

Jeanrey V. Paculan

III-ACSAD

NFA – ASSIGNMENT2

NFA, NFA to DFA

A. Create an NFA and provide the 5 Tuple for the following:

1. $L(M) = \{w \mid w \text{ starts with } 111\}$
2. $L(M) = \{w \mid w \text{ ends with } 00\}$
3. $L(M) = \{w \mid w \text{ is empty or starts with } 1\}$

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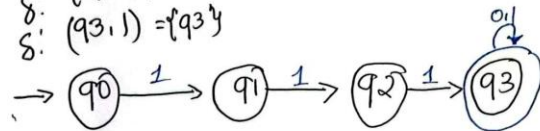
A. NFA

1.) $L(M) = \{w \mid w \text{ starts with } 111\}$

$Q: \{q_0, q_1, q_2, q_3\}$ $q: \{q_0\}$
 $\Sigma: \{0, 1\}$ $F: \{q_3\}$

$\delta: (q_0, 1) = \{q_1\}$
 $\delta: (q_1, 1) = \{q_2\}$
 $\delta: (q_2, 1) = \{q_3\}$
 $\delta: (q_3, 0) = \{q_3\}$
 $\delta: (q_3, 1) = \{q_3\}$

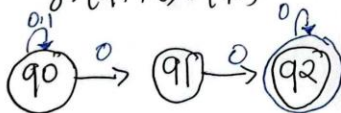
δ	q_0	q_1	q_2	q_3
0	\emptyset	\emptyset	\emptyset	q_3
1	q_1	q_2	q_3	q_3



2.) $L(M) = \{w \mid w \text{ ends with } 00\}$

$Q: \{q_0, q_1, q_2\}$ $\Sigma: \{0, 1\}$ $q: \{q_0\}$ $F: \{q_2\}$

$\delta: (q_0, 0) = \{q_0, q_1\}$ $\delta: (q_1, 1) = \emptyset$
 $\delta: (q_1, 0) = \{q_2\}$



δ	q_0	q_1	q_2
0	q_0, q_1	q_2	\emptyset
1	q_0	\emptyset	\emptyset

3.) $L(M) = \{w \mid w \text{ is empty or starts with } 1\}$

$Q: \{q_0, q_1\}$

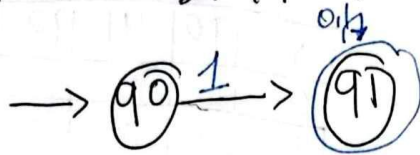
$q: q_0$

$\Sigma: \{0, 1\}$

$F: \{q_1\}$

$\delta: (q_0, 1) = \{q_1\}$ $\delta: (q_1, 0) = \{q_1\}$
 $\delta: (q_1, 1) = \{q_1\}$ $\delta: (q_0, 0) = \{\emptyset\}$

δ	q_0	q_1
0	\emptyset	q_1
1	q_1	q_1



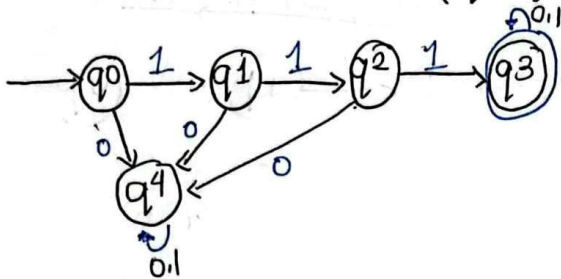
B. Using the Transition Diagram for each sub-item in Test A, provide the equivalent DFA (Transition Diagram, 5 Tuple, and State Diagram)

B.

NFA - DFA

1) $Q: \{q_0, q_1, q_2, q_3, q_4\}$ $\Sigma: \{0, 1\}$ $q: q_0$ $F: \{q_3\}$

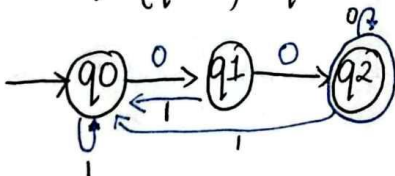
$\delta: (q_0, 1) = q_1$ $\delta: (q_2, 1) = q_3$ $\delta: (q_1, 0) = q_4$
 $\delta: (q_0, 0) = q_4$ $\delta: (q_2, 0) = q_4$ $\delta: (q_4, 1) = q_4$
 $\delta: (q_1, 1) = q_2$ $\delta: (q_3, 1) = q_3$
 $\delta: (q_1, 0) = q_4$ $\delta: (q_3, 0) = q_3$



δ	q_0	q_1	q_2	q_3	q_4
0	q_4	q_4	q_4	q_3	q_4
1	q_1	q_2	q_3	q_3	q_4

2) $Q: \{q_0, q_1, q_2\}$ $\Sigma: \{0, 1\}$ $q: q_0$ $F: \{q_2\}$

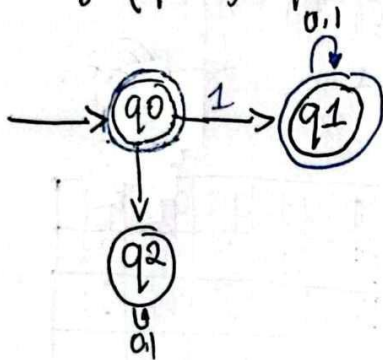
$\delta: (q_0, 0) = q_1$ $\delta: (q_1, 1) = q_0$
 $\delta: (q_0, 1) = q_0$ $\delta: (q_2, 0) = q_2$
 $\delta: (q_1, 0) = q_2$ $\delta: (q_2, 1) = q_0$



δ	q_0	q_1	q_2
0	q_1	q_2	q_2
1	q_0	q_0	q_0

3.) $Q: \{q_0, q_1, q_2\}$ $\Sigma: \{0, 1\}$ $q: q_0$ $F: \{q_0, q_1\}$

$\delta: (q_0, 1) = q_1$ $\delta: (q_1, 1) = q_1$ $\delta: (q_2, 0) = q_2$
 $\delta: (q_0, 0) = q_2$ $\delta: (q_1, 0) = q_1$ $\delta: (q_2, 1) = q_1$



δ	q_0	q_1	q_2
0	q_2	q_1	q_2
1	q_1	q_1	q_2

C. Perform the Union operation on B.1 and B.2.

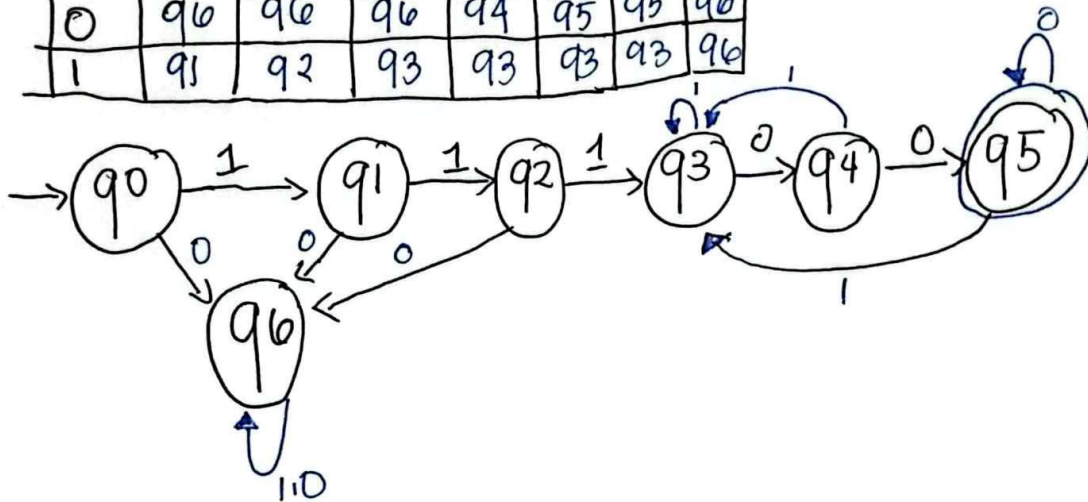
Provide the equivalent DFA and 5 Tuple

C. Perform Union on B1, B2

$Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$

$\Sigma = \{0, 1\}$ $q = \{q_0\}$ $F = \{q_5\}$

δ	q_0	q_1	q_2	q_3	q_4	q_5	q_6
0	q_6	q_6	q_6	q_4	q_5	q_5	q_6
1	q_1	q_2	q_3	q_3	q_3	q_3	q_6



$$\delta'(q_0, 0) = q_6$$

$$\delta'(q_0, 1) = q_1$$

$$\delta'(q_1, 0) = q_6$$

$$\delta'(q_1, 1) = q_2$$

$$\delta'(q_2, 0) = q_6$$

$$\delta'(q_2, 1) = q_3$$

$$\delta'(q_3, 0) = q_4$$

$$\delta'(q_3, 1) = q_3$$

$$\delta'(q_4, 0) = q_5$$

$$\delta'(q_4, 1) = q_3$$

$$\delta'(q_5, 0) = q_5$$

$$\delta'(q_5, 1) = q_3$$