

CS581 Theory of Computation: Homework #5

Due on March 2 2016 at 2:00pm

Harry H. Porter Winter 2016

Konstantin Macarenco

Problem 5.3

Find a match in the following instance of the Post Correspondence Problem.

$$\left\{ \left[\frac{ab}{abab} \right], \left[\frac{b}{a} \right], \left[\frac{aba}{b} \right], \left[\frac{aa}{a} \right] \right\}$$

Solution

$$\frac{ab}{abab}, \frac{ab}{abab}, \frac{aba}{b}, \frac{b}{a}, \frac{b}{a}, \frac{aa}{a}, \frac{aa}{a}$$

Problem 5.4

If $A \leq_m B$ and B is a regular language, does that imply that A is a regular language? Why or why not?

Solution

No it doesn't imply that A is regular, for example: $\{a^n b^n \mid n \geq 0\}$ can be reduced to $\{a^n\} \mid n \geq 0$, by following procedure: Check if input $\in a^n, b^n$, output a^n if it is, and b if it is not.

Description of the TM from problems 1 and 2.

1. $Q = \{A, B, C, D\}$
2. $\Sigma = \{0, 1\}$
3. $\Gamma = \{0, 1, \}$
4. $\delta =$
 1. $\delta(A, 0) = (B, 1, R)$
 2. $\delta(A, 1) = (A, 1, R)$
 3. $\delta(A,) = (C, L)$
 4. $\delta(B, 0) = (D, 0, L)$
 5. $\delta(B, 1) = (A, 0, R)$
 6. $\delta(B,) = (D, L)$
5. $q_0 = A$
6. $q_{accept} = C$
7. $q_{reject} = D$

Problem 1

Convert this into an instance of the PCP.

Problem 2

Show that the string "01" is in the language recognized by this TM by showing a solution to your instance of the PCP.