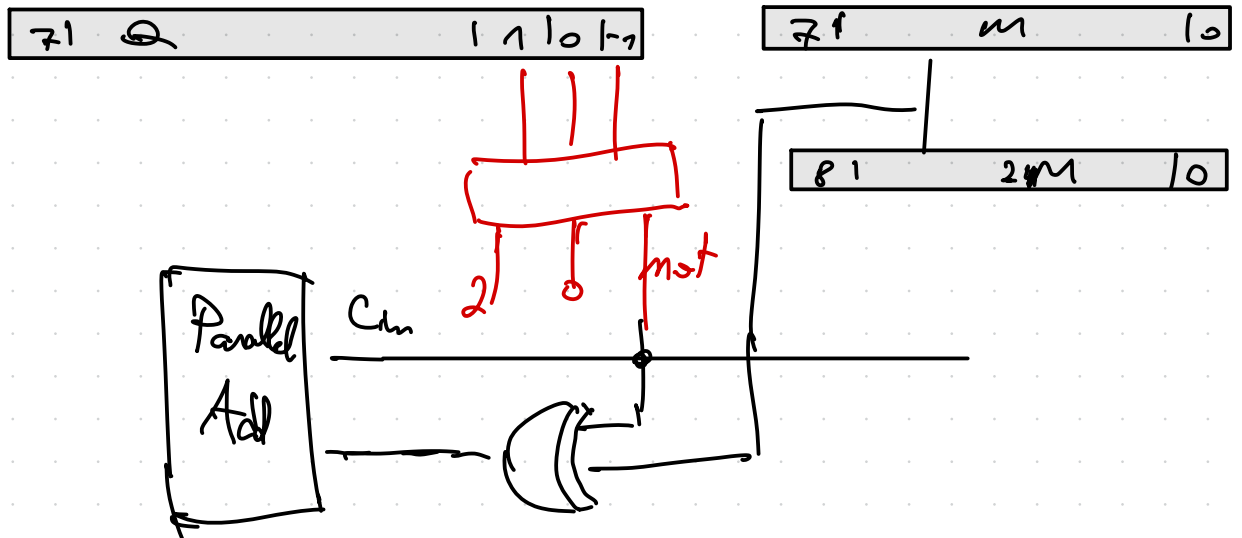


Lab 3

Booth Radix 4			Radix 2		Radix 4	
2^{i+1}	2^i	2^{i-1}	2^{i+1}	2^i	2^{i+1}	2^i
0	0	0	0	0	0	0
0	0	1	0	1	0	1
0	1	0	1	0	1	0
0	1	1	1	0	1	1
1	0	0	1	1	2	0
1	0	1	1	1	2	1
1	1	0	0	1	2	1
1	1	1	0	0	0	0

$$\begin{aligned}
 X_{C2} &= 10101101 \dots 0 \\
 X_B &= \bar{1}1\bar{1}10\bar{1}1\bar{1} \\
 X_{B4} &= \bar{1}\bar{1}\bar{1}1
 \end{aligned}$$



for op. \rightarrow 2 bit counter (m bits op / m. shifters)

$$X = -115$$

$$Y = -88$$

$$-115 = -128 + 13 = -128 + 8 + 4 + 1$$

$$-88 = -128 + 40 = -128 + 32 + 8$$

$$x_{c2} = 110001101$$

$$x_{c2} = 110101000$$

$$-x_{c2} = 001011000$$

$$2x_{c2} = 101010000$$

$$-2x_{c2} = 010110000$$

CNT	A	Q	Q[-1]	M
00	$\begin{array}{r} 00000000 \\ + 110101000 \\ \hline 110101000 \\ 111101010 \end{array}$	10001101	0	+M
01	$\begin{array}{r} + 001011000 \\ 001000010 \\ 000010000 \end{array}$	10001000	1	+M
10	$\begin{array}{r} + 110101000 \\ 110111000 \\ 111101110 \end{array}$	00100010	0	-2M
11	$\begin{array}{r} + 010110000 \\ 010011110 \\ 000100111 \end{array}$	10001000	1	

$$X = -77$$

$$x = -128 + 51 = -128 + 32 + 16 + 2 + 1$$

$$Y = 79$$

$$y = 64 + 15 = 64 + 8 + 4 + 2 + 1$$

$$X = 10110011$$

$$-Y = 110110001$$

$$Y = 001001111$$

$$2M = 010011110$$

$$-2M = 101100010$$

CNT	A	Q	Q[-1]
00	$\begin{array}{r} 00000000 \\ 11011000 \\ \hline 11011000 \\ 11110110 \end{array}$	$\begin{array}{r} 10110011 \\ 01101100 \end{array}$	$\begin{array}{r} 0 \\ 1 \end{array}$
01			

Booth radix 4		Q	Q[-1]	DCI-PUBLIC dcti 1966	
CNT	A				
00	$\begin{array}{r} 00000000 \\ 11011000 \\ \hline 11011000 \end{array}$	10110011	0	-M	X = -77
					Y = 79
01	$\begin{array}{r} 11110110 \\ 00100111 \\ \hline 00011101 \end{array}$	01101100	1	+M	-77 = -128 + 51
					= 10110011 // Q
10	$\begin{array}{r} 00001110 \\ 11011000 \\ \hline 11011000 \end{array}$	11011011	0	-M	79 = 01001111
					= 64 + 15 // M
11	$\begin{array}{r} 11011000 \\ 11011000 \\ \hline 11011000 \end{array}$	11110110	1	-M	M = 00100111
					-M = 110110001
					2M = 010011110
					-2M = 101100010

Radix 4 $x = -117$
 $y = 83$

$x = -128 + 11 = -128 + 8 + 2 + 1$

$x_2 = 10001011$

$y = 83 = 64 + 16 + 2 + 1$

$y_2 = 001010011$

$-y_2 = 110101101$

$2y = 010100110$

$-2y = 101011010$

CNT	A	Q	Q-1
00	$\begin{array}{r} 00000000 \\ + 110101101 \\ \hline 110101101 \\ 111101011 \end{array}$	$\begin{array}{r} 10001011 \\ 01100010 \end{array}$	$\begin{array}{r} 0 \\ 1 \end{array}$
01	$\begin{array}{r} + 110101101 \\ \hline 110011000 \\ 111100110 \end{array}$	00011000	$\begin{array}{r} 1 \\ +1 \end{array}$
10	$\begin{array}{r} + 001010011 \\ \hline 000111001 \\ 000001110 \end{array}$	01000110	$\begin{array}{r} 0 \\ -2 \end{array}$
11	$\begin{array}{r} + 101011010 \\ \hline 101101000 \\ 111011010 \end{array}$	00010001	1

$-117 \times 83 = -9711$

Radix 8

$$x = -104$$

$$y = -99$$

$$x = -128 + 24 = -128 + 16 + 8$$

$$x_{C_2} = 10011000$$

$$2M = 1100111010$$

$$y = -128 + 29 = -128 + 16 + 8 + 4 + 1$$

$$-2M = 0011000110$$

$$y = 1110011101$$

$$-3M = 0100101001$$

$$-y = 0001100011$$

$$+3M = 1011010111$$

$$\begin{array}{r} 1110011101 + \\ + 3M \quad 1100111010 \\ \hline 1011010111 \end{array}$$

$$\begin{array}{r} 0001100011 + \\ 0011000110 \\ \hline 0100101001 - 3M \end{array}$$

CNT	A	Q	Q[-1]
00	$\begin{array}{cc} 00 & 0000 & 0000 \\ 00 & 0000 & 0000 \end{array}$	$\begin{array}{cc} 110011 & 000 \\ 000110 & 011 \end{array}$	$\begin{array}{c} 0 \\ 0 \\ +3M \end{array}$
01	$\begin{array}{cc} +101101 & 0111 \\ \hline 101101 & 0111 \\ 111101 & 1010 \end{array}$	111000110	$\begin{array}{c} 0 \\ -12M \end{array}$
10	$\begin{array}{cc} +0011000110 \\ \hline 0010100000 \\ 000[00101000 \end{array}$	000111000	$\begin{array}{c} 1 \end{array}$
	$-104 \times -99 = 10296$	✓	