

# Automata Theory - Quiz II

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## 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:  $L = \{a^i b^j \mid i, j \geq 1, j = i + 1\}$ . (3 points)