

# Theory of Computation

## Exercise 11\_12: (Pushdown Automata & Properties of CFL)

1. Find the language of NPDA M.

$M = (\{q_0, q_1, q_f\}, \{0, 1\}, \{0, 1, \$\}, \delta, q_0, \$, \{q_f\})$

$\delta: \delta(q_0, 0, \$) = \{ (q_1, 0), (q_f, \lambda) \},$

$\delta(q_1, 1, 1) = \{ (q_1, 1) \},$

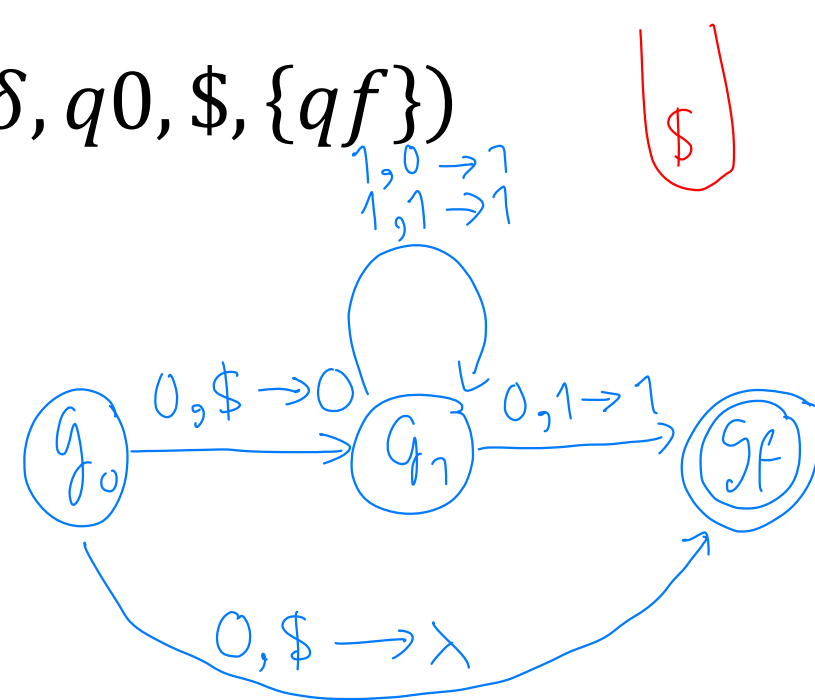
$\delta(q_1, 1, 0) = \{ (q_1, 1) \},$

$\delta(q_1, 0, 1) = \{ (q_f, 1) \}$



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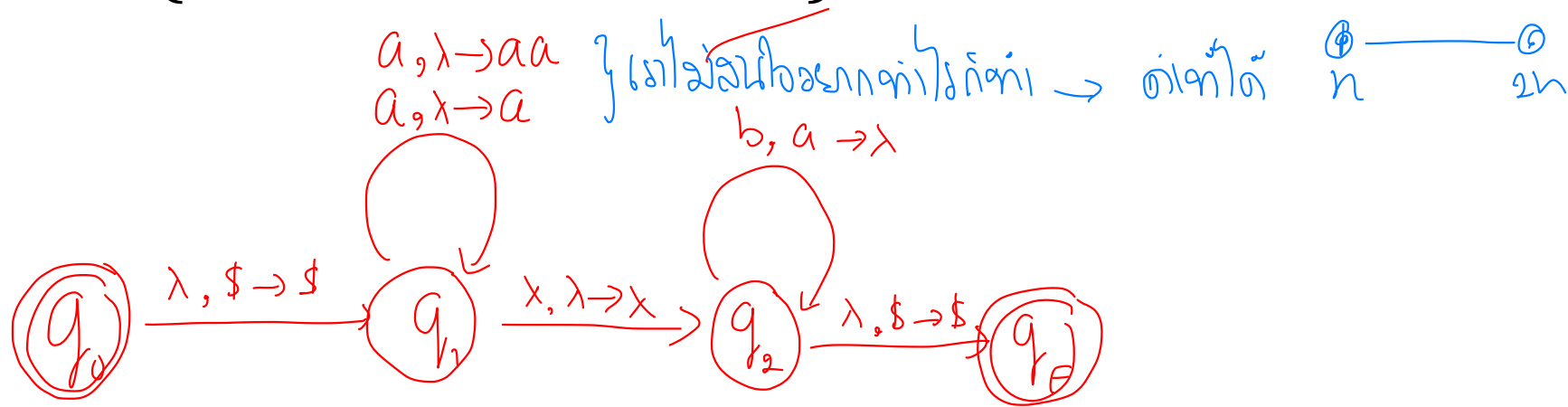
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$L = \{011^n0 : n \geq 0\}$

2. Find PDA for the language L2.

$$L2 = \{a^n b^m : n \leq m \leq 2n\}$$



\*3. Prove that the language  $L$  is CFL by using properties of CFL (DO NOT draw PDA or CFG).

(Submit 9)

$$L_3 = \{0^i 1^j 2^k : j = i + k\}$$

$$\begin{aligned} L_1 &= 0^i 1^i \\ L_2 &= 1^k 2^k \end{aligned} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{are 2 context free}$$

↓  
CFL are closed under concatenation

↓  
∴  $L_1 \cdot L_2 = L_3$  Thus CFL = CFL