CSCI 447 – Summer 2003

LL Parsing

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1. For each of the following grammars, find the predict sets and state whether the grammar is LL(1) or not.

a.
$S \rightarrow A\ B\ \mathbf{c}$
$A \rightarrow \mathbf{a} \mid \varepsilon$
$B \rightarrow \mathbf{b} \mid \varepsilon$

b.
$S \rightarrow A\ \mathbf{b}$
$A \rightarrow \mathbf{a} \mid B \mid \varepsilon$
$B \rightarrow \mathbf{b} \mid \varepsilon$

c.
$S \rightarrow A\ B\ B\ A$
$A \rightarrow \mathbf{a} \mid \varepsilon$
$B \rightarrow \mathbf{b} \mid \varepsilon$

d.
$S \rightarrow \mathbf{a}\ S\ \mathbf{e} \mid B$
$B \rightarrow \mathbf{b}\ B\ \mathbf{e} \mid C$
$C \rightarrow \mathbf{c}\ C\ \mathbf{e} \mid \mathbf{d}$

2. Given the following grammar

lexp → **(** *lexpseq* **)** | **id** | **num**
lexpseq → *lexp* *lexptail*
lexptail → **,** *lexp* *lexptail* | ε

a. Find the First and Follow sets of all nonterminals

b. Find the predict sets of all productions

c. Construct the LL(1) parse table

d. Show the parsing of **((id , num) , id) $** and **(id , (id $**

3. **a)** Show that an LL(1) grammar cannot be ambiguous.
b) Show that a left-recursive grammar cannot be LL(1).

4. Transform the following grammar into LL(1)

DeclList → *DeclList* **;** *Decl* | *Decl*
Decl → *IdList* **:** *Type*
IdList → *IdList* **,** **ID** | **ID**
Type → *ScalarType* | **array** **(** *ScalarTypeList* **)** **of** *Type*
ScalarTypeList → *ScalarTypeList* **,** *ScalarType* | *ScalarType*
ScalarType → **ID** | *Bound* **..** *Bound*
Bound → *Sign* **INTLIT** | **ID**
Sign → + | – | ε