

Csci 465 Fall 2011

December 2011

Final Exam

Total Points (100)

TAKE HOME

Due: December 12 at 3:00 p.m.

Name: _____

1. (10 points) You need to briefly answer the following questions regarding your the compiler project:
 - a. What was the main obstacle when you first started working on your project?
 - b. Which delivery was the easiest one and how long did it take you to do it?
 - c. Which delivery was the hardest part and how long did it take you to do it?
 - d. Of which part of your project is the most rewarding part?
 - e. Which part of your compiler would you like to re-implement if you had the chance to improve *your compiler*?
 - f. What are the lessons you learn from your compiler? What would you do differently if you are asked to construct yet another compiler next time?
 - g. What type of discussion would like to be added/deleted from the course so the course becomes more interesting and meaningful?
 - h. How big is your compiler in terms of line of code (LOC)?
 - i. If you are given enough time, what would be the additional features you would like to add to your compiler?
 - j. What is the most important property of a compiler? How did you validate your compiler according to this property?

To answer, you can use textbook, lecture notes, your own note, etc. Please be more specific. Your feedback will be used to improve the quality of the course when it offers next time.

2. (20 points) a) What are the easiest ways to access a nonlocal variable? b) Explain the concept of a static link. c) Why is it needed? d) Explain the concept of a dynamic link and why is it needed?

3. (10 points) The following declarations are given for a language that uses name equivalence:

A, D: array [1..100] of int;

C: array [1..100] of int;

F: array [1..100] of int;

Explain which of these four variables have the same type and which have different types.

3. (15 points) What is the main benefit of intermediate code generations? Furthermore generate three-address code (i.e., intermediate code) for the following While Loop statements using syntax-directed definitions for flow-of control statements and Booleans.

While $a < b$ **or** $c < d$ **do**

If $e < f$ **then**

$x := y + z$

else

$x := y - z$

5. (10 points) In most languages activation record can be allocated on the stack. Under what conditions heap allocations is used instead of the stack?

6. (20 points) strongly typed, statically checked languages can help the programmer produce valid programs by detecting large classes of erroneous programs.

a) In what way this feature can improve the compiler's ability to generate efficient code for a program?

b) Some programming languages either omit declarations or treat them as optional information. Examples include Scheme program that lacks declarations for variables. Therefore, in the absence of declarations, what element of type system can be used to determine a type for each variable, and in what way it makes harder to implement the language.

7.(20 points) Using SDD, compute the types and the widths for array types `int[2][3]` (i.e. Array of two arrays each having three elements) .

$T \rightarrow B C$ $\{t=B.type; w=B.width\}$

$B \rightarrow \text{int}$ $\{B.type = \text{integer}, B.width = 4\}$

$B \rightarrow \text{float}$ $\{B.type = \text{float}; B.width = 8;\}$

$C \rightarrow \varepsilon$ $\{C.type = t; C.width = w;\}$

$C \rightarrow [\text{num}] C1$ $\{ \text{array}(\text{num.value}, C1.type); C.width=\text{num.value} \times C1.width;\}$

