Theory of Automata – Home Work 2

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1. **For the following two state diagrams of DFAs M1 and M2. Answer the following questions about each of these machines.**

Diagram, engineering drawing

Description automatically generated

**Sol :** a) **what is the start state**?

For M1: q1 and M2: q1

b) **What is the set of accept states**?

For M1: {q2} and M2: {q1, q4}

c) **What sequence of states does machine go through on input aabb**?

For M1 : q1, q2, q3, q1, q1 and M2: q1, q1, q2, q4

d) **Does the machine accept the string aabb**?

For M1 : it does not accept and M2: Yes, it accepts.

e) **Does the machine accept the string Ɛ**?

No

1. **Give a formal description of the above two DFAs by specifying the 5-tuple.**

**Sol: M1:**

M1 = (Q, Σ, δ, q1, F) where

* Q = {q1, q2, q3},
* Σ = {a, b},
* The transition function δ :

|  |  |  |
| --- | --- | --- |
|  | a | b |
| q1 | q2 | q1 |
| q2 | q3 | q3 |
| q3 | q2 | q1 |

* **q1** is the start state
* and F= {**q2**}

**M2:**

M2 = (Q, Σ, δ, q1, F) where

* Q = {q1, q2, q3, q4},
* Σ = {a, b},
* The transition function δ :

|  |  |  |
| --- | --- | --- |
|  | a | b |
| q1 | q1 | q2 |
| q2 | q3 | q4 |
| q3 | q2 | q1 |
| q4 | q3 | q4 |

* **q1** is the start state
* and F= {**q1, q4**}

1. **Construct a Deterministic Finite Automata accepting each of the following:** 
   1. **{w ∈ {a, b}∗: 𝑤 has *𝑎bab* as a substring}**

**Sol :**

Diagram

Description automatically generated

* 1. **{w ∈ {a, b}∗: 𝑤 has neither *𝑎𝑎* nor *𝑏𝑏* as a substring}**

**Sol**:

Diagram

Description automatically generated