

## CS 361 – Homework 2

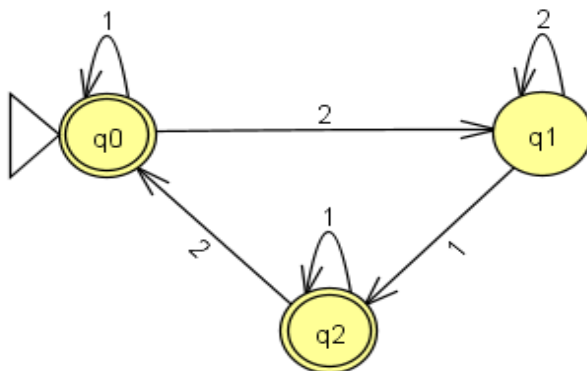
Total possible points: 65

1. (10 points) Let  $M_1$  be the FA defined by  $Q = \{q_0, q_1, q_2\}$ ,  $\Sigma = \{1, 2\}$ ,  $F = \{q_0, q_2\}$ , and  $\delta$ :

$\delta$	1	2
$q_0$	$q_0$	$q_1$
$q_1$	$q_2$	$q_1$
$q_2$	$q_2$	$q_0$

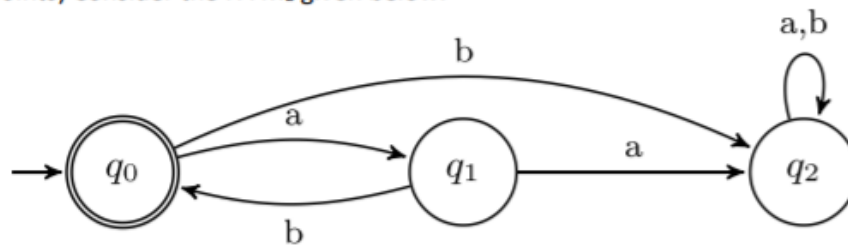
- Give the state diagram of  $M_1$ .
- Trace the computations of  $M$  that process the string 1211, 222122, 212121, and 22211.
- Which of the strings in part (b) are accepted by  $M_1$ ?

- a. State diagram of  $M_1$



- 1211 will be accepted.  
222122 will be rejected because the last state is not a final state.  
212121 will be accepted.  
22211 will be accepted.
- 1211, 212121, and 22211 will be accepted.

2. (10 points) Consider the FA  $M_2$  given below:

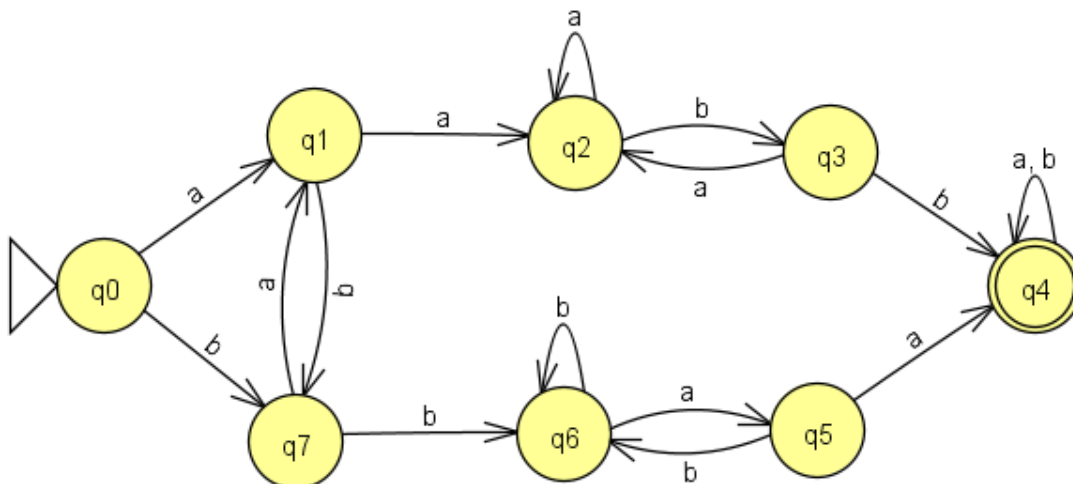


- Explain, i.e., describe, what is the language recognized by  $M_2$
- Which of the strings *baba*, *baab*, *abaaab*,  $\epsilon$  are accepted by  $M_2$ ?

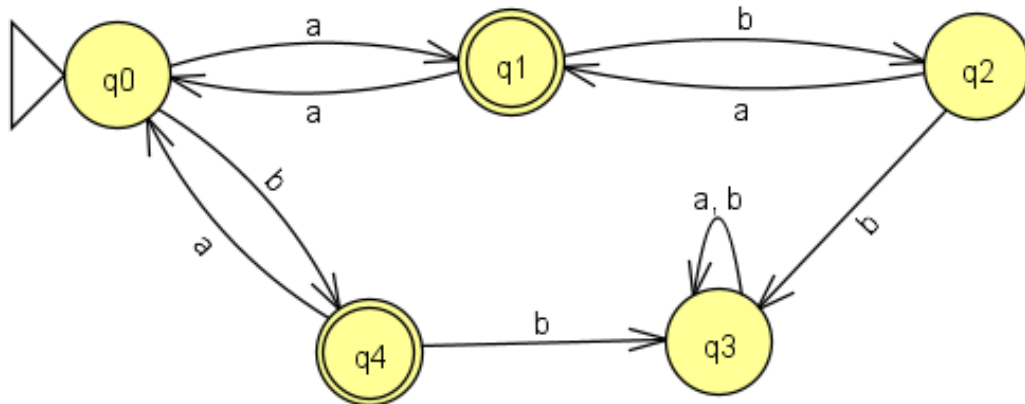
- $L(M_1) = \{w \mid w \text{ ends with } b \text{ or } |w| \text{ is } 2 \text{ or } w \text{ is the empty string}\}$
- baba* will be rejected because the last state is not a final state.
  - baab* will be rejected because the last state is not a final state.
  - abaaab* will be rejected because the last state is not a final state.
  - $\epsilon$  will be accepted.

(Hint: in constructing each deterministic FA for problems 3, 4, and 5 make sure to consider *all the possibilities*, i.e., the different types of strings in the language of the corresponding FA.)

3. (15 points) Build a *deterministic* FA for the following language  $L = \{x \text{ over } \{a, b\} \mid x \text{ contains both substrings } aa \text{ and } bb\}$



4. (15 points) Build a *deterministic FA* that accepts the set of strings of odd length over  $\{a, b\}$  that **do not** contain the substring  $bb$ .



5. (15 points) Build a *deterministic FA* for the following language  $L = \{x \text{ over } \{a, b\} \mid x \text{ contains an odd number of } a \text{ symbols, or exactly two } b \text{ symbols}\}$

