PROBLEMA 3.2

					Lectura MP			Escritura MP		
Tipo	@	Bloque	Conj.	H/M	S/N	@	tam	S/N	@	tam
R byte	8890	889	1	m	S	8890	16	N		
W word	EC51	EC5	1	H	N			S	EC51	2
W byte	EC62	EC6	2	H	N			S	EC62	1
W word	23D3	23D	1	m	N			S	23D3	2
W byte	ABA4	ABA	2	m	N			S	ABA4	1
R word	ABA5	ABA	2	m	S	ABA5	16	N		
R byte	23D6	23D	1	m	S	23D6	16	N		
W word	EC57	EC5	1	H	N			S	EC57	2
R byte	EC68	EC6	2	H	N			N		
R word	8899	889	1	m	S	8899	16	N		

Conjunto 0		conjunto 1		conjunto 2		conjunto 3	
EC8	1	EC5	0	EC6	1	EC7	1
AB4	0	889	1	ABA	0	libre	0

PROBLEMA 3.10

a) $P_{din.conm.} = CV^2f = 5 \cdot 10^{-9} \cdot 1'2^2 \cdot 2 \cdot 10^9 = \underline{14'4\ W}$

$P_{est.fuga} = I_{fuga} V = 3 \cdot 1'2 = \underline{3'6\ W}$

$P_{TOT} = 14'4 + 3'6 = \underline{18\ W}$

b) $128\ KB = 2^{17}\ B \quad 2^{17} / 64 = \underline{2048\ bloques}$

$2048 / 2 = \underline{1024\ conjuntos}$

$\underline{2\ vias}$

$\underline{1024\ bloques / via}$

c) @ XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
tag 32 bits | coj. 10 bits | byte 6 bits

d) $M_{em\ datos} = 1024 \cdot 64 \cdot 8 = 524288$ bits

$M_{em\ tags} = 1024 \cdot 32 = 32768$ bits

e) $P_{est\ fuga} = I_{fuga} \cdot V = 3 \cdot 10^{-6} \cdot (524288 + 32768) \cdot 1'2 \cdot 2 = 4'01$ W

f) $MFLOPS = \frac{2 \cdot 10^9}{5} = 400 \cdot 10^6$ op/s $=$ 400 MFLOPS

g) $CPI = \frac{T_{exe}}{N \cdot T_c} = \frac{5}{4 \cdot 10^9 \cdot \frac{1}{2 \cdot 10^9}} = 2'5$ c/i

Ciclos no ideales $= 10^9 \cdot 0'1 \cdot 20 = 2 \cdot 10^9$ ciclos de más

Ciclos ideales $= \left(5 \frac{5}{\frac{1}{2 \cdot 10^9}} - 2 \cdot 10^9\right) = 8 \cdot 10^9$ ciclos ideales

$CPI\ ideal = \frac{8 \cdot 10^9}{4 \cdot 10^9} = 2$ c/i

h) $E = 2 \cdot 30 \cdot 10^{-9} = 60 \cdot 10^{-9}$ J $=$ 60 nJ

i) $P = \frac{E}{t} = \frac{60 \cdot 10^{-9} \cdot 10^9}{5} =$ 12 W

j) $P_T = P_{CPU} + P_{CACHE} = 18 + (4'01 + 12) =$ 34'01 W

k) $E = P \cdot t = 34'01 \cdot 5 =$ 170 J

Eficiencia $= \frac{400}{34'01} =$ 11'76 MFLOPS/W

l) $T_{ex} = N \cdot CPI \cdot T_c$

$T_{ex} = 4 \cdot 10^9 \cdot \left(\frac{10 \cdot 10^9 + 0'9 \cdot 10^9}{4 \cdot 10^9} \right) \cdot \frac{1}{2 \cdot 10^9} = \underline{5'45\ s}$

$MFLOPS = \frac{2 \cdot 10^9}{5'45} = \underline{366'97\ MFLOPS}$

m) $E = 2 \cdot 5\ 10^{-9} + 25 \cdot 10^{-9} = \underline{35\ nJ}$

n) $P = \frac{35 \cdot 10^{-9} \cdot 10^9}{5'45} = \underline{6'42\ W}$

o) $P_T = 18 + 4'01 + 6'42 = \underline{28'43\ W}$

p) $E = 28'43 \cdot 5'45 = \underline{154'94\ J}$

$Eficiencia = \frac{366'97}{28'43} = 12'91\ MFLOPS/W$

q) No.

r) $P_{est\ fge} = 3 \cdot 10^{-6} \cdot 8 \cdot 1024 \cdot 1'2 = \underline{29'49\ mW}$

s) $T_{ex} = 4 \cdot 10^9 \cdot \left(\frac{10 \cdot 10^9 + 0'2 \cdot 10^9}{4 \cdot 10^9} \right) \cdot \frac{1}{2 \cdot 10^9} = \underline{5'1\ s}$

$MFLOPS = \frac{2 \cdot 10^9}{5'1\ s} = \underline{392'16\ MFLOPS}$

t) $E_A = 5 \cdot 10^{-9} + 25\ 10^{-9} + 10^{-9} = \underline{31\ nJ}$

$E_F = 2 \cdot 5 \cdot 10^{-9} + 2 \cdot 25 \cdot 10^{-9} + 10^{-9} = \underline{61\ nJ}$

$E_M = 31 \cdot 0'8 + 61 \cdot 0'2 = \underline{37\ nJ}$

u) $P = \frac{37 \cdot 10^{-9} \cdot 10^{9}}{5'1} = \underline{7'25\ W}$

v) $P = 18 + 4'01 + 7'25 + 29'49 \cdot 10^{-3} = \underline{29'29\ W}$

w) $E = 29'29 \cdot 5'1 = \underline{149'38\ J}$

$Eficiencia = \frac{392'16}{29'29} = \underline{13'39\ MFLOPS/W}$

x) $Ganancia_{s-p} = \frac{12'91}{11'76} = \underline{1'098}$

$Ganancia_{v-s} = \frac{13'39}{12'91} = \underline{1'037}$

PROBLEMA 3.11

a) X1; $t_c = 0'45 + 0'1 = \underline{0'55\ ns}$

$t_{acc} = \underline{0'55\ ns}$

X2; $t_c = 0'55 + 0'05 = \underline{0'6\ ns}$

$t_{acc} = 0'6 \cdot 2 = \underline{1'2\ ns}$

X3; $t_c = 0'45 + 0'05 = \underline{0'5\ ns}$

$t_{acc} = 0'5 \cdot 3 = \underline{1'5\ ns}$

X4; $t_c = 0'45 + 0'05 = \underline{0'5\ ns}$

$t_{acc} = 0'5 \cdot 4 = \underline{2\ ns}$

b) El t_c de X2 es el más alto

El t_{acc} de X4 es muy alto.

c) X_1; $f = \frac{1}{0'55 \cdot 10^{-9}} = \underline{1'81\ GHz}$

X_3; $f = \frac{1}{0'5 \cdot 10^{-9}} = \underline{2\ GHz}$

d) X_1; $CPS = 0'6 \cdot 5 + 0'2 \cdot 4 + 0'2 \cdot (4+1) = \underline{4'8\ c/i}$

X_3; $CPS = 0'6 \cdot 5 + 0'2 \cdot 4 + 0'2 \cdot (4+3) = \underline{5'2\ c/i}$

e) $S_{peedup} = \frac{4'8 \cdot \frac{1}{1'81}}{5'2 \cdot 1/2} = \underline{1'015} = \underline{1'5\ \%}$

f) X_1; $CPS = 4'8 + 0'2 \cdot 60 \cdot 0'1 = \underline{6\ c/i}$

X_3; $CPS = 5'2 + 0'2 \cdot 60 \cdot 0'1 = \underline{6'4\ c/i}$

$S_{peedup} = \frac{6 \cdot \frac{1}{1'81}}{6'4 \cdot 1/2} = \underline{1'031} = \underline{3'1\ \%}$