CS3311 Homework 11

Due: Wednesday, April 5, 2017, by class time, 12:05pm
Submission: Typed, pdf on Canvas
(scanned submissions are not allowed)

The answers must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. Any other source must be specified clearly.

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1. *(20+10 points)* Consider the grammar G from Example 4.5.2:

$$S \to AT \,|\, AB \qquad T \to XB \qquad X \to AT \,|\, AB \qquad A \to a \qquad B \to b$$

(a) Give the upper diagonal matrix produced by the CYK algorithm when run with G and the input string $abbb$. **Show all your work.**

(b) Is $abbb \in L(G)$? Why? Provide the reason based on the upper diagonal matrix you constructed.

2. *(20+10+10 points)* Consider the following grammar G. Note that G was obtained by transforming the grammar $S \to aSa \,|\, bSb \,|\, a \,|\, b \,|\, \lambda$ to Chomsky Normal Form.

$S \to AR \,|\, BX \,|\, AA \,|\, BB \,|\, a \,|\, b \,|\, \lambda$
$T \to AR \,|\, BX \,|\, AA \,|\, BB \,|\, a \,|\, b$
$R \to TA$
$X \to TB$
$A \to a$
$B \to b$

(a) Give the upper diagonal matrix produced by the CYK algorithm when run with G and the input string $abba$. **Show all your work.**

(b) Is $abba \in L(G)$? Why? Provide the reason based on the upper diagonal matrix you constructed.

(c) Is $abb \in L(G)$? Why? Provide the reason based on the upper diagonal matrix you constructed.

3. *(30 points)* Let M be the PDA in Example 7.1.3 on page 226.
M accepts even length palindromes. Show the computation trees for the strings $aabbaa$ and aba.