Student Information

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Answer 1

a.

It is countably infinite.
Lets think that there are only n rational numbers in the interval which is like
$c < r_1 < r_2 < r_3 < ... < r_n < d$
But there must be a rational in the interval $c < r_1$, hence this is a contradiction and we can count them so this is a countably infinite.

b.

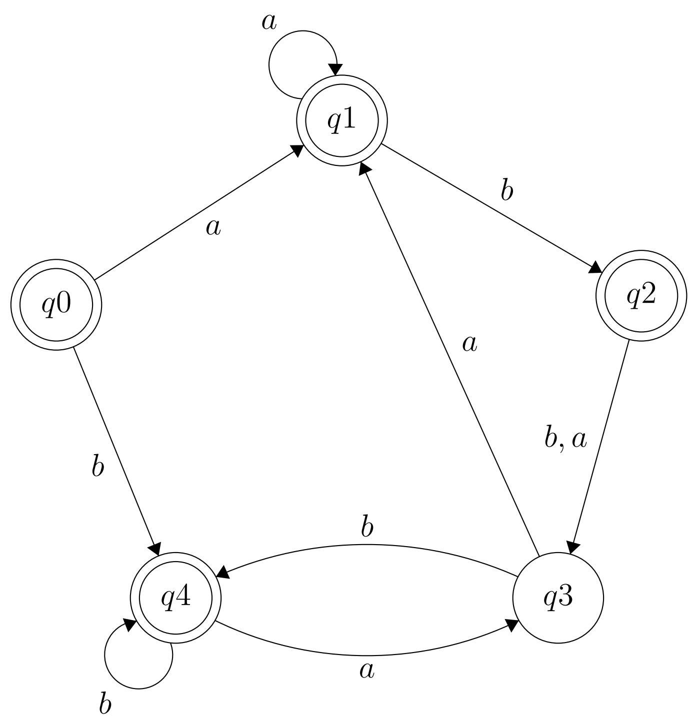
By the definition of non regular languages, L^+ can not be finite and countable, so D is uncountable infinite set.

c.

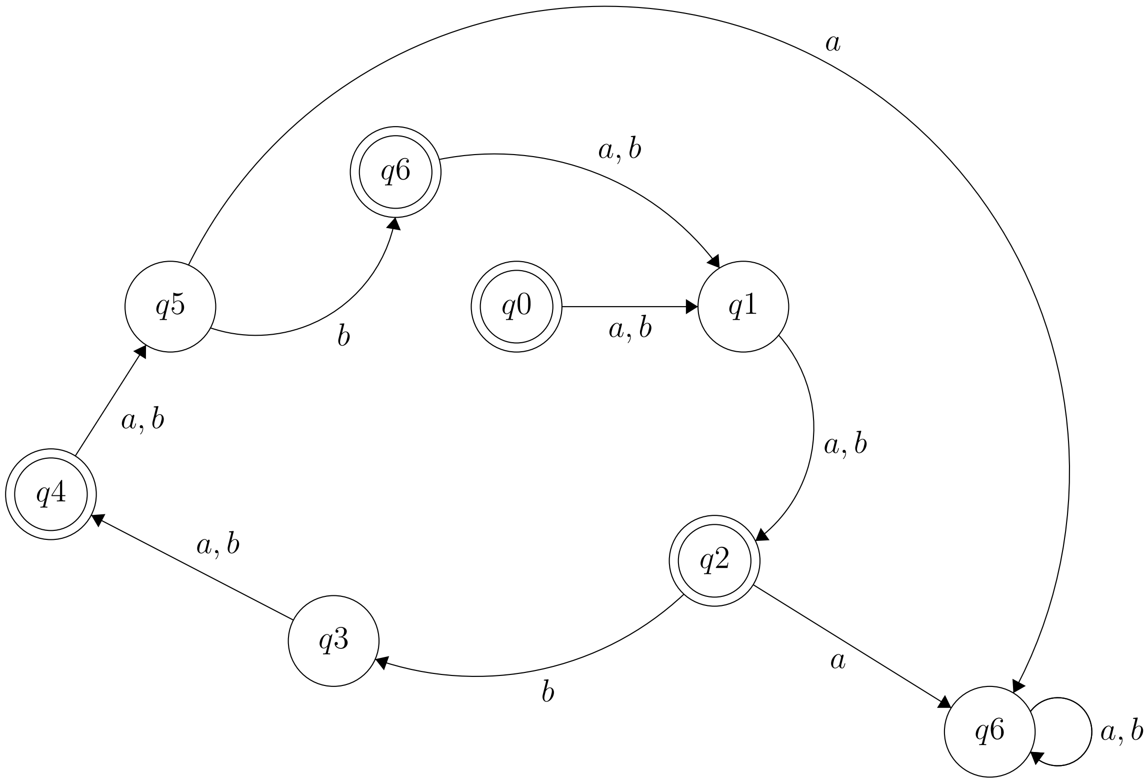
If the set is can not be recognized by Finite Automaton it must be non regular set so that it must be uncountable infinite set.

Answer 2

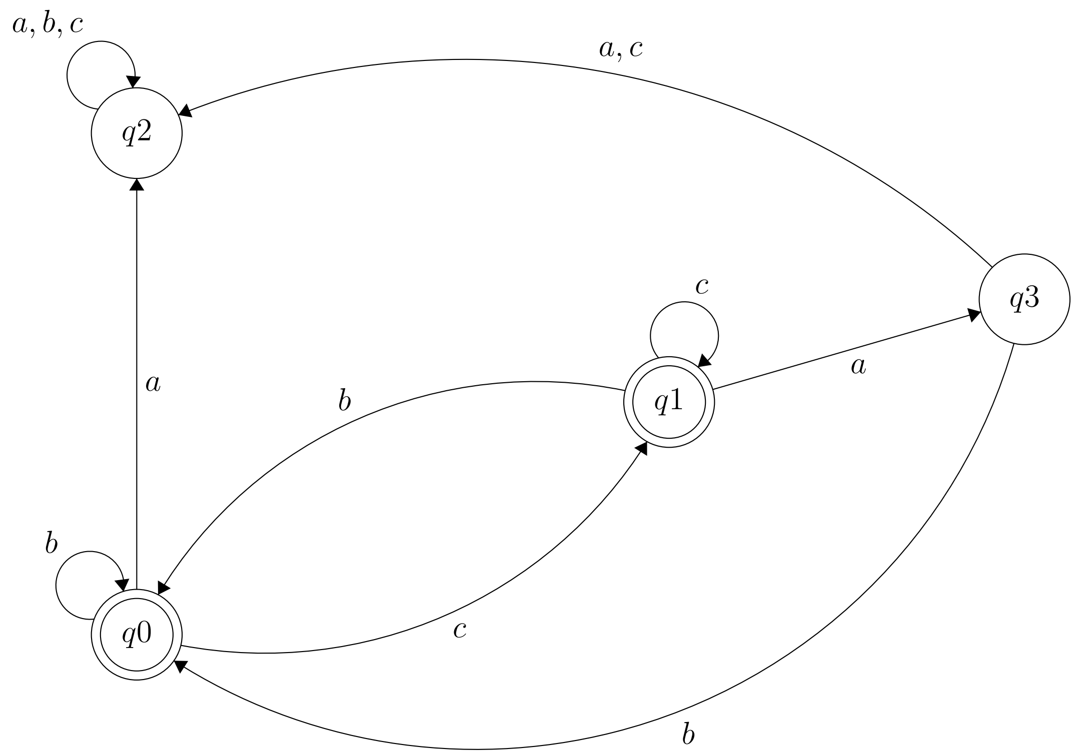
a.



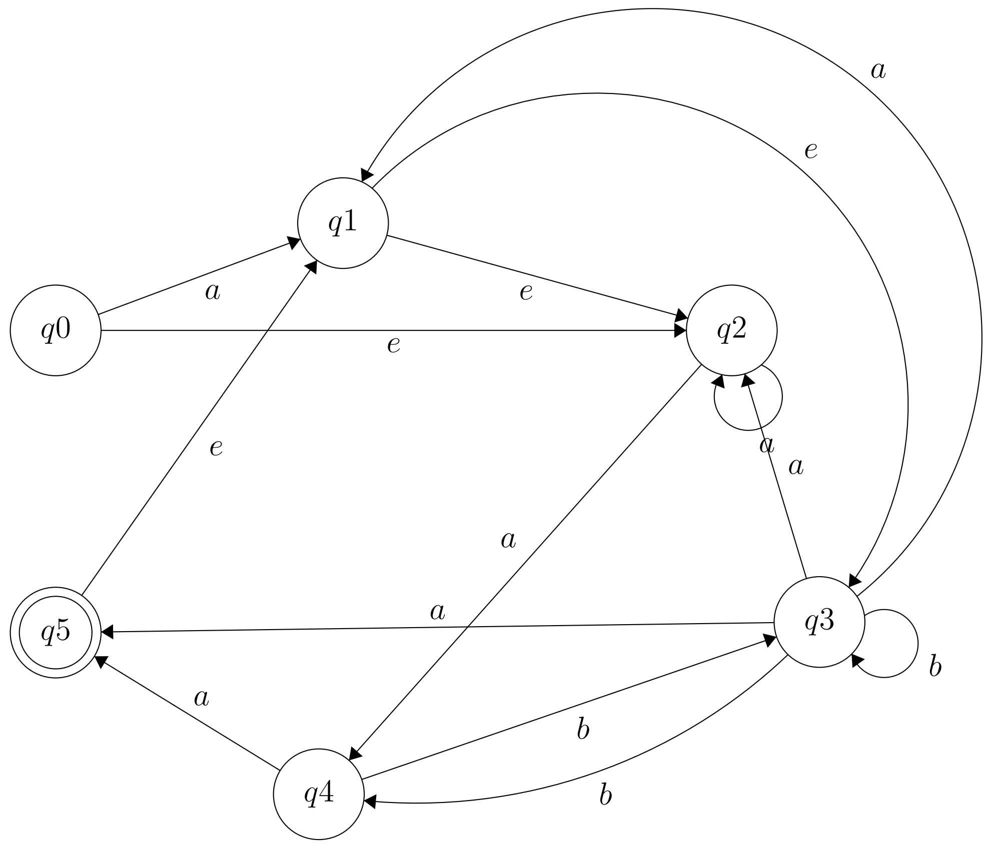
b.



c.



Answer 3



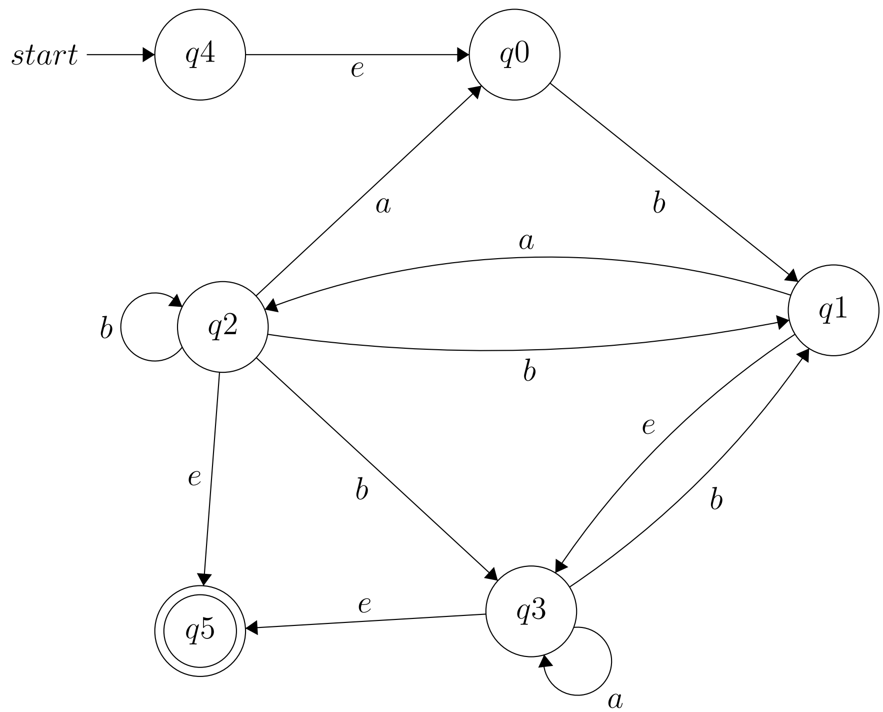
a.

We can only reach q_5 with an a. They are $q_4 \to q_5$ and $q_3 \to q_5$. So that $abbb$ is not reachable.

b.

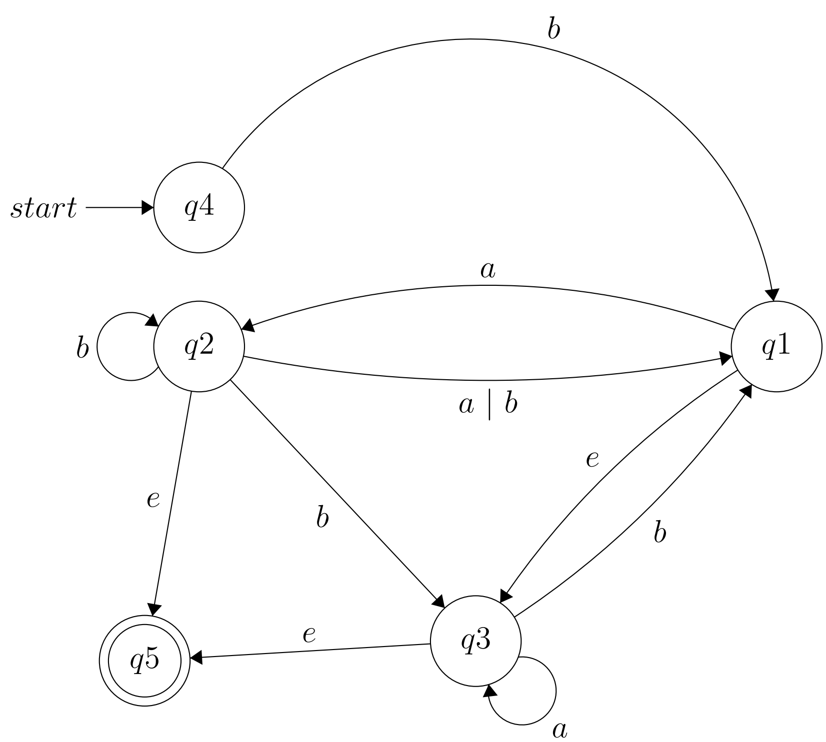
For $w = ababa$ we can trace $q_0 \to q_1 \to q_3 \to q_3 \to q_5 \to q_1 \to q_3 \to q_3 \to q_5$.

Answer 4

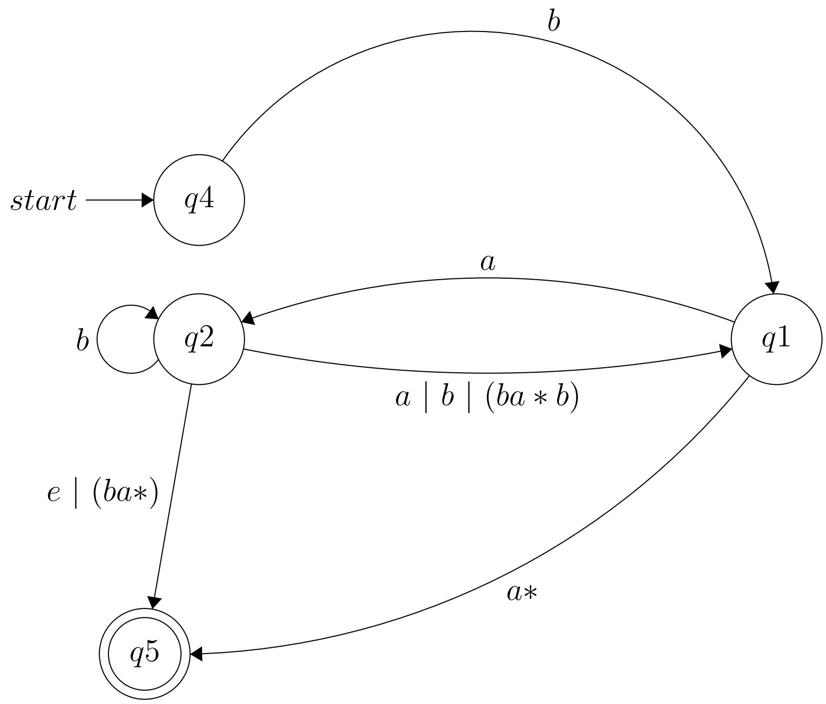


b.

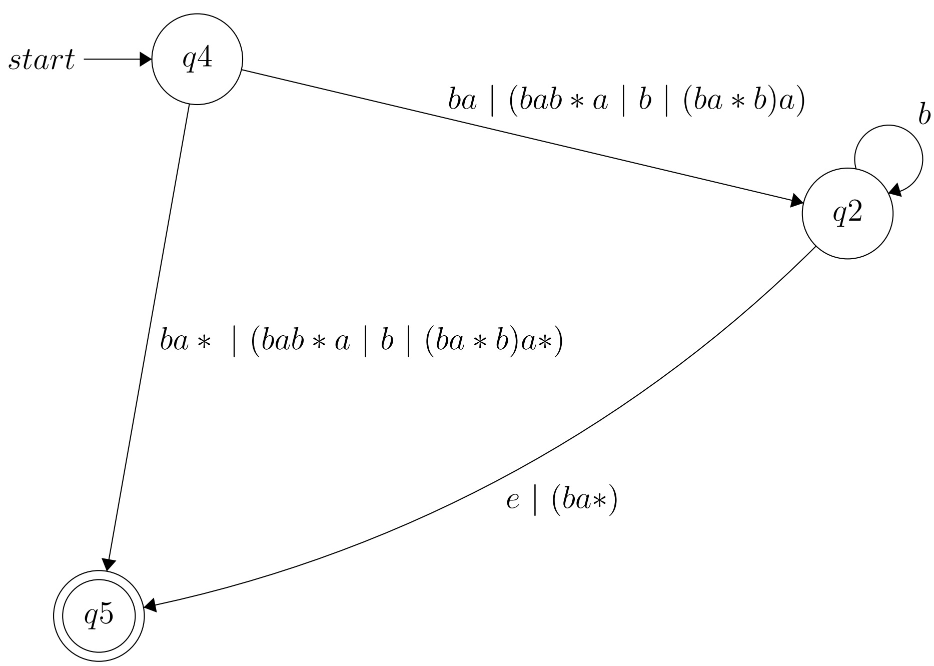
Eliminate q_0



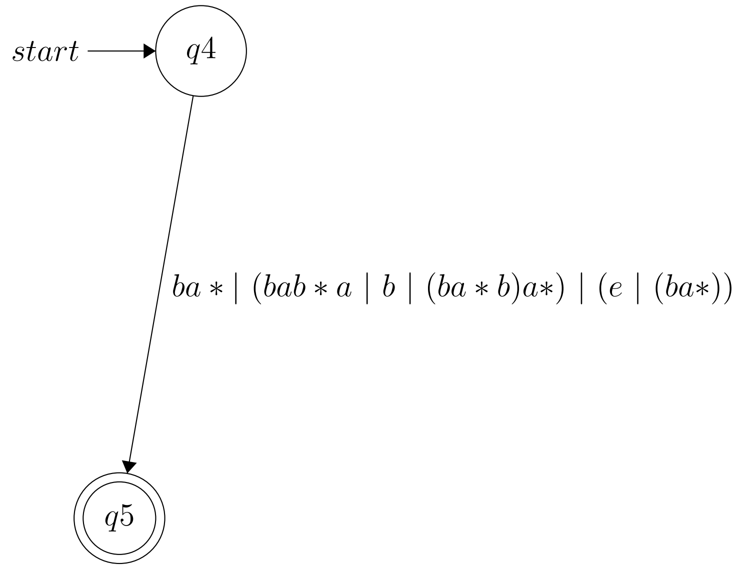
Eliminate q_3



Eliminate q_1



Eliminate q_2

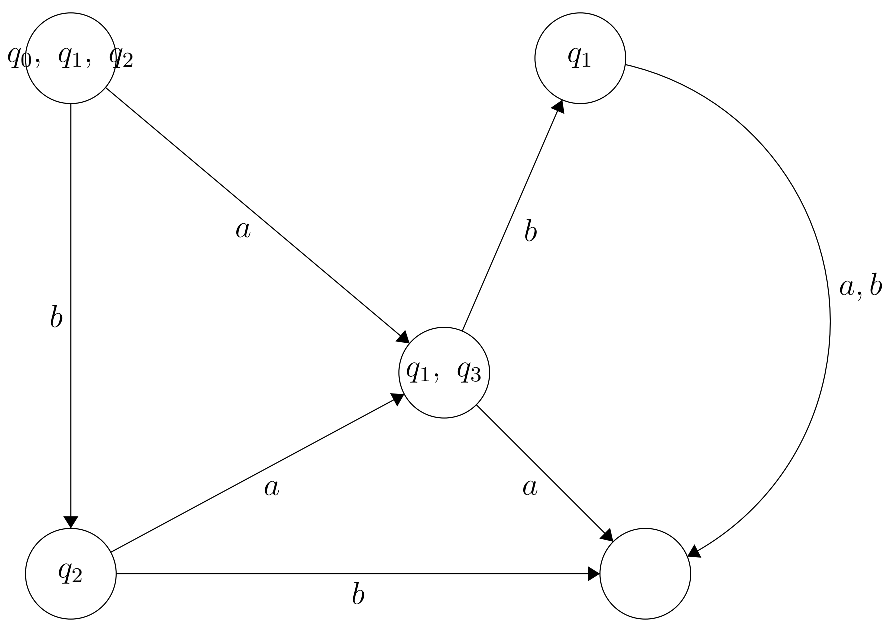


Answer 5

a.

Table 1: Transition Table

	a	b
{q0, q1 ,q2}	{q1,q3}	{q2}
{q1, q3}	Ø	{q1}
{q2}	{q1, q3}	Ø
{q1}	Ø	Ø



b.

We can figure out that:
$L(N) = a|ba$ so that,
$\overline{L}(N) = \{a, b\}^* - a|ba$

Answer 6

L_1 and L_2 is regular expression and we know that L_1 - L_2 is also regular but we must prove that by constructing NFA.
1- Change the expression: L_1 - $L_2 = L_1 \cap \overline{L_2}$
2- We can use method which we used in Question 4 part A.
3- When we using method $\overline{L_2}$ we must change the arrows' directions.
4- After that we must use intersection operation on NFA. 5- Now the expression is $= L_1 \cap \overline{L_2}$ which is equal to L_1 - L_2.
6- We can use this algorithm.

Answer 7

a.

Lets assume $w = aaaaaaaaa$
And $x = aaaa$, $y = aa$ and $z = aaa$.
Lets take xy^2z which is equal to $aaaaaaaaaaa$
Hence, number of a's are 11 so this is not a regular.