The final will be 8-9:50 AM on Tuesday, December 11 in ITT 322. The test will be closed book and notes, except for one 8.5” x 11” sheet of paper (front and back) with notes, purple MARIE Assembly Language handout, and the front four pages of your MIPS Assembly Language Guide (both available at: http://www.cs.uni.edu/~fienup/cs041f07/lectures).

About 65% of the Final will focus on the material since the last test, and about 35% will focus on the material from tests 1 and 2.

**MIPS Assembly Language**
MIPS Processor Architecture: registers, register conventions, addressing modes, memory layout
Basic MIPS Instruction Set: loads/stores, arithmetic instructions, logical instructions, shift/rotate instructions, branch/jump instructions
SPIM Assembler Directives: .data, .text, .word, .globl, .asciiz
MIPS Instruction Set: three ML instruction formats
Subprograms: MIPS Register conventions
MIPS Logical, Shift/Rotate Instructions
SPIM I/O and other System Calls:
SPIM Assembler Directives: .asciiz, .ascii, .align, .space
Arrays: element addressing 1-d, 2-d, 3-d, and higher
Walking pointer through an array

In addition to knowledge about the above concepts, the following assembly-language programming skills are to be tested too:
1) translate high-level language control statements (while, for, if, etc.) into MARIE and MIPS assembly language (be able to handle complex Boolean expressions involving ANDs, ORs, etc.)
2) translate high-level language code containing array accesses into MIPS assembly language
3) use MIPS register conventions to decide which arguments/parameters and local variables should be stored in caller-saved ($a and $t-registers) or callee-saved ($s-registers)
4) translate high-level language subprograms into MIPS assembly language (passing parameters into the subprogram using the $a registers, building the call frame on the run-time stack if necessary, save $s and $ra registers if necessary, passing the value returned by a function in the $v0 register, restoring $s and $ra registers if necessary, jr back to the caller)