Programming Language Concepts

CS 280

Final Exam

Summer 2017

July 17, 2017

Do not open this exam until instructed to do so. The exam consists of 5 problems. Please check that you have all the pages.

The answers to the exam problems should be written in the space provided with the question. Read each question carefully before answering. Make sure you print your answer neatly!

During the exam it is prohibited to:
   1. Use any books or notes.
   2. Use any electronic aid, including calculators.
   3. Exchange information with any person other than the exam proctor.
   4. Leave the exam room before you turn in your exam.

It is strongly suggested that you use all the time available. If you finish early, double check your work. By signing below you acknowledge that you have read and understood all of the instructions above.

Good luck!

NJIT Academic Honor Code Agreement

On my honor, I pledge that I have not violated the provisions of the NJIT Academic Honor Code.

Name: ___________________________    SID: _______________________

Signature: ___________________________   Section: ________________
Problem 1.

Describe, in English, the language defined by the following grammar:

\[
\begin{align*}
&S \rightarrow ABBCC \\
&A \rightarrow aA | a \\
&B \rightarrow bB | b \\
&C \rightarrow cC | c
\end{align*}
\]
Problem 2.

Write a grammar for the language consisting of strings that have $n$ copies of the letter “a” followed by the same number of copies of the letter “b”, where $n > 0$. For example, the strings “ab”, “aaaabbbb”, and “aaaaaaaaabbbbbbb” are in the language but “a”, “abb”, and “aaabb” are not.
Problem 3.

Consider the following C-like program:

```c
int fun(int *i) {
    *i += 5;
    return 4;
}
void main() {
    int x = 3;
    x = x + fun(&x);
}
```

What is the value of “x” after the assignment statement in `main`, assuming

a. Operands are evaluated left to right.

b. Operands are evaluated right to left.
Problem 4.

Consider the following program written in a C-like syntax:

```c
void fun(int first, int second) {
    first += first;
    second += second;
}
void main() {
    int list[2] = {1, 3};
    fun(list[0], list[1]);
}
```

For each of the following parameter passing methods, what are the values of the list array after execution?

a. Passed by value

b. Passed by reference
Problem 5.

Consider the following C program:

```c
void fun(void) {
    int a, b, c; /* definition 1 */
    ...
    while (...) {
        int b, c, d; /* definition 2 */
        ...
        while (...) {
            int c, d, e; /* definition 3 */
            ...
        }
        ...
    }
    ...
}
```

For each of the four marked points in this function, list each visible variable, along with the number of the definition statement that defines it.