CSE 322 Winter 2008
Assignment #7

Due: Friday, March 7, 2008

Reading assignment: Read the CKY algorithm handouts and Section 2.3 of Sipser's book.

Problems:

1. Apply the Cocke-Kasami-Younger algorithm to the following Chomsky Normal Form grammar to show that string $babbaa$ is accepted (show the tableau):

$$\begin{array}{rcl} S & \rightarrow & AB \mid BA \mid AT \mid BU \mid SS \\ T & \rightarrow & SB \mid SU \\ U & \rightarrow & SA \\ A & \rightarrow & a \\ B & \rightarrow & b \end{array}$$

2. Convert the PDA given in the diagram in Sipser's text 2nd edition Figure 2.19, page 114 (1st edition Figure 2.8, page 106) into an equivalent CFG using the general construction of CFGs from PDAs given in Sipser's text 2nd edition Lemma 2.27 (1st edition Lemma 2.15). Note that without loss of generality you can restrict the rules to those only involving variables of the form A_{pq} such that state q is reachable from state p in the PDA diagram. Show your work.

3. Sipser's text 2nd edition, Problem 2.30 (a), (d) (1st edition, Problem 2.18 (a), (d)).

4. Let B be the language of all palindromes (strings w such that $w = w^R$) over $\{0, 1\}$ containing an equal number of 0s and 1s. Show that B is not context-free.

5. (Extra Credit) Show that any grammar for the language $A = \{a^i b^j c^k \mid i = j \text{ or } j = k\}$ must be ambiguous.

6. (Extra Credit: Due Friday March 14) For a PDA $M = (Q, \Sigma, \Gamma, \delta, q_0, F)$ we say that a string $\alpha \in \Gamma^*$ is a *possible stack of* M if there is some input and some choice of moves of M such that α appears on the stack at some point during its computation. Prove that the language $L \subseteq \Gamma^*$ of possible stacks of M is regular.