Homework 5
CS 770: Formal Language Theory

Assigned: March 11, 2016 Due on: March 24, 2016

Instructions: This homework has 2 required problems and 1 extra credits problem that can be solved individualy. Please follow the homework guidelines given on the class website. Solutions not following these guidelines will not be graded.

Recommended Reading: Lectures 13 and 14 (Context Free Grammars and Pushdown Automata).

Problem 1. [Category: Design+Proof] Let L be the language consisting all strings over $\{a, b\}$ that have as many as as bs. For example, $abab \in L$ and $\epsilon \in L$ but $a \notin L$.

1. Design a context-free grammar for L. **[5 points]**
2. Prove that your grammar is correct. **[5 points]**
3. Design a PDA to recognize L. You need not prove that your construction is correct, but you should clearly explain the intuition behind your construction. **[5 points]**

Problem 2. [Category: Design+proof] Give a context-free grammar that generates the language $A = \{a^i b^j c^k | i = j \text{ or } j = k \text{ where } i, j, k \geq 0\}$. Is your grammar ambiguous? Why or Why not? **[10 points]**

Extra Credits

Problem 3. [Category: Design] Design a PDA to recognize the language $C = \{x\#y \,|\, x, y \in \{0,1\}^* \text{ and } x \neq y\}$; thus, $C \subseteq \{0, 1, \#\}^*$. You need not prove that your construction is correct, but you should clearly explain the intuition behind your construction. **[10 points]**