

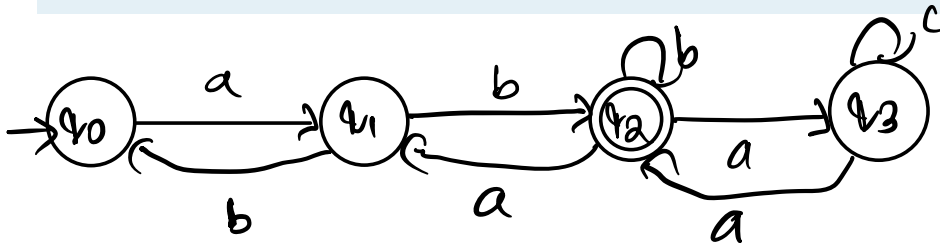
Q1 =>

Consider the following finite-state automaton A over $\Sigma = \{a, b, c\}$:

$A = (\Sigma, \{q_0, q_1, q_2, q_3\}, \delta, q_0, \{q_2\})$

where $\delta = \{(q_0, a, q_1), (q_1, b, q_2), (q_1, a, q_0), (q_2, b, q_2), (q_2, a, q_1), (q_2, c, q_3), (q_3, a, q_2), (q_3, c, q_3)\}$.

Draw the automaton A as a transition graph.



Q2 =>

Give three words contained in the language accepted by the automaton A , and three words not contained in the language.

All words should be over the alphabet Σ .

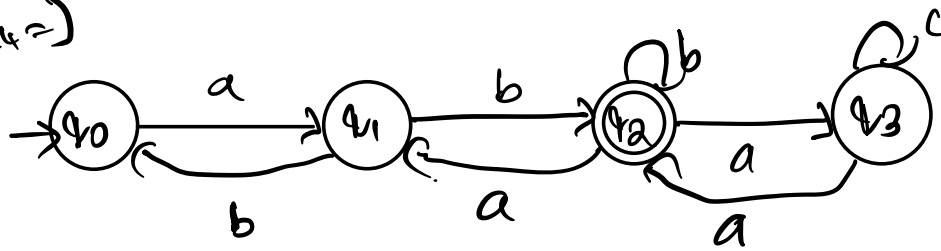
words contain => abb,
abbabb
ab

words does not contain => abac
ababacc
ababca

Q3 =>

Explain why the automaton A is not deterministic

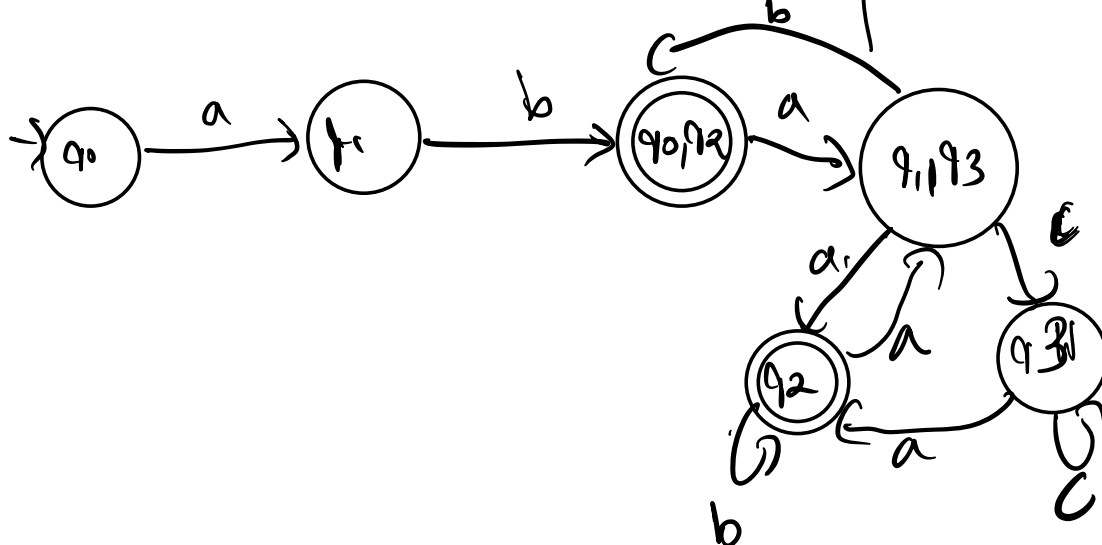
$Q_4 \Rightarrow$

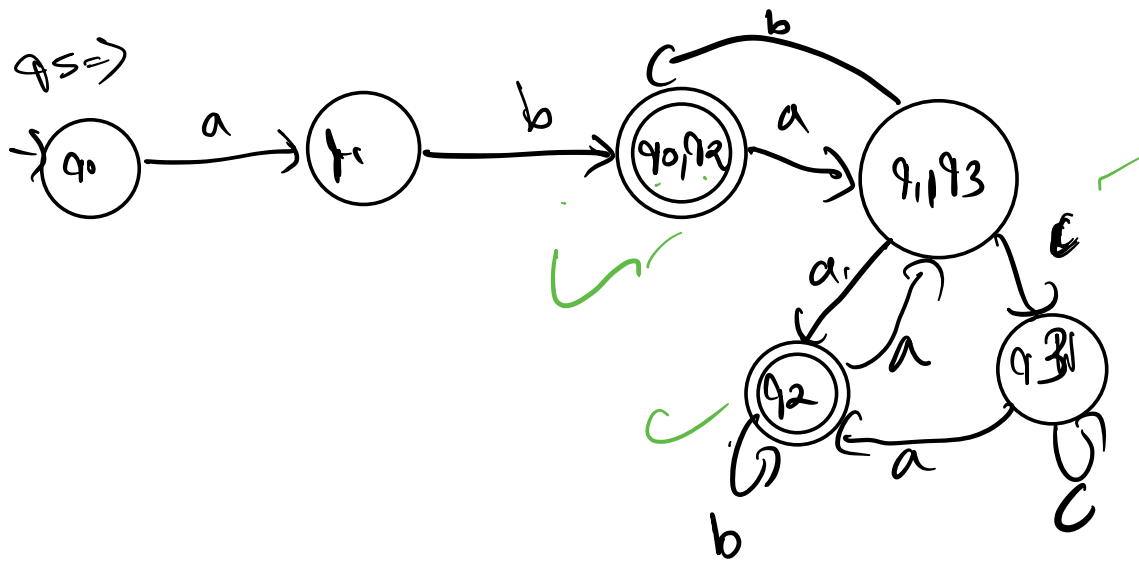


S	a	b	c
q_0	$\{q_1\}$	\emptyset	\emptyset
q_1	\emptyset	$\{q_0, q_2\}$	\emptyset
q_2	$\{q_1, q_3\}$	$\{q_2\}$	\emptyset
q_3	$\{q_2\}$	\emptyset	$\{q_3\}$

✓

S'	a	b	c
q_0	$\{q_1\}$		
$\{q_1\}$	\emptyset	$\{q_0, q_2\}$	\emptyset
$\{q_0, q_2\}$	$\{q_1, q_3\}$	\emptyset	\emptyset
$\{q_1, q_3\}$	$\{q_2\}$	$\{q_0, q_2\}$	$\{q_3\}$
$\{q_2\}$	$\{q_1, q_3\}$	$\{q_2\}$	\emptyset
$\{q_3\}$	$\{q_2\}$	\emptyset	$\{q_3\}$





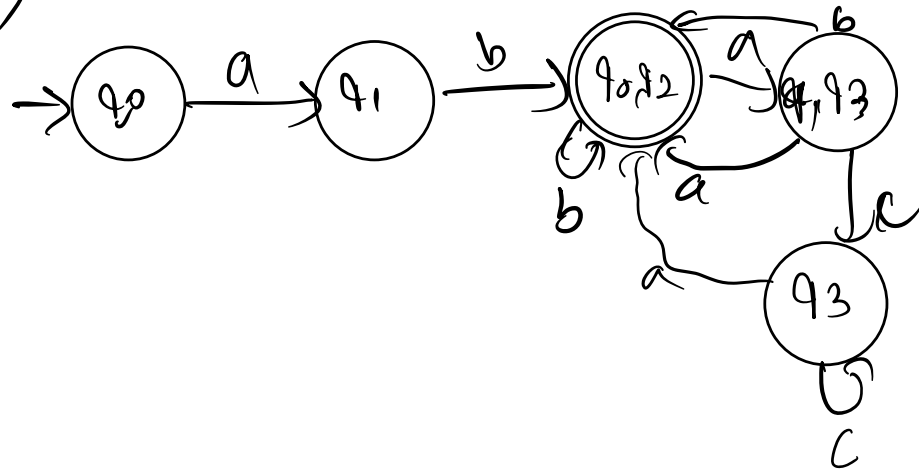
q1	X					
q0, q2	X	X				
q1, q3	X	X	X			
q2	X	X		X		
q3	X	X	X	X	X	
	q0	q1	q0, q2	q1, q3	q2	

$(q_0, q_1) \xrightarrow{a} (q_1, \dots)$
 $(q_0, q_1) \xrightarrow{b} (\dots, q_0, q_2)$
 $(q_0, (q_1, q_3)) \xrightarrow{a} (q_1, q_2)$

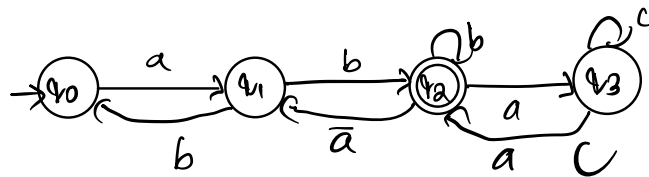
$(q_0, (q_1, q_3)) \xrightarrow{b} (q_0, q_2)$
 $((q_0, q_2), q_2) \xrightarrow{a} (q_1, q_3)$
 $\xrightarrow{b} (q_2)$

$(q_0, q_3) \xrightarrow{a} (q_1, q_2)$
 $(q_0, q_3) \xrightarrow{b} (\dots, \dots)$
 $(q_1, (q_1, q_3)) \xrightarrow{a} (\dots, (q_1, q_3, q_1)) \xrightarrow{a} (q_2, q_2)$
 $(q_1, q_3) \xrightarrow{a} (\dots, q_2)$
 $\xrightarrow{b} (\dots, \dots)$

Answer \Rightarrow

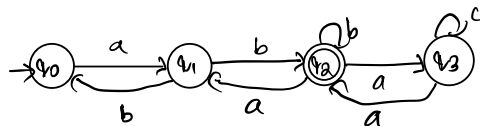


Q6 =



$$a(bb^* + (ba)^*b + bb^*(a^*c^*a^*)(abb^* + ab)^*)^*$$

Q7 \Rightarrow CFG



$$q_0 \rightarrow aq_1$$

$$q_1 \rightarrow bq_2 \mid bq_0$$

$$q_2 \rightarrow aq_3 \mid aq_1 \mid bq_2 \mid \epsilon$$

$$q_3 \rightarrow aq_2 \mid cq_3$$

Q7 $\Sigma = \{a, b, c\}$

$S \rightarrow a | Sb | X$

$X \rightarrow acXa | a | \epsilon$

Using the rules of G , and **the three words that we have provided you**, check whether each of those words is accepted by G .

Set 1:

- > 011
- > 202
- > 10121

Set 2:

- > ccb
- > bbb
- > acaab

ccc: $S \rightarrow Sb \rightarrow xb \rightarrow \cancel{axab}$

ccb word is not accepted by G because in order to have c the ϵ must be followed by a but in the word it doesn't have a

bbb: $S \rightarrow Sb \rightarrow Sbb \rightarrow Sbbb \rightarrow \cancel{xbbb} \rightarrow$

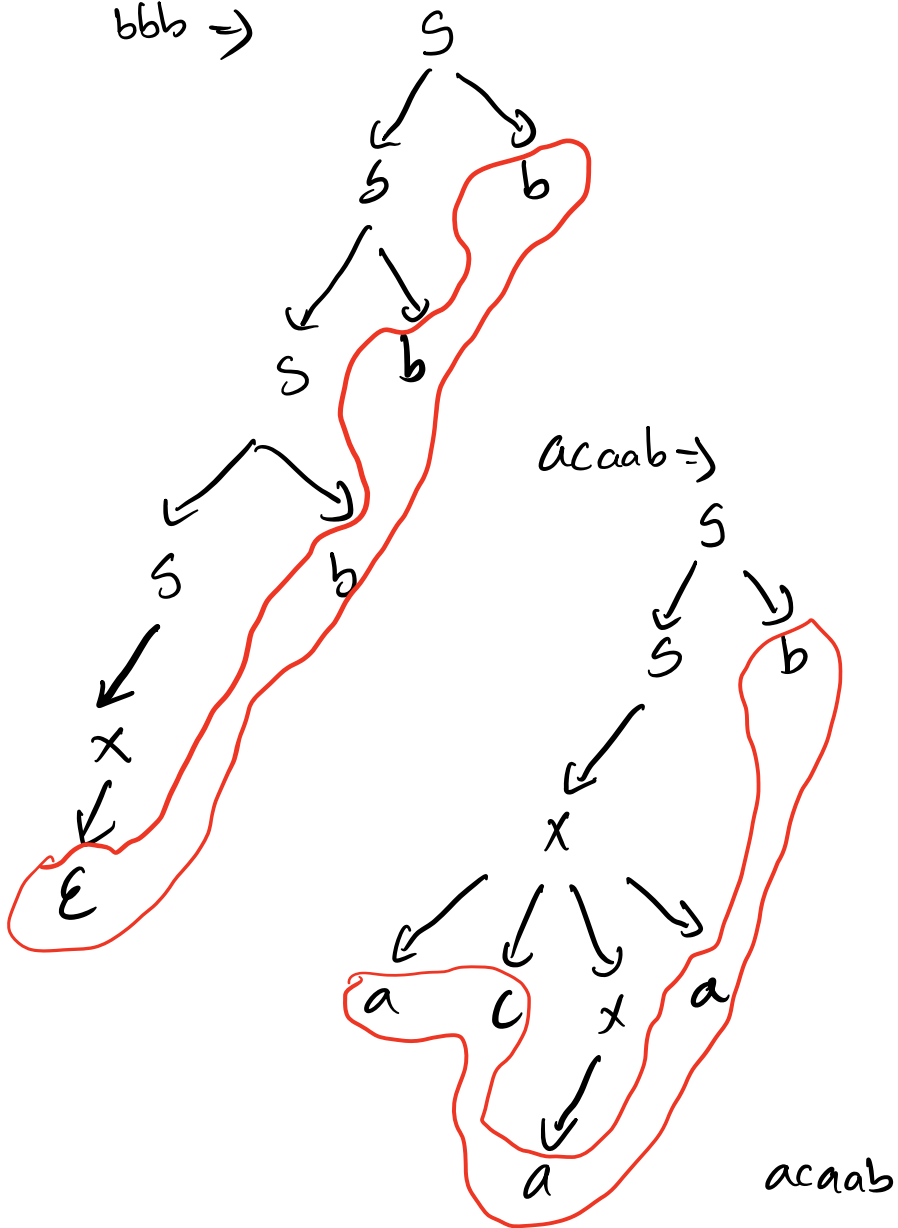
bbb

acaab: $S \rightarrow Sb \rightarrow xb \rightarrow acxab \rightarrow acaab$

Q4 ⇒

$S \rightarrow a | Sb | X$
 $X \rightarrow acXa | a | \epsilon$

bbbb ⇒



$Q_1 \Rightarrow$