Compilers Study Guide for Second Exam
Fall 2013

1 References
- Class-time notes and slides from October 24, 2013 to 12/03/2013
- Assignments (Decaf project with AST builder, semantic analysis, TAC generation)
- Handouts from class - see the course calendar
- Quizzes
- For further reading, look at the textbook pages cited in the course calendar/syllabus   if you
  need more details

2 Topic Coverage
- Semantic analysis – kinds of checking at semantic analysis time and how implemented
- Implementing static scoping (symbol tables) – including block-structured (procedural) and OO
  languages
- Formal type systems – how to write
- Type checking and type inference
- Overloading, coercion, polymorphism and handling during type checking
- Types of Intermediate representations
- Generation of three address code – function calls/returns, control structures, etc
- Code generation for OO languages – vtables, object layouts, new object storage, object accesses,
  polymorphic call site handling
- Activation record/frame layout and manipulation
- Run-time storage management – static, stack, heap, including garbage collection techniques
  (reference counting, mark-and-sweep, stop-and-copy, generational
- Optimization – control flow graph, call graph, levels and goals of optimization, local
  optimizations

3 Format of Exam
The exam is closed book, closed neighbor and you will have the full final exam time period to work. In
general, the exam will be a combination of testing your basic knowledge and understanding of the
concepts covered in class and application of the concepts. Some example types of questions:
Partial credit will be given when possible on any question in the exam.
- True and false with justification
- Show scopes of variables and symbol tables
- Draw diagrams to show concepts of code generation and run-time storage management.
- Read and explain type rules in terms of what checks and inferences should be implemented.
- Draw pictures of memory at different points during run-time.
- Make and justify compiler design decisions.
- Draw the representation of a particular data structure in the activation record.
- Describe and justify which items can be stored on the stack, heap, static store.
- Short-answer questions
- Show type checking in Decaf program
- Convert program to three address code and TAC code; read and explain what TAC code is achieving
- Display an AR frame , stack and heap elements

4 How to Study
Review your lecture notes, handouts, labs, and textbook chapters. Concentrate on your lecture notes and
handouts.