

# Automata and Formal Languages

Homework Set 2

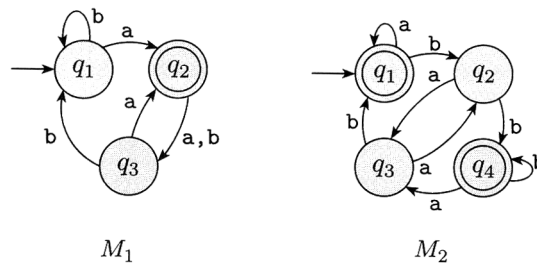
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## Problem 1

- 1.1 The following are the state diagrams of two DFAs,  $M_1$  and  $M_2$ . Answer the following questions about these machines.



- What is the start state of  $M_1$ ?
- What is the set of accept states of  $M_1$ ?
- What is the start state of  $M_2$ ?
- What is the set of accept states of  $M_2$ ?
- What sequence of states does  $M_1$  go through on input aabb?
- Does  $M_1$  accept the string aabb?
- Does  $M_2$  accept the string  $\epsilon$ ?

## Problem 2

Give the formal description of the machines  $M_1$  and  $M_2$  pictured in Problem 1.

## Problem 3

- 1.3 The formal description of a DFA  $M$  is  $(\{q_1, q_2, q_3, q_4, q_5\}, \{u, d\}, \delta, q_3, \{q_3\})$ , where  $\delta$  is given by the following table. Give the state diagram of this machine.

	u	d
$q_1$	$q_1$	$q_2$
$q_2$	$q_1$	$q_3$
$q_3$	$q_2$	$q_4$
$q_4$	$q_3$	$q_5$
$q_5$	$q_4$	$q_5$

**Problem 4**

Give state diagrams of DFAs recognizing the following languages. In all cases the alphabet is  $\{0, 1\}$ .

1.  $\{w \mid w \text{ begins with a 1 and ends with a 0}\}$ .
2.  $\{w \mid w \text{ contains at least three 1s}\}$ .