CS323 Assignment 4

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_A4). **The submission deadline is 10:00 PM, November 24, 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)

Bottom-Up Parsing: Consider the following context-free grammar G:

$$S \to SA \mid SB \mid a$$
$$A \to S+$$
$$B \to S-$$

Exercise 1 (SLR Algorithm): Please complete the following tasks or answer the questions:

1. Construct the shift-reduce parsing table for the above grammar G using the SLR algorithm. Please put down the detailed steps, including the calculation of item sets. For the calculation of closures, GOTO targets, and FIRST/FOLLOW sets, you may choose to omit the details. [15 points]
2. Is the grammar SLR(1)? [5 points]
3. Can an SLR parser accept the input string aaaa+++? If yes, please list the moves made by the parser; otherwise, state the reason. Before parsing, please resolve conflicts in the parsing table if any. [10 points]

Exercise 2 (CLR Algorithm): Please complete the following tasks or answer the questions:

1. Construct the shift-reduce parsing table for the above grammar G using the CLR algorithm. Please put down the detailed steps, including the calculation of item sets. For the calculation of closures, GOTO targets, and FIRST/FOLLOW sets, you may choose to omit the details or reuse the results in the above exercise. [20 points]
2. Is the grammar LR(1)? [5 points]
3. Can an CLR parser accept the input string aaaa- - -? If yes, please list the moves made by the parser; otherwise, state the reason. Before parsing, please resolve conflicts in the parsing table if any. [10 points]

Exercise 3 (LALR Algorithm): Please complete the following tasks or answer the questions:

1. Construct the shift-reduce parsing table for the above grammar G using the LALR algorithm. Please put down the detailed steps, including the calculation of item sets. For the calculation of closures, GOTO targets, and FIRST/FOLLOW sets, you may choose to omit the details or reuse the results in the above exercises. [20 points]
2. Is the grammar LALR(1)? [5 points]
3. Can an LALR parser accept the input string aaaa+-+? If yes, please list the moves made by the parser; otherwise, state the reason. Before parsing, please resolve conflicts in the parsing table if any. [10 points]