CS 3530: Assignment 3b

Fall 2014

Exercises

Exercise 2.9 (10 points)

Problem

Give a context-free grammar that generates the language

$$A = \{a^i b^j c^k : i = j \text{ or } j = k \text{ where } i, j, k \geq 0\}.$$

For all CFGs, describe the role that each rule performs as well as giving the actual rule.

Solution

S -> ε | T | U	We will need to first choose if i=j or j=k
T -> ε | TaTbT | TbTaT | TcT	This will allow any combination of i=j with any number of k
U -> ε | UbUcU | UcUbU | UaU	This will allow any combination of j=k with any number of i

Problems

Problem 1.47 (10 points)

Problem

Let $\Sigma = \{1, \#\}$ and let

$$Y = \{w : w = x_1 \# x_2 \# \cdots \# x_k \text{ for } k \geq 0, \text{ each } x_i \in 1^*, \text{ and } x_i \neq x_j \text{ for } i \neq j\}$$

Prove that Y is not regular.

Solution

Assume Y is regular
string s=$1^p\#1^p$
split s into s=xyz where:
1. $xy^iz \in Y$(for each i>=0)
2. |y| > 0
3. |xy| <= p

Any value of p would result in the same number of ones on both sides of the # any other format of string s could result in two different amounts of 1's but that would result in future $x \in Y$ to have the same number of 1's