Automata Theory - Quiz II

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

1 Instructions

1. The quiz should be returned by $9:15\ am$ on 11/9/04.
2. Each question is worth 2 points.
3. Attempt as many problems as you can. You will be given partial credit, as per the policy discussed in class.

2 Problems

1. Let L be a language over $\Sigma = \{0,1\}$ defined as follows: $L = \{w \mid w \in \Sigma^*$ and w ends in 01 or 10 or 00 or $11\ \}$.
   Is L regular?
2. Let L be a regular language over an alphabet Σ. Let L_1 and L_2 denote two languages over the same alphabet, such that $L = L_1 \cup L_2$. Should each of L_1 and L_2 also be regular?
3. Let L be a regular language over an alphabet Σ. Assume that you are given the DFA D of L. How would you *efficiently* check that $L = \Sigma^*$?
4. Write a Context-Free Grammar for the language L defined as follows:
   $L = \{w \mid w \in \{0,1\}^*$ and w contains two consecutive 0's. $\}$
5. Consider the CFG defined by:

$$\begin{aligned} S &\rightarrow aS \\ S &\rightarrow Sb \\ S &\rightarrow a \\ S &\rightarrow b \end{aligned}$$

   Argue that no string derived from S can have ba as a substring.
   Hint: Use induction on the length of the strings derived from S.