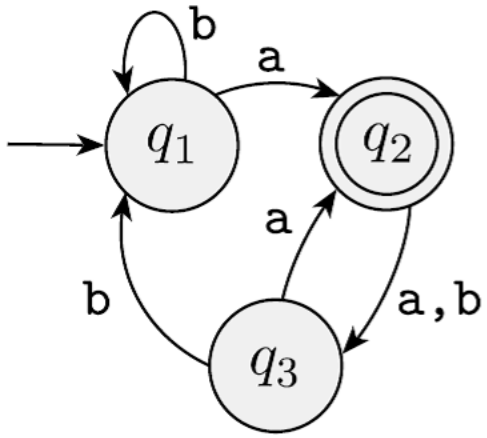
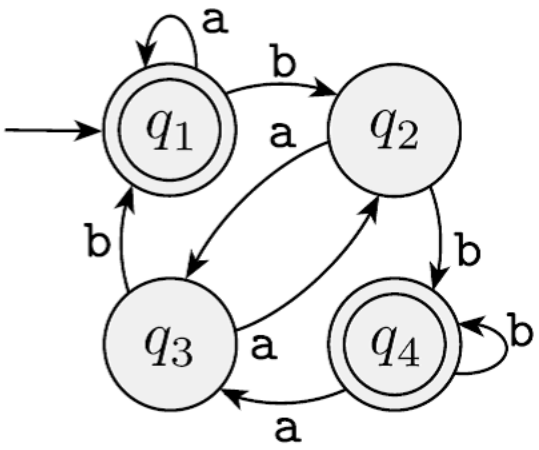
**Problem**

Give the formal description of the machinesM1 and M2 pictured in Exercise 1.1.




$M_1$

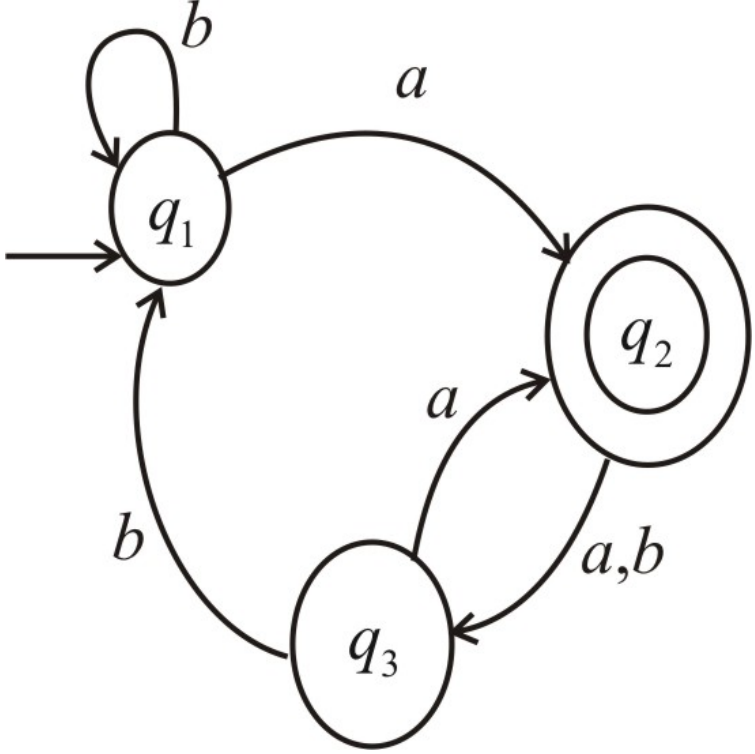



$M_2$

**Step-by-step solution**

**Step 1** of 4

Given state diagram for the machine $M_1$ is




Comment

**Step 2** of 4

Formal definition of a finite automata is

A finite automaton is a 5-tupel $(Q,\Sigma,\delta,q_0,F)$

Where

1. $Q$ is a finite set called states
2. $\Sigma$ is a finite set called alphabet
3. $\delta : Q\times\Sigma \to Q$ is the transition function.
4. $q_0 \in Q$ is the start state
5. $F \subseteq Q$ is the set of accept states.

Now we can describe $M_1$ formally by writing $M_1 = (Q,\Sigma,\delta,q_1,F)$, where

1. $Q = \{q_1,q_2,q_3\}$
2. $\Sigma = \{a,b\}$
3. $\delta$ is described as

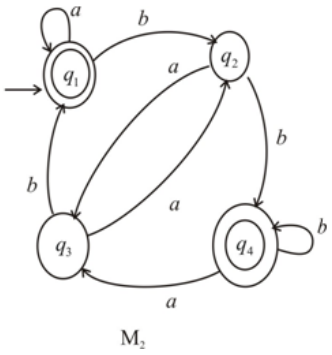
| | $a$ | $b$ |
|---|---|---|
| $q_1$ | $q_2$ | $q_1$ |
| $q_2$ | $q_3$ | $q_3$ |
| $q_3$ | $q_2$ | $q_3$ |

4. $q_1$ is the start state
5. Set of accept states $F = \{q_2\}$.

Comments (3)

**Step 3** of 4

Given state diagram for the machine $M_2$ is




$M_2$

Comment

**Step 4** of 4

Now we can describe $M_2$ formally by writing

$M_2 = (Q, \Sigma, \delta, q_1, F)$, where

1. Set of states $Q = \{q_1, q_2, q_3, q_4\}$

2. Set of alphabet $\Sigma = \{a, b\}$

3. $\delta$ is described as

| | $a$ | $b$ |
|---|---|---|
| $q_1$ | $q_1$ | $q_2$ |
| $q_2$ | $q_3$ | $q_4$ |
| $q_3$ | $q_2$ | $q_1$ |
| $q_4$ | $q_3$ | $q_4$ |

4. $q_1$ is the start state

5. Set of accept states $F = \{q_1, q_4\}$

Comments (4)