CPTR-380
Planning for Exam 1

The exam will be closed book, closed notes, no calculators, no cell phone apps, etc.

Defining performance
- Throughput and response time
- Relative performance
- Measuring performance
  - clock time, response time, elapsed time
- Factors used in quantifying performance
  - CPU execution time, CPU clock cycles for a program, Clock rate,
  - Clock cycles per instruction
- Calculation of performance based on the above factors - know relationships and use them

Know what the power wall is

Know the machine language and assembly language instruction format for R type instructions
- add, subtract, and, or
- shift left, shift right
- set less than

Know the machine language and assembly language instruction format for I type instructions
- immediate: add, subtract, and, or
- load word, store word, load upper immediate
- branch on equal, branch on not equal

Know the machine language and assembly language instruction format for J type instructions
- jump, jump register, jump and link

Know the range of branching and jumping

Regarding numbers, you should know binary numbers, i.e. unsigned binary and 2's complement signed binary numbers. For example, if you needed an 8-bit negative twelve in 2's complement format you could create it without using a calculator.
From chapter 3, you should know binary addition of numbers and how to determine overflow if the numbers are unsigned and overflow if numbers are signed. Know how to do subtraction with addition. Understand how long multiplication might be done in multiple steps by hand but I don't expect you to have memorized the algorithm as shown in fig,.3.4. I will not ask about division.

Regarding floating point numbers, know the floating-point representation for a single precision IEEE-754 standard number, i.e. the fields of the number and how they form a real number. I will not ask you to do numeric operations with floating point numbers. (You should be aware from your reading that to support floating point numbers there is additional hardware in a CPU for that including another set of registers, an ALU devoted to floating point numbers, and a sizable list of additional machine instructions. But no questions about floating point instructions)

Chapter 4 is the heart of computer architecture. Chapter 4 questions on exam 1 will come from sections 4.1 through 4.4. There will be no pipeline questions on this exam.

These first four sections explain the organization of a single-cycle datapath and how instructions are executed with it. Figures 4.17 through 4.21 are the same datapath but are highlighted to show the hardware sections used by the three categories of instruction formats. Figure 4.24 adds support for jumps. I will not ask you to reproduce one of these figures in total, but you should have a good mental image of the organization of functional blocks in these figures. You should understand how this hardware executes instructions of the three types (focus on the instructions I listed above for each instruction format. You can ignore the shift instructions as hardware for that is not explicitly shown in these datapaths). I will not assume you have memorized the numeric values for ALUop, function field, and ALU control as detailed in figures 4.12, 4.13, 4.18, and 4.22.