

# Theory of Computer Science

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## Exercise meeting 5

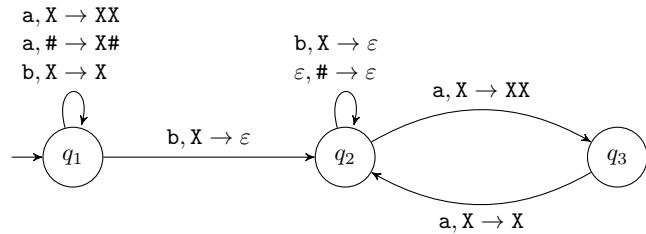
### Exercise 5.1

Specify a grammar  $G'$  in Chomsky normal form that generates the same language as the context-free grammar  $G = (\Sigma, V, P, S)$  with  $\Sigma = \{a, b\}$ ,  $V = \{S, X, Y, Z\}$  and the following rules in  $P$ :

$$\begin{array}{lllll} S \rightarrow \varepsilon & S \rightarrow XZ & S \rightarrow Y & X \rightarrow Z & X \rightarrow aYa \\ Y \rightarrow bb & Y \rightarrow bY & Z \rightarrow X & Z \rightarrow bZ & \end{array}$$

### Exercise 5.2

(a) Consider the PDA  $M = \langle \{q_1, q_2, q_3\}, \{a, b\}, \{X, \#\}, \delta, q_1, \#\rangle$  with the following transition function  $\delta$ :



Prove that  $M$  accepts the word **aababbaabb** by specifying a sequence of configurations as defined in chapter C5.

(b) Specify a PDA that accepts the language  $L = \{(ab)^n c a^n c \mid n \geq 0\}$  over  $\Sigma = \{a, b, c\}$ .