Automata Theory - Quiz II

K. Subramani
LCSEE,
West Virginia University,
Morgantown, WV
{ksmani@csee.wvu.edu}

1 Instructions

1. Attempt as many problems as you can. You will be given partial credit.

2 Problems

1. Let $L_1$ and $L_2$ be 2 regular languages, over the same alphabet $\Sigma$ and let them be respectively represented by DFAs $A_1$ and $A_2$. Discuss a strategy by which you could check whether there is a string in $\Sigma^*$, that is neither in $L_1$ nor in $L_2$. (3 points)

2. Consider the grammar $G = (\{S\}, \{a, b\}, P, S)$, where $P$ is defined as the following set of rules:

   
   \[
   S \rightarrow aSbS \mid bSaS \mid \epsilon
   \]

   Argue using mathematical induction, that $L(G)$ is the set of all strings with an equal number of $a$'s and $b$'s. (4 points)

3. Write a CFG for the following language: $L = \{a^ib^j \mid i, j \geq 1, j = i + 1\}$. (3 points)