COS487 Theory of Computation **Fall 2006**

Assignment #5

Due: Thursday October 26 *Sean Hallgren*

1. Show that a language is decidable iff some enumerator enumerates the language in lexicographic order.

2. Let $INFINITE_{PDA} = \{\langle M\rangle \mid M \text{ is a PDA and } L(M) \text{ is an infinite language}\}$. Show that $INFINITE_{PDA}$ is decidable.

3. Let $A = \{\langle R\rangle \mid R$ is a regular expression describing a language containing at least one string w that has 111 as a substring (i.e., $w = x111y$ for some x and y)$\}$. Show that A is decidable.

4. Let $S = \{\langle M\rangle \mid M$ is a DFA that accepts w^R whenever it accepts $w\}$. Show that S is decidable.

5. A useless state in a pushdown automaton is never entered on any input string. Consider the problem of determining whether a pushdown automaton has any useless states. Formulate this problem as a language and show that it is decidable.

6. (Optional) Let $E = \{\langle M\rangle \mid M$ is a DFA that accepts some string with more 1s than 0s$\}$. Show that E is decidable. (Hint: Theorems about CFLs are helpful here.)