

Student Info

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Question 1

a)

False. Because for example π can not be represented over Σ .

b)

False. Only countably many languages can be represented.

c)

True. If you take 0 a 's from the first a^* , 2 b 's from the first b^* , 1 a from the second a^* , and 0 b 's from the second b^* ; then bba will be generated.

d)

False. We can form the string aab with the given regular expression, which does not have ab as prefix.

Question 2

a)

$$K = \{q_0, q_1, q_2, q_3, q_4\}$$

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

$$s = q_0$$

$$F = \{q_0, q_1, q_2, q_3\}$$

$$\begin{aligned} \delta(q_0, a) &= q_1, \delta(q_0, b) = q_2, \delta(q_1, a) = q_1, \delta(q_1, b) = q_3, \delta(q_2, a) = q_1, \\ \delta(q_2, b) &= q_2, \delta(q_3, a) = q_4, \delta(q_3, b) = q_0, \delta(q_4, a) = q_4, \delta(q_4, b) = q_4 \end{aligned}$$

b)

$$\begin{aligned} (q_0, abbaabab) \vdash_M (q_1, bbaabab) \vdash_M (q_3, baabab) \vdash_M (q_0, aabab) \vdash_M (q_1, abab) \vdash_M \\ (q_1, bab) \vdash_M (q_3, ab) \vdash_M (q_4, b) \vdash_M (q_4, e) \end{aligned}$$

The DFA will not accept the input because it ends at q_4 , which is the trap state (not a final state). In other words, $abbaabab \notin L(M)$.

Question 3

a)

$$E(q_0) = \{q_0, q_2\}$$

$$E(q_1) = \{q_1\}$$

$$E(q_2) = \{q_2\}$$

$$E(q_3) = \{q_0, q_2, q_3\}$$

$$E(q_4) = \{q_0, q_2, q_3, q_4\}$$

b)

Step 1: True.

Step 2: True.

Step 3: False. $s' = E(s)$ which definitely has the element s , but it can also have other elements.

Step 4: False. F' consists of the elements of K' . Those elements of K' definitely have at least one state $q \in F$, but they can have other states too. The other states do not have to be in F .

Step 5: False. The transition function δ takes two inputs: an element Q of K' and an element a of Σ' . The function returns the set which is the union of $E(p_i)$'s for $p_i \in Q$, for which there exists a $q \in Q$ and $(q, a, p_i) \in \Delta$.