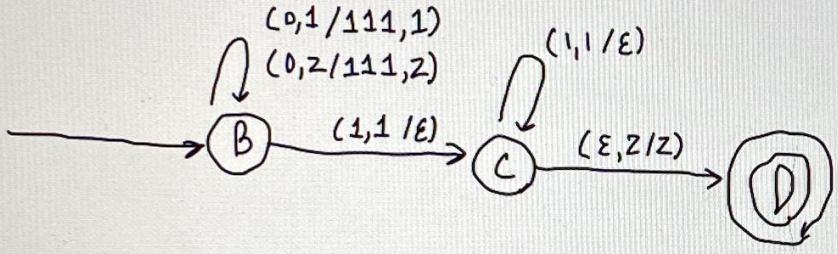
Cpts 317 - Homework #8

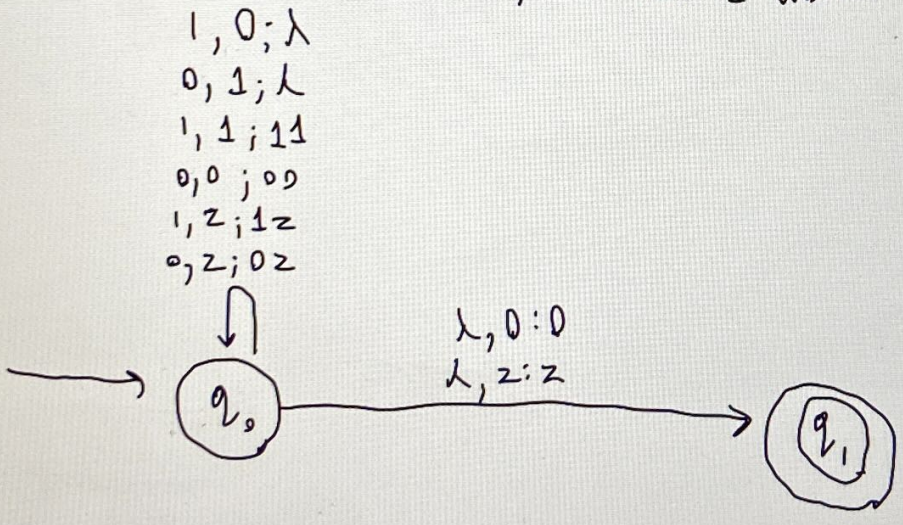
1. Construct a DPDA (yes, deterministic DPA) to accept language $\{0^n 1^{3n} : n \geq 1\}$. You need write down the explicit construction.

* DPDA for $0^n 1^{3n}$ where $n >= 1$



2. Construct a PDA to accept language $\{w \in \{0,1\}^* : \#_0(w) \geq \#_1(w)\}$

(It is fine you describe how your machine works in English.)



3. Construct a PDA to accept language $L = \{w \in \{0,1\}^* :$ each prefix of w is in the language defined in problem 2.$\}$ You need also write down the explicit construction. (This is actually an easy Problem. First, you have to understand the language. For instance $0001100111001 \in L$, but $00111 \notin L$. Why? Since $w \in L$ requires that each prefix of w contains more or the same number of 0's than 1's.)

* $(q0, a, z)(q_0, az)(q_0, a, a)(q0, aa)(q0, b, z)(q_0, bz)(q_0, b, b)$

$(q_0, bb)(q_0, a, b)(q_0, ab)(q_0, b, a)(q_0, ba)(q_0, c, a)(q_1, a)(q_0, c, b)$

$(q_1, b)(q_1, a, a)(q_1, \epsilon)(q_1, b, b)(q_1, \epsilon)(q_1, \epsilon, z)(q_f, z)$

Where, q_0 = initial state

q_f = final state

ϵ = indicates pop operation

4. Let L be a language accepted by a pDA M. Define prefix(L) = $\{x$: there exists y such that $xy \in L\}$. Describe a construction of a PDA M' accepting prefix(L). (You only need to describe in english how M' works)

* prefix(L) = $\{x$: there exists y such that $xy \in L\}$

1. If M is in state q and sees input x, then M' moves to state q'
2. If M is in state q and sees input y, then M' moves to state q'' and outputs x
3. If M is in state q' and sees input y, then M' moves to state q'' and outputs x
4. If M is in state q'' and sees input x, then M' outputs x and stays in state q''
5. if M is in state q'' and sees input y, then M' outputs x and stays in state q''

* Given some language L, we can construct a DFA M that recognizes prefix(L):

$M = \{Q, \Sigma, \delta, q_0, F\}$

$Q = \{q_0, q_1 \dots, q_n\}$

The transitional rule function δ is defined as follows:

$\delta(q_0, a) = \{q_1 \dots, q_n\}$ for all $a \in \Sigma$

$\delta(q_i, a) = q_{i+1}$ for all $1 \le i < n$ and all $a \in \Sigma$

$\delta(q_n, a) = \{q_1 \dots, q_n\}$ for all $a \in \Sigma$

The language accepted by M is exactly the prefix of the language accepted by the NFA. The DFA M can be used to construct a NFA that recognizes the prefix of any language.

5.

c, x|ε
b, y|ε
a, y|ε
c, y|yy
b, x|xx
a x|xx
c, Z_0|yZ_0
b, Z_0|xZ_0
a, Z_0|xZ_0

∴ The PDA will accept the language which has sum of number of a's and number of b's is equal to the number of c's.