CS410P/510 Programming Language Compilation Winter 2024 Additional Final Exam Sample Questions

These are the types of short essay questions which might be asked about the lecture material that was not also covered by the book or homework. There are unlikely to be more than one or two questions of this type on the exam.

Each of these questions asks for a brief paragraph answer. Sample solutions are not provided, but feel free to ask if you want feedback on your own solution attempts.

- 1. **Dataflow Analysis.** How is dataflow analysis useful for performing the constant propagation optimization? What information does the analysis compute at each program point? What is the underlying value lattice used? Why is this a forward analysis?
- 2. Garbage Collection. Both mark-and-sweep GC and copying GC trace out all live data. What is the difference between them? What are some pros and cons of each?
- 3. Garbage Collection. What is the basic idea of conservative GC? Why might it be useful when we have an "uncooperative" compiler? Can it leak more space than a precise collector? Can it leave dangling pointers?
- 4. Garbage Collection. What is the basic idea of generational GC? What property of object lifetimes does it depend on? How does it safely collect the youngest generation without tracing all generations?
- 5. Verification. What is the difference between a "verifying" compiler and a "checking" (or "translation validation") compiler? What are some pros and cons of each approach?
- 6. Interpretation. What are the similarities and differences between a JVM-like stack machine instruction set and a register-based IR such as $\mathcal{L}_{While}^{mon}$?
- 7. Interpretation. What is just-in-time compilation? Why is it useful?