

## 2. Parsing

**Due** Mar 8 by 11:59pm      **Points** 30      **Submitting** a file upload

1. This assignment is to be done individually.
2. The assignment has 3 questions.
3. You are required to submit solutions to all the questions.
4. The marks for individual questions (and subparts) are given as [...]

### Q1: Ambiguous Grammar? [10]

Consider the context-free grammar where  $*$ ,  $+$ , and  $a$  are the terminals.

$$S \rightarrow SS * \mid SS + \mid a$$

- Describe the language described by this grammar. [2]
- Is this grammar ambiguous? Give intuitive reason to support your answer. [2]
- Generate SLR parse table for the grammar. [6]

## Q2: Parse Table [10]

Consider the following grammar  $G$  which is not SLR, i.e. the SLR parsing table will have conflicts:

$$S \rightarrow M a$$
$$S \rightarrow b M c$$
$$S \rightarrow d c$$
$$S \rightarrow b M a$$
$$M \rightarrow d$$
$$M \rightarrow \epsilon \quad \# \epsilon \text{ is the empty string}$$

Construct the SLR parse table for G. Clearly specify the states having a conflict and the type of conflict. [4]

Answer the following:

- For each conflict state, show the pair of items that cause the conflict. [2]
- Give an input string  $w_1 \in L(G)$  for which conflicting state will be exercised. Show the steps in reduction of  $w_1$  until the conflict occurs. [2]
- Give an input string  $w_2 \in L(G)$  for which  $M \rightarrow \epsilon$  rule will be used for reduction in some step. show the complete reduction from  $w_2$  to the start state. [2]

### Q3: SLR vs CLR vs LALR [10]

For the grammar

$$S \rightarrow id[E] := E$$
$$E \rightarrow E + T \mid T$$
$$T \rightarrow T * F \mid F$$
$$F \rightarrow (E) \mid id$$

answer the following questions:

- In the automaton for the SLR parser, there is a state with a self loop. Identify the state through all the viable prefixes that takes the automaton to this state. You may represent the set of viable prefixes by regular expressions over the grammar symbols. [4]
- Show an example string for which the SLR and CLR parsers for the grammar behave differently and, in not more than five lines, explain the difference. [3]
- Show an example string for which the CLR and LALR parsers for the grammar behave differently and, in not more than five lines, explain the difference. [3]