COMP 335 Assignment 4

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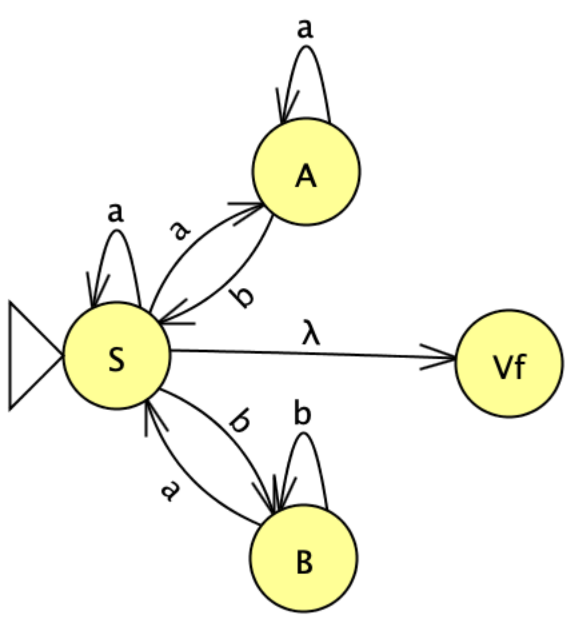
Question 1.

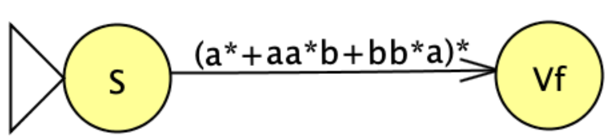
(a)
aabbba
S ⇒ aS ⇒ aaS ⇒ aabB ⇒ aabbB ⇒ aabbbB ⇒ aabbbaS ⇒ aabbbaλ ⇒ aabbba
baaba
S ⇒ bB ⇒ baS ⇒ baaA ⇒ baabS ⇒ baabaS ⇒ baabaλ ⇒ baaba

(b)
Language L can be defined as a language that starts as well as ends with b and has at least one a.
There exists no string in L(G) that follows this definition of L.
L=$\{b^i a^j b^k : j,i,k \geq 1\}$

(c)
the regex r = $(a^*+aa^*b+bb^*a^*)^*$
To get the regex, we convert the regular grammar to NFA, and then determine the regex.

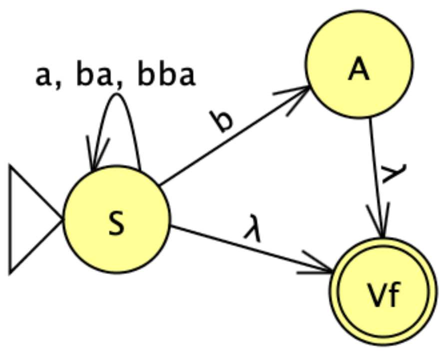


On simplifying the NFA we get:



Question 2.

Converting it and then simplifying the NFA, we get:



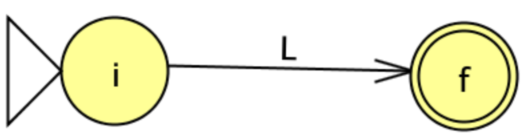
∴, the left-linear grammar that generates the desired language can be represented as:
S → Sa | Sab | Sabb | Ab | λ
A → Ab | λ

Question 3.

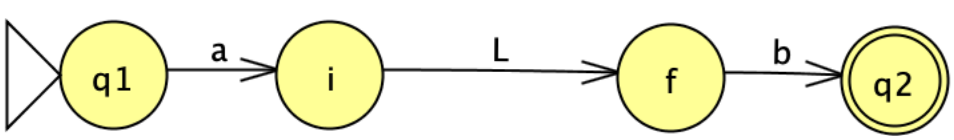
The NFA can be written as a regular grammar described as:
$q_0 \rightarrow 0q_0 \mid 1q_2$
$q_1 \rightarrow q_0 \mid 0q_1 \mid 1q_3$
$q_2 \rightarrow 1q_2 \mid 0q_3$
$q_3 \rightarrow 1q_3 \mid \lambda$

Question 4.

Let the alphabet be represented by Σ
Assume a,b $\in \Sigma$
Since L is a regular language, it can be shown as an NFA with i as the initial and f as the final states:



To this, add an initial and finial state to the NFA, and link them with to i and f using a and b respectively, and reassign the initial and final states:



We know that L is regular, and a,b $\in \Sigma$. The NFA of the language binding q1 and q2 is given by w where middle(w) $\in$ L. Therefore, using the concatenation property of regular languages it can be said that the language binding q_1 and q_2 is regular, i.e, f_f(L) is regular.