

CS334  
Problem Set 3

9/20/19

Problem 1

\* give regular expressions to generate the given languages. \*

a) language =  $\{w \in \{a,b\}^* : w \text{ contains string } aa \text{ but not } bba\}$

$$\rightarrow (aa)^* ((aa^* ba^*)^* + (a^* ba^* a))$$

$$\rightarrow [(aa^* ba^*)^* + (a^* ba^* a)]$$

b) language =  $\{w \in \{a,b\}^* : w \text{ contains even \# a's but no string of } aa\}$

$$\Rightarrow [b^* a b b^* a b^* b]^*$$

c)  $C = \{ \text{all valid delimited comment strings. each member must begin with } / \# \text{ and end with } \# / \text{ with no intervening } \# / \}$

$$C = \{a, b, /, \#\}$$

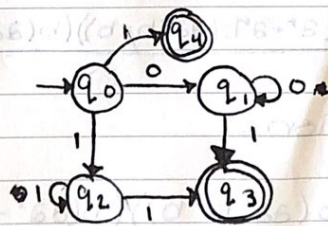
$$\Rightarrow [/\# (a+b)^* \# /]$$

Problem 2

\* Prove that DFA's recognize all and only regular languages \*

Consider a Regular Expression of (All set of strings ending with 1)

NFA:



$$\Rightarrow (0+1)^* 1$$

$$F = \{q_3, q_4\}$$

possible  
All final states  
are final states

All reach  
Final  
States

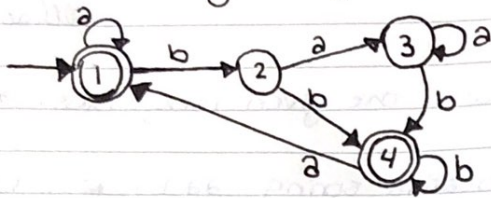
input

$$\begin{aligned} 1 &: \delta(q_0, 1) = q_1 \\ 11 &: \delta(q_0, 1) = q_1, \delta(q_1, 1) = q_3 \\ 01 &: \delta(q_0, 0) = q_1, \delta(q_1, 1) = q_3 \end{aligned}$$

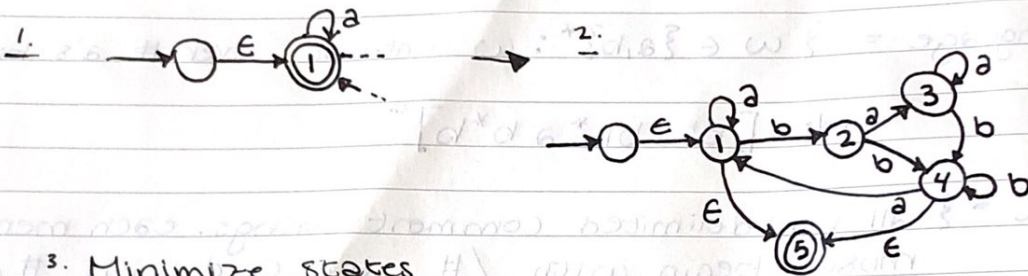
processing ~~all~~ <sup>only/all</sup> Regular languages  
without a dead state

### Problem 3

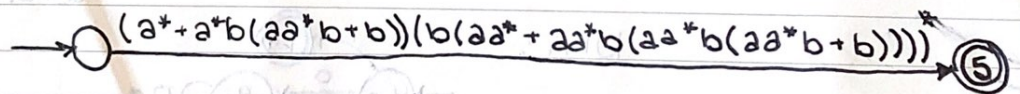
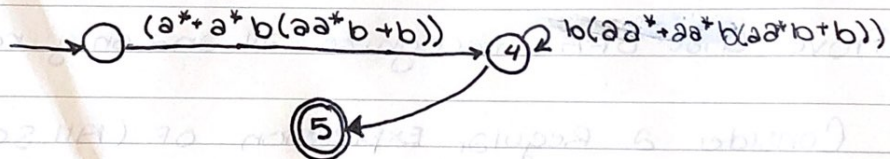
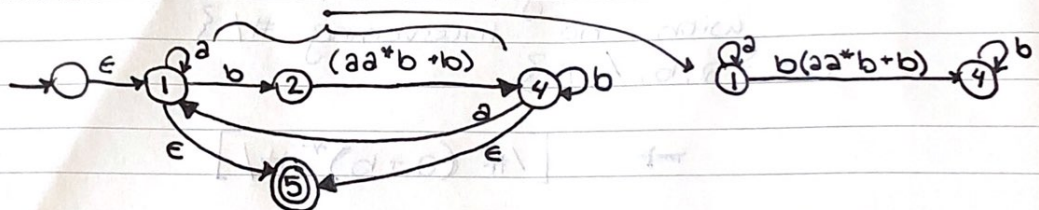
\*give reg exp. for DFA  $\rightarrow$  use conversion theorem \*show steps\*



1. Add initial state to fix incoming edges
2. Eliminate outgoing edges from final states



3. Minimize states



Regular Expression:

$$(a^* + a^*b(aa^*b + b))(b(aa^* + aa^*b(aa^*b + b)))^*$$



Optional

$ONCE(A) = \{w \in A : \text{on input } w, \text{ every FSA for } A \text{ enters the accept state exactly once}\}$

$NEVERAGAIN(A) = \{w \in A : \text{no extension of } w \text{ is accepted by an FSA for } A.\}$

if  $w \in A$

ONCE  $w \rightarrow$  Accepted

NEVER  $w \rightarrow$  Not accepted

Regular if A is regular

Regular if A is Regular  
for a language of  
a set of strings