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AT TUTORIAL NO: 7

Q.1] Design a ~~DFA~~ PDA for recognizing the $L = \{a^m b^n c^{m+n} \mid m, n \geq 1\}$

Ans: Logic : For every a push 1 x on stack
For every b push 1 x on stack
For every c pop 1x from stack

Instantaneous Description: m = n = 2 (aabbcccc)

$\delta(q_0, a, Z_0) \longrightarrow (q_0, XZ_0)$
$\delta(q_0, a, X) \longrightarrow (q_0, XX)$
$\delta(q_0, b, X) \longrightarrow (q_0, XX)$
$\delta(q_0, b, X) \longrightarrow (q_1, \epsilon)$
$\delta(q_1, c, X) \longrightarrow (q_1, \epsilon)$
$\delta(q_1, \epsilon, Z_0) \longrightarrow (q_f, Z_0)$

$M = (Q, \Sigma, F, \delta, q_0, Z_0, \Gamma)$

$Q = \{q_0, q_1, q_f\}$
$\Sigma = \{a, b\}$
$F = \{q_f\}$
$\Gamma = \{X, Z_0\}$

eg: aabbcccc
$\delta(q_0, aabbcccc, Z_0)$
$\delta(q_0, abbcccc, XZ_0)$
$\delta(q_0, bbcccc, XXZ_0)$
$\delta(q_0, bcccc, XXXZ_0)$
$\delta(q_0, cccc, XXXXZ_0)$
$\delta(q_1, ccc, XXXZ_0)$
$\delta(q_1, cc, XXZ_0)$
$\delta(q_1, c, XZ_0)$
$\delta(q_1, \epsilon, Z_0)$
$\delta(q_f, Z_0)$
i.e final state.

Q.2] Design a PDA for accepting $L = \{a^m b^m c^n \mid m, n \geq 1\}$

Ans: Logic : for every a push 1x on stack
for every b pop 1x from stack
for every c don't do anything
no. of a = = no. of b.

Instantaneous Description:

$\delta(q_0, a, Z_0) \longrightarrow (q_0, X Z_0)$

$\delta(q_0, a, a) \longrightarrow (q_0, XX, Z_0)$

$\delta(q_0, b, a) \longrightarrow (q_1, \epsilon)$

$\delta(q_1, b, a) \longrightarrow (q_1, \epsilon)$

$\delta(q_1, c, Z_0) \longrightarrow (q_f, Z_0)$

$\delta(q_1, c, Z_0) \longrightarrow (q_f, Z_0)$

$M = (Q, \Sigma, F, \delta, q_0, Z_0, \Gamma)$

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

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

$F = \{q_f\}$

$\Gamma = \{X, Z_0\}$

let $m = 2, n = 1$ aabbc

$\delta(q_0, aabbc, Z_0)$

$\delta(q_0, abbc, X Z_0)$

$\delta(q_0, bbc, X X Z_0)$

$\delta(q_1, bc, X Z_0)$

$\delta(q_1, c, Z_0)$

$\delta(q_f, \epsilon, Z_0)$

i.e final state.

Q3] Design PDA for recognizing $L = \{a^n b^{2n+1} \mid n \geq 1\}$

Ans: Logic: For every 'a' push 2X into stack
For 1st 'b' perform bypass operation
After that perform pop for each 'b'

Instantaneous Description: Let n = 2 (aabbbbb)

$\delta(q_0, a, Z_0) \longrightarrow (q_0, XXZ_0)$
$\delta(q_0, a, X) \longrightarrow (q_0, XXXXZ_0)$
$\delta(q_0, b, X) \longrightarrow (q_1, X)$
$\delta(q_1, b, X) \longrightarrow (q_1, \varepsilon)$
$\delta(q_1, \varepsilon, Z_0) \longrightarrow (q_f, Z_0)$

$M = (Q, \Sigma, F, \delta, q_0, Z_0, \Gamma)$

eg: ~~aabb~~ aabbbbbb

$\delta(q_0, aabbbbbb)$
$\delta(q_0, abbbbb, XXZ_0)$
$\delta(q_0, bbbbb, XXXXZ_0)$
$\delta(q_0, bbbb, XXXXZ_0)$
$\delta(q_0, bbb, XXXZ_0)$
$\delta(q_0, bb, XXZ_0)$
$\delta(q_0, b, XZ_0)$
$\delta(q_0, \varepsilon, Z_0)$
$\delta(q_f, Z_0)$

i.e final state.