Ejercicios AC

Ejercicio 1.

$$T_{CPU} = NI \cdot CPI \cdot T_{ciclo} = NI \cdot \left[\frac{\sum_{n=1}^{i} NI_i \cdot CPI_i}{NI}\right] \cdot \frac{1}{Freq} \;;$$

	NI_i	CPI_i	$NI_i \cdot CPI_i$
LOAD	0'2	4	0'8
STORE	0'1	3	0'3
INT	0'25	6	1'5
FLOAT	0'15	8	1'6
JMP	0'3	3	0'9
	1	24	5'1

$$= 24 \cdot \left[\frac{5'1}{24}\right] \cdot \frac{1}{300MHz} =$$

$$S = \frac{T_b}{T_p} = \frac{\cancel{NI_b} \cdot CPI_b \cdot \cancel{T_{ciclo_b}}}{\cancel{NI_p} \cdot CPI_p \cdot \cancel{T_{ciclo_p}}} = \frac{CPI_b}{CPI_p} \;;$$

a)

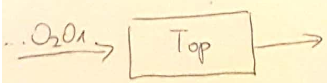
$\cancel{S = \frac{4'35}{5'1} =}$ $\quad S = \frac{5'1}{4'35} = 1'1724$

b)

$$S = \frac{5'1}{3'95} = 1'2911$$

Ejercicio 2.

$T_{op} = T_{rep} = 450\ ns.$



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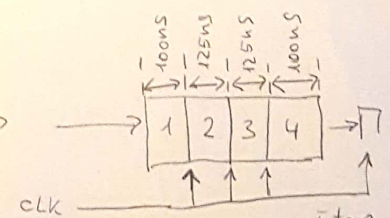
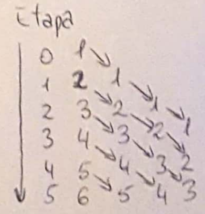


$\tau = 25\ ns$

$T_c = 125ns + 25ns$
$= 150ns$



a)

$$S = \frac{T_b(n)}{T_p(n)} = \frac{n \cdot 450ns}{4 \cdot T_c + (n-1) \cdot T_c} = \frac{n \cdot 450ns}{(450ns) + (n-1)150ns}$$

$$= \frac{3n}{4+(n-1)} = \frac{3n}{3+n} = \frac{3}{3/n + 1} \xrightarrow[n \to \infty]{} 3$$

Continuación ejercicio 2.

a)

$$P(n) = \frac{n}{T_s(n)} = \frac{n}{3\cdot T_c + n\cdot T_c} \xrightarrow{n\to\infty} \frac{1}{T_c} = \frac{1}{150}$$

b)

$$\frac{n}{3\cdot T_c + n\,T_c} = 0'9\cdot\frac{1}{T_c}\ ;\ \frac{n}{T_c(3+n)} = \frac{0'9}{T_c}\ ;\ \frac{n}{3+n} = \cancel{T_c}\,\frac{0'9}{\cancel{T_c}}\ ;$$

$$n = 0'9(3+n);\ n = 2'7 + 0'9n;\ n - 0'9n = 2'7,\ 0'1\cdot n = 2'7,\ \boxed{n = 27\,ops}$$

Ejercicio 3.

Suponemos que NI es igual para ALT1 y ALT2.

$$S = \frac{T_{ALT1}}{T_{ALT2}} = \frac{\cancel{NI_1}\cdot CPI_1\cdot T_{c1}}{\cancel{NI_2}\cdot CPI_2\cdot T_{c2}} = \frac{\left(\frac{0'8\cdot 3 + 0'2\cdot 4}{NI}\right)\cdot\frac{3}{4}\cdot \cancel{T_{c1}}}{\left(\frac{n\cdot 0'3 + (1-n)4}{NI}\right)\cdot \cancel{T_{c2}}}$$

$$= \frac{2'4/\cancel{NI}}{(-3'7\cdot n + 4)/\cancel{NI}} = \frac{2'4}{4 - 3'7\cdot n}$$

Ejercicio 4.

El tiempo de ALT2 se vería multiplicado por 1'10, quedando la ecuación final de este modo:

$$S = \frac{2'4}{(4 - 3'7\cdot n)\cdot 1'10}$$

Ejercicio 5.

$Tipo^1_i$	CPI^1_i	NI^1_i
ALU r,r	3	0'43 NI
LD	4	0'21 NI
ST	4	0'12 NI
BR	4	0'24 NI

$Tipo^2_i$	CPI^2_i	NI^2_i
ALU r,m	4	0'25·(0'43·NI)
ALU r,r	3	0'75 (0'43 NI)
LD	4	0'21 NI
ST	4	0'12 NI
BR	5	0'24 NI

$$T^1_{CPU} = NI^1 \cdot \left[\frac{3 \cdot 0'43NI + 4 \cdot 0'21NI + 4 \cdot 0'12NI + 4 \cdot 0'24NI}{NI^1} \right] \cdot T_c$$

$$= 3'57 \cdot T_c$$

$$T^2_{CPU} = NI^2 \cdot \left[\frac{4 \cdot [0'25(0'43NI)] + 3 \cdot [0'75(0'43NI)] + 4 \cdot 0'21N + 4 \cdot 0'12NI + 5 \cdot 0'24NI}{NI^2} \right] T_c$$

$$= 3'4875 \cdot T_c$$

$T^2_{CPU} < T^1_{CPU}$; T^2_{CPU} es mejor, se mejorarían las prestaciones.

Ejercicio 6.

$Tipo^2_i$	CPI^2_i	NI^2_i
ALU r,r	3	0'5·0'43NI
LD	4	0'21NI
ST	4	0'12 NI
BR	4	0'24NI
		0'785

$$T^2_{CPU} = NI^2 \cdot [0'645 + 0'84 + 0'48 + 0'96] T_c$$

$$T^2_{CPU} = 0'785 \cdot 2'915 \cdot \frac{1}{50 \cdot 10^6 Hz}$$

$$T^2_{CPU} = 4'57655 \cdot 10^{-8} \, s$$

$$= 45'77 \, ns$$

$$T^2_{CPU} < T^1_{CPU}$$

$$MIPS = \frac{Freq}{CPI \cdot 10^6} = \frac{50 \cdot \cancel{10^6} \, Hz}{2'915 \cdot \cancel{10^6}} = \boxed{17'15 \text{ MIPS}}$$

Ejercicio 7

$Tipo_i^1$	CPI_i^1	NI_i^1
LOAD	4	0'2NI
STORE	3	0'15NI
ALU	6	0'4NI
JMP	3	0'25NI
		NI

$$T_c = \frac{1}{100 \cdot 10^6} = 1 ns$$

$$T_{CPU}^1 = NI^1 \cdot \left[\frac{4 \cdot 0'2NI + 3 \cdot 0'15NI + 6 \cdot 0'4NI + 3 \cdot 0'25NI}{NI} \right] T_c$$

$$T_{CPU}^1 = 4'4\, NI^1 T_c$$

$Tipo_i^2$	CPI_i^2	NI_i^2
LOAD	4	0'2NI
STORE	3	0'15NI
ALU	4	(0'4NI)
JMP	3	0'25NI

$$T_{CPU}^2 = [4 \cdot 0'2NI + 3 \cdot 0'15NI + 4 \cdot 0'4NI + 3 \cdot 0'25NI] \cdot \frac{T_c}{2}$$

$$= NI^1 \cdot 3'6 \cdot \frac{T_c}{2}$$

a)

$$S = \frac{Tb}{Tp} = \frac{\cancel{NI} \cdot 4'4 \cdot \cancel{T_c}}{\cancel{NI} \cdot 3'6 \cdot \frac{\cancel{T_c}}{2}} = 2'4$$

b)

$$T_{CPU}^2 = [4 \cdot 0'2NI + 3 \cdot 0'15NI + 4 \cdot xNI + 3'025NI] \cdot \frac{T_c}{2}$$

$$= NI(2 + 4x) \cdot \frac{T_c}{2}$$

$$S = \frac{Tb}{Tp} = \frac{\cancel{NI} \cdot 4'4 \cdot \cancel{T_c}}{\cancel{NI} \cdot (2+4x) \cdot \frac{\cancel{T_c}}{2}} > 2 \; ; \; \frac{2 \cdot 4'4}{2+4x} > 2 \; ; \; \frac{\cancel{2} \cdot 4'4}{\cancel{2}} > 2 + 4x \; ;$$

$$4'4 > 2 + 4x \; ; \; \frac{4'4 - 2}{4} > x \; ; \; 0'6 > x$$

Con cualquier porcentaje menor a 0'6 NI.

Scanned by CamScanner

Ejercicio 8

a) $S = \frac{4/3}{1+0'5\left(\frac{4}{3}-1\right)} = \frac{4/3}{1+0'043} = 1'2784$

b) $S = \frac{T_b}{T_p} = \frac{\cancel{NI} \cdot \cancel{CPI} \cdot T_c}{\cancel{NI} \cdot \cancel{CPI} \quad T_c \cdot (3/4)} = \frac{4}{3}$

c)

$S = \frac{T_b}{T_p} = \frac{NI \cdot CPI \cdot T_c}{NI \cdot CPI \cdot T_c \cdot x} = 4 \; ; \quad S = \frac{1}{x} = 4 \; ; \quad x = 1/4$

d) $S = \frac{T_b}{T_p} = \frac{\cancel{NI} \cdot \cancel{CPI} \cdot T_c/4}{\cancel{NI} \cdot \cancel{CPI} \cdot T_c \cdot x} = 2 \; ; \quad S = \frac{1}{4x} = 2 \; ; \quad x = 1/8$

Ejercicio 9

a) $GFLOPS = \frac{n^o \, FP}{T(N) \cdot 10^9} = \frac{3 \cdot \cancel{10^9}}{0'5s \cdot \cancel{10^9}} = 6$ GFLOPS

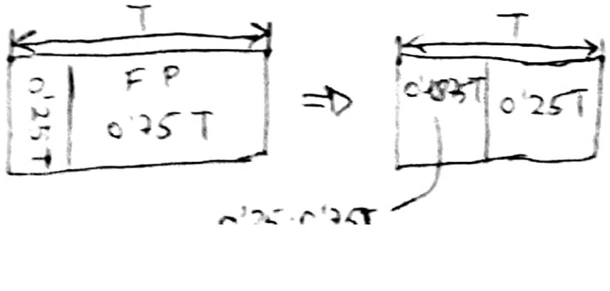
b)

$T_{CPU} < 0'5s$,

$T_{CPU} = NI \cdot CPI \cdot T_c \; ; \quad \frac{NI \cdot CPI}{F} < 0'5 \; ; \quad CPI < \frac{0'5 \cdot 2 \cdot \cancel{10^9}}{7 \cdot \cancel{10^9}} \; ; \quad CPI \leq \frac{1}{7}$

$IPC = \frac{1}{CPI} \; ; \quad IPC = \frac{1}{7} \leq 7$

c)



$T_p = 0'25\,T + 0'1875\,T = 0'4375\,T$

$\frac{T_p}{T} = 0'4375$ T_p es un 43'75 % de T

T disminuye un 56'25%