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MCS202304

34/50

~~32+2~~/50

(1) let the DFA have 6 states.

Intuition. We will create the states in such a way that it stores the number of 0s and number of 1s and can be distinguished

~~So, let q = { {0,0}, }~~

let $Q = \{ \langle 0,0\rangle, \langle 0,1\rangle, \langle 0,2\rangle, \langle 1,0\rangle, \langle 1,2\rangle, \langle 1,1\rangle \}$

$q_0 = \langle 0,0\rangle$

$F = \{ \langle 0,0\rangle \}$

$\Sigma = \{0,1\}$

10

and δ will be such that

mod

$$\delta(\langle a,b\rangle, 0) = \langle (a+1)\%2, b\rangle$$

$$\delta(\langle a,b\rangle, 1) = \langle a, (b+1)\%3 \rangle$$

we can show that if for any a. st $0<a<2$ and $0<b<3$

~~we can also~~ the next states will always be among $\{Q\}$

	0	1
$\rightarrow \langle 0,0 \rangle$	$\langle 1,0 \rangle$	$\langle 0,1 \rangle$
$\langle 0,1 \rangle$	$\langle 1,1 \rangle$	$\langle 0,2 \rangle$
$\langle 0,2 \rangle$	$\langle 1,2 \rangle$	$\langle 0,0 \rangle$
$\langle 1,0 \rangle$	$\langle 0,0 \rangle$	$\langle 1,1 \rangle$
$\langle 1,1 \rangle$	$\langle 0,1 \rangle$	$\langle 1,2 \rangle$
$\langle 1,2 \rangle$	$\langle 0,2 \rangle$	$\langle 1,0 \rangle$

So, $\langle a, b \rangle$ stores

$a \% 2$ times 0 has appeared

and $b \% 3$ times 1 has appeared.

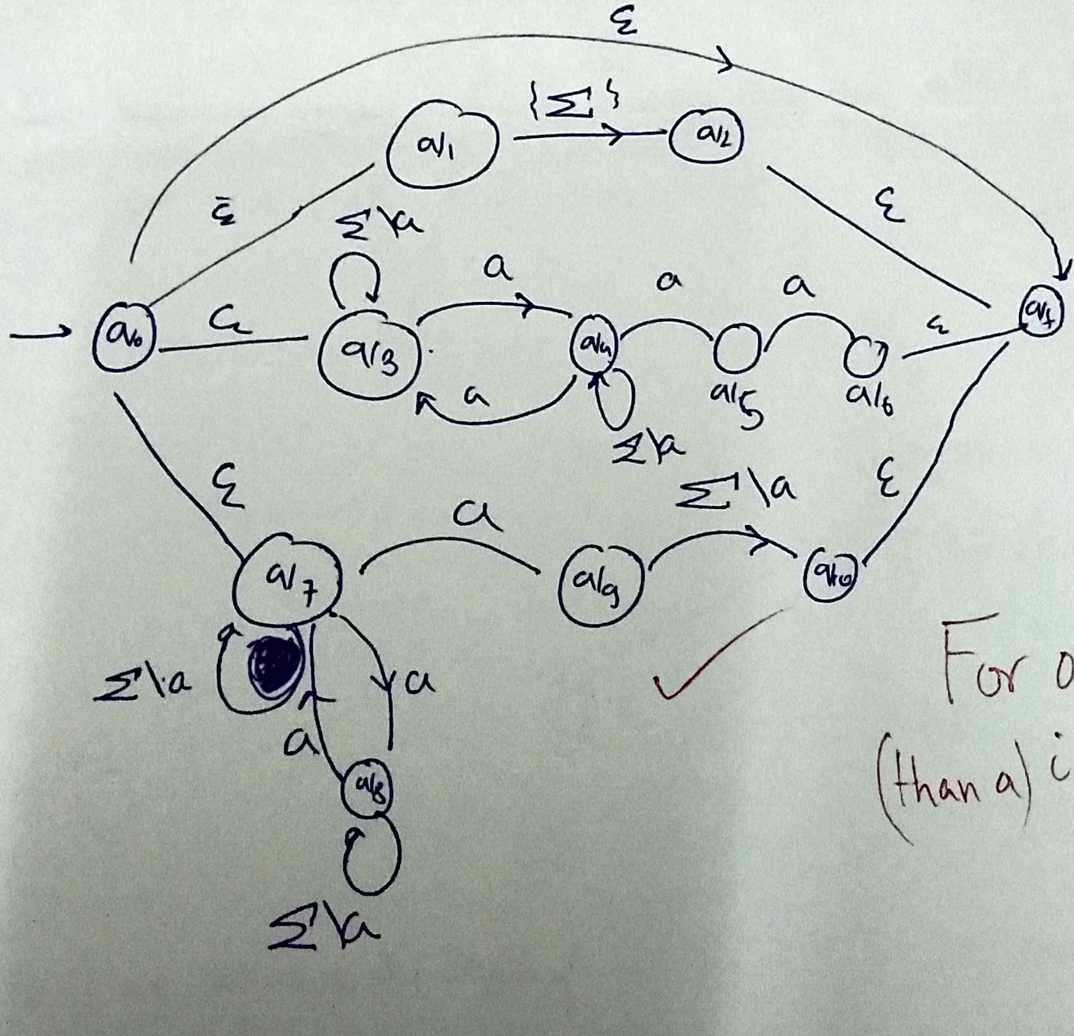
(2) M be the ε-NFA for the language.

1> M should accept empty string

2> M accept any string with length 1

3> if last two characters are same (aa), then a must occur odd number of times in the Remaining string

4> if last two characters are not same (ab) $b \in \Sigma \setminus a$ then a must occur even number of times in the string



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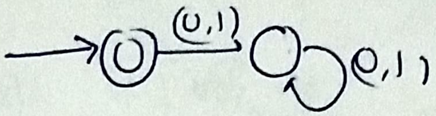
For other letter (than a) in Σ?

on length of w

5). we will prove this using induction. Alternatively we will try to prove that this requires (2^K+1) where (1) is for trap state

Base case:- $(K=0) \Rightarrow w = \varepsilon$.

So we need only two state to represent the ~~Base case~~ ε



$\therefore$ This holds true

Induction hypothesis: ~~lets say we can create a DFA~~ lets say (2^K+1) is the best we can do for ~~K state~~ K length strings.

So, now our strategy will be to prove that we atleast requires 2^{K+1} +1 states to accept all such w where w is of (K+1) length.

There is no proof in your answer

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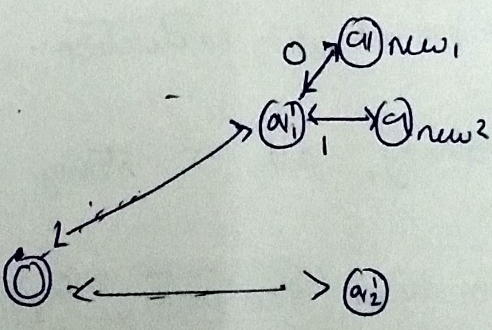
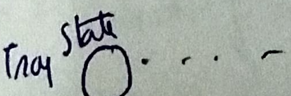
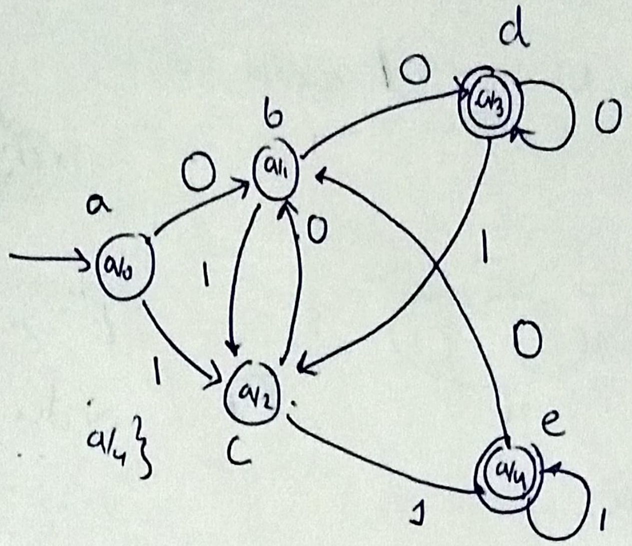
Proof:





now if we increase the length of w by 1, we will require 2 more states for each state that is farthest away the root / accepting node

(4) lets construct a DFA for $(0+1)^*(00+11)$



$Q = \{q_0 \ldots q_4\}$

So, it's a DFA, with starting state q_0, $F = \{q_1, q_2\}$

$\Sigma = \{0, 1\}$ and δ is shown above

Now, lets use myhill nerode table minimization method to see if we can do this using lesser number of states

let $q_0 = a$
$\vdots$
$q_4 = e$

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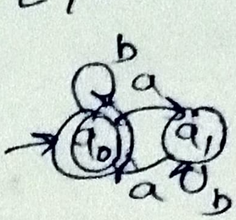
	a	b	c	d
a				
b	x			
c	x	x		
d	x	x	x	
e	x	x	x	x

now, we can see that, no way we can minimize the number of states in this DFA as all the states are distinguished.

∴ So, we can't create a DFA with fewer states

(5) lets try this approach

L, L'.



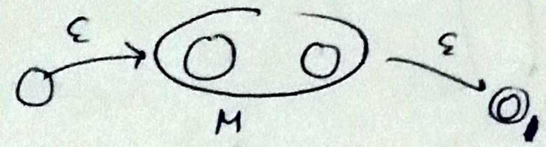
$b\omega' \in L(G)$.

Let M be an NFA that accepts ω.

$L'' = \{ \omega \in L \,/\, \omega$

$L \cap a^i b^j c^k$

$\boxed{a^n b^n c^n}$



S der ω' $S \to \epsilon$

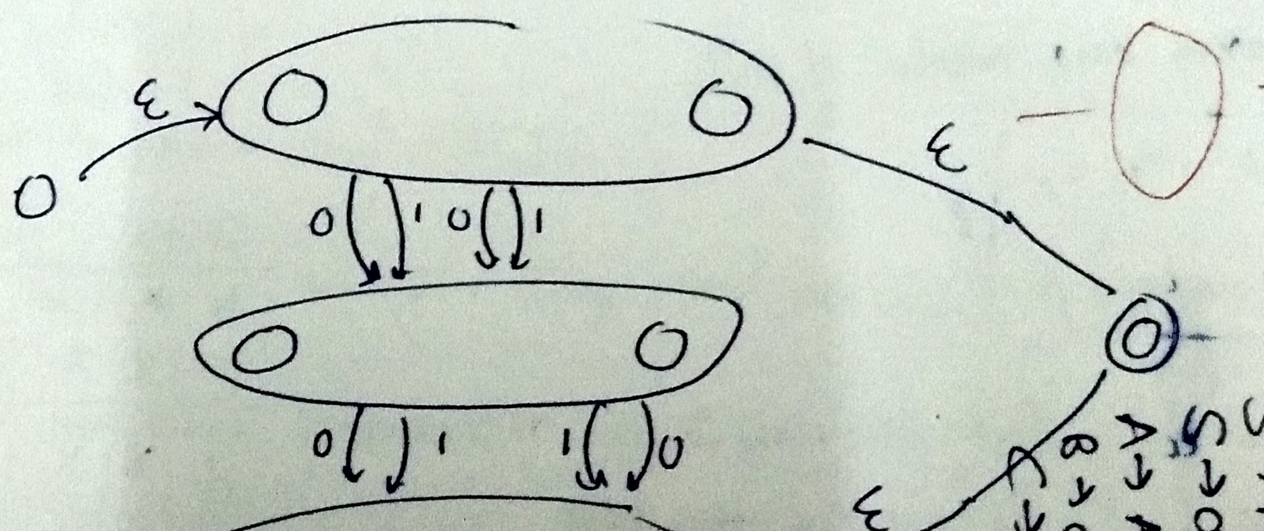
$S \to$ ... $\to$ $b \geq a$

$S \to$ ... $\to$ $a > b$.

$\therefore L(M) = \omega$.

So, we will use this strategy to allow at most two violation of actual string

Does not make sense to me



$S \to abC$.

$S \to Abc$

$S \to aBC$.

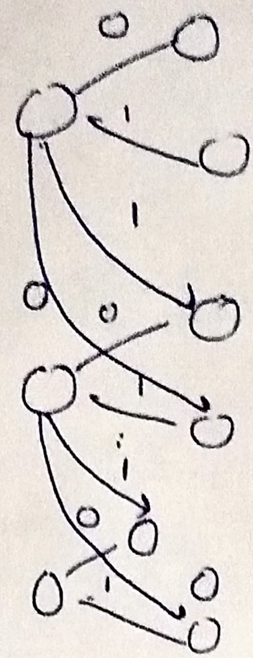
$A \to AAbc \mid a$

$B \to aBBc \mid b$

$C \to abCC \mid c$

$\boxed{ababcc}$

M



$M' = M$

$M'' = M$

Our strategy is

if $(q_{00}, 0) = q_{10}$

then $(q_{00}, 1) = q_{11}$

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and we are allowing two ~~ab~~ reverse transition / no transition to ~~and~~ allow two distance. More over it will be ~~...~~ ~~a~~ linear. (w has length K) K state DFA X ~~k is r~~ |w| is not fixed.

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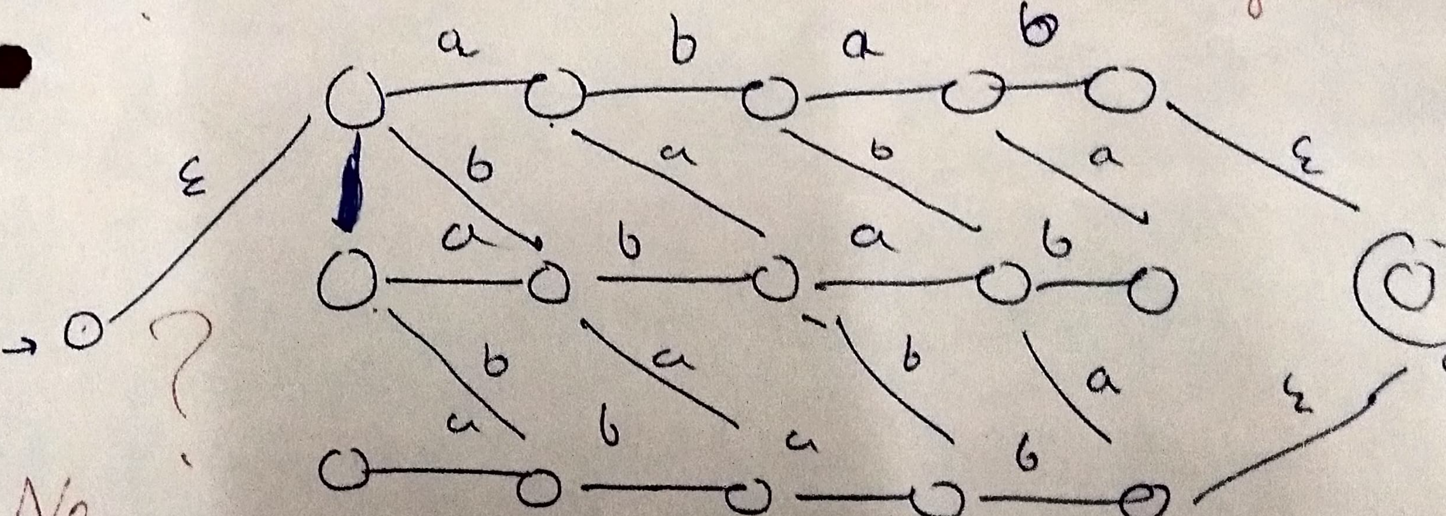

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No explanation.

This way we can construct an NFA.

So regular

2+2