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"DISPROVING"

3. Consider $L_1 = b^* a^*$ $\quad$ L_1 is regular because it is a regular expression.

L = set of all string over $\{a, b\}$ which contains more a than b.

Consider $L_2 = L \cap L_1$. If L is regular then L_2 should have been regular, but I claim that L_2 is not regular therefore L is not regular.

Proof of claim - L_2 is not regular.

$L_2 = \{ b^i a^j \mid j > i \}$

let n be the pumping lemma constant

Choose $z = \cancel{b^n} \cancel{a}\, b^n a^{n+1} \in L_2$

Let $z = uvw$ st $|v| = m > 0$ and $|uv| \leq n$

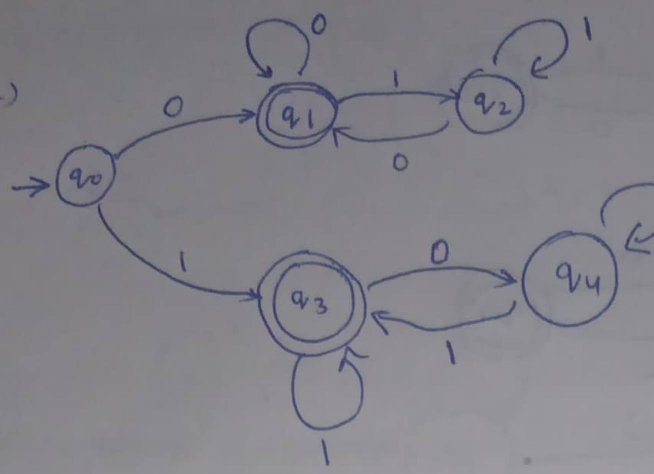
then $v = b^m$ and $uv^iw = b^{n+(i-1)m} a^{n+1}$

For $i = 2$, $n + (i-1)m = n + m \geq n+1$. Hence $uv^2w \notin L_2$. So we have a contradiction

Hence L_2 is not regular.

Q1

(a)



This DFA represents the given language.

Minization of above DFA

D0

q_1	X			
q_2		X		
q_3	X		X	
q_4		X		X
	q_0	q_1	q_2	q_3

D1

q_1	X			
q_2	X	X		
q_3	X	X	X	
q_4	X	X	X	X
	q_0	q_1	q_2	q_3

All states belong to different classes in R_L

$\therefore$ Above DFA is the minimal DFA

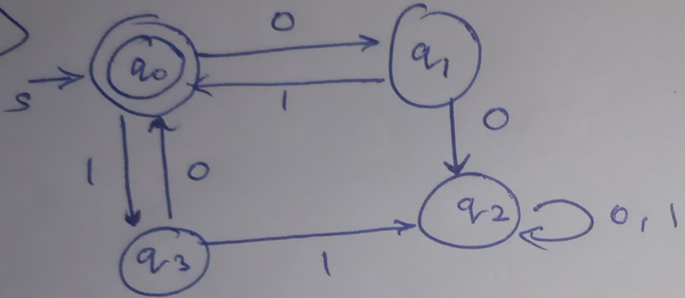
$(q_0, q_2) \xrightarrow{1} (q_3, q_2)$

$(q_0, q_4) \xrightarrow{0} (q_1, q_4)$

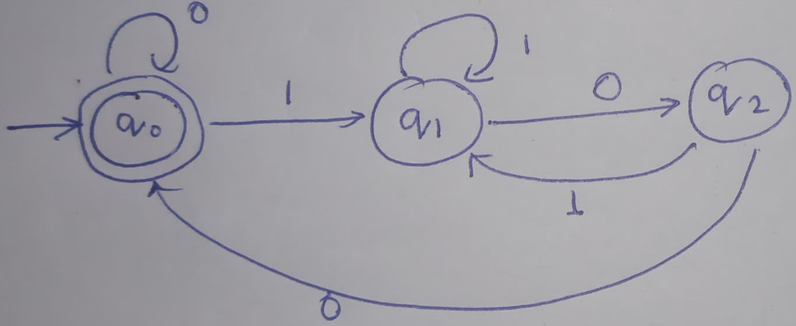
$(q_1, q_3) \xrightarrow{0} (q_1, q_4)$

$(q_2, q_4) \xrightarrow{1} (q_2, q_3)$

1b)



1c)



1b Minization

1.) b)

D_0

	q_0	q_1	q_2
q_1	X		
q_2	X		
q_3	X		

D_1

	q_0	q_1	q_2
q_1	X		
q_2	X	X	
q_3	X	X	X

$(q_1, q_2) \xrightarrow{1} (q_0, q_2)$

$(q_1, q_3) \xrightarrow{1} (q_0, q_2)$

$(q_2, q_3) \xrightarrow{1} (q_2, q_0)$

∴ Given DFA is minimal.

1c.)

D_0

	q_0	q_1
q_1	X	
q_2	X	

D_1

	q_0	q_1
q_1	X	
q_2	X	X

$(q_1, q_2) \xrightarrow{0} (q_2, q_0)$

$\therefore$ This is minimal DFA