

Section 2: Textbook questions

1.1.1-1.1.26

1. server (pg 5)	2. petabyte (pg 5)	3. supercomputer (pg 5)	4. virtual world (pg 4)
5. RAM (pg8)	6. CPU (pg8)	7. datacenter (pg 5)	8. mulicore processors (8)
9. low-end server (pg5)	10. embedded computer	11. VHDL	12. desktop computers
13. compiler (pg 11)	14. assembler (pg11)	15. cobol (pg 13)	16. machine language (12)
17. instruction	18. Fortran (python :P)	19. assembly language	20. operating system
21. application software	22. bit	23. system software	24. C
25. high-level language	26. terabyte		

1.7.1 – 1.7.6.

1.7.1

Clock rate geometric mean = $(16/12.5 * 25/16 * 66/25 * 200/66 * 2000/200 * 3.6/2 * 2.667/3.6)^{1/7} = \mathbf{2.15}$

Power geometric mean = $(4.1/3.3 * 4.9/4.1 * 10.1/4.9 * 29.1/10.1 * 75.3/29.1 * 103/75.3 * 95/103)^{1/7} = \mathbf{1.62}$

1.7.2

Largest clock change = $2000/200 = \mathbf{10}$

Largest power change ratio = $29.1/10.1 = \mathbf{2.88}$

1.7.3

Clock rate change = $2667/12.5 = \mathbf{213.36}$

Power change = $95/3.3 = \mathbf{28.79}$

1.7.4

Power = capacitance*voltage²*frequency

$C = p/V^2 * f$

80286: $3.3/(5^2 * 12.5e6) = \mathbf{1.056 \times 10^{-8}}$

80386: $\mathbf{1.025 \times 10^{-8}}$

80486: $\mathbf{7.840 \times 10^{-9}}$

Pentium: $\mathbf{6.121 \times 10^{-9}}$

Pentium Pro: $\mathbf{1.336 \times 10^{-8}}$

Pentium 4 Willamette: $\mathbf{1.229 \times 10^{-8}}$

Pentium 4 Prescott: $\mathbf{1.831 \times 10^{-8}}$

Core 2 Ketsfield: $\mathbf{2.944 \times 10^{-8}}$

1.7.5

$3.3/1.75 = \mathbf{1.78}$

1.7.6

Geometric mean = $(3.3/5 * 1.75/3.3 * 1.25/1.75 * 1.1/1.25)^{1/4} = \mathbf{.685}$

Section 3: Laboratory

3.1: Inspect the assembly code for the program “lab1.s” and simulate its execution to the following questions:

a)

```
loop1: #t0=4*$a0
add  $t0,$t0,$a0
addi $t1,$t1,-1
bne  $t1,$zero,loop1
#t2 = 4*$a0+8
#t3 = 4*$a0-8
add  $t2,$t0,$a2
sub  $t3,$t0,$a2
add  $v0,$zero,$zero
```

loop2:

```
add  $v0,$v0,$t2
addi $t3,$t3,-2
bne  $t3,$zero,loop2
#$v0 = (4*$a0+8)*((4*$a0-8)/2)
```

FINAL EQUATION: $\$v0 = (\$a1 * \$a0 + \$a2) * ((\$a1 * \$a0 - \$a2) / 2)$.

b)

Operands:

In the final equation: $\$a0, \$a1, \$a2$

In intermediate steps: $\$a0, \$a1, \$a2, \$t0, \$t1, \$t2, \$t3, \$v0, \$zero$

Results:

Final: $\$v0$

Intermediate: $\$a0, \$a1, \$a2, \$t0, \$t1, \$t2, \$t3, \$v0$