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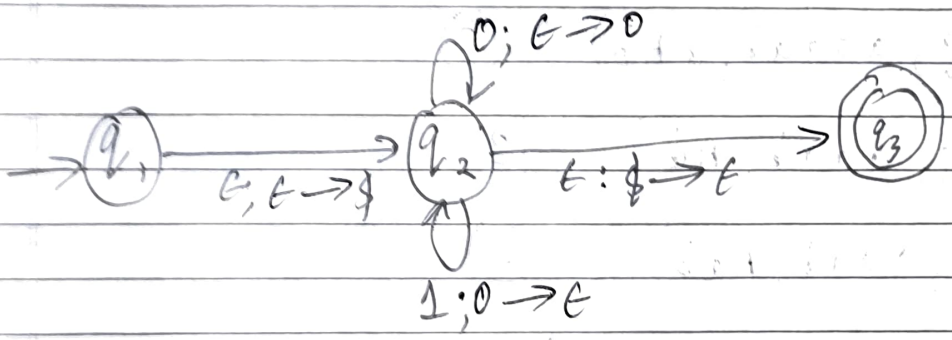
TOC Tut-7

(Q.1) Convert to equivalent PDA

$S \rightarrow aAb \mid b$
$A \rightarrow Aa \mid \epsilon$ $\quad \epsilon \Rightarrow$ Epsilon.

(Q.2) Convert the given PDA to Equivalent CFG.



(Ans1)

$S \rightarrow aAb \mid b$
$A \rightarrow Aa \mid \epsilon$

Test a^4b
a a a a b

Equivalent PDA for given grammar

$\delta(q, \epsilon, S) = (q, aAb), (q, b)$ ——— (1)

$\delta(q, \epsilon, A) = (q, Aa), (q, \epsilon)$ ——— (2)

For non-terminals

$(q, a, a) = (q, \epsilon)$ ——— (3)

$(q, b, b) = (q, \epsilon)$ ——— (4)

Rule 1: For each variables A

$\delta(q, \epsilon, A) = (q, B)$ where $A \rightarrow B$ is a production grammar

Rule 2: For each terminal 'a'

$$\delta(q, a, a) = (q, \epsilon)$$

Testing for String a^4b

$\delta(q, aaaab, S)$ ⇒ Using Transition 1

$\delta(q, aaaab, aAb)$ (3)

$\delta(q, aaab, Aab)$ (2)

$\delta(q, aaab, Aaab)$ (2)

$\delta(q, aaab, Aaaab)$ (2)

$\delta(q, aaab, aaab)$ (2) → $A \to \epsilon$.

$\delta(q, aab, aab)$ (3)

$\delta(q, ab, ab)$ (3)

$\delta(q, b, b)$ ⇒ (3)

$\delta(q, \epsilon, \epsilon)$ (4)

String is matching

(Ans 2) PDA to CFG

$P = (\{q_1, q_2, q_3\}, \{0, 1\}, \{0, \$\}, \delta, q_1, \$)$

Transitions

(1) $\$\$$

(1) $\delta(q_1, \epsilon, \epsilon) = (q_2, \$)$

(2) $\delta(q_2, 0, \epsilon) = (q_2, 0\$)$

(3) $\delta(q_2, 1, 0) = \delta(q_2, 0)$

(4) $\delta(q_2, \epsilon, \$) = (q_3, \$)$.

$S \rightarrow [q_1, \$, q_1]$

$S \rightarrow [q_1, \$, q_2]$

$S \rightarrow [q_1, \$, q_3]$

(1) $\delta(q_1, \epsilon, \epsilon) = (q_2, \$)$

$[q_1, \epsilon, q_1] \rightarrow \epsilon [q_2, \$, q_1]$

$[q_1, \epsilon, q_2] \rightarrow \epsilon [q_2, \$, q_2]$

$[q_1, \epsilon, q_3] \rightarrow \epsilon [q_2, \$, q_3]$.

② $\delta(q_2, 0, \epsilon) = (q_2, 0\$)$

$[q_2, \epsilon, q_1] \to 0\,[q_2, 0, q_1]\,[q_1, \$, q_1]$

$[q_2, \epsilon, q_1] \to 0\,[q_2, 0, q_2]\,[q_2, \$, q_1]$

$[q_2, \epsilon, q_1] \to 0\,[q_2, 0, q_3]\,[q_3, \$, q_3]$

$[q_2, \epsilon, q_2] \to 0\,[q_2, 0, q_1]\,[q_1, \$, q_2]$

$[q_2, \epsilon, q_2] \to 0\,[q_2, 0, q_2]\,[q_2, \$, q_2]$

$[q_2, \epsilon, q_2] \to 0\,[q_2, 0, q_3]\,[q_3, \$, q_2]$

$[q_2, \epsilon, q_3] \to 0\,[q_2, 0, q_1]\,[q_1, \$, q_3]$

$[q_2, \epsilon, q_3] \to 0\,[q_2, 0, q_2]\,[q_2, \$, q_3]$

$[q_2, \epsilon, q_3] \to 0\,[q_2, 0, q_3]\,[q_3, \$, q_3]$

③ $\delta(q_2, 1, 0) = (q_2, 0)$

$[q_2, 0, q_1] \to 1\,[q_2, 0, q_1]$

$[q_2, 0, q_2] \to 1\,[q_2, 0, q_2]$

$[q_2, 0, q_3] \to 1\,[q_2, 0, q_3]$

④ $\delta(q_2, \epsilon, \$) = (q_3, \$)$

$[q_2, \$, q_1] \rightarrow \epsilon\,[q_3, \$, q_1]$

$[q_2, \$, q_2] \rightarrow \epsilon\,[q_3, \$, q_2]$

$[q_2, \$, q_3] \rightarrow \epsilon\,[q_3, \$, q_3]$

~~CFG~~

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