CS323 Assignment 4

1 Requirements

You are expected to complete all required exercises in this assignment. For submission, please put all your answers in a single PDF file and submit it via the assignment channel on SAKAI. The name of the file should follow the format **"studentID_A#"** (e.g., 30003554_A1). **The submission deadline is 11:55 PM, November 22, 2022.** 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, meaning that you will get a zero for the assignment.

2 Bottom-Up Parsing Exercises (100 points)

Exercise 1 (Simple LR): Consider the following grammar G:

$$S \to aB$$

$$B \to S * B \mid \epsilon$$

1. Construct the SLR(1) parsing table for G. Please put down the detailed steps, including the calculations of LR(0) item sets. For the calculations of closures, GOTO targets, and FIRST/FOLLOW, you may choose not to put down the internal details. [20 points]
2. Is the grammar SLR(1)? [5 points]
3. If your answer to the above question is "yes", then can the SLR(1) parser accept the input string $aaaa***$? If the input string can be accepted, please list the moves made by the parser; otherwise, state the reason. If your answer to the above question is "no", please explain why the grammar is not SLR(1). [10 points]

Exercise 2 (Canonical LR): Consider the grammar G in Exercise 1:

1. Construct the canonical LR(1) parsing table for G. Please put down the detailed steps, including the calculations of LR(1) item sets. For the calculations of closures, GOTO targets, and FIRST/FOLLOW, you may choose not to put down the internal details. [20 points]
2. Is the grammar LR(1)? [5 points]
3. If your answer to the above question is "yes", then can the canonical LR(1) parser accept the input string $aaaa***$? If the string can be accepted, please list the moves made by the parser; otherwise, state the reason. If your answer to the above question is "no", please explain why the grammar is not LR(1). [10 points]

Exercise 3 (Lookahead LR): Consider the grammar G in Exercise 1:

1. Construct the LALR(1) parsing table for G. Please put down the detailed steps, including the merging of LR(1) item sets. [15 points]
2. Is the grammar LALR(1)? [5 points]
3. If your answer to the above question is "yes", then can the LALR(1) parser accept the input string $aaaa***$? If the string can be accepted, please list the moves made by the parser; otherwise, state the reason. If your answer to the above question is "no", please explain why the grammar is not LALR(1). [10 points]