CSE P 501 exam checklist 2/29/08

You may bring: Your compiler textbook(s), plus the course slides/notes. No additional books or reference materials.

- Interpreters and compilers – key differences
- Gross structure of compilers – task of front/middle/back ends
- Basic notions of grammars – productions, terminals, non-terminals
- Regular expressions and DFAs
  - RE operators
  - Constructing REs and DFAs
- Scanners – transforming character stream to token stream
- Context-free grammars
  - Derivations, leftmost, rightmost, etc.
  - Constructing grammars for sets of strings
  - Ambiguity
- LR parsing
  - Shift-reduce parsing
  - Construction of LR(0) and SLR(1) parse tables
    - Items
    - Shift-reduce and reduce-reduce conflicts; table differences between LR(0) and SLR(1) due to lookahead
  - First, follow, and nullable
- LL and recursive-descent parsers
  - How to construct a hand-written recursive-descent parser
  - Fixing grammar rules – left recursion, ambiguities like if-else
- Intermediate representations – particularly abstract syntax trees (ASTs)
- Static semantics & symbol tables
  - Typical kinds of conditions that are tested here
  - Basic symbol table structures for languages like MiniJava
- Basic x86 architecture
  - Core 32-bit instruction set – don’t memorize details, but be generally familiar with the basics
  - Be able to write simple C-level functions in x86 assembly language, including, in particular, calling conventions and stack frame layouts.
- Code shape
  - Representation of common high-level language constructs in x86 assembly language
  - Implementation of dynamic dispatch
    - Method tables
    - Indirect method calls, including how method overriding and super work
    - Be sure you understand basic Java rules for method overriding and field hiding in extended classes.
  - Representation of objects and implementation of new
- Back-end issues. You should have a general familiarity with the basic ideas discussed in lecture, but are not expected to provide detailed implementations.
  - Instruction selection – what are the basic ideas behind tree pattern matching and peephole scheduling
  - Instruction scheduling – what is list scheduling; what are some of the issues that determine a good instruction schedule (resource contention including registers; operation latencies)
  - Register allocation – what is the role of the interference graph and the ideas behind using graph coloring to allocate registers

- Dataflow analysis and optimization
  - What is the control flow graph, what are basic blocks
  - General form of dataflow equations (def, use, in, and out sets) and how these can be used to solve typical problems like liveness analysis; be able to set up or solve simple problems like the liveness one we did in lecture
  - Interaction between analysis and optimizations – what can we do with the information that is discovered by the analysis; how to the transformations interact with the analysis