

Exercise 8 – Pushdown Automata (PDAs)

Consider the following context-free grammar (CFG) G:

$$\begin{aligned} S &\rightarrow AX \\ A &\rightarrow aAa \mid bAb \mid \varepsilon \\ X &\rightarrow aX \mid Xc \mid \varepsilon \end{aligned}$$

- (a) Describe in plain text the language accepted by the grammar;
- (b) Convert G into a PDA accepting by empty stack. Is the PDA deterministic or non-deterministic? Justify your answer;
- (c) Represent the PDA using the formal definition consisting of the 6-tuple $(Q, \Sigma, \Gamma, \delta, q_0, Z_0)$;
- (d) Write the PDA accepting by empty stack computation steps (using instantaneous descriptors (IDs)) that accept the input string: abbaaac.
- (e) Draw a PDA accepting by final state for G and represent the PDA using the formal definition consisting of the 7-tuple $(Q, \Sigma, \Gamma, \delta, q_0, Z_0, F)$;