Homework 6

Due Wednesday, 3/6/2019

The purpose of this homework assignment is to help you deepen your understanding of context free languages and push-down automata.

Like last week I want you to turn in a file Hmwk6.pdf with all the answers to the homework to GradeScope.

Problems from the texts are given in the form c.n where c is the chapter and n is the problem number. Thus problem 2.7 is problem 7 from Chapter 2.

1. (0 points) **Academic Honesty Statement**

2. (10 points) **PDA Variants**

   Let $M = (K, \Sigma, \Gamma, \Delta, s, A)$ be a pda. The language accepted by M by final state is defined as follows:

   $$L_f(M) = \{w \in \Sigma^* | (s, w, \epsilon) \vdash_M^* (f, \epsilon, \alpha) \text{ for some } f \in A, \alpha \in \Gamma^*\}$$

   This differs from the definition in Rich by allowing acceptance even when the stack is non-empty.

   Note that to show two languages L_1 and L_2 are the same (e.g., as in the two parts below), it is generally simplest to show that $L_1 \subseteq L_2$ *and* the reverse. You will need to do this in each of the cases below to show the languages are the same!

   (a) For every pda M, show there is a pda M' s.t. $L(M') = L_f(M)$. Notice that one uses the subscript f and the other does not.

   Hint: Let M' be a variant of M that allows the possibility of emptying its stack whenever M enters a final state.

   (b) *This is for 10 points extra credit. It is not required!* For every pda M, show there is a pda M' s.t. $L_f(M') = L(M)$.

   Hint: Let M' begin by putting a special marker on top of the stack that will allow a check to see if the stack is otherwise empty.

3. (5 points) **Non-context-free Languages**

   Rich 13.1.i. *Hint: You will need to look at cases. See the examples in the book.*

4. (10 points) **Closure**

   Rich 13.13.ef.

5. (15 points) **Closure**

   Rich 13.22bcd. *Be careful, these are tricky!*