CMPE 350 - Spring 2019

PS 7 - 01.04.19

2.18 a) Let C be a context-free language and R be a regular language. Prove that the language $C \cap R$ is context-free.

b) Use part a) to show that the language $A = \{w | w \in \{a, b, c\}^*$ and contains equal number of a's, b's and c's$\}$ is not a CFL.

2.30 Use the pumping lemma to show that the following languages are not context-free.

a) $\{0^n 1^n 0^n 1^n | n \geq 0\}$

d) $\{t_1 \# t_2 \# \dots \# t_k | k \geq 2,$ each $t_i \in \{a, b\}^*,$ and $t_i = t_j$ for some $i \neq j\}$

2.31 Let B be the language of all palindromes over $0, 1$ containing an equal number of 0's and 1's. Show that B is not context-free.

2.47 Let $\Sigma = \{0, 1\}$ and let B be the collection of strings that contain at least one 1 in their second half. In other words, $B = \{uv | u \in \Sigma^*, v \in \Sigma^* 1 \Sigma^*$ and $|u| \geq |v|\}$.

a) Give a PDA that recognizes B.

b) Give a CFG that generates B.

• Assume that we modify the PDA model so that the stack now has only a finite capacity. Can this new type of machine recognize any infinite context-free language? Is the set of languages recognized by this new type of machine equal to the set of regular languages?