

CSE625 Homework 7
Due Monday, March 9

1. Construct a pushdown automaton which accepts the language generated by the context-free grammar over the alphabet set $\{a, b\}$ where the production rules P are:

$$\begin{aligned} S &\rightarrow aUb \\ U &\rightarrow \Lambda \\ U &\rightarrow WW \\ W &\rightarrow VaS \\ W &\rightarrow a \\ V &\rightarrow bb \\ V &\rightarrow Wb \end{aligned}$$

2. Use the pumping lemma to show that the following languages are not CFL:

- (a) $\{ a^i b^j c^k : i < j < k \}$.
- (b) $\{ w \in \{a, b\}^* : n_a(x) = n_b(x)^2 \}$.
- (c) $\{ a^n b^{3n} c^n : n \geq 0 \}$.
- (d) $\{ a^i b^j a^i b^{i+j} : i, j \geq 0 \}$.
- (e) $\{ w \in \{a, b, c\}^* : n_a(x) = \max\{n_b(x), n_c(x)\} \}$.