WASHINGTON STATE UNIVERSITY

CPTS 260 Intro to Computer Architecture, Quiz 1 Solutions

Q 1 Select the principle or technique that helps a designer increase performance of an application.

Solution: Optimize for the common case. This follows from the Amdahl's law formula.

Q 2 Select all the components that influence the CPU time for a program.

Solution: All the components in the quiz (Instructions, clock cycles for executing an instruction, clock frequency, and compiler) affect the CPU time for the program. The compiler has an effect on the CPU time because it influences the instructions generated for the program. For example, a poor compiler can generate unnecessary instructions that increase the CPU time.

Q 3 For any program or computer, the elapsed time and CPU time are the same (True or False).

Solution: The answer is false because the elapsed time considers time spent in I/O, OS overhead, and idle time, while CPU time does not include these. Hence, they are not the same.

Q 4 Arrange the blocks to show the sequence of code conversion of a program from high level language to the hardware.

Solution: The order follows from the steps discussed in Lectures 1 and 2. The answer is below:

1. High Level Language code
2. Compiler
3. Assembly language code
4. Assembler
5. Binary machine code

Q 5 Assume that a program takes a total of 5 seconds to execute. When you analyze the program in more detail, you realize that 3 seconds are spent in computation and 2 seconds are spent in fetching data from the memory. The computation part can be speeded up using new processors. Before choosing the new processor, your manager asks you about the maximum speedup that can be achieved for the program. What is the speedup that you will report to the manager?

Solution: We use Amdahl's law for this question. It is known that the computation part can be speeded up. In an ideal scenario, the computation can achieve infinite speedup with zero execution time. As a result, the program only spends time in fetching data from memory. With this information, the speed-up equation can be written as:

$$Speedup = \frac{T_{old}}{T_{new}} = \frac{3+2}{0+2} = 2.5$$