CS323 Assignment 3

1 Requirements

You are expected to complete all required homework exercises and encouraged to complete the optional ones (if there are). For submission, please put all your answers in a single PDF file and submit it via the assignment channel on Blackboard. The name of the file should follow the format "**studentID_A#**" (e.g., 30003554_A3). **The submission deadline is 10:00 PM, October 31, 2024.** Late submissions are allowed within one week after the deadline (grace period). If you submit your assignment during the grace period, your score will be 80% of the score you could get if the submission was made in time. Assignment submitted after the grace period will not be graded.

2 Required Exercises (100 points)

Exercise 1 (Grammar Basics): Consider the following context-free grammar G:

$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$

1. Is the string "$aabbab$" a valid sentence in $L(G)$? [3 points]
2. Give a leftmost derivation for the string $aabbab$. [8 points]
3. Give a rightmost derivation for the string $aabbab$. [8 points]
4. Give a parse tree for the string $aabbab$. [6 points]

Exercise 2 (Top-Down Parsing): Consider the above grammar G:

1. Compute the FIRST and FOLLOW sets for G. [15 points]
2. Construct the predictive parsing table for G. [15 points]
3. Is the grammar LL(1)? [5 points]

4. Can an LL(1) parser accept the input string $ababab$? If yes, please list the moves made by the parser; otherwise, please state the reason. Before parsing, you may need to resolve conflicts in the parsing table. [10 points]

Exercise 3 (Grammar Rewrite and Parsing): Consider the following context-free grammar G:

$$S \to SS+ \mid SS- \mid a$$

Is it possible, by modifying the grammar in any way, to construct a predictive parser for the language $L(G)$? If yes, please modify the grammar and provide the predictive parsing table. Otherwise, please state the reason. [30 points]