

### Week 9 Tutorial Session

1. Consider the following context-free grammar  $G$ :

$$S \rightarrow (S) \mid ()$$

It generates expressions like  $()$ ,  $((()))$ ,  $((()))()$ , and so on.

- (a) Every partially completed rule of the form  $A \rightarrow \alpha \bullet \beta$  is known as an *item*. Write all items in the grammar  $G$  and construct an NFA for all valid item updates.
- (b) Convert the NFA to a DFA. Which of the states are shift states and which are reduce states? Are there any conflicts?
- (c) Using the DFA, show an execution of the LR(0) parsing algorithm on the input

$$((()))$$

Show the stack of states, stack of processed input, and remaining input throughout the execution.

- (d) Now consider the following extended context-free grammar  $G'$ :

$$S \rightarrow (S) \mid (S)S \mid ()$$

Show that  $G'$  is not an LR(0) grammar.