

**CSEN 1003 Compiler, Spring Term 2020**  
**Practice Assignment 5**

Discussion: 1.03.20 - 04.03.20

**Exercise 5-1**

Consider the following CFG:

$$\begin{aligned} S &\rightarrow 0T1S \mid \varepsilon \\ T &\rightarrow 0T1 \mid \varepsilon \end{aligned}$$

- Compute the FIRST and FOLLOW sets.
- Compute the parsing table.
- Prove that this grammar is LL(1).
- What language does this grammar recognize?

**Exercise 5-2**

Consider the following CFG:

$$\begin{aligned} S &\rightarrow SAB \mid SBC \mid \varepsilon \\ A &\rightarrow aAa \mid \varepsilon \\ B &\rightarrow bB \mid \varepsilon \\ C &\rightarrow cC \mid \varepsilon \end{aligned}$$

- Compute FIRST and FOLLOW sets for each non-terminal.
- Build the parsing table.
- From the parsing table, show why the grammar is not LL(1).

**Exercise 5-3**

Construct a parsing table for the following grammar. Is the grammar LL(1)?

$$\begin{aligned} S &\rightarrow AB \\ A &\rightarrow \mathbf{id} A \mid \mathbf{num} \\ B &\rightarrow CA \\ C &\rightarrow 0C \mid 1 \end{aligned}$$

**Exercise 5-4**

Consider the following CFG:

$$\begin{aligned} S &\rightarrow (L) \mid \mathbf{a} \\ L &\rightarrow L, S \mid S \end{aligned}$$

- a) Eliminate left recursion.
- b) Compute FIRST and FOLLOW sets for each non-terminal.
- c) Build the parsing table.
- d) Trace the operations of a predictive top-down parser on the string  $(\mathbf{a}, (\mathbf{a}, \mathbf{a}))$ .

**Exercise 5-5**

Consider the following CFG:

$$S \rightarrow SS+ \mid SS* \mid \mathbf{a}$$

- a) Eliminate left recursion and left factor the grammar.

- b) Compute FIRST and FOLLOW sets for each non-terminal.
- c) Build the parsing table.
- d) Draw the corresponding PDA for the above grammar.
- e) Trace the operations of a predictive top-down parser on the string **aa+**.