CS 2210: Compiler Design

Homework #1

Due Time: midnight January 28th, 2020

1. (8 points) Construct regular expressions for the following languages.
   a) All strings of lowercase letters that contain the five vowels in order.

   b) Strings with even number of quotes. That is, 'abc', abc''dd, aa'a'a'a' are legal strings while 'a, 'a'a'ab'a' are illegal strings.

   c) All strings of as and bs that do not contain the subsequence abb.

   d) All strings of as and bs with an even number of as and an odd number of bs.

2. (4 points) Answer the following questions about context free and regular grammars.
   a) Write a grammar for non-empty strings with matching quotes where T = {a, b, '}. E.g. 'aba', aba"bb, aa'a'a'a'.

   b) Is the language expressed in a) a regular language? If not, explain why not. If so, modify grammar so that it is a regular grammar (if not already).

3. (4 points)

   a) Is the C programming language a context free language? Why or why not?

   b) Is the C programming language ambiguous? Why or why not?

4. (6 points) Given the three grammars:

   G1: S-> aS/Sa/a

   G2: S->aSbS/bSaS/ε

   G3: R->R+R/RR/R*/a/b/c

   a) Are they ambiguous? If not, why? If yes, give a string example and construct two parse trees which generate the same string.
   b) Can you modify the grammars and make them unambiguous?

5. (2 points) modify the regular grammar we have discussed on class to exclude illegal digits (e.g., 000 and 001 are illegal digits)