Joseph Camacho-Terrazas
9/28/2020
Chapter 4 Problem Set

1. Perform the pairwise disjointness test for the following grammar rules.
   a. A → aB | b | cBB
   b. B → aB | bA | aBb
   c. C → aaA | b | caB

a. FIRST (aB) = {a}
   FIRST (b) = {b}
   FIRST (CBB) = {c}
   Passed – doesn't intersect

b. FIRST (aB) = {a}
   FIRST (bA) = {b}
   FIRST (aBb) = {a}
   Fail – Intersection

c. FIRST (aaA) = {a}
   FIRST (b) = {b}
   FIRST (caB) = {c}
   Passed – doesn't intersect

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

Call lex(): next lexeme is a
Enter <expr>
Enter <term>
Enter <factor>
Call lex(): next lexeme is +
Exit <factor>
Exit <term>
Call lex(): next lexeme is b
Enter <term>
Enter <factor>
Call lex(): next lexeme is *
Exit <factor>
Call lex(): next lexeme is c
Enter <factor>
Call lex(): next lexeme is EOF
Exit <factor>
Exit <term>
Exit <expr>

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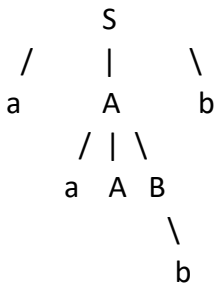
5. Given the following grammar and the right sentential form, draw a parse tree and show the phrases and simple phrases, as well as the handle.

$S \rightarrow aAb \mid bBA \quad A \rightarrow ab \mid aAB \quad B \rightarrow aB \mid b$

a. aaAbb
b. bBab
c. aaAbBb

a.

Parse tree:



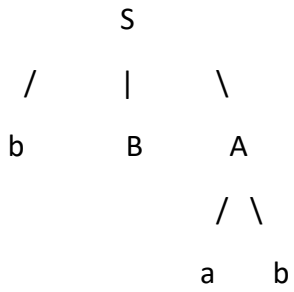
Phrases: aaAbb, aaABb, aAb

Simple Phrase: b

Handles: b, aAB

b.

Parse Tree:



Phrases: bBab, bBA

Simple Phrase: ab

Handles: ab

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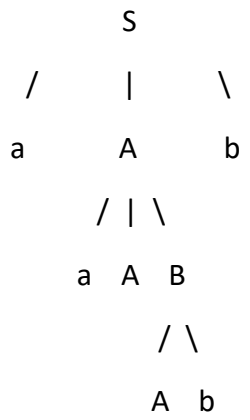
c.



Cannot derive from current grammar