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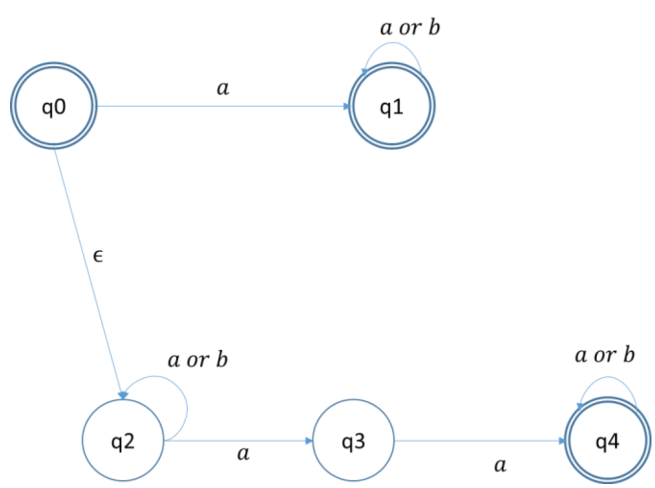
Question 1

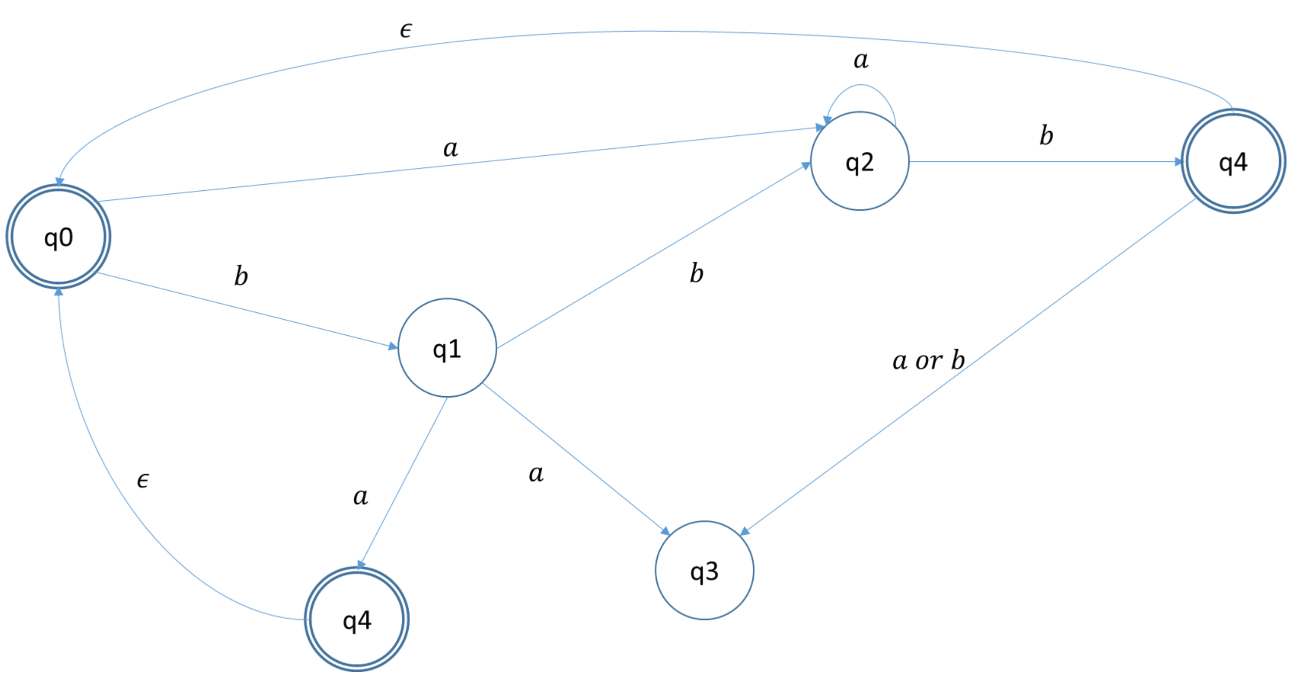
1. $a(a+b)^*a$
2. $(b(a+b))^*b^*$
3. $a^*baaa^* + a^*abaa^* + a^*aaba^* + aaa^*$
4. $(a+b)(a+b)^*$

Question 2

1. $\epsilon + a(a+b)^* + (a+b)^*aa(a+b)^*a(a+b)^*$



2. $[ba + (a+bb)a^*b]^*$



Question 3

In fact the only condition for it to work is to satisfies this expression which correspond to having at least an $a \ and \ b$

$$\Sigma^*$$

Let take a string that satisfies the expression

Let split this string in two pieces $x \ and \ y$ with n a in x and $m \ a$ in y and $n, m \geq 0$

If $n = m$ then we are done the string is in the set

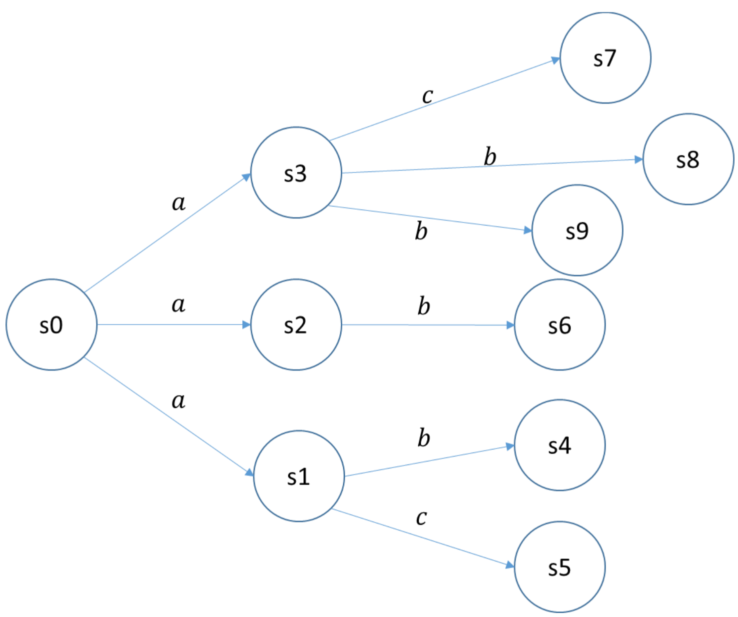
Let suppose $n < m$

Then we can move the split of the string one letter further. If the letter is a then we have $n + 1 \ a's \ in \ x$ and still $m \ b's \ in \ y$, if it's a b then we have still $n \ a's \ in \ x$ and $m - 1 \ b's \ in \ y$ Then we check if the amount are the same now, if not then we can repeat this step until they match

Similarly with $n > m$ we move the split left

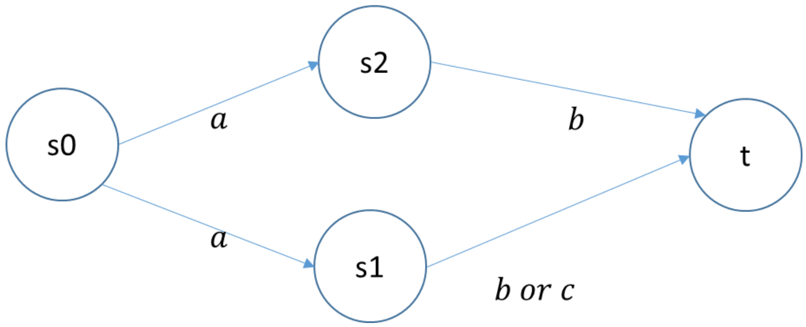
Then this expression define this language and thus it's a regular language.

Question 4



We see that s_1 and s_3 are bisimilar as we have the same outgoing transition (b and c)

We also have s_4 to s_9 bisimilar as they don't have any outgoing transitions



Question 5

	ϵ	a	b	aa	bb
ϵ	Eq				
a		Eq			
b			Eq		
aa				Eq	
bb			Eqq		Eq

Nothing starts with b that is in L. All equivalent classes on a are equivalent to themselves. ax is equivalent to ax for any x.

The only equivalent classes in L are on a^*

Because $a^n, n \in N$ there are infinite equivalence classes as there is an equivalent classes for each a^n where $n \in N$, N is distinct from itself