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Answer 1

a)False. Since the real numbers are uncountably infinite, and we can create countably infinite string from a finite alphabet, it is not possible to represent.

b)False. Although some languages can be finitely representable, there are a lot of languages that are infinite, and can not finitely representable.

c)True.

$$bba \in \mathcal{L} = a^*b^*a^*b^*$$

. The first a^* creates empty string, the first b^* creates bb, the second a^* creates a ,and the last b^* creates empty string.

d)False. a^+ can create more than one a as a substring, and also b^+ can create more than one b as a substring, so ab may not be prefix of a string.

Answer 2

a)We let $M = (K, \Sigma, \delta, s, F)$, where
$K : \{q_0, q_1, q_2, q_3\}$,
$\Sigma : \{a, b\}$,
$s : q_0$,
$F : \{q_0, q_1, q_2\}$,
and δ is the function tabulated below.

q	σ	$\delta(q, \sigma)$
q_0	a	q_1
q_0	b	q_0
q_1	a	q_1
q_1	b	q_2
q_2	a	q_3
q_2	b	q_0
q_3	a	q_3
q_3	b	q_3

b)If M is given the input $abbaabab$, its initial configuration is $(qo, abbaabab)$.

$$(q_o, abbaabab) \vdash_M (q_1, bbaabab)$$
$$\vdash_M (q_2, baabab)$$
$$\vdash_M (q_0, aabab)$$
$$\vdash_M (q_1, abab)$$
$$\vdash_M (q_1, bab)$$
$$\vdash_M (q_2, ab)$$
$$\vdash_M (q_3, b)$$
$$\vdash_M (q_3, e)$$

Since q_3 is not in the F final states set, DFA doesn't accept the input.

Answer 3

The first 3 steps are correct.

4) The Theorem 2.2.1 in the book states that the set of final states of M' will consist of all those subsets of K that contain **at least** one final state of M, **not only** the states $q \in F$. Therefore, step 4 is false.

5)There is an error in the output part of the function definition. The function returns the set whose elements are precisely those states p in K for which there exists a $q \in Q$ and $(q, a, p) \in \triangle$, but also the set includes the empty closure of every $p \in K$. Therefore, the set is the union of the empty closures of those states $p \in K$ for which there exists a $q \in Q$ and $(q, a, p) \in \triangle$.