University of Nevada, Las Vegas Computer Science 456/656 Spring 2018

Assignment 4: Due February 14, 2018

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. You may attach extra sheets, using a stapler.

1. Let R be the language consisting of all regular expressions over the alphabet a,b.
   (a) Is R regular?
   (b) Give a context-free grammar for R. Explicitly state the terminals and variables of your grammar, as well as the start symbol, and, of course, the productions.
   (c) Does your grammar respect the semantics of the language?

2. Let L be the language of all non-empty palindromes over the alphabet a,b.

   (a) Give an informal reason for believing that there is no deterministic PDA which accepts L.

   (b) Give a Chomsky Normal Form grammar for L.

(c) Give the state diagram of a PDA which accepts L.

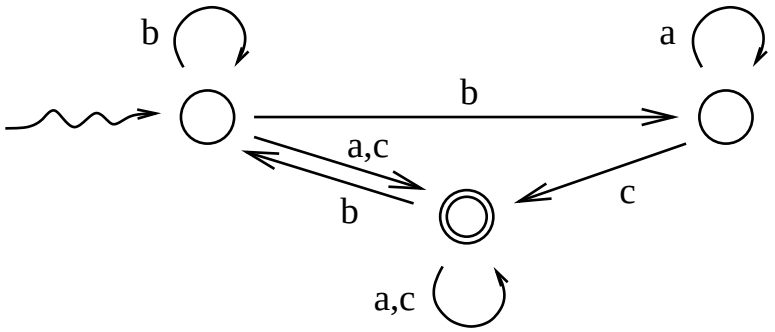
3. Let G be the following context-free grammar, with terminal alphabet a,e,i,w and start symbol S.
   1. $S \to a$
   2. $S \to wS$
   3. $S \to iS$
   4. $S \to iSeS$

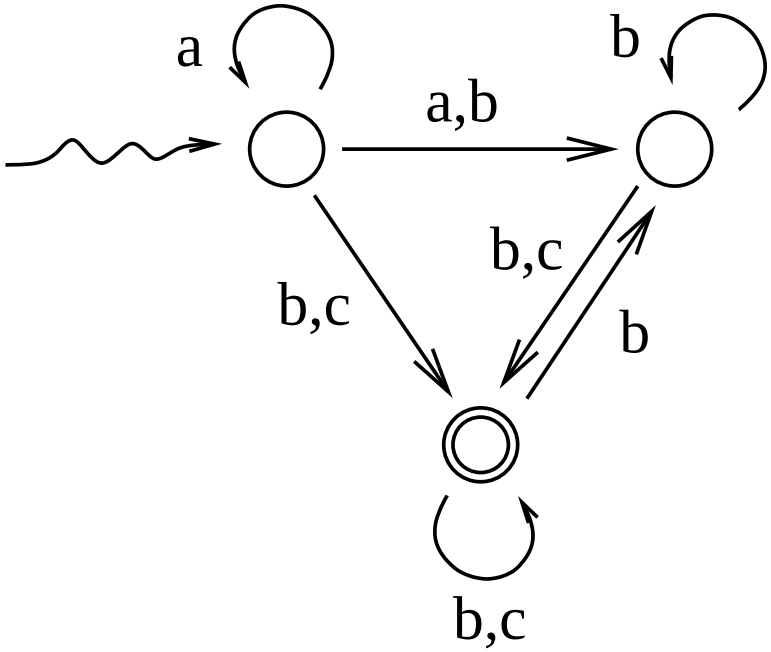
   (a) Show that G is ambiguous. This is the dangling else problem.

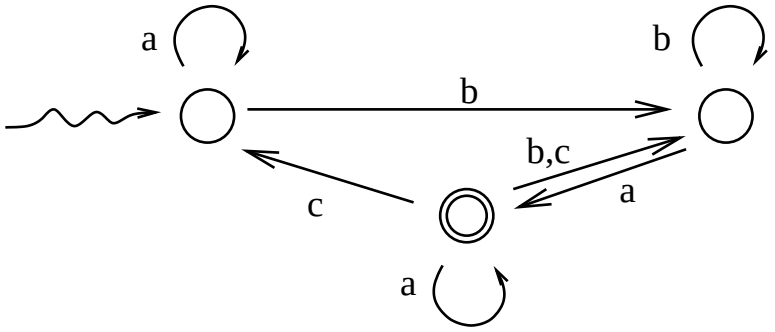
(b) Give an unambiguous grammar equivalent to G.

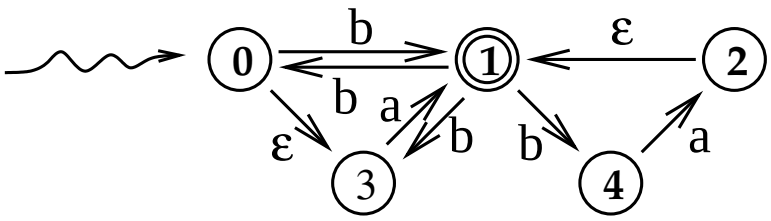
4. Use the CYK algorithm to show that the string wiaeaia is not in the language generated by the grammar given in problem 3.

5. Draw a minimal DFA equivalent to each NFA shown. In each case show your work.




a
b
a,b
b,c
b,c
b
b,c


a
b
b
b,c
a
c
a


b
ε
0
1
2
b
a
ε
b
b
a
3
4