CSCI 4717 – Single Processor Architecture Quiz

General Quiz Information
- If you are submitting this quiz *other* than through D2L, please create a separate MS Word or RTF document and submit it to me though the course dropbox labeled "Performance Quiz - Sept. 11."
- This quiz is to be completed with your team. If you are not part of a team, be sure to work with another individual or a team of two to complete this quiz.
- Due to limitations with D2L, the assignment of points to the individual questions on the D2L version of this quiz is not quite right. For example, I cannot create an input for you without assigning points to it, so even though it would be nice to receive points for entering your name, this is not how I will be grading the assignment. ☺

1. In your submitted Word or RTF document, please enter the z-account userids for all team members taking this quiz. Separate the userids with spaces or tabs. Oh, what the heck. Here's a point. :-)

2. Describe how Moore's law has affected the cell phone market. (If you need a guideline for how much to write, shoot for 75 to 100 words.)

   The cell phone market has been greatly affected due to improvements in smaller packaging, lower power requirements, lower pricing, and higher functionality including things like cameras.

3. Describe how Moore's law has affected circuit board reliability. (If you need a guideline for how much to write, shoot for 75 to 100 words.)

   By incorporating more functionality in a single chip, the number of solder connections has been reduced thereby improving reliability at the circuit board level. In addition, lower power consumption allows for cooler operation. Expansion caused by changes in heat cause failures too.

For each of the following four applications, identify the top *two* performance requirements from the list below that your group feels are important regarding the system design.

- Accuracy
- Throughput
- Processing speed
- Cost
- Adaptability

- Reliability
- Security
- User interface
- Compatibility with other systems

4. Identify the top two performance requirements of streaming video.

- Accuracy: No real need. Glitches are acceptable
- Throughput: Yes. Video is a real bandwidth hog.
- Processing speed: Yes. Processing is necessary for CODECs.
- Cost: It depends on the buyer. Businesses, not really. Individuals, yes.
- Adaptability: Important, but I wouldn't label it as a top need. Functionality really isn't changing that fast.
- Reliability: It depends on the buyer. Businesses, oh yes. Individuals, not so much.
- Security: For most applications, security is more to protect copyrighted material than anything else.
- User interface: The simplicity and existing standards for video playback mean that the interface is going to be simple. Not critical.
- Compatibility with other systems: Yes, this could be important considering there will be many platforms this might be played across.

5. Identify the top two performance requirements of gaming.

- Accuracy: Depends on the game, but in general, no real need for precision.
- Throughput: With the exception of data to the video card, gaming doesn't require a great deal of throughput. Response time, however, is a different matter. This is not the same as throughput though.
- Processing speed: Yes, especially in terms of biological/physical simulation.
- Cost: Yes, cost is king for anything in the consumer market.
- Adaptability: Yes, if you are concerned with reusing components of one system with another.
- Reliability: As with anything in the consumer market, an unreliable system will cost you consumer loyalty. Can you imagine being on a roll in a game and suddenly it locks up? If it does it twice, you'll probably stop using the game.
- Security: Not really.
- User interface: Yes, mostly because of things like ease of use, functionality, and avoiding injury due to repetitive motion.
- Compatibility with other systems: Cross-platform functionality has become very important.

6. Identify the top two performance requirements of weather forecasting.

- Accuracy: Yes, weather forecasting is full of simulations requiring great deals of number crunching all of which are susceptible to errors with accuracy.
- Throughput: Not a great deal of data transmission.
- Processing speed: Yes, hugely important.
- Cost: The limited number of installed systems mean that cost is not going to be a factor.
- Adaptability: Being able to adapt to new forecasting algorithms may be important.
- Reliability: System reliability (different than forecast reliability) is basically average. Not as important as it would be for say the space shuttle.
- Security: Not really.
- User interface: Not as important, once again because of the limited distribution of the system.
- Compatibility with other systems: Not important either because of limited number of installations.

7. Identify the top two performance requirements of medical instrumentation.

- Accuracy: Yes. Accuracy is important.
- Throughput: Not a great deal of data transmission.
- Processing speed: Not really. Okay, a patient may want their test results on the same day, but the amount of processing probably isn't great.
- Cost: Nothing in the medical field is cheap, right? Once again, not really important.
- Adaptability: Not really a huge deal.
- Reliability: This is vital.
- Security: Patient confidentiality is important, but hacking into a medical instrument usually isn't an issue.
- User interface: This is important as a difficult user interface may cause errors.
- Compatibility with other systems: Not important either.

8. Identify what you feel is the most important reason why measuring CPU performance using cycles per instruction may yield misleading results.

There are a number of problems including:
- CPI analysis is terribly difficult.
- Applications will vary with respect to the ratios of the different instructions executed.
- Code "tuning" may change the average CPI.
- Multiple-core processors and superscalar processors execute instructions in parallel through multiple instruction pipe lines. This makes CPI invalid in many cases.
- Advances in processor technology may vary the cycle duration.
- Some instructions require more cycles than others depending on the instruction's requirements:

9. Name two reasons why the execution times of different instructions may vary significantly.

Execution time varies from instruction to instruction because of:
- differences in the number of operand fetches;
- differences in the number of operand stores; and
- time required to perform the execution, e.g., an integer divide takes much longer than a shift left.