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Question 1:

a) ***False***. We are given a countably infinite set of strings over the alphabet {1, 2,..., 9}, yet the real numbers are uncountably infinite; so it's not possible to represent all the real numbers.

b) ***False***. Having countable representations and uncountable numbers to be represented, it is not possible to represent all languages finitely (from our textbook).

c) ***True***. If a* generates zero a's, b* generates two b's, a* generates one a, and b* generates zero b's.

d) ***False***. The given regular expression generats an "a" followed by any number of a's, followed by one or more b's, followed by any number of a's or b's.

Question 2:

a)

- **K:** $\{q_0, q_1, q_2, q_3\}$
- $\boldsymbol{\Sigma} = \{a, b\}$
- $\boldsymbol{s}: q_0$
- $\boldsymbol{F}: \{q_0, q_1, q_2\}$
- $\boldsymbol{\delta}$ **:** $\{\delta(q_0, a) = q_1, \delta(q_0, b) = q_0, \delta(q_1, a) = q_1, \delta(q_1, b) = q_2, \delta(q_2, a) = q_1, \delta(q_2, b) = q_0, \delta(q_3, a) = q_3, \delta(q3, b) = q_3\}$

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

Since q_3 is not an final (accepting) state, DFA does not accept the input.

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 4 and 5 are incorrect:**

STEP 4: The correct form should be "... which consists one or more states of q ∈ F." As the set of final states M' should include all subset of *K* containing at least one final state of M, as stated in the textbook. So, the F' is the set of final states and it contains elements of K' and, one or more final states of q ∈ F.

STEP 5: I think the problem is the wording *"... precisely those states p in K..."* as this function the returns the set whose elements are all of the E(*p*), *p* in K which there exists a q ∈ Q and (q, a, p) ∈ Δ. In the textbook under the example 2.2.3 function δ is defined as union of the all E(p). If we change the wording to "a set of E(p)'s elements' union", the instruction will be corrected.