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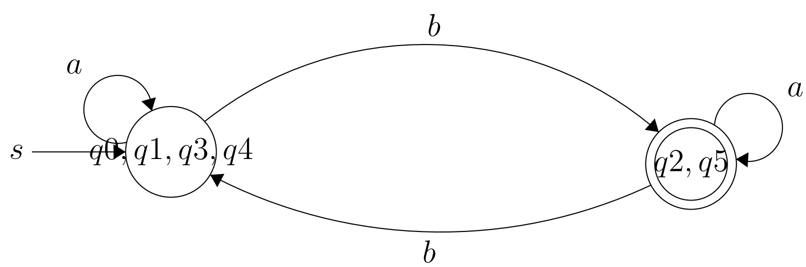
Answer 1

a)
First separate equivalence classes based on whether they are final or not. The set $\{q_0, q_1, q_3, q_4\}$ is base class for non-finals and $\{q_2, q_5\}$ is for final states. Now we try to separate them further. $\{q_0, a\}$ goes q_0, the same class. $\{q_0, b\}$ goes the final state equivalence class. $\{q_1, a\}$ and $\{q_1, b\}$ goes the same classes with q_0 as well. This situation is valid for q_4 and q_3, too. We can say they are all in the same equivalence class if the final states are in the same equivalence class. If we look at $\{q_2, a\}$ it goes final state eqv. class, and $\{q_2, b\}$ goes non-final equivalence class. This situation is exactly the same for q_5. So, there are only two equivalence classes, $\{q_0, q_1, q_3, q_4\}$ and $\{q_2, q_5\}$ we can draw the minimized DFA as:



b)
For the first equivalence class:
a^*ULba^*
For the second:
L

c) The theorem says that if there are no finite automata for a given language L, then L is not regular. And if there are no finite automata, then there are infinitely many equivalence classes. Our equation is m + n = k + 2u. For different m + n values, there are different k + 2u values. Each of different m + n values creates a new and unique equivalence class. Since m and n are natural numbers and m + n can vary 0 between ∞ there are infinitely many equivalence classes and infinitely many states for an automaton, therefore our language is not regular.

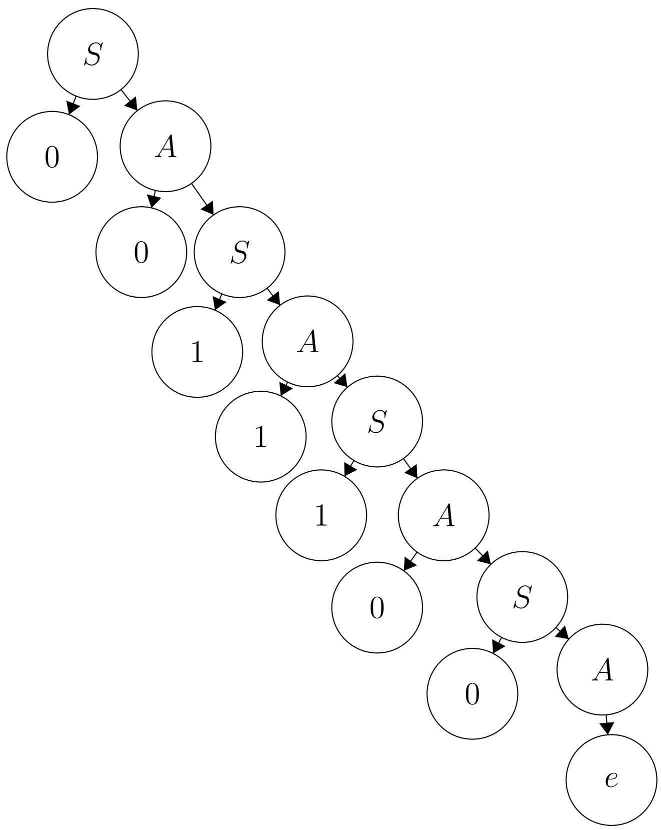
Answer 2

1.
S is the starting string and,

S = FS | Bb | SFB
B = Bb | ϵ
F = aFb | bFa | FF | ϵ

2.
S is the starting string and,
S = AB
A = $0A1$ | ϵ
B = $1B2$ | ϵ

3.
S is the starting string and,
S = $1A$ | $0A$
A = $0S$ | $1S$ | ϵ



Answer 3

1.
{w | the length of w is not 1, first and last character of w is the same and w $\in \{0,1\}^*$ }

2.
$\{$w | w has at least 2 1's and w $\in \{0,1\}^*$ $\}$