VE370

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Home work 1

1.3

1. $\text{performance} \propto \frac{1}{\text{cpu Time}}$

$$\text{cpu Time} = \frac{\text{Instruction count} \times \text{CPI}}{\text{Clock Rate}}$$

$\therefore$ performance $\propto$ clock Rate / CPI

$\therefore$ $P_1 = 2\times10^9/1.5$, $P_2 = 1.5\times10^9/1.0$, $P_3 = 3\times10^9/2.5$

$\therefore$ P_2 has the highest performance.

2. ① No. cycles = time × clock rate eg: cydes (P1) $= 10 \times 2\times10^9 = 2\times10^9$

② No. instructions $= \frac{\text{CPU Time} \times \text{clock rate}}{\text{CPI}} = \frac{\text{No. cycles}}{\text{CPI}}$

eg: ~~P~~ ins (P1) $= 20\times10^9/1.5 = 13.33\times10^9$

3. $\frac{\text{cpu Time} \times 70\% \times \text{clock rate}}{\text{cpi} \times 120\%} = \text{No. instructions (Const)}$

$\Rightarrow$ clock rate (New) = 120% / 70% clock rate (old)

$\therefore$ increase

$$\text{clock rate} = \frac{\text{No. instructions} \times \overbrace{\text{CPI} \times 120\%}^{\text{New CPI}}}{\underbrace{\text{Cpu Time} \times 70\%}_{\text{New Cpu Tim}}}$$

eg: $f(P_1) = (13.33\times10^9) \times \frac{(1.5\times1.2)}{(10\times0.7)}$

1.4

4. exaution Time $= (\sum \text{Instruction} \times \text{cycle}) \times \frac{1}{2G}$

$= 675\,ns$

5. $CPI = \frac{\text{exaution Time} \times \text{clock rate}}{\text{NO. Instructions}} = \frac{675\,ns \times 2G\,Hz}{700} = 1.92$

6. X

~~1.9~~

1.10

1.

processors	Ins / processor	Total Ins	exaution tim	Double CPI
1	4096	4096	4.096	
2	2048	4096	2.048	
4	1024	4096	1.024	
8	512	4096	0.512	

2. exaution time = Ins / proc / 2G so ↗

3. exaution time $= \frac{CPI \cdot NO.Ins}{\text{clock rate}} \propto CPI$????

4. exaution time $= \frac{\text{Ins/core} \times CPI}{\text{clock rate}}$

Cores / pro	~~Ins / Core~~ Exa Time (s)
1	4.00
2	2.17
4	1.25
8	0.75

5. $V = \frac{1}{5} \times 3.9 + 0.4 = 1V$

$P = \frac{5.0m}{3000\,MHz} \cdot (1V)^2$

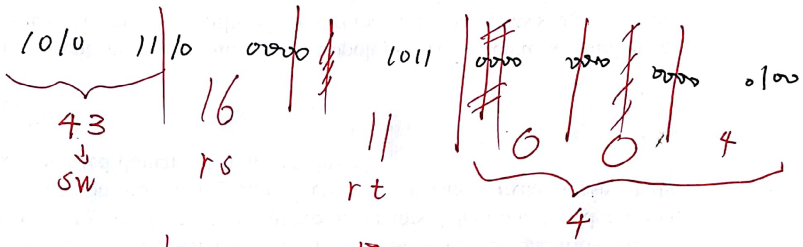
2.3

1. sub t $zero f
   sub f $t g
   ~~add f $zero~~

2.6.1 lw $s0 , 4($s7)
sub $s0 , $s0, $s1
add $s0 , $s0 , $s2

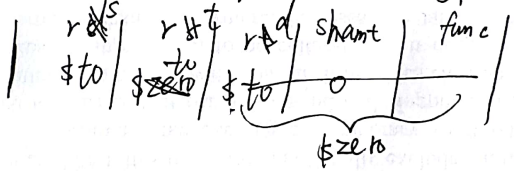
2.6.4 f=i+h

2.10



sw $11 t3 4($16) ~~t3~~ s0

2.10.4



000100

2.12.1

2.13 0x57755778

2.14.1

```
add  $t0, $t1, $0
srl  $t1, $t1, 5
andi $t1, $t1, 0x0001FFFF
```

2.16.4

```
if ($t0 < $t0) $t2 = 1
   else $t2 = 0
```

if $t2 = $zero, → ~~add~~ $t2 = $t2 + 2.

Done

⇒ t2 = 2

2.17.3

```
ABS: sub $t2, $zero, $t3
     ble $t3, $zero, done
     add $t2, $t3, $zero
```

Done.

2.17.4 20

2.18.4 501

2.18.5

```
for (i = 100; i > 0; i--)
    rst += M[50];
    50++;
}
```

2.18.6