

Chapter 4 Problem Set

Question 1

1. Perform the pairwise disjointness test for the following grammar rules.

- a. $A \rightarrow aB \mid b \mid cBB$
- b. $B \rightarrow aB \mid bA \mid aBb$
- c. $C \rightarrow aaA \mid b \mid caB$

Answer:

- a. First (aB) = a
First (b) = b
First (cBB) = c so, $a \neq b \neq c$
All disjoint \rightarrow test passed!
- b. First (aB) = a
First (bA) = b
First (aBb) = a so, $a == a$
Not disjoint \rightarrow test failed
- c. First (aaA) = a
First (b) = b
First (caB) = c so, $a \neq b \neq c$
All disjoint \rightarrow test passed!

Question 3

2. Show a trace of the recursive descent parser given in Section 4.4.1 for the string $a + b * c$.

Answer:

Next token is: 11 Next lexeme is a
Enter <expr>
Enter <term>
Enter <factor>
Next token is: 21 Next lexeme is +
Exit <factor>
Exit <term>
Next token is: 11 Next lexeme is b
Enter <term>
Enter <factor>
Next token is: 23 Next lexeme is *
Exit <factor>
Next token is: 11 Next lexeme is c
Enter <factor>
Next token is: -1 Next lexeme is EOF
Exit <factor>
Exit <term>
Exit <expr>

Question 5

3. Given the following grammar and the right sentential form, draw a parse tree and show the phrases and simple phrases, as well as the handle.

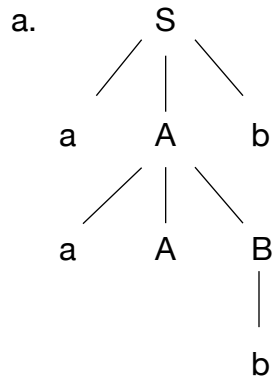
$S \rightarrow aAb \mid bBA$

$A \rightarrow ab \mid aAB$

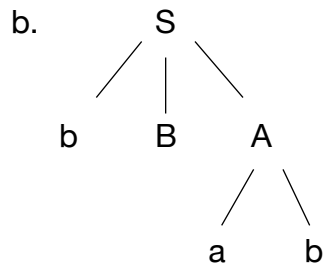
$B \rightarrow aB \mid b$

- a. aaAbbb
- b. bBab
- c. aaAbBb

Answers:



Phrases: aaAbbb, aAb, b
Simple phrases: b
Handle: b



Phrases: bBab, ab
Simple phrases: ab
Handle: ab

- c. Not parsable