PR 8 TBFO

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Exercise 6.3.1

Convert the grammar

$S \rightarrow 0S1 \mid A$

$A \rightarrow aS \mid bS \mid a$

to a PDA that accepts the same language by empty stack.

PDA = $(\{q\}, \{0,1\}, \{0,1,A,S\}, \delta, q, S)$

δ :
1) $\delta(q, \varepsilon, S) = \{(q, 0S1), (q, A)\}$
2) $\delta(q, \varepsilon, A) = \{(q, 1A0), (q, S), (q, \varepsilon)\}$
3) $\delta(q, 0, 0) = \{(q, \varepsilon)\}$
4) $\delta(q, 1, 1) = \{(q, \varepsilon)\}$

Exercise 6.3.2

convert the grammar

$S \rightarrow aAA$

$A \rightarrow aS \mid bS \mid a$

to a PDA that accepts the same language by empty stack.

PDA = $(\{q\}, \{a,b\}, \{a,b,A,S\}, \delta, q, S)$

δ :
1) $\delta(q, \varepsilon, S) = \{(q, aAA)\}$
2) $\delta(q, \varepsilon, A) = \{(q, aS), (q, bS), (q, a)\}$
3) $\delta(q, a, a) = \{(q, \varepsilon)\}$
4) $\delta(q, b, b) = \{(q, \varepsilon)\}$

Exercise 6.3.3

Convert the PDA $P = (\{p, q\}, \{0,1\}, \{X, Z_0\}, \delta, q, Z_0)$ to a CFG, if δ is given by :

1) $\delta(q, 1, Z_0) = \{(q, XZ_0)\}$

S = start string
e = empty string
t = Z_0
in $S \rightarrow [qtq] \mid [qtp]$

- $[qtq] \rightarrow 1\,[qXq]\,[qtq]$
- $[qtq] \rightarrow 1\,[qXp]\,[ptq]$
- $[qtp] \rightarrow 1\,[qXq]\,[qtp]$
- $[qtp] \rightarrow 1\,[qXp]\,[ptp]$

2) $\delta(q, 1, X) = \{(q, XX)\}$

S = start string
e = empty string
t = Z_0
in $S \rightarrow [qtq] \mid [qtp]$

- $[qXq] \rightarrow 1\,[qXq]\,[qXq]$
- $[qXq] \rightarrow 1\,[qXp]\,[pXq]$
- $[qXp] \rightarrow 1\,[qXq]\,[qXp]$
- $[qXp] \rightarrow 1\,[qXp]\,[pXp]$

3) $\delta(q, 0, x) = \{(p, x)\}$

s = start string
e = empty string
z = z_0
in $s \rightarrow [qzq][qzp]$

- $[q x q] \rightarrow 0\,[p x q]$
- $[q x p] \rightarrow 0\,[p x p]$

4) $\delta(q, \varepsilon, x) = \{(q, \varepsilon)\}$

s = start string
e = empty string
z = z_0
in $s \rightarrow [qzq] \mid [qzp]$

- $[q x q] \rightarrow \varepsilon$

5) $\delta(p, 1, x) = \{(p, \varepsilon)\}$.

s = start string
e = empty string
z = z_0
in $s \rightarrow [qzq] \mid [qzp]$

- $[p x p] \rightarrow 1$

6) $\delta(p, 0, z_0) = \{(q, z_0)\}$

s = start string
e = empty string
z = z_0
in $s \rightarrow [qzq] \mid [qzp]$

- $[pzp] \rightarrow 0\,[qzq]$
- $[pzp] \rightarrow 0\,[qzp]$