Automata Theory 2014.12.14

Homework 4

Due: 2014.12.17 in class

Problem 1 Let R be a regular set. Prove that the set obtained from R by replacing every copy of the substring 001 in each string in R by the symbol 0 is also regular. Note that after replacement of the substring 001 by 0 you may have introduced new copies of 001 but that is okay.

Problem 2 Define substitution $s(a) = R_a$, $s(b) = R_b$ where each copy of a symbol in a string is replaced by a regular set. Prove that regular sets are closed under substitution of regular sets Hint: Think about a simple proof. Then the problem will be easy.

Problem 3 Prove that the following sets are not regular.

1. $\{a^i b^j c^k | either\ i = j\ or\ i = k\ or\ j = k\}$
2. $\{(0+1)^n 1^n | n \geq 1\}$
3. $\{0^i 1^j | i\ and\ j\ are\ relatively\ prime\}$