Lecture 12 : Pushdown automata

Tuesday, February 23, 2021 10:59 AM

Finite state + unbounded stack

Pushdown automata:

Q : (finite) set of states

Σ : input alphabet $\quad \Sigma_\varepsilon = \Sigma \cup \{\varepsilon\}$

Γ : stack alphabet $\quad \Gamma_\varepsilon = \Gamma \cup \{\varepsilon\}$

usually $\Sigma \subseteq \Gamma$ but Γ may have additional symbols.

$\delta : Q \times \Sigma_\varepsilon \times \Gamma_\varepsilon \longrightarrow \mathcal{P}_f(Q \times \Gamma_\varepsilon)$

$\mathcal{P}_f$: finite powerset

$q_0 \in Q$ start state

$F \subseteq Q$ accept states

To describe transitions

$$a, b \longrightarrow c$$

$a \in \Sigma_\varepsilon, b, c \in \Gamma_\varepsilon$

The PDA sees 'a' in the input

sees 'b' on top of the stack

[illegible] pops the stack & pushes c

Now it pops the stack symbol c onto the stack

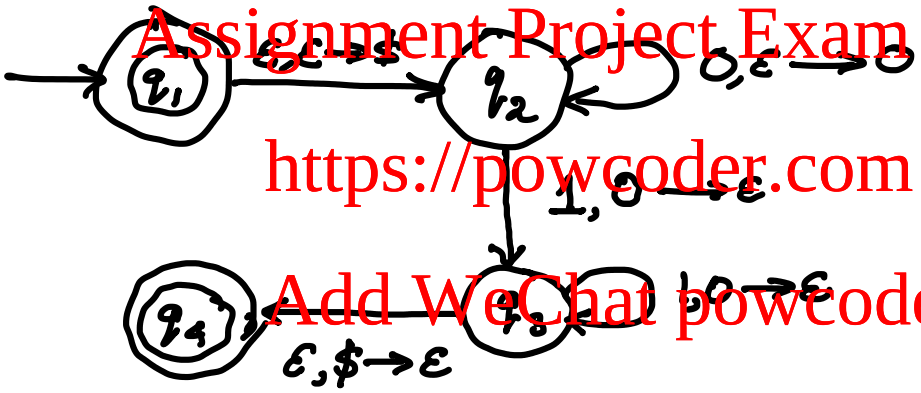
a may be ε : doesn't look at input

b may be ε : just push c on the stack don't pop it

c may be ε : just pop the stack

PDA for $\{0^n 1^n \mid n \geq 0\}$ $\Sigma = \{0, 1\}$

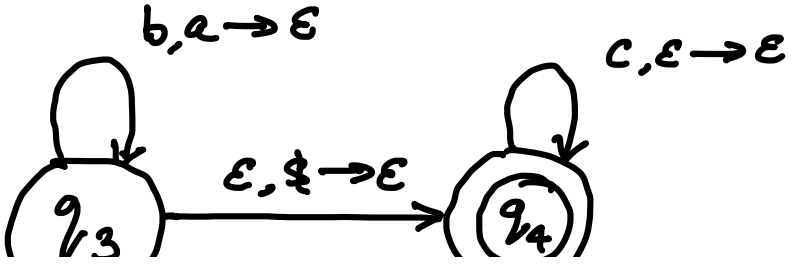
$\Gamma = \{0, 1, \$\}$

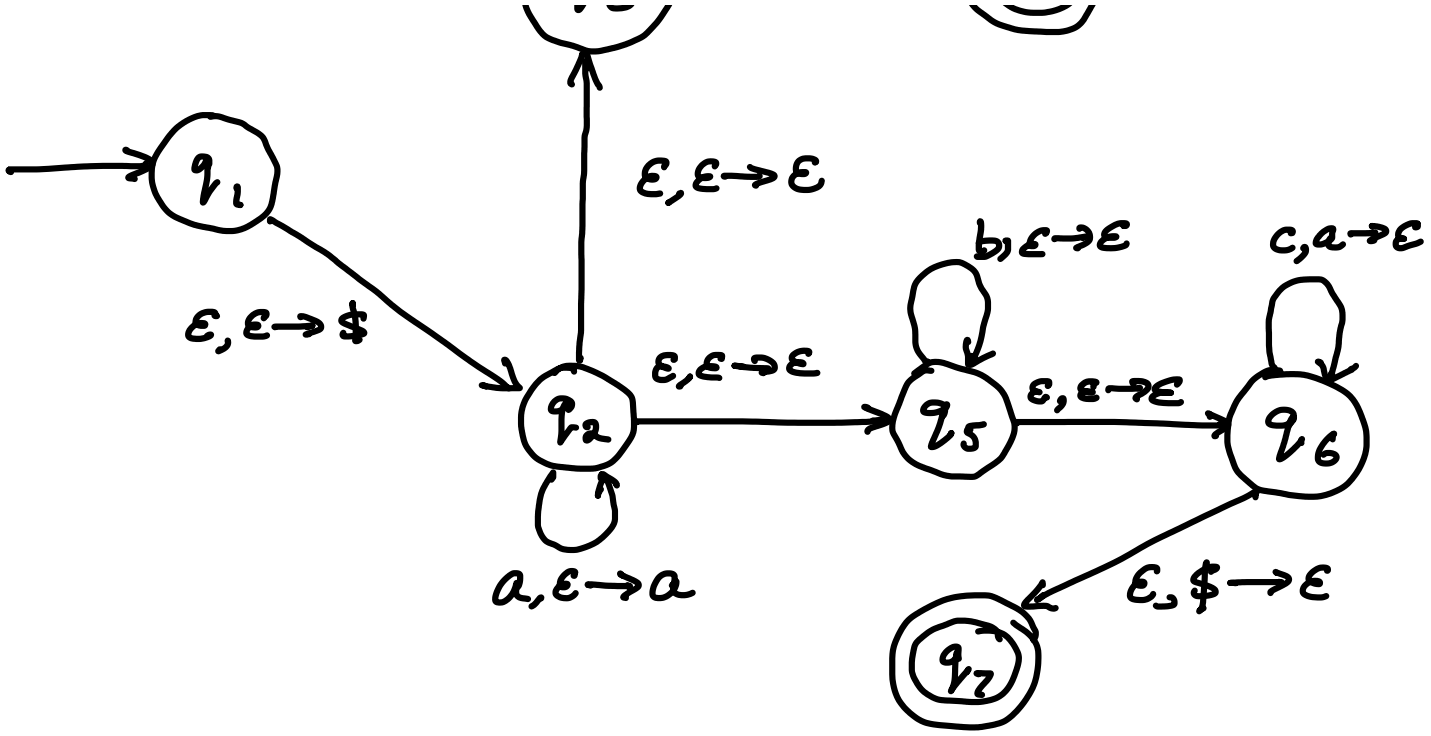


If no transition is indicated and there is still input; jam and reject.

$\Sigma = \{a, b, c\}$ $\Gamma = \{a, b, c, \$\}$

$L = \{a^i b^j c^k \mid i, j, k \geq 0;\ i = j \text{ OR } i = k\}$





SOME IMPORTANT REMARKS:

(i) Acceptance decisions only happen at the end of the input.

(ii) A PDA cannot decide to jam and reject when e