

CSE 340 Spring B 2022

HOMEWORK 1

Due by 3/28/2022 at 11:59 pm AZ time

All submissions must be PDF and should be typed. Exception can only be made for drawing parse trees, which can be handwritten and scanned in the submitted document.

Problem 1 (20 points). Consider the following regular expressions (we omit the dot operator)

$$\begin{aligned}R_0 &= 1|2|3|4|5|6|7|8|9 \\R_1 &= 0|1|2|3|4|5|6|7|8|9 \\R_2 &= (0|1)^* R_0 (0|1) \\R_3 &= 00 R_0^* (0|1)^* \\R_4 &= R_3^* R_2^* 000\end{aligned}$$

Assume that the longest prefix-matching rule is used. Assume that ties are broken in favor of the regular expression listed first in the list.

1. Give an example of input for which `getToken()` returns R_0
2. Give an example of input for which `getToken()` returns R_1
3. Give an example of input for which `getToken()` returns R_2
4. Give an example of input for which `getToken()` returns R_3
5. Give an example of input for which `getToken()` returns R_4
6. If `getToken()` if called repeatedly on the following input, what is the sequence of tokens returned?

99001101678100010101030123457000010

Explain your answers by showing the step by step table.

Problem 2 (10 points). Consider the grammar

$$S \rightarrow AB$$

$$A \rightarrow aB \mid \varepsilon$$

$$B \rightarrow bB \mid abA \mid A$$

1. Show that this grammar is ambiguous by constructing two different leftmost derivations for the sentence abab
2. Show that this grammar is ambiguous by constructing two different parse trees for the string abab

Problem 3 (20 points). Compute FIRST and FOLLOW sets for the following grammar.

$$S \rightarrow aABc \mid CD$$

$$A \rightarrow DC \mid BE \mid \varepsilon$$

$$B \rightarrow aCB \mid AF$$

$$C \rightarrow cC \mid \varepsilon$$

$$D \rightarrow CDb \mid \varepsilon$$

$$E \rightarrow eFc$$

$$F \rightarrow Fg \mid \varepsilon$$

Show your work. An answer by itself does not count.