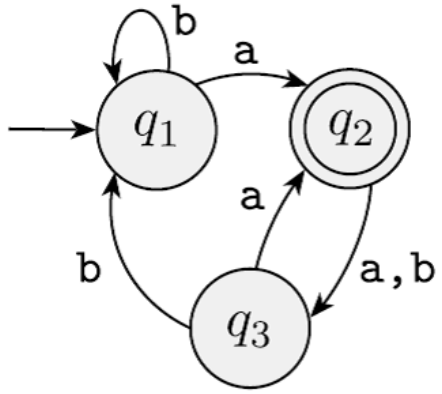
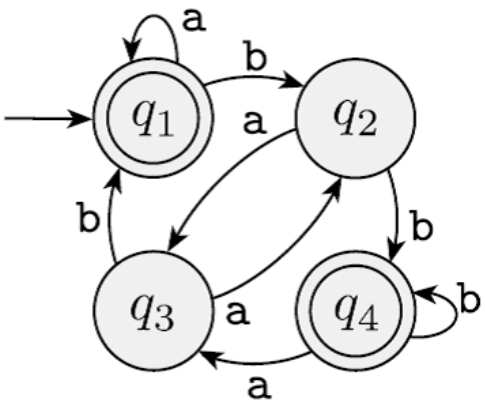
Problem

The following are the state diagrams of two DFAs,M_1 andM_2. Answer the following questions about each of these machines.



M_1



M_2

a. What is the start state?

b. What is the set of accept states?

c. What sequence of states does the machine go through on input aabb?

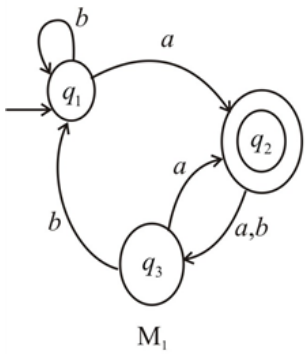
d. Does the machine accept the string aabb?

e. Does the machine accept the string "?

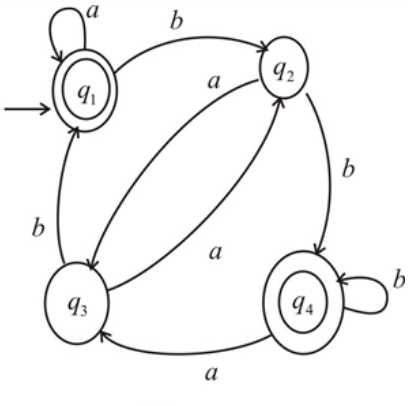
Step-by-step solution

Step 1 of 7

State diagrams for two DFAs, M_1 and M_2 are



M_1



M_2

Comment

Step 2 of 7

(a) Start state is indicated by the arrow pointing towards it.

• For the DFA (Deterministic Finite Automata) M_1, an arrow is pointing towards the state q_1. So q_1 is the start state.

• For the DFA M_2, arrow is pointing towards the state q_1. So q_1 is the start state.

Comment

Step 3 of 7

(b) The accept state is the one which is identified by a double circle.

• In state diagram of M_1, the state q_2 has double circle. So $\{q_2\}$ is the accept state.

• In the sate diagram of M_2, the states q_1 and q_4 have double circles. So the set $\{q_1, q_4\}$ are the accept states.

Comment

Step 4 of 7

(c)

• When we given the string *aabb* as input to the machine M_1 then the following transitions will takes place

(1) Start in state q_1

(2) Read *a*, follow transition from q_1 to q_2

(3) Read *a,* follow transition from q_2 to q_3.

(4) Read *b*, follow transition from q_3 to q_1.

(5) Read *b*, follow transition from q_1 to q_1

From (1), (2), (3), (4), (5)

So the machine M_1 will go through following sequence of states on input *aabb*. q_1, q_2, q_3, q_1, q_1

• When we give the input *aabb* to machine M_2 then the following transitions will takes place

(1) Start in state q_1

(2) Read *a*, follow transition from q_1 to q_1

(3) Read *b*, follow transition from q_1 to q_2

(5) Read *b*, follow transition from q_2 to q_4

From (1), (2), (3), (4), (5)

The machine M_2 will go through the following sequence of states on input *aabb*

q_1, q_1, q_1, q_2, q_4

Comment

Step 5 of 7

(d)

• Machine M_1 will go through following sequence of sates on input *aabb*

1. Start in state q_1

2. Read *a*, follow transition from q_1 to q_2

3. Read *a*, follow transition from q_2 to q_3

4. Read *b*, follow transition from q_3 to q_1

5. Read *b*, follow transition from q_1 to q_1

On reading the input *aabb*, M_1 finally entered into state q_1, which is not an accept state.

So M_1 reject the input *aabb*.

• Machine M_2 will go through the following sequence of sates on input *aabb*

1. Start in state q_1

2. Read *a*, follow transition from q_1 to q_1

3. Read *a*, follow transition from q_1 to q_1

4. Read *b*, follow transition from q_1 to q_2

5. Read *b*, follow transition from q_2 to q_4

On reading the input *aabb*, M_2 finally entered into state q_4.

q_4 accept state of M_2.

Hence M_2 accept the input *aabb*.

Comment

Step 6 of 7

(e)

• On giving the input $\in$(empty string) to machine M_1, M_1 always in the start state q_1.

But $\{q_1\}$ in not the accept sate of M_1.

Thus M_1 does not accept the string $\in$

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Comment

Step 7 of 7

On giving the input $\in$(empty string) to the machine M_2, M_2 always in the start state q_1.

But $\{q_1\}$ is also accept state of M_2.

Thus M_2 accept the string $\in$.

Comment