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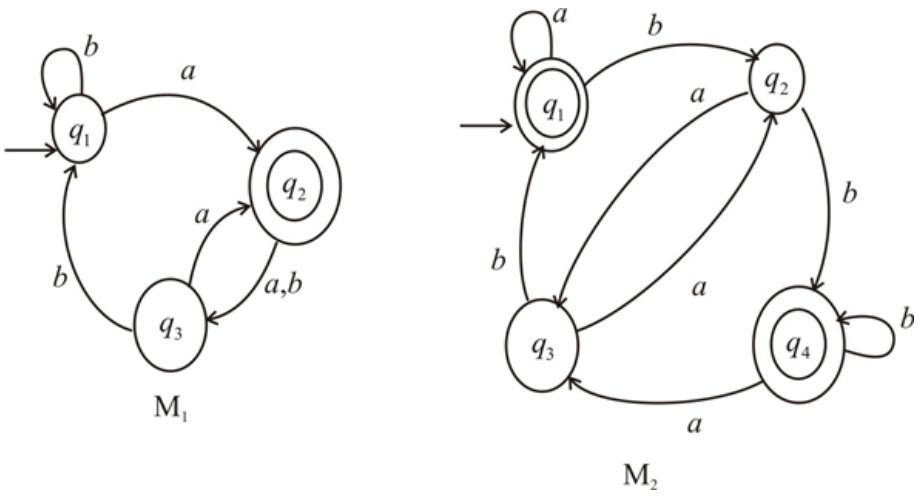
State diagrams for two DFAs, M_1 and M_2 are



(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.

(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.

(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

(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*.

(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 $\in$

•

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 $\in$.