Exam #1 review
ECE 429/629 Fall 2004

The exam will be closed-book, closed-notes.

Exam will consist of

- Short answer questions
- Computational questions on Amdahl's Law, CPU performance equation (Iron Law), SPEC, means (arithmetic, geometric, harmonic)
- Datapath / control logic questions on single-cycle machine, and MIPS instruction set

For the exam, students should be able to

- outline some key developments in the history of computer architecture, including the RISC architecture
- identify the key developers of the RISC architecture
- define and explain the difference between RISC and CISC architectures
- name the only CISC machine to survive the RISC vs. CISC debate, and why
- compute the execution time of a program on a machine, given the instruction mix and the clock cycle time
- compute and compare the SPEC ratings of different machines
- compute the arithmetic and geometric means of execution times
- identify when to use arithmetic, geometric, and harmonic means
- identify the most reliable way of measuring machine performance, along with listing the problems of using MIPS (millions of instructions per second)
- compute the overall speedup of a machine given the speedup of some portion
- list the components of a von Neumann computer
- build a logic gate from transistors
- build a simple ALU from logic gates
- list the values for control lines needed for different instructions on a single-cycle MIPS (microprocessor without interlocked pipeline stages) machine, given a diagram of the datapath
- describe the modifications necessary to implement new instructions on a single-cycle MIPS machine, given a diagram of the datapath
- convert a C program to MIPS assembly and machine code, given a table of machine codes; and convert back to C from machine code
- specify whether an assembly instruction is I-type, R-type, or J-type

Sample short answer questions:

- Explain the difference b/w RISC and CISC. What do the acronyms stand for?
- When did the RISC vs. CISC debate take place? Name two prominent RISC advocates.
- Name the only CISC computer to survive the debate. Why did it survive?
- List some differences between the 80x86 and MIPS computers.
- List the five components of a von Neumann computer.

- What is the key idea behind a von Neumann computer?
- How did von Neumann get his name attached to this concept? Who else deserves credit?
- Why have stack-based architectures fallen out of favor today? Name at least one current machine where you can find stack-based architecture.
- List some factors that a computer designer take into account.
- What is wrong with using Whetstone and/or Dhrystone to measuring computer performance?
- What is the most reliable measure of computer performance?
- List two flaws with using MIPS (millions of instructions per second) to measure computer performance.