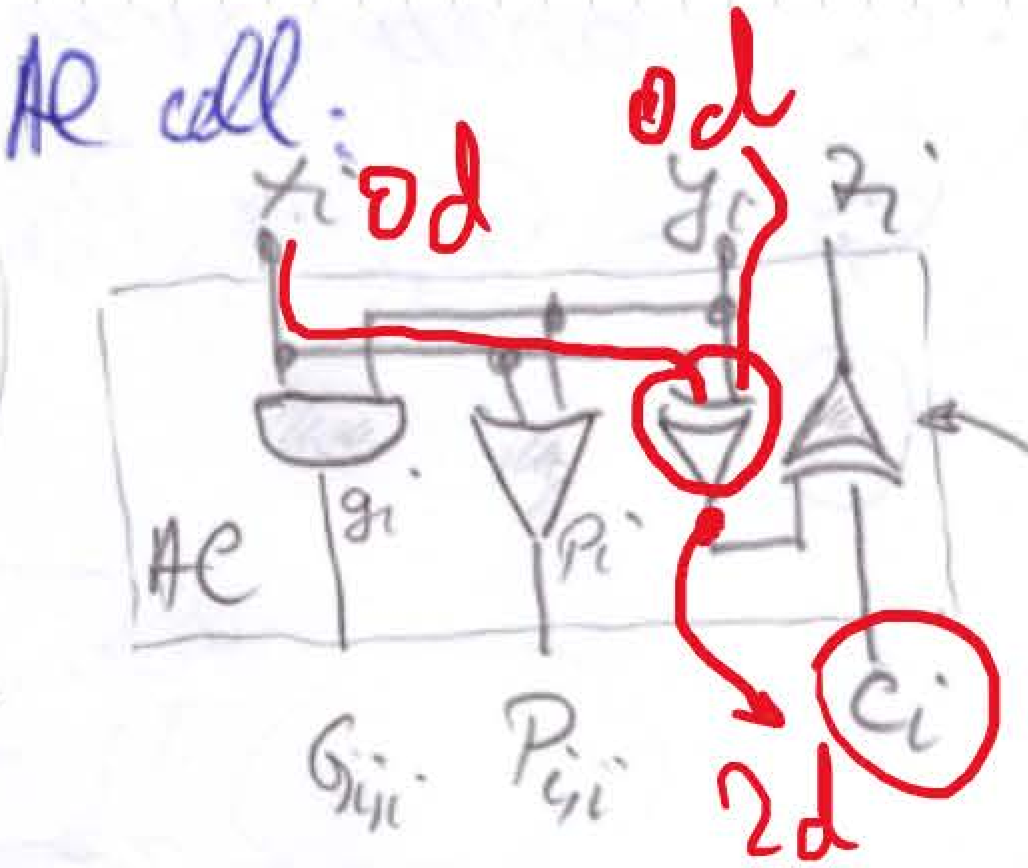
$D_{1 \text{ grupă din celula matrice}} = \underset{HAE}{1d} + (n-2) \cdot \underset{PAE}{2d} =$
$(2n-3)d$.

$D_{PAE_{matr}} = 2(2n-3)d$.

B+C cell



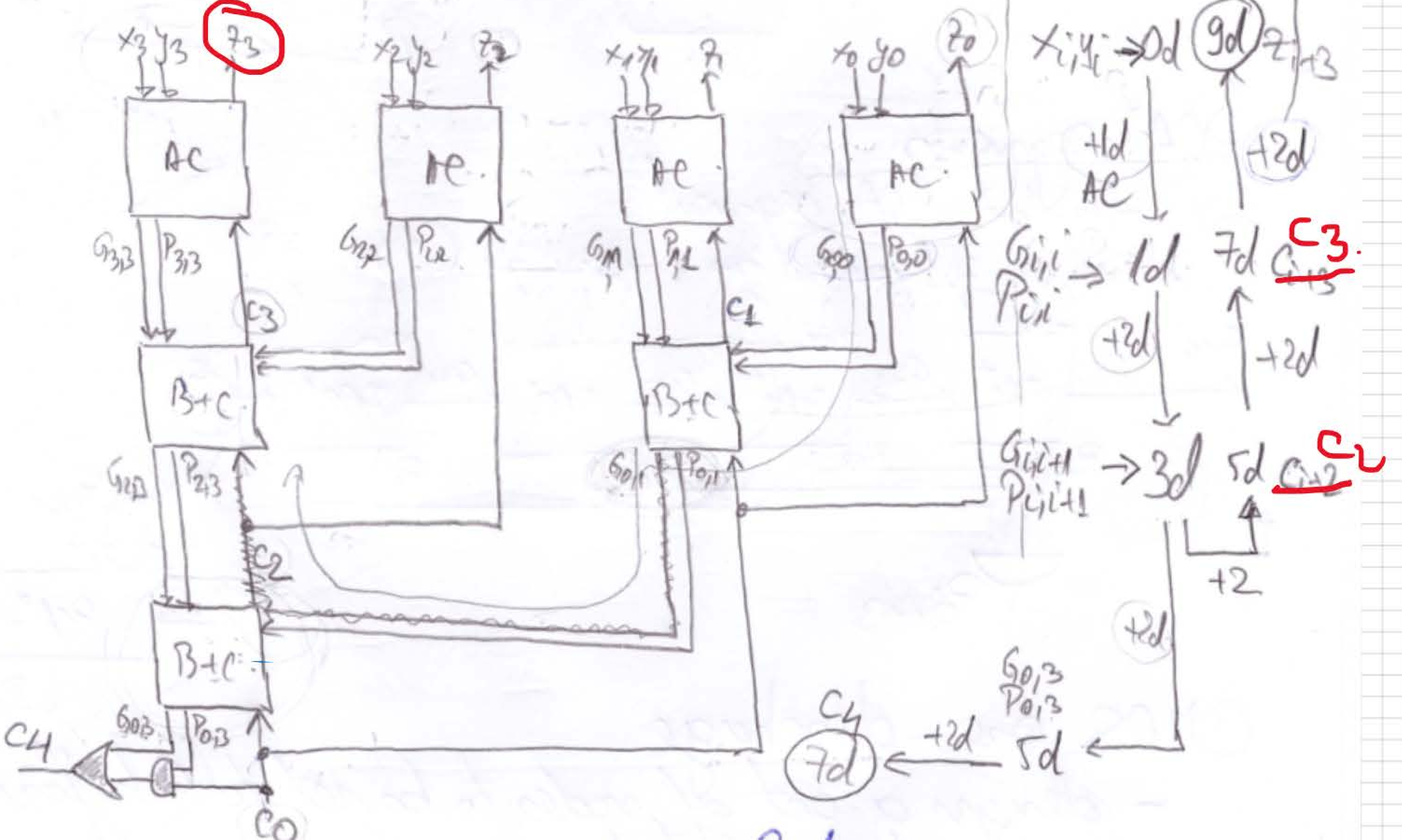
AC cell:



⇒ 2d

x_i, y_i – 0d

ML-CLA architecture – 4-bits



$$z_3 = \underbrace{\max(2d, 7d)}_{\text{inputs to exOR gate}} + 2d = 9d$$

bl 0÷9

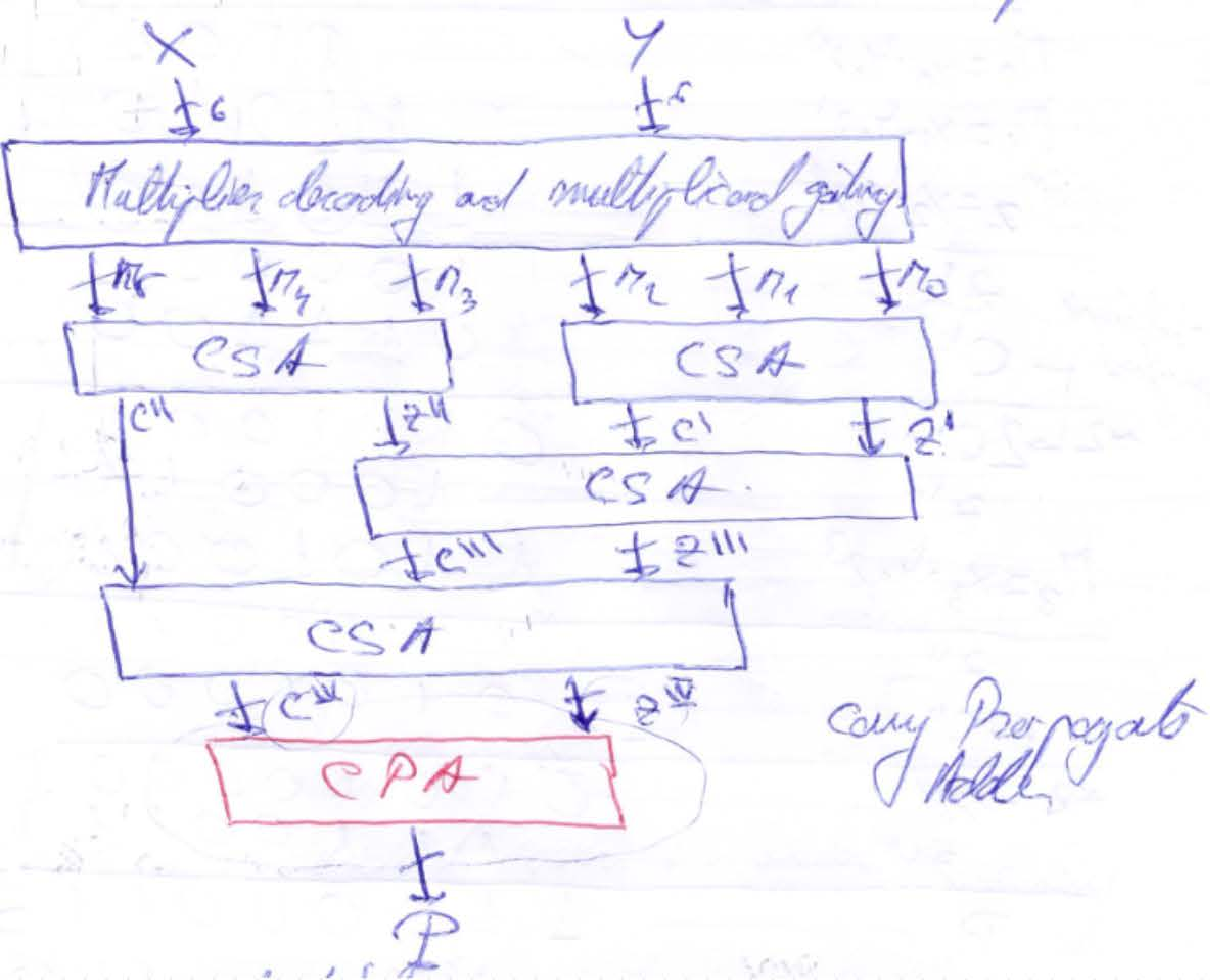
$C_0=0$

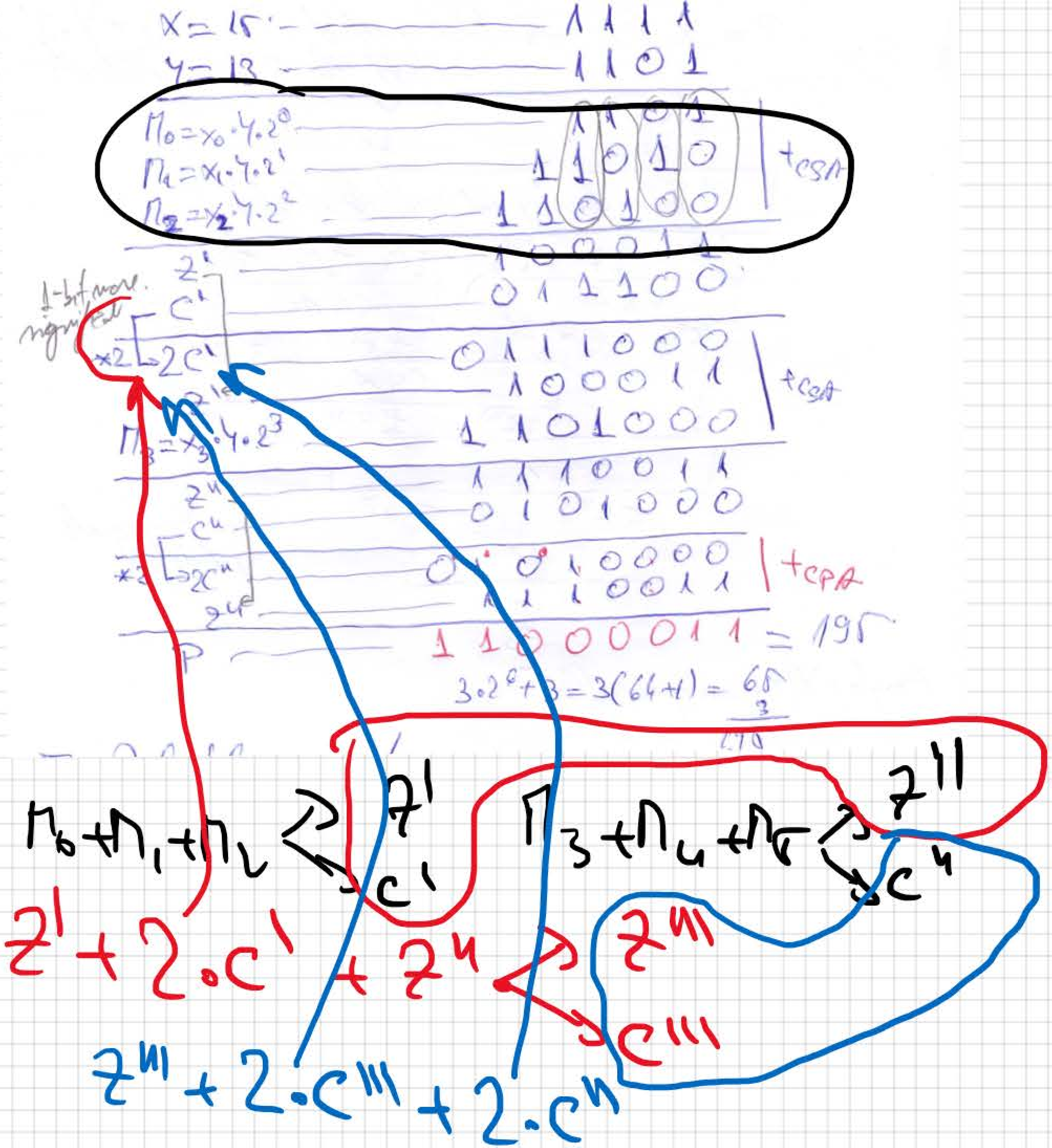
Operands \ Rank		9		8		7		6		5		4		3		2		1		0	
X		1		0		1		1		0		1		1		0		0		1	
Y		0		1		0		0		1		0		1		1		0		0	
Block level	carry in	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S
i=0	cin=0	0	1	0	1	0	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1
	cin=1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	0	1	▨	▨
i=1	cin=0	0	1		1	0	1		1	0	1		1	1	0		1	0	0		1
	cin=1	1	0		0	1	0		0	1	0		0	1	1		0	▨	▨	▨	▨
i=2	cin=0	0	1		1	0	1		1		1		1	1	0		1		0		1
	cin=1	1	0		0	1	0		0		0		0	▨	▨	▨	▨	▨	▨	▨	▨
i=3	cin=0	0	1		1	1	0		0		0		0		0		1		0		1
	cin=1	1	0		0	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
i=4	cin=0	1	0		0		0		0		0		0		0		1		0		1
	cin=1	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨

$1+0+0 \rightarrow z=1,\ C_{out}=0$

$0+1+1 \rightarrow z=0,\ c=1$

$1+1+1 \rightarrow z=1,\ c=1$


X
Y
6
6
Multiplier decoding and multiplicand gating
M5
M4
M3
M2
M1
M0
CSA
CSA
C''
Z''
C'
Z'
CSA
C'''
Z'''
CSA
C^IV
Z^IV
CPA
P
Carry Propagate Adder


X = 15 1111
Y = 13 1101
M0 = x0·Y·2^0 1101
M1 = x1·Y·2^1 11010
M2 = x2·Y·2^2 110100
tCSA
100011
Z' 011100
1-bit more significant
C'
×2 2C'
0111000
1000011
tCSA
M3 = x3·Y·2^3 1101000
1110011
Z'' 0101000
C''
×2 2C''
Z'''
0010000
1110011
tCPA
P 11000011 = 195
3·2^6+3 = 3(64+1) = 65
3
195
M0+M1+M2
Z'
C'
M3+M4+M5
Z''
C''
Z'+2·C'+Z''
Z'''
C'''
Z'''+2·C'''+2·C''

format ipotetic: 1 sign, 4 exponent $\rightarrow$ bias $= 2^{4-1} - 1 = 7$; 3 significant $\Rightarrow \underline{2}$ partea fr. a significant

$X = 0.3125$

$Y = -0.4375$

Round to $-\infty$

$0.4375 = 0.0111_{(2)}$

0.4375	·2
0.8750	·2
1.7500	·2
1.5000	·2
1.0000	

$0.3125_{(10)} = 0.0101_{(2)}$

0.3125	·2
0.6250	·2
1.2500	·2
0.5000	·2
1.0000	

$X = 0.0101 = 1.\underline{01} \times 2^{-2}$

$Y = -0.0111 = -1.\underline{11} \times 2^{-2}$

$-2 + 7 = +5$

X:

0	0	1	0	1	0	1

Y:

1	0	1	0	1	1	1

S1:

0	0	1	0	1	1.	0	1
	X_E					X_M	

1	0	1	0	1	1.	1	1
	Y_E					Y_M	

S2: $d = X_E - Y_E = 0101_{(2)} - 0101_{(2)} = 0 \Rightarrow Z_E = X_E = 0101_{(2)} = 5_{(10)}$

S3: $Y_M = 1.11$

$Y_{MC2} = 0.01$

S4: $Y_{MC2} = 0.01 \mid \overset{g}{0} \; \overset{r}{0} \; \overset{s}{0}$

S5:

$$\begin{array}{rl} X_M = & 1.01 \\ Y_{MC2} = & 0.01 \mid \underset{g}{0} \; \underset{r}{0} \; \underset{s}{0} \end{array} +$$

$$Z_M = \cancel{0}1.10 \mid \underset{g}{0} \; \underset{r}{0} \; \underset{s}{0}$$

Carry

S6: Complement of Z_M

$Z_{MC2} = \cancel{0}.10 \mid \underset{g}{0} \; \underset{r}{0} \; \underset{s}{0}$ $\leftarrow$ 1 bit LShift

$Z_{MC2} = 1.00 \mid$

$Z_E-- \Rightarrow Z_E = 4_{(10)}$

S7: $R = r = 0 \quad S = s = 0$

S8: to $-\infty$ if (R or S) then Z_{MC2}++ $\quad 0$ or $0 = 0$

S9: sign of Z = sign of Y = "−"

S10: sign of = "−" $\quad Z_E = 4_{(10)} = 0100_{(2)}$, $\quad Z_M = 1.\underbrace{00}$

Z:

1	0	1	0	0	0	0
	Z_E					

$Z = -1.00 \times 2^{4-7} = 1 \times 2^{-3} = 0.125$