Homework 6
CIS 770: Formal Language Theory

Assigned: March 31, 2016   Due on: April 7th, 2016

Instructions: This homework has 3 problems that can be solved individually. Please follow the homework guidelines given on the class website. Solutions not following these guidelines will not be graded.

Recommended Reading: Lectures 13, 14 and 15 Context Free Grammar, PDA and Pumping Lemma.

Problem 1. [Category: Design] If A and B are languages, define $A \diamond B = \{xy \,|\, x \in A,\ y \in B$ and $|x| = |y|\}$. Show that if A and B are regular languages, then $A \diamond B$ is context free. If you construct a CFG or PDA for $A \diamond B$, you need not prove that your construction is correct, but your intuitions behind the construction should be clearly spelt out. **[10 points]**

Problem 2. [Category: Proof] Let B be the language of all palindromes over $\{0,1\}$ containing an equal number of 0s and 1s. Prove that B is not context-free. **[10 points]**

Problem 3. [Category: Proof] Let $A = \{wtw^R \,|\, w, t \in \{0,1\}^*$ and $|w| = |t|\}$. Prove that A is not context-free. **[10 points]**