Homework 6
CS611: Theory of Computation

Instructions: This homework has required problems that can be solved individualy and also optional problems. You don't need to submit for the optional problems. Please follow the homework guidelines given on the class website. Solutions not following these guidelines will not be graded.

Recommended Reading: Lectures 11 - 13 (Pushdown Automata and pumping lemma).

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 PDA to recognize L. You need not prove that your construction is correct, but you should clearly explain the intuition behind your construction. **[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 $A = \{wtw^R \mid w, t \in \{0, 1\}^* \text{ and } |w| = |t|\}$. Prove that A is not context-free. **[10 points]**

Problem 4. [Category: OPTIONAL: Design] Design a PDA to recognize the language $C = \{x\#y \mid x, y \in \{0, 1\}^* \text{ and } x \neq y\}$; thus, $C \subseteq \{0, 1, \#\}^*$. You need not prove that your construction is correct, but you should clearly explain the intuition behind your construction. **[15 points]**