

## PROBLEMAS ACI

5.1)

$$Q = (- (A-B) / (C-D))$$

a) push D

push C

sub

push B

push A

sub

div

push C

sub

pop R

b) load A

sub B

store R

load C

sub D

store temp

load R

div temp

store R

load C

sub R

store R

5.2)

$10^9$  inst, 2,5  $\mu$ s, 30% instr mem op1  $f_{clk} = 2,5$   
10% instr mem op2

70% access mem  $\rightarrow$  cache + local.

20% displ words  $\rightarrow$  16 bits

20% access mem  $\rightarrow$  cache + store + indirect

20% instr  $\rightarrow$  operands immediate

15% immediate  $\rightarrow$  16 bits

a)  $10^9 \cdot 0,3 = 3 \cdot 10^8$   $(10^9 \cdot 0,1) = 10^8$   $\rightarrow 5 \cdot 10^8$  accesses

b)  $E_{acc} = \frac{N \cdot (P.T.)}{f} = \frac{10^9 \cdot 2,5}{2,5} = 10^8$  ns

c) Ejecutar  $1,75 \cdot 10^9$  instrucciones dinámicas en RISC

1)  $F = \frac{1,75 \cdot 10^9 \cdot 1,2}{2,5} = 8,4 \cdot 10^8$  Hz  $\rightarrow 0,84$  GHz

e) CISC  $\rightarrow I_{avg} = 10A$   
 $\rightarrow C = 50mF$

RISC  $\rightarrow I_{avg} = 8A$   
 $\rightarrow C = 40mF$

1V tensión

$P_{avg} = I_{avg} \cdot V = 10W$

$P_{comutacion} = 50 \cdot 10^{-9} F \cdot (1V)^2 \cdot 10^9 Hz = 50W$

$P_{total} = 10 + 50 = 60W$

$E = P \cdot t = 60W \cdot 2,5s = 150J$

1)  $speedup = \frac{150J}{109J} = 1,44 \rightarrow (44,2\%)$

$P_{avg} = 8A \cdot 1V = 8W$

$P_{comutacion} = 40 \cdot 10^{-9} F \cdot (1V)^2 \cdot 8,4 \cdot 10^8 Hz = 33,6W$

$P_{total} = 8 + 33,6W = 41,6W$

$E = P \cdot t = 41,6W \cdot 2,5s = 104J$

g)  $F = \frac{1,5 \cdot 10^9 \cdot 1,3}{2,5} = 0,78$  GHz

h)  $P_{total} = 8W + (40 \cdot 10^{-9} F \cdot (1V)^2 \cdot 7,8 \cdot 10^8 Hz) = 39,2W$

$E = P \cdot t = 39,2W \cdot 2,5s = 98J$

$speedup = \frac{150J}{98J} = 1,53 \rightarrow (53,06\%)$

5.3)  $load, store, mov, add, comp, sacro$

valores intermedios (1/8, ..., 7/8)

a) movl %eax ← \$0

loop: compl %ecx ← \$1000000

use %im

load %eax ← \*

load %r1 ←  $\sqrt{\%ecx + 4}$

imull %eax ←  $\%eax + \%r1$

load %r2 ← summa

addl %r2 ←  $\%r2 + \%eax$

store summa ← %r2

addl %ecx ←  $\%ecx + $1$

jne loop

%im.

6.1)

$$a) CPE = \frac{1}{2.4} = 1/4 = 10.125 \%$$

b) instr dinamicas:  $1000000 \cdot 7 + 1 = 12000001$

loops dinamicas:  $1000000 \cdot 10 + 1 = 10000001$

$$c) 1,3 \frac{CPE}{instr} = \frac{1}{1,3} \frac{instr}{CPE} = 10.000.001 \text{ ops} =$$

$$= 12692309 \text{ alts}$$

$$CPE = \frac{CPE}{instr} = \frac{2692309}{2000001} = 1,0984 \%$$

$$d) T_{acc} = \frac{N \cdot CPE}{F} = \frac{2000000 \cdot 1,0984}{3 \cdot 10^9} = 12,56 \text{ ms}$$

$$e) \text{Temps vops} = 6 \cdot 11 = 66 \text{ ns}$$

$$\text{Temps codigs} \times 86 = 44 \text{ ns}$$

$$\text{movl: } 1+1+4 \quad \text{jle: } 1+4$$

$$\text{compl: } 1+1+4 \quad \text{cmovl: } 14+1+1+4$$

$$\text{addl: } 1+1+1+4 \quad \text{imull: } 1+1+4+1$$

$$\text{jeq: } 1 \quad \text{jne: } 1+4$$