Problem Set 5 – Due Tuesday, May 4, 2010, at 4:15 pm

Problem 1. Formally specify both **(a)** a CFG and **(b)** a PDA for the language

$$L = \{x \in \{a, b, c\}^* : x \text{ contains an equal number of two different characters}\}.$$

Make your CFG and PDA as simple as possible. (If they're not obviously correct to the TA, it's defined as wrong.)

Problem 2.

a. Prove that $L_a = \{a^i b^j c^k : j = \max\{i, k\}\}$ is not context free.

b. Prove that $L_b = \{b_i \# b_{i+1} : b_i \text{ is } i \text{ in binary}, i \geq 1\}$ is not context free.

Problem 3. Are the following languages context free? Prove your answers either way.

a. $L = \{ww^R : w \in \{a, b\}^*\}$

b. $L = \{ww^R w : w \in \{a, b\}^*\}$