AC-PROBLEMES-5.pdf

Arnau_FIB

Arquitectura de Computadores

2º Grado en Ingeniería Informática

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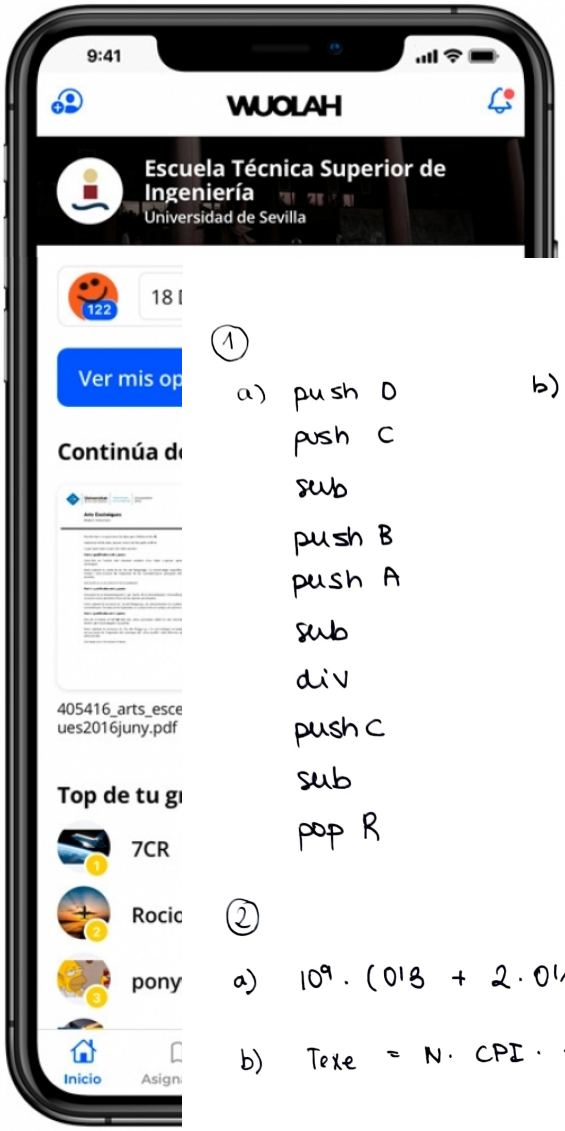

①

a)
```
push D
push C
sub
push B
push A
sub
div
push C
sub
pop R
```

b)
```
load  C
sub   D
store AUX
load  A
sub   B
div   AUX
store AUX
load  C
sub   AUX
store R
```

②

a) $10^9 \cdot (0'3 + 2 \cdot 0'1) = 500 \cdot 10^6$ ~~instr~~ accesos

b) $T_{exe} = N \cdot CPI \cdot \frac{1}{F} \rightarrow F = \frac{N \cdot CPI}{T_{exe}} = \frac{10^9 \cdot 2'5}{2'5} = 10^9\ Hz = 1\ GHz$

c) $10^9 \cdot (0'3 \cdot 2 + 0'1 \cdot 2 + 0'4 \cdot 0'3 \cdot 2 + 0'4 \cdot 0'7 \cdot 0'2 \cdot 2 + 0'2 \cdot \overset{0'15}{\cancel{2}} + 0'3 \cdot 4 \cdot 1)$

$= 1'606 \cdot 10^9$ instr din

d) $F = \frac{1'606 \cdot 10^9 \cdot \overset{1/2}{\cancel{2'5}}}{2'5} = 0'770\ GHz = 770\ MHz$

e) CISC: $P_f = 10A \cdot 1V = 10W$

$P_c = 50nF \cdot 1V^2 \cdot 1\ GHz = 50W$ } $P_T = 60W$

$E = P \cdot t = 60W \cdot 2'5s = 150J$

RISC: $P_f = 8A \cdot 1V = 8W$

$P_c = 40nF \cdot 1V^2 \cdot 770MHz = 30'8W$ } $38'8W$

$E = P \cdot t = 38'8W \cdot 2'5s = 97J$

f) $G = \frac{150J}{97J} = 1'546 \rightarrow 54'6\%$

g) $F = \frac{115 \cdot 10^9 \cdot 1'3}{2'5} = 780MHz$

$P_T = 8 + 40 \cdot 1 \cdot 0'780 = 39'2W \rightarrow E = 39'2 \cdot 2'5 = 98$

$G = \frac{150}{98} = 1'530 \rightarrow 53'0\%$

③ a)

```
movl   %ecx ← $0
loop: cmpl   %ecx ← $1.000.000
      jge    fin
      load   %eax ← X
      load   %r1 ← V[%ecx * 4]
      imull  %eax ← %eax * r1
      load   %r2 ← suma
      addl   %r2 ← %r2 + %eax
      store  suma ← %r2
      addl   %ecx ← %ecx + $1
      jmp    loop
fin:
```

b) instr. dinámicas:

$10^6 \cdot 7 + 1 = 7 \cdot 10^6$ i

instr. uops din:

$10^6 \cdot 10 + 1 = 10 \cdot 10^6$ uops

c) UPC = 1'13

$\frac{1 \text{ ciclo}}{1'13 \text{ uops}} \cdot 10 \cdot 10^6 \text{ uops} =$

$7169 \cdot 10^6$ ciclos

$CPI = \frac{7169 \cdot 10^6 \text{ c}}{7 \cdot 10^6 \text{ i}} = 1'098 \text{ c/i}$

d) $T_{exec} = 7 \cdot 10^6 \cdot 1'098 \cdot \frac{1}{3 \cdot 10^9} =$

$= 2'57$ ms

e) Tamaño uops = $6 \cdot 11 = 66$ B

Tamaño x86 = 44 B

x86 instr → uops

f) $10 \cdot 10^6$ uops $\cdot$ 6 B = 60 MB

$BW = 60 \text{ MB} / 2'57 \text{ ms} = 23'34$ GB/s

g) 44 B $\cdot 10^6 = 44$ MB

BW = 44 MB / 2'57 ms = 17'12 GB/s

h) $E_{sense\ caché\ uops} = (1nJ + 10nJ) \cdot 7 \cdot 10^6 = 77$ mJ

$E_{amb\ caché\ uops} = (1nJ + 1nJ) \cdot 7 \cdot 10^6 = 14$ mJ

$G = \frac{77}{14} = 5'5$