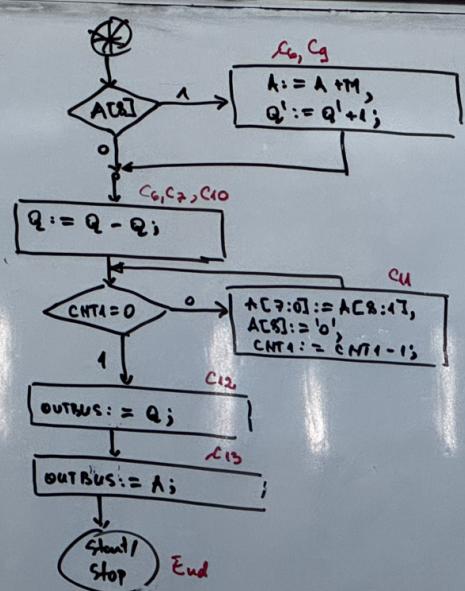
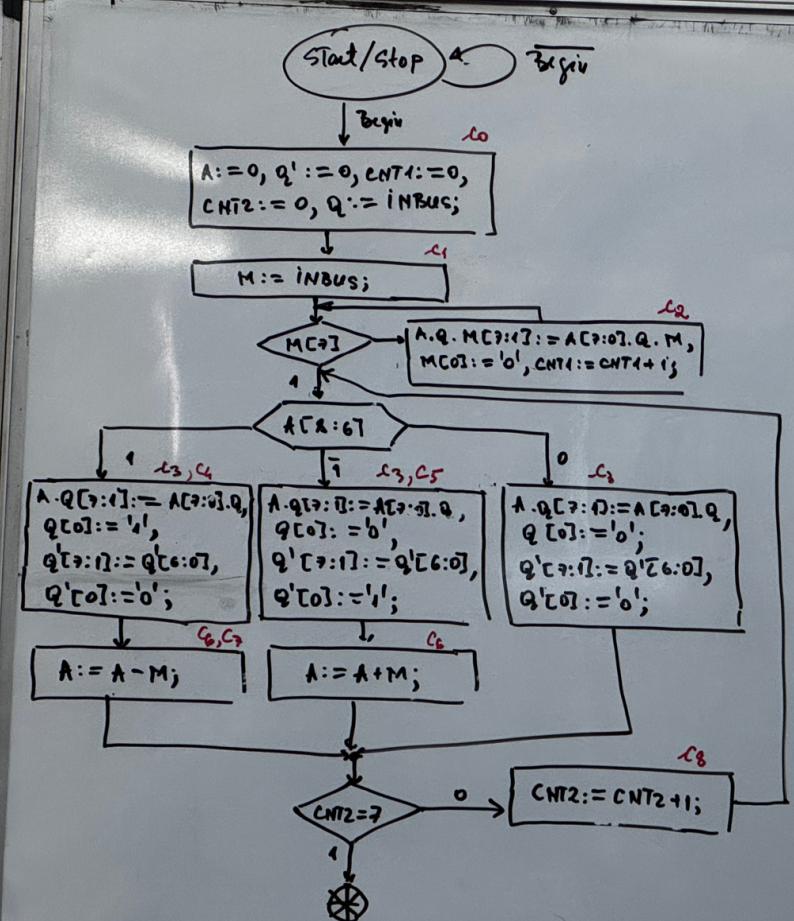
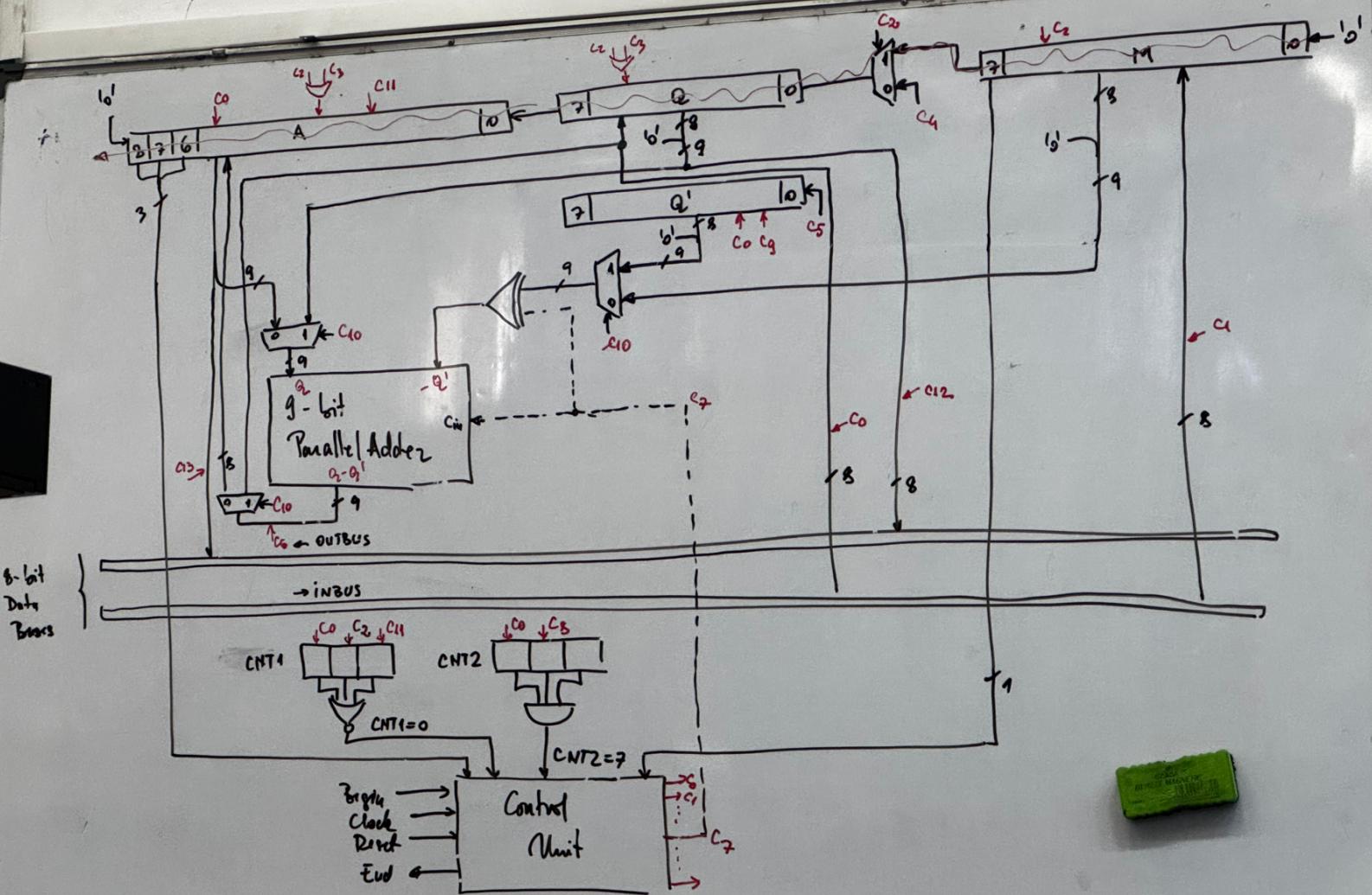


Radix 2 SRT



1. 4. 4. Radix-4 SRT

radix 2 $r_{i+1} \leftarrow 2r_i - g_i b$
 $g_i \in \{ \bar{1}, 0, 1 \}$

radix 4 $r_{i+1} \leftarrow 4r_i - g_i b$
 $g_i \in \{ \bar{2}, \bar{1}, 0, 1, 2 \}$

if $|r_i| < b$ then $|r_{i+1}| < b$

$$r_i = b \rightarrow 4^3 - \frac{g_i}{2} b^3 \leq b$$

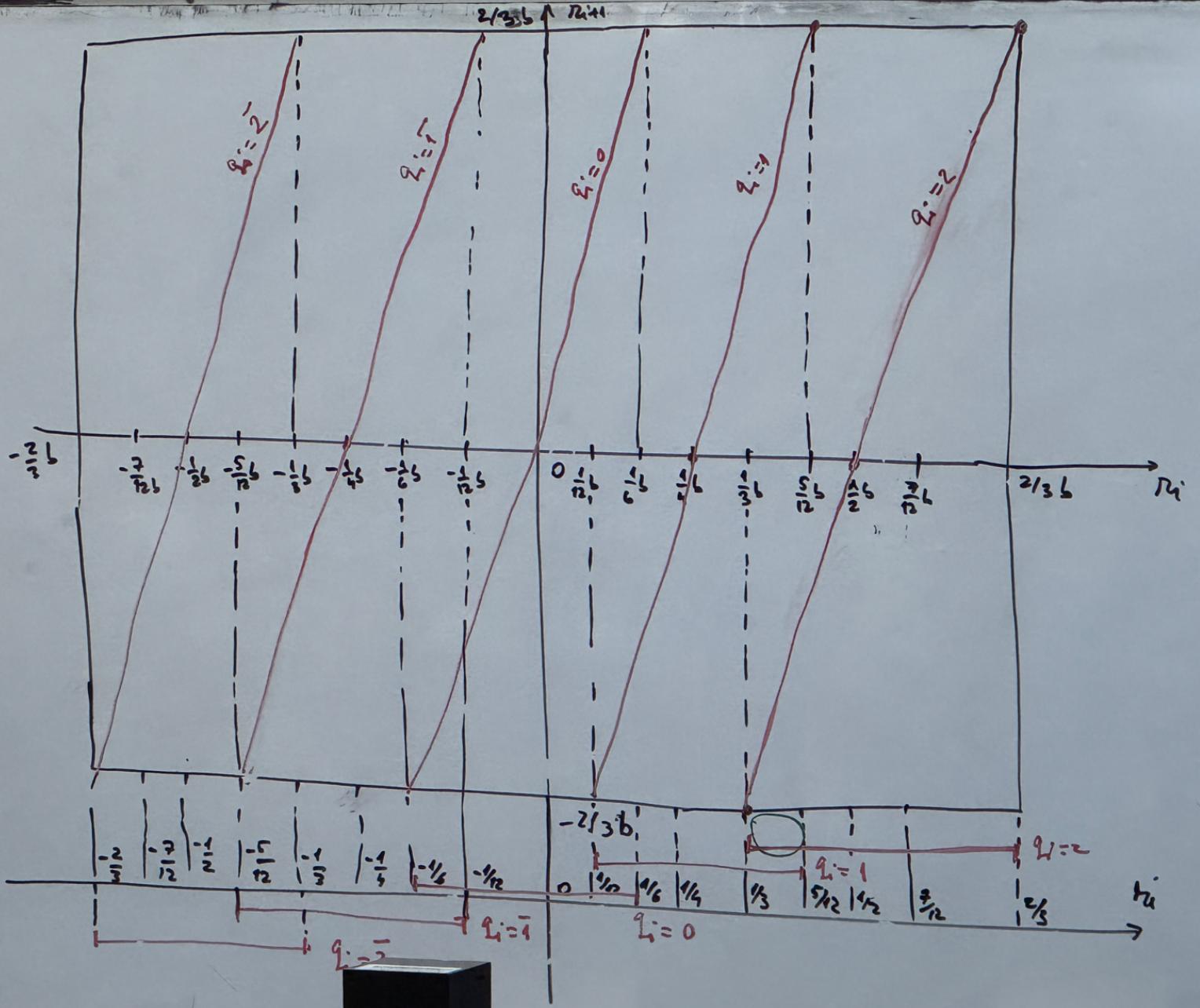
$$\geq 2b$$

Constraints: $|r_i| < \frac{2}{3} b$

$$\Rightarrow |r_{i+1}| < \frac{2}{3} b$$

$$r_i = \frac{2}{3} b \rightarrow 4 \cdot \frac{2}{3} b - 2 \leq b$$

$$\frac{8-6}{3} b \leq \frac{2}{3} b$$



$$0 \rightarrow \begin{matrix} 0 & 0 \\ 0 & 0 \end{matrix} \quad 1 \rightarrow \begin{matrix} 0 & 1 \\ 0 & 0 \end{matrix} \quad 2 \rightarrow \begin{matrix} 1 & 0 \\ 0 & 0 \end{matrix}$$

$$\overline{1} \rightarrow \begin{matrix} 0 & 0 \\ 0 & 1 \end{matrix} \quad \overline{2} \rightarrow \begin{matrix} 0 & 0 \\ 1 & 0 \end{matrix}$$

1.4.4. Radix-4 SRT

COUNT	P	A	B
00	0 0000 0000 0 0001 1010	1101 0011 0110 0000	0000 0110 1100 0000
00	$q_0 = 0$ 0 0110 1001 $\cancel{1-2}$	10 00 00 00 00 00	
01	11010 0110 - 11000 0000 00010 0110	00 00 00 10 00 00	
10	$q_2 = 1$ - 010 01 1000 011 00 0000 111 01 1000	00 00 10 01 00 00 00 00	
11	$q_3 = \bar{1}$ + 101 10 0000 011 00 0000 000 10 0000	00 10 01 00 00 00 00 01	
Shift + Carry	000 00000 01	00 10 00 11	
		quotient = 35 ₁₀	
		remainder = 1 ₁₀	

$$b = 12$$

$$\begin{array}{r}
 211 - \\
 128 - \\
 \hline
 83 - \\
 64 - \\
 \hline
 19 - \\
 16 - \\
 \hline
 3
 \end{array}$$

$$0 \rightarrow 00 \quad 1 \rightarrow 01 \quad 2 \rightarrow 10$$

$$\bar{1} \rightarrow 00 \quad \bar{2} \rightarrow 10$$

$$t_{i+1} \leftarrow t_i - q_i b$$

$$B = 01100 0000$$

$$2B = 11000 0000$$

$$\begin{array}{l}
 11011_{G_2} \\
 \downarrow \\
 111010_{C_1} \\
 \downarrow \\
 100101_{SM} \\
 (-5)_{K_1}
 \end{array}$$

$$\begin{array}{l}
 11011_{G_2} \\
 \downarrow \\
 111010_{C_1} \\
 \downarrow \\
 100101_{SM} \\
 (-5)_{K_1}
 \end{array}$$

1 SRT-4

b	Range of P	q	b	Range of P	q
8	-12 -7	-2	12	-18 -10	-2
8	-6 -3	-1	12	-10 -4	-1
8	-2 1	0	12	-4 3	0
8	2 5	1	12	3 9	1
8	6 11	2	12	9 17	2
9	-14 -8	-2	13	-19 -11	-2
9	-7 -3	-1	13	-10 -4	-1
9	-3 2	0	13	-4 3	0
9	2 6	1	13	3 9	1
9	7 13	2	13	10 18	2
10	-15 -9	-2	14	-20 -11	-2
10	-8 -3	-1	14	-11 -4	-1
10	-3 2	0	14	-4 3	0
10	2 7	1	14	3 10	1
10	8 14	2	14	10 19	2
11	-16 -9	-2	15	-22 -12	-2
11	-9 -3	-1	15	-12 -4	-1
11	-3 2	0	15	-5 4	0
11	2 8	1	15	3 11	1
11	8 15	2	15	11 21	2

$$\begin{array}{r}
 211 \mid 6 \\
 18 \overline{) 35} \\
 = 31 \\
 30 \overline{) } \\
 = 1
 \end{array}$$

$$\begin{array}{r}
 213 \mid 5 \\
 20 \overline{) 42} \\
 = 13
 \end{array}$$

$$\begin{array}{r}
 10 \\
 \hline
 = 3 \\
 111000c_2 \\
 \downarrow \\
 111000c_1 \\
 \downarrow \\
 213 - 1001115M \\
 128 \overline{) } \\
 = 85 - (-7)_{10} \\
 64 \\
 \hline
 21 - \\
 16 \overline{) } \\
 = 5
 \end{array}$$

COUNT	P	A	B
00	00000 0000 00001 1010	11010101 10100000	0000 0101 1010 0000
00	$q_0 = 1$ 00110 1010 - 01010 0000 <u>11100 1010</u>	100000001 00	
01	$q_1 = 1$ 10010 1010 + 01010 0000 <u>11100 1010</u>	0000 0100 00 01	
10	$q_2 = 1$ 10010 1000 + 01010 0000 <u>11100 1000</u>	00010000 000101	
11	$q_3 = 1$ 10010 0000 + 01010 0000 <u>11100 0000</u>	01000000 100010101	
02	01010 0000 + 00110 0000 <u>00110 0000</u>	01000000 00010110	
00	0000000011 0000000000	00101010 quotient = (42)_{10}	
		remainder = (3)_{10}	

$$b = (10)_{10}$$

$$B = 01010 0000$$

2. Computer System Performance

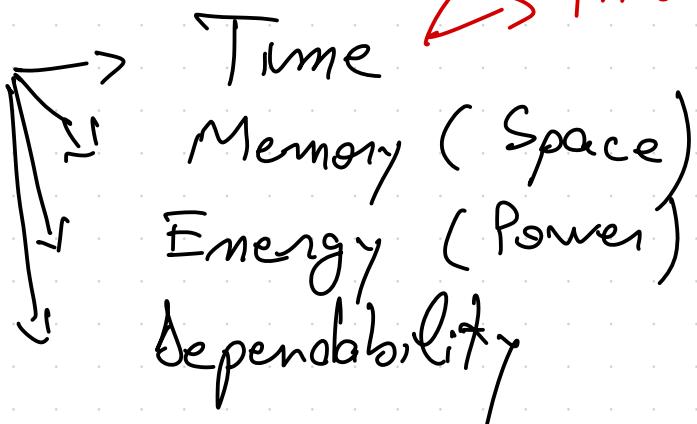
2.1 Intro

- * 1. Desktop Comp.
- 2. Servers
- 3. Embedded Systems

Exec. Time / Run Time

→ Throughput

Performance



Desktop → Run Time

Server → Throughput

Embedded → "computers as components"

→ Real Time Systems

(maximo de perf. → Deadline)
Worst Case Scenario

1 CPU and 10 Tasks (Seg.)

a) faster processor → faster run time
Implicit ⇒ throughput

b) add a 2nd processor → better throughput

Implicit ⇒ run time

$$\text{Performance} \times = \frac{1}{\text{Exec. time}} \times$$

Machine X as M times faster than My

$$\frac{\text{Perf. } x}{\text{Perf. } y} = \frac{\text{Exec. time } y}{\text{Exec. time } x} = M$$

2.2. Benchmark Suites

Spec. org

- Synthetic Benchmarks {
 - strong tests
 - Toy Programs

if $A > B$ and $B > C \Rightarrow A > C$

$$SPEC = \sqrt[m]{\prod_{i=1}^m \frac{1}{\text{Exec. } i}} \quad i = 1 + m \quad \text{programs}$$

+ Magnó de referência

$$SPEC_X = \sqrt{\prod_{i=1}^n \frac{Perf_x^i}{Perf_{Ref}^i}}$$

($\frac{Exec\ Ref^i}{Exec\ X^i}$)

SPEC Ratio X