CS 350 SPRING 2023

HW2

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I declare that I have completed this assignment entirely on my own.
I have read the UAB Academic Integrity Code and understand that any breach of this code may result in severe penalties, including failure of the class.
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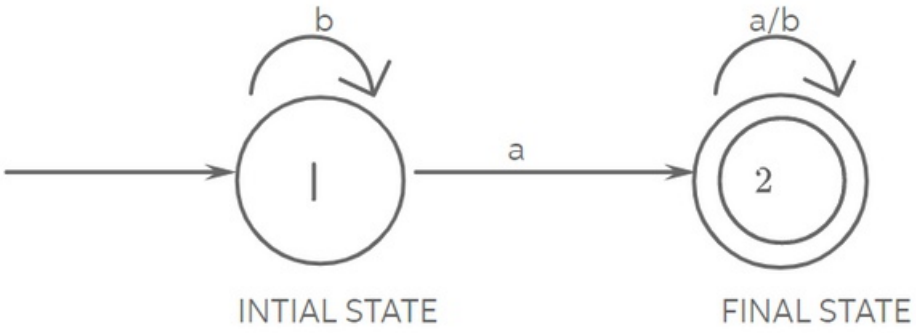
1. (a) The language accepted by this DFA is the set of all strings consisting of an even number of 0's.
{ x | x ∈ {0,1}* and |x| mod 2 = 0 }
Here, {0,1}* represents the universe of all possible strings, x is a variable representing a specific string in this universe, and the constraint |x| mod 2 = 0 ensures that x has an even number of 0's.
(b) The 5 components of the DFA quintet for this machine are as follows:
Q = {q1, q2}
Σ = {0, 1}
δ = {(q1, 0) -> q2, (q1, 1) -> q1, (q2, 0) -> q1, (q2, 1) -> q2}
q0 = q1
F = {q2}
(c) This machine can be encoded in our file format like this:

```
start_state: q1
accept_states: q2

transitions:
q1 0 q2
q1 1 q1
q2 0 q1
q2 1 q2
```



2. (a)

For the above DFA, Sample Input String check (random inputs):

(i) Test case 1: Input string = “aabab”

- The DFA starts at state 1, reads the first character ‘a’ and moves to state 2, reads the second character ‘a’ and stays in state 2, reads the third character ‘b’ and stays in state 2, reads the fourth character ‘a’ and stays in state 2, reads the fifth character ‘b’ and stays in state 2, which is an accept state. Therefore, the input string “aabab” is accepted by the DFA.

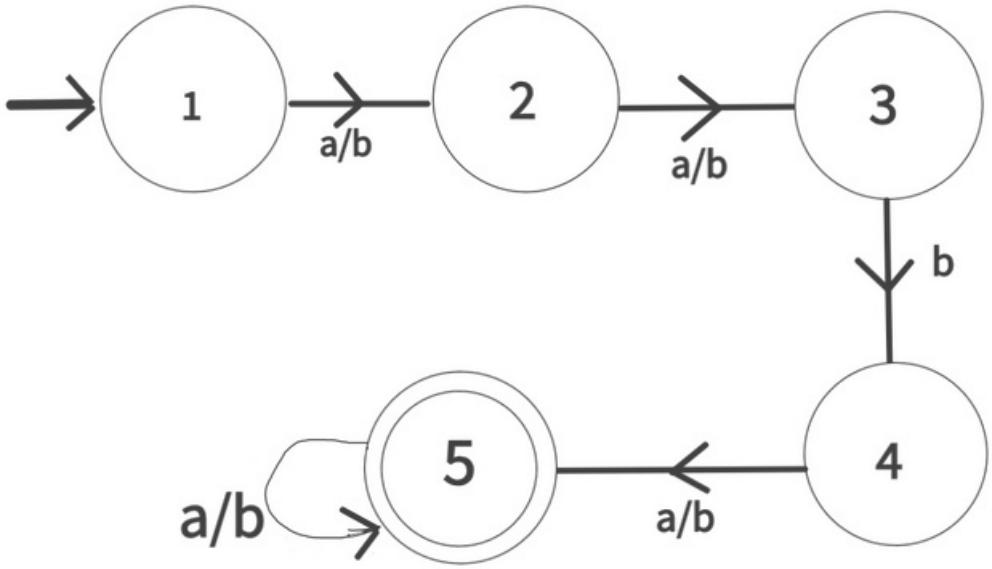
(ii) Test case 2: Input string = “aabb”

- The DFA starts at state 1, reads the first character ‘a’ and moves to state 2, reads the second character ‘a’ and stays in state 2, reads the third character ‘b’ and stays in state 2, reads the fourth character ‘b’ and stays in state 2, which is an accept state. Therefore, the input string “aabb” is not accepted by the DFA.

(b) Encoding the machine in our file format:

```
start_state: 1
accept_states: [2]

transitions:
1: {‘a’: 2, ‘b’: 1}
2: {‘a’: 2, ‘b’: 2}
```



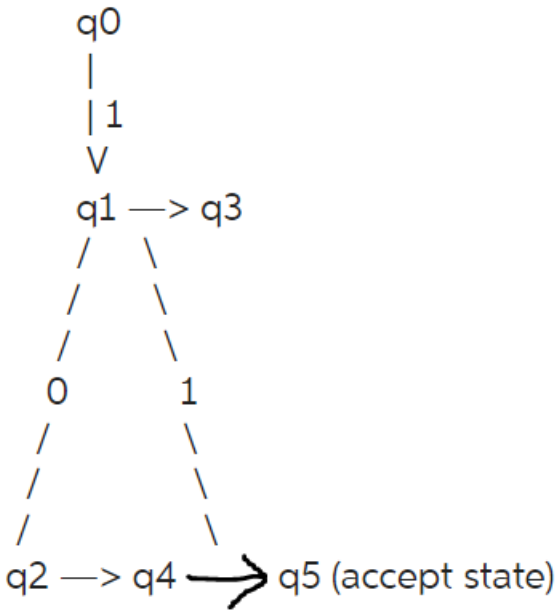
3. (a)

(b) Encoding the machine in our file format:

```
start_state: 1
accept_states: 5

transitions:
1 a 2
1 b 2
2 a 3
2 b 3
3 b 4
4 a 5
4 b 5
```

4. (see next page)


q0
1
q1 —> q3
0
1
q2 —> q4
q5 (accept state)