

Tutorial-7

1] Design PDA for $L = \{a^n b^n c^{m+n} \mid m, n \geq 1\}$

— Logic: For every a push 1x on stack

For every b push 1x on stack

For every c pop 1x from stack.

Instantaneous description: Let $m = n = 2$

$$S_0 = aabbbcccc$$

$$\delta(q_0, a, z_0) \rightarrow (q_0, xz_0)$$

$$\delta(q_0, a, x) \rightarrow (q_0, xx)$$

$$\delta(q_0, b, x) \rightarrow (q_0, xx)$$

$$\delta(q_0, a, x) \rightarrow (q_0, \epsilon)$$

$$\delta(q_1, c, x) \rightarrow (q_1, \epsilon)$$

$$\delta(q_1, \epsilon, z_0) \rightarrow \delta(q_1, z_0)$$

$$M = (Q, \Sigma, \Gamma, \delta, q_0, z_0, \Gamma)$$

$$Q = \{q_0, q_1, q_f\}$$

$$\Sigma = \{a, b\} \quad \Gamma = \{x\}$$

$$\Gamma = \{x, z_0\}$$

$$\text{eg. } aabbbcccc$$

$$\delta(q_0, aabbbcccc, z_0)$$

$$\delta(q_0, aabbbcccc, xxz_0)$$

$$\delta(q_0, aabbbcccc, xxxz_0)$$

$$\delta(q_0, bbbcccc, xxxz_0)$$

$$\delta(q_0, ccccc, xxxz_0)$$

$$\delta(q_1, ccc, xxxz_0)$$

$$\delta(q_1, cc, xxxz_0)$$

$$\delta(q_1, c, xxxz_0)$$

$$\delta(q_1, \epsilon, z_0)$$

$$\delta(q_f, z_0)$$

i.e. final state.

Q9] PDA for $L = \{a^m b^n c^n \mid m, n \geq 1\}$

Logic : For every a push x on stack
 For every b pop x from stack
 For every c don't do anything.
 no of a = no of b

Instantaneous Description:

$\delta(q_0, a, z_0) \rightarrow (q_0, xz_0)$
 $\delta(q_0, a, x) \rightarrow (q_0, xx, z_0)$
 $\delta(q_0, b, x) \rightarrow (q_1, \epsilon)$
 $\delta(q_1, b, x) \rightarrow (q_1, \epsilon)$
 $\delta(q_1, c, z_0) \rightarrow (q_f, z_0)$
 $\delta(q_1, c, z_0) \rightarrow (q_f, z_0)$

$M = (Q, \Sigma, \Gamma, \delta, q_0, z_0, \Gamma)$

$Q = \{q_0, q_1, q_f\}$

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

$\Gamma = \{x\}$

$\Gamma = \{x, z_0\}$

Let $m = 2, n = 1$

$aabbc$

$\delta(q_0, aabbc, z_0)$

$\delta(q_0, abbc, xxz_0)$

$\delta(q_0, bbc, xxxz_0)$

$\delta(q_0, bc, xxxz_0)$

$\delta(q_1, c, xxxz_0)$

$\delta(q_f, c, xxxz_0)$

i.e. final state.

$$\text{eg } L = \{a^n b^{2n+1} \mid n \geq 1\}$$

Logic: For every 'a' push 2x onto stack

For every 'b' 1st 'b' perform bypass operation

After that perform pop for each 'b'.

Instantaneous Description: Let $n=2$, $aabbhhbb$

$$\delta(q_0, a, z_0) \rightarrow (q_0, xx, z_0)$$

$$\delta(q_0, a, x) \rightarrow (q_0, xxx, z_0)$$

$$\delta(q_0, b, x) \rightarrow (q_1, x)$$

$$\delta(q_1, b, x) \rightarrow (q_1, \epsilon)$$

$$\delta(q_1, \epsilon, z_0) \rightarrow (q_f, z_0)$$

$$M = (Q, \Sigma, F, \delta, q_0, z_0, \Gamma)$$

eg. $aabbhhbb$

$$\delta(q_0, aabbhhbb)$$

$$\delta(q_0, abhhbb, xxz_0)$$

$$\delta(q_0, bhhbb, xxxz_0)$$

$$\delta(q_0, hhhbb, xxxz_0)$$

$$\delta(q_0, hh, xxxz_0)$$

$$\delta(q_0, h, xxz_0)$$

$$\delta(q_0, \epsilon, z_0)$$

$$\delta(q_f, z_0) \text{ is final state.}$$