CPSC 418	Advanced Computer Architecture	Spring 1996

Homework 2: Due 16 Jan

Problem 1 (3 Points)

In a current microprocessor load and store instructions comprise 26% of the instructions and have a CPI of 2.3. The average CPI of all other instructions is 1.5:

Instruction	%Inst	CPI
LD/ST	0.26	2.3
Other	0.74	1.5

The next generation implementation will have a larger transistor budget. There are two options being considered as ways to use the additional transistors:

1. Increase the on-chip cache, which will reduce the CPI for load/store instructions by 20%.
2. Distribute the transistors more evenly throughout the chip and decrease the clock period by 10%.

Which option will result in a microprocessor with higher performance?

How much faster is the faster option?

Problem 2 (9 Points)

Support or refute the following statement: *The average performance of computers in a given class (*e.g. *personal computers, small workstations, supercomputers,* etc.*) doubles every year.*

Use data from at least ten different computers and spanning at least the last five years (1990 – 1995).

2(a) (5 Points) Draw a graph of performance vs time.

2(b) (2 Points) Describe how you defined "performance." Justify the usefulness of your definition.

2(c) (1 Points) What factors have contributed the most to the increase in performance in the computers you surveyed?

2(d) (1 Points) Based upon the data you gathered, has the rate at which performance increases slowed down recently?

Problem 3 (7 Points)

Based upon the data for the Alpha 21064 — 21164a in Handout 5 (General Processor Information) and any other information you gather:

3(a) (1 Points) Which of the microprocessors were made using the same fabrication technology?

3(b) (2 Points) What are the primary design differences between the 21064 and the 21064a?

3(c) (3 Points) Which transitions (*e.g.* 21064 to 21064a-1, 21064a-1 to 21064a-2, 21064a to 21164) represent improvements purely in clockspeed, which are minor micro-architectural changes, and which are major changes? *Justify your answers.*

3(d) (1 Points) Does the 21066a represent a technological disaster? If not, what do you think it's purpose is? *Justify your answer.*

Problem 4 (1 Points)

How much time did you spend total on the assignment and on each of these problems? Which problems were useful or useless? How well did the lectures and text book prepare you for this homework? Which concepts needed better explanation?