

CFG Assignment

1- Prove that the following CFG generate the language that is defined by the following Regular Expression $(ba)^*b$:

$$S \rightarrow baS \mid b$$

2- What language does this CFG describe:

$$S \rightarrow aS \mid bS \mid \Lambda$$

3- Prove that the following CFG generates a language in form of “anything bb anything”:

$$\begin{aligned} S &\rightarrow \text{CATEGORY1 CATEGORY2 CATEGORY1} \\ \text{CATEGORY1} &\rightarrow a \text{ CATEGORY1} \mid b \text{ CATEGORY1} \mid \Lambda \\ \text{CATEGORY2} &\rightarrow bb \end{aligned}$$

4- What is the language generated by the following CFG:

$$\begin{aligned} S &\rightarrow XaXaX \\ X &\rightarrow aX \mid bX \mid \Lambda \end{aligned}$$

5- What is the language generated by the following CFG:

$$\begin{aligned} S &\rightarrow SS \\ S &\rightarrow XX \\ X &\rightarrow aX \mid Xa \mid b \end{aligned}$$

6- Find the CFG for each of the languages defined by the following RE's:

- a. ab^*
- b. a^*b^*
- c. $(baa + abb)^*$
- d. $(a + bb)^*$
- e. $(aa)^*b(bb)^*$

7- Find the CFG for each of the languages over the alphabet $\Sigma = \{a,b\}$

- a. All words that contain exactly three b 's in total.
- b. All strings that end in a double letter.
- c. All strings that have exactly one double letter in them.
- d. Anything that starts with double letter using CGF.

8- Is CFG powerful enough to represent all types of languages? Can CFG represent a language like $a_n b_n b_{n+1}$?

Submission :

- The assignment is individual.
- Cheating could lead to serious consequences.