

# Automata

---

COURSE WORK 1.3  
F29LP

SUBMITTED BY

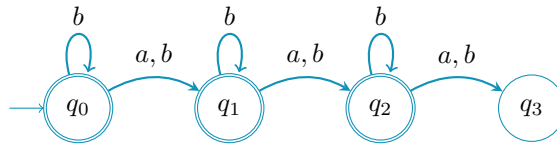
YOAV LEVI  
*H00347035*

1  $/(ab)^*/$

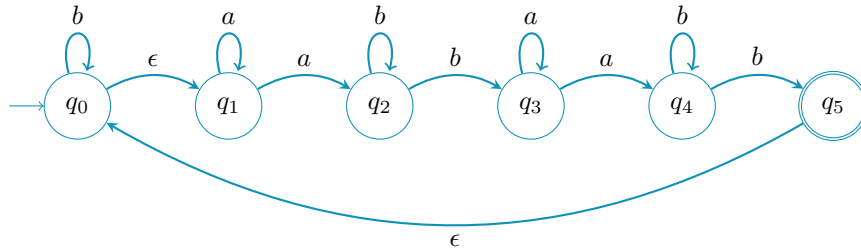
2  $/(b^*a) + a + b[ab]^*/$

### 3 NFA

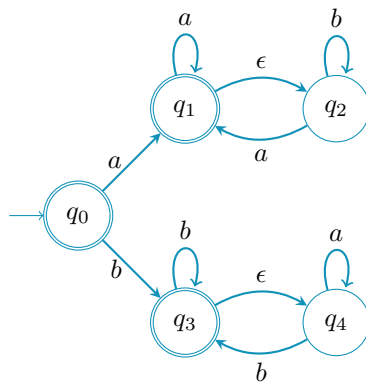
1.  $L = \{w \in \{a, b\}^* \mid w \text{ contains at most two } a\text{'s}\}$



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



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



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

5

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

6 Unmarked, N/A

7

1.

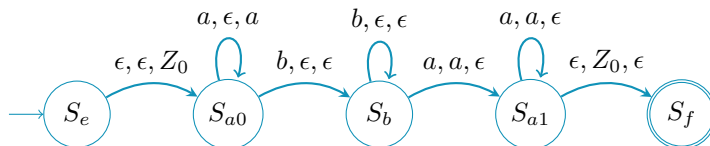
$$\begin{aligned} S &\rightarrow aA|bB \\ A &\rightarrow aA|bS|aB|\epsilon \\ B &\rightarrow aS \end{aligned}$$

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>

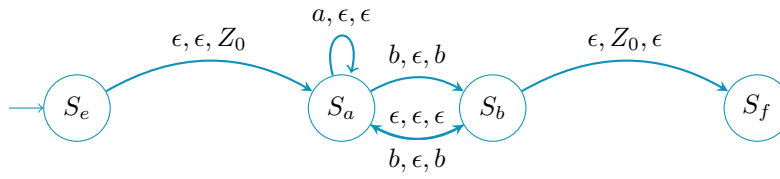
8 The CFG is used to create a number of a's with an equivalent number of b's, in any order.

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

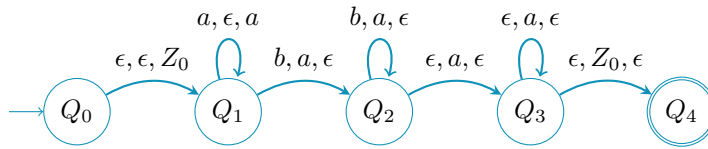


10 Not possible as DFA express regular languages, and  $a^m b^n a^m$  is only expressible as a context-free language.

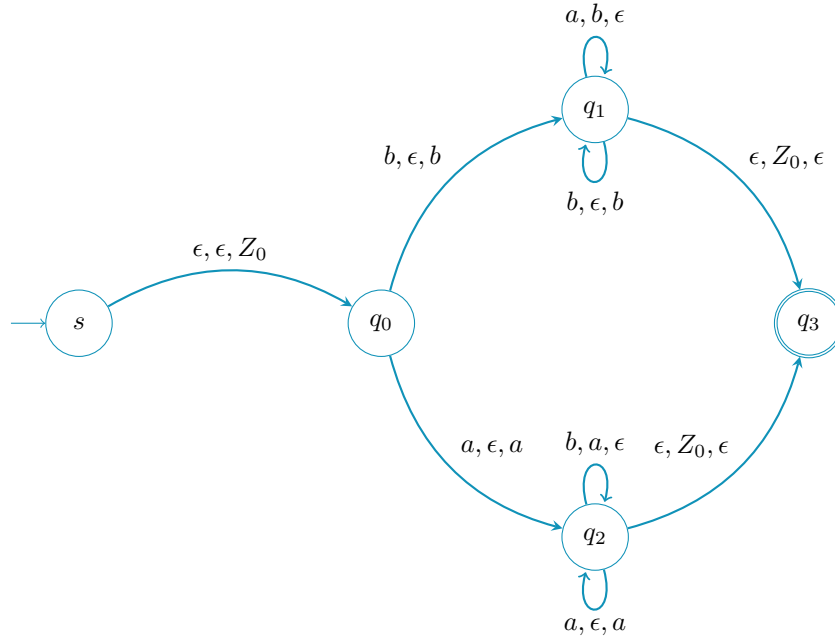
11  $L = \{a^m b^{2n} \mid m, n \geq 0\}$



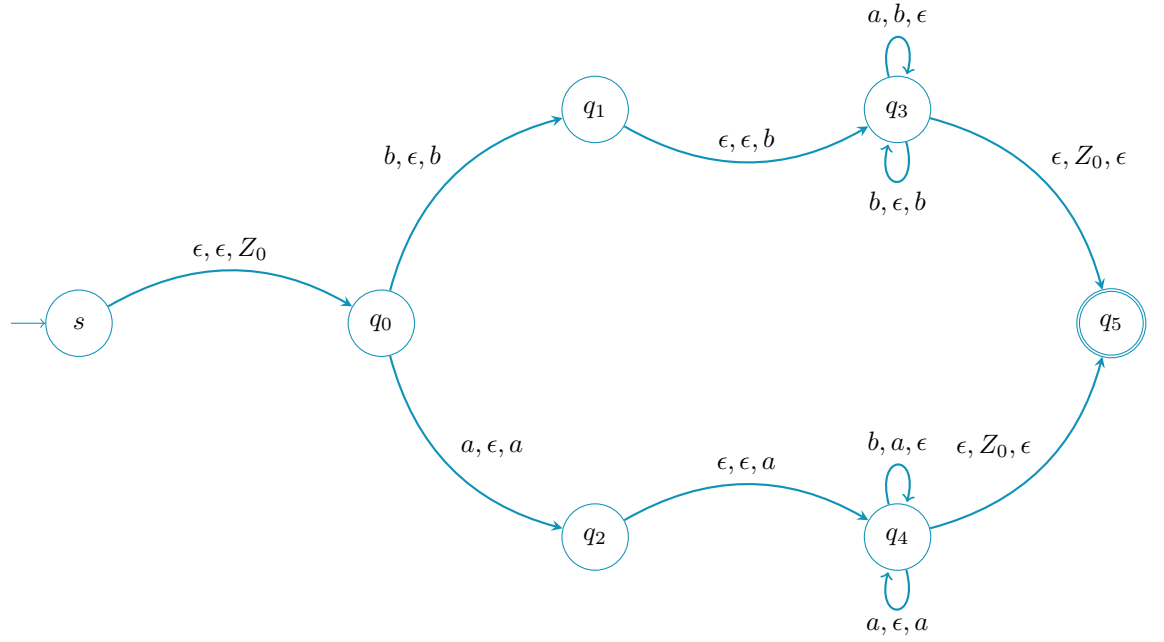
12  $L = \{a^m b^n \mid m > n > 0\}$



**13**  $L = \{W \mid \#_a W = \#_b W\}$



14  $L = \{W \mid \#_a W = 2\#_b W\}$



15

