

# Automata

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COURSE WORK 1.3  
F29LP

SUBMITTED BY

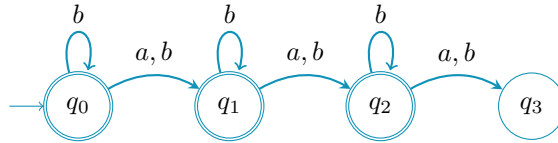
YOAV LEVI  
*H00347035*

1  $/(ab)^*/$

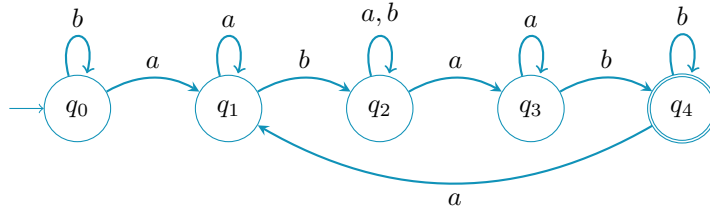
2  $/(b^*a) + a + b[ab]^*/$

### 3 NFA

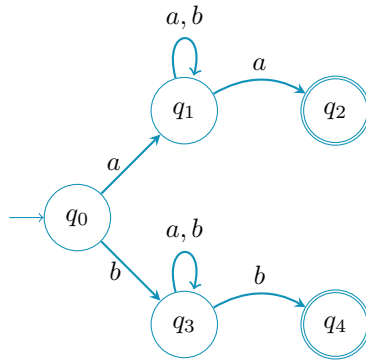
1.  $L = \{w \in \{a, b\}^* \mid w \text{ contains at most two a's}\}$



2.  $L = \{w \in \{a, b\}^* \mid w \text{ contains an even number of occurrences of ab as a subword}\}$



3.  $L = \{w \in \{a, b\}^* \mid \text{the first and the last letter of } w \text{ are identical}\}$



4  $/a * (ba\{2, \})^*/$

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$$\begin{aligned} S &\rightarrow aA \\ A &\rightarrow aB \\ B &\rightarrow aS \mid aC \\ C &\rightarrow S \mid \epsilon \end{aligned}$$

## 6 Unmarked, N/A

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1.

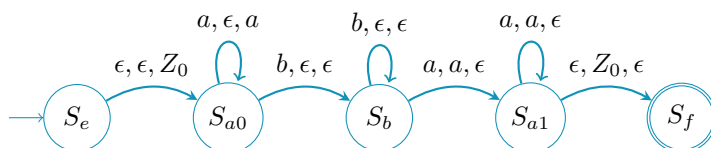
$$\begin{aligned} S &\rightarrow aA|bB \\ A &\rightarrow aA|bS|aB|\epsilon \\ B &\rightarrow aS \end{aligned}$$

2. Is ambiguous as "aaaa" can be constructed in two ways

	Rule	Result		Rule	Result
(I)	$S \rightarrow aA$	a	(II)	$S \rightarrow aA$	a
	$A \rightarrow aA$	aa		$A \rightarrow aB$	aa
	$A \rightarrow aA$	aaa		$B \rightarrow aS$	aaa
	$A \rightarrow aA$	aaaa		$S \rightarrow aA$	aaaa
	$A \rightarrow \epsilon$	<u>aaaa</u>		$A \rightarrow \epsilon$	<u>aaaa</u>

8 The CFG is used to create a number of a's with an equivalent number of b's, in any order.

9  $L = \{a^m b^n a^m | m, n \geq 0\}$ , alphabet =  $\{a, b, Z_0\}$ ,  
Start stack symbol =  $Z_0$

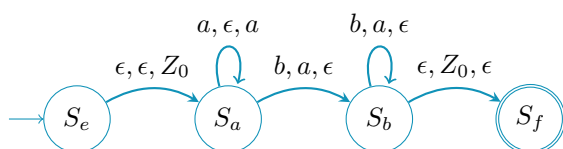


10 Not possible as DFA express regular languages,  
and  $a^m b^n a^m$  is a only expressable as a context-  
free language.

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13  $L = \{w | \#_a = \#_b\}$ , alphabet =  $\{a, b, Z_0\}$ , Start  
stack symbol =  $Z_0$



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