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Computer Architecture

Due: 2/10/23

1. A. RISC has simple, straightforward instructions
B. RISC also has a small number of instructions
C. RISC processors only perform computations on registers, where other ISA's might be able to actively use system memory.
D. Typically used in mobile applications (phones, some laptops), due to the greater average power efficiency.
2. 2.1 - No, since the assembly program was only written for P1, it only supports ISA A. A program written for ISA A simply will not assemble correctly or at all on a different ISA.

2.2 - C code can be run on multiple platforms because each platform has their own C compiler, which will properly pre-process and compile the C code into assembly code that will work on that platform's specific ISA. Java works similarly, except Java uses what's called the JVM (Java Virtual Machine). The JVM is yet another abstraction away from assembly code and even beyond a compiler. The JVM is an OS runtime service that turns Java code into Java bytecode, which the JVM can interpret and compile into assembly for the platform. Both languages do this in an attempt to be more portable and work on many different systems and architectures.

2.3

P1: $(2.3 \times 10^9) \text{GHZ} * 1 * 2 / 2.1 \text{ CPI} == 2.190 \times 10^9$ Instructions per second

P2: $(1.4 \times 10^9) \text{GHZ} * 1 * 2 / 1.1 \text{ CPI} == 2.545 \times 10^9$ Instructions per second

P3: $(5.2 * 10^9) \text{GHZ} * 1 * 2 / 4.3 \text{ CPI} == 2.419 \times 10^9$ Instructions per second

According to these calculations, P2 executes the most instructions per second

2.4 Since P2 performs more instructions per second than the other processors, it would provide better performance in a C program than the other processors. While they do have different ISA's, we still know exactly how many instructions each of them can perform per second, so we can evaluate their relative performance accurately. This performance difference applies even to C programs because the C program is eventually compiled into each ISA's respective assembly code.

3. Computer architecture allows a programmer to gain a greater understanding of the underlying computer hardware, and thus write more efficient and optimized code. This is extremely important for software to run smoothly and generally be the best it can be. Also, leveraging certain advantages of different ISA's can be very helpful. For example, a programmer might utilize multi-threading in their application to make it's performance scalable and fast for that platform.