Activity: Midterm Review

Midterm Exam: Wed Oct 21

The midterm exam will cover material from weeks 1–7 [≤ Lecture 13, ≤ Lab 7]. It will be 60 min long, about half on weeks 6 and 7 (von Neumann computers and the LC-3), and half on earlier material. Open book, open notes as usual. Maybe at most 25% objective questions?

A. Review of Outcomes for Weeks 6 & 7

Below, the more stars, the most important.

1. **Know that in the von Neumann model, programs are stored in memory as data.
2. *Know that a Central Processing Unit contains a Processing Unit and Control Unit.
3. Know how memory is accessed using memory address and data registers.
4. *Know what the ALU (Arithmetic Logical Unit) and data registers do
5. *Know that the Control Unit contains an Instruction Register and Program Counter.
6. ***Know the different parts of the instruction cycle and what happens during them.
7. Know the fundamental differences between data movement, calculation, and control instructions.
8. *Be able to trace the execution of a simple von Neumann machine.
   - Discuss: Should we include the simple decimal computer from Lecture 10? (Nah.) Or just use the LC-3?
9. *Know the basic architecture of the LC-3: word size, number of registers, data types supported.
10. *Be able to simulate subtraction, OR, register-zeroing and register-copying using available instructions (AND, ADD, NOT).
11. *Know how the LC-3 load and store instructions work.
12. *Know the different addressing modes of the LC-3.
13. Know what addressing mode to use in different situations.
14. *Be able to find what operand is specified by the different LC-3 addressing modes.
15. Know what advantages and disadvantages the different addressing modes have.
16. **Know how the LC-3 branch and jump instructions work.
17. Know how the LC-3 TRAP instruction is used to read or write a character or halt the program.
18. *Be able to inspect an LC-3 program and determine whether or not it will take a conditional branch.
19. *Know the difference between branch and jump instructions on the LC-3.

B. Questions

1. During what phase of the instruction cycle does a branch or jump instruction cause the branch/jump to occur (by setting the PC)?
2. Say register number R contains value V; to store V into memory location L, what actions do we have to take with the MAR and MDR?
3. Do all instruction phases take the same amount of time for all instructions?
4. Give 2 examples of LC-3 instructions that cause the value in R7 to be copied to R6.
5. If the P condition code is set, then what do (fill in 16 bits or 4 hex digits) do?
6. What instruction does (fill in 16 bits or 4 hex digits) stand for?
7. Write an LC-3 instruction (in binary) that increments R1 by 1.
8. Write an LC-3 instruction (in binary) that sets R2 to zero.
9. Write an LC-3 instruction (in binary) that loads the value pointed to by R7 into R6.
10. Write an LC-3 instruction (in binary) that loads the value pointed to by M[x4000] into R6, when we're at x3F00.

C. Write Questions

- Write a couple of questions that cover points not included in part B.