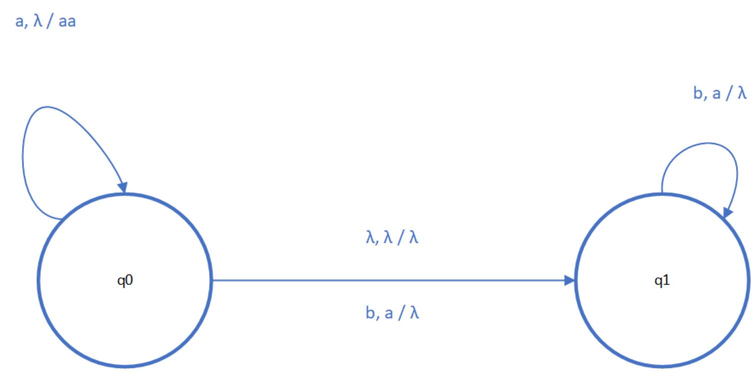
Computing Theory HW Set 3

Chapter 7

4. Construct npda's that accept the following languages on $\Sigma = \{a, b, c\}$.

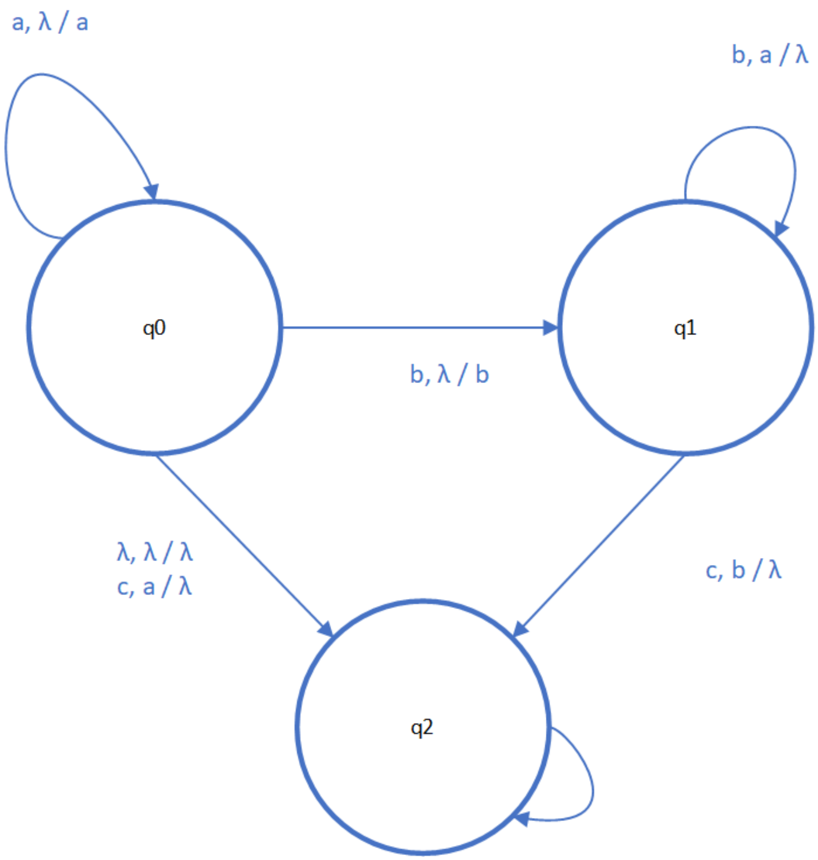
(a) $L = \{a^n b^{2n} : n \geq 0\}$.

(($q0$, λ, λ) = ($q1$, λ))
(($q0$, a, λ) = ($q0$, aa))
(($q0$, b, a) = ($q1$, λ))
(($q1$, b, a) =($q1$, λ))



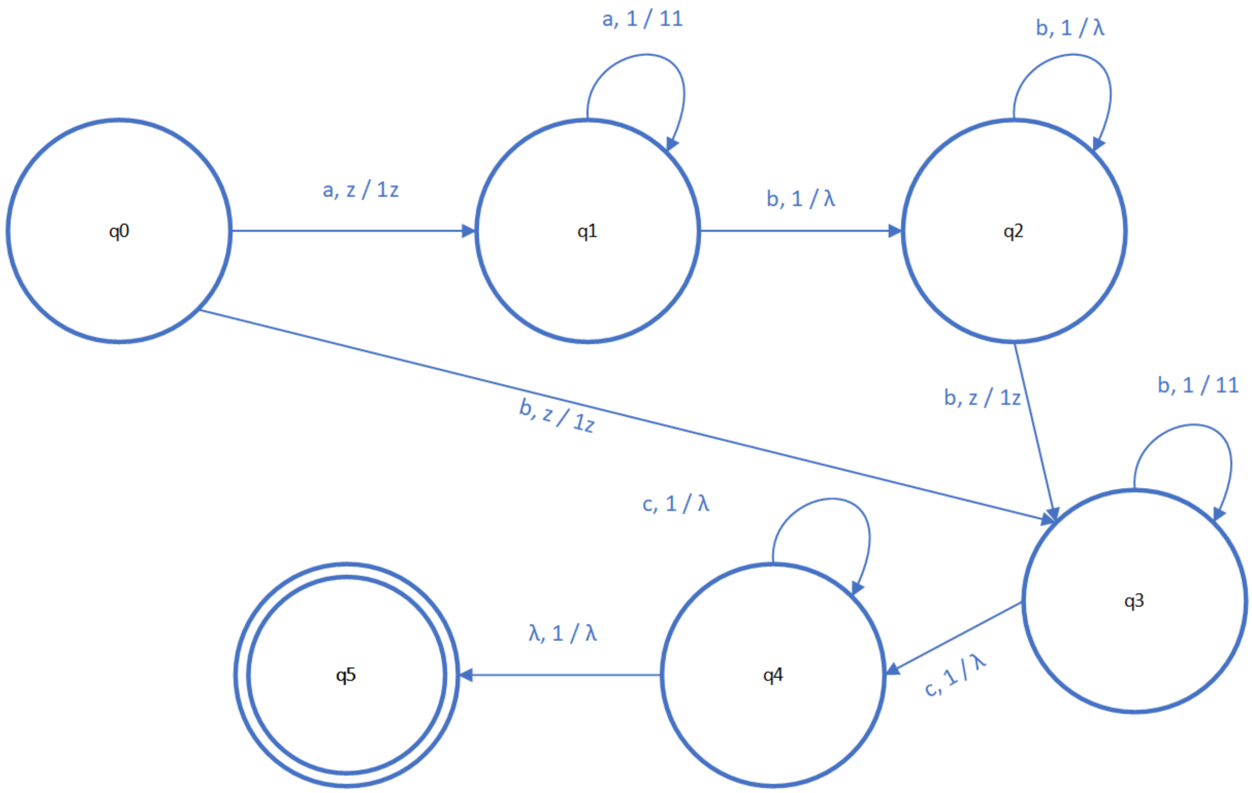
(c) $L = \{a^n b^m c^{n+m} : n \geq 0, m \geq 0\}$.

(($q0$, λ, λ) = ($q2$, λ))
(($q0$, a, λ) = ($q0$, a))
(($q0$, c, a) = ($q2$, λ))
(($q0$, b, λ) = ($q1$, b))
(($q1$, b, λ) = ($q1$, b))
(($q1$, c, b) = ($q2$, λ))
(($q2$, c, b) = ($q2$, λ))
(($q2$, c, a) = ($q2$, λ))



(d) $L = \{a^n b^{n+m} c^m : n \geq 0, m \geq 1\}$.

((q0, a, z) = (q1, 1z)
(q0, b, z) = (q3, 1z)
(q1, a, 1) = (q1, 11)
(q1, b, 1) = (q2, λ)
(q2, b, 1) = (q2, λ)
(q2, b, z) = (q3, 1z)
(q3, b, 1) = (q3, 11)
(q3, c, 1) = (q4, λ)
(q4, c, 1) = (q4, λ)
(q4, λ, 1) = (q5, λ)



(f) $L = \{a^n b^m : n \leq m \leq 3n\}$.

(q0, a, z) = (q0, az)

(q0, a, z) = (q0, aaz)

(q0, a, z) = (q0, aaaz)

(q0, a, a) = (q0, aa)

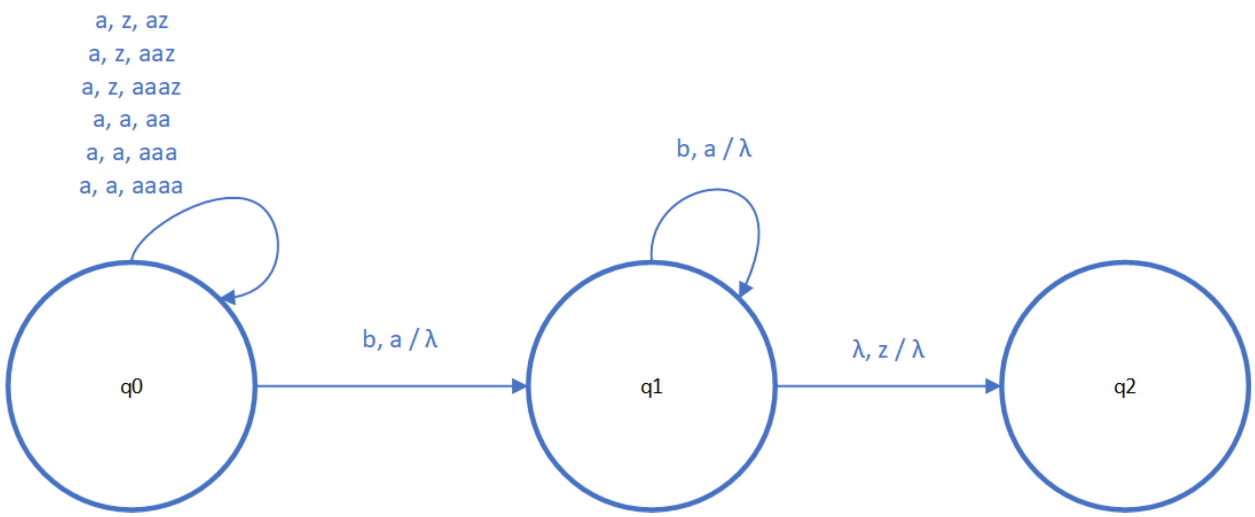
(q0, a, a) = (q0, aaa)

(q0, a, a) = (q0, aaaa)

(q0, b, a) = (q1, λ)

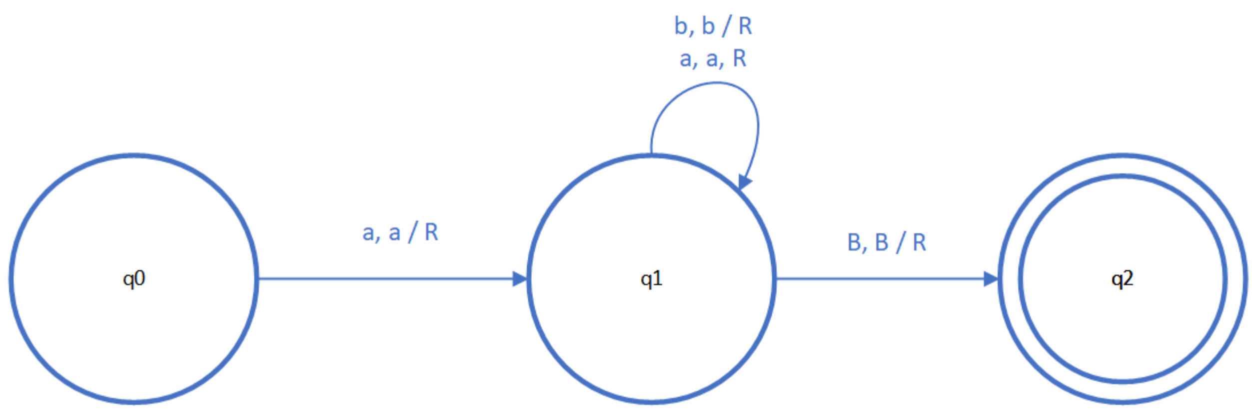
(q1, b, a) = (q1, λ)

(q1, λ, z) = (q2, λ)



Chapter 9

2. Design a Turing machine with no more than three states that accepts the language L(a (a + b)*). Assume that Σ = {a,b}. Is it possible to do this with a two-state machine?



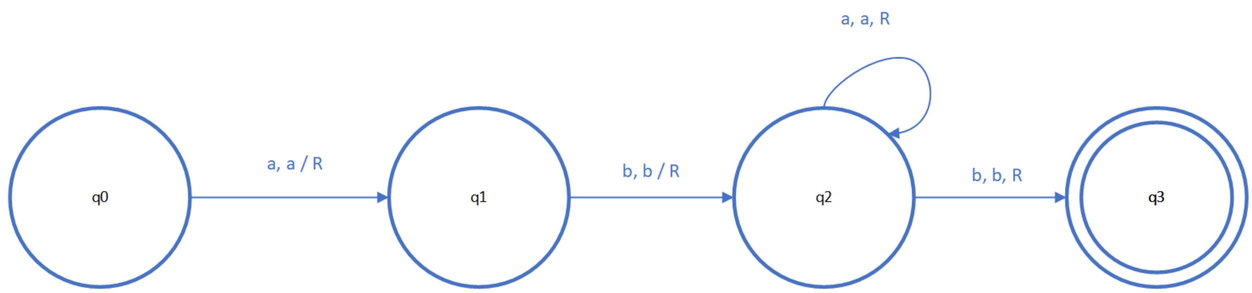
It is not possible with just two states, because two states are required to validate inputs 'a' and (a+b)* and after that you need an accept state.

5. What language is accepted by the Turing machine whose transition graph is in the figure below?

L = ab*+ bb* a…… strings either start or end with a and rest of the elements are all b

7. Construct Turing machines that will accept the following languages on {a, b}.

(a) L = L(aba*b).


a, a, R
q0
a, a / R
q1
b, b / R
q2
b, b, R
q3