CSE 322 Winter 2004
Assignment #7

Due: Friday, March 5, 2004

Reading assignment: Finishing reading Sipser's text Chapter 2 and read pages 240-241 from section 7.2.

Problems:

1. Convert the PDA given in the diagram in Figure 2.8, page 106 of the text into an equivalent CFG using the general construction of the proof of Lemma 2.15. Show your work.

2. Apply the Cocke-Kasami-Younger algorithm (in the proof of Theorem 7.14) to the following Chomsky Normal Form grammar to show that string $babbaa$ is accepted (show the tableau):

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

3. Sipser's text, page 121, Problem 2.17.

4. Sipser's text, page 121, Problem 2.18 (b).

5. Use the pumping lemma for CFL's to show that

$$\{w\#w^R\#y \mid w \in \{0,1\}^* \text{ and either } y = w \text{ or } y = w^R\}$$

   is not context-free.

6. (Bonus) A regular grammar is a CFG in which every rule is of the form $A \rightarrow wB$ or $A \rightarrow w$ where $w \in \Sigma^*$ and $A, B \in V$. Show that L is regular if and only if $L = L(G)$ for some regular grammar G.
   (Hint: Associate a state of an NFA for L with each variable of G.)
   Make sure you argue both directions.

7. (Bonus) Sipser's text, page 122, Problem 2.24.