Problem

Use the construction in the proof of Theorem 1.49 to give the state diagrams of NFAs recognizing the star of the languages described in

a. Exercise 1.6b.

b. Exercise 1.6j.

c. Exercise 1.6m.

THEOREM **1.49**

The class of regular languages is closed under the star operation.

Step-by-step solution

Step 1 of 3

(a) Language $L_1 = \{w \mid w \text{contains at least three 1s}\}$

Let M_1 be the NFA that recognizes L_1.

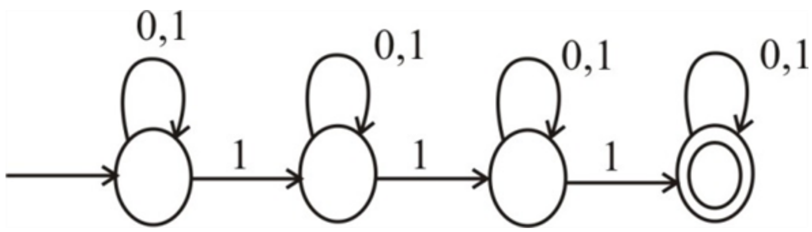
Let $L = L_1^*$

Let *M* be the NFA that recognizes *L*.

$L_1 = \{w \mid w \text{ contains at least three 1s}\}$

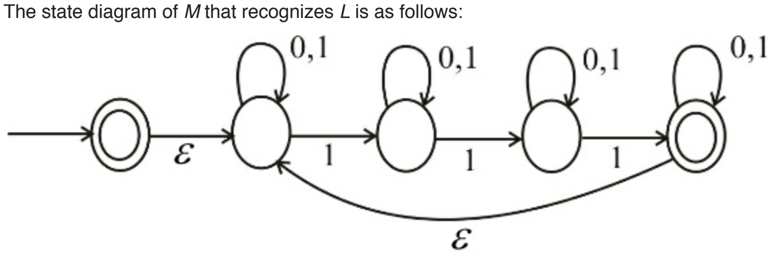
$L_1 = (0,1)^* 1(0,1)^* 1(0,1)^* 1(0,1)^*$

The state diagram of M_1 that recognizes L_1 is as follows:



L is the language that recognizes star of L_1

The state diagram of *M* that recognizes *L* is as follows:



Comments (7)

Step 2 of 3

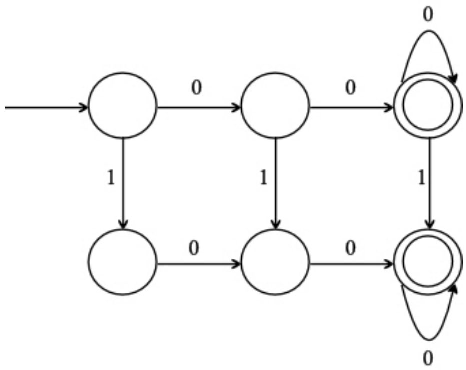
(b) Languages $L_1 = \{w \mid w \text{ contains at least two 0s and at most one 1}\}$

Let M_1 be the NFA that recognizes L_1.

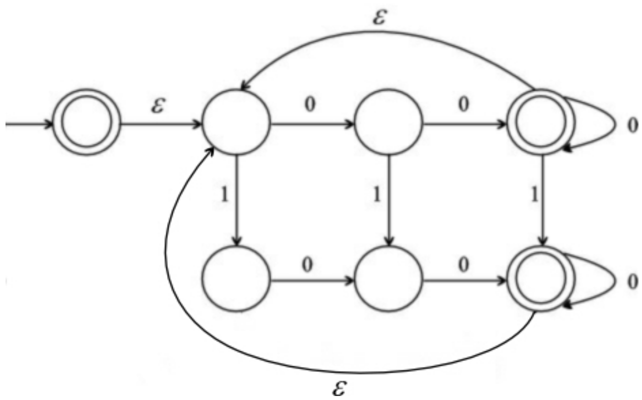
Let $L = L_1^*$

Let *M* be the NFA that recognizes *L*.

$L_1 = \{w \mid w \text{ contains atleast two 0s and at most one 1}\}$



The state diagram of *M* that recognizes *L* is as follows:



Comment

Step 3 of 3

(c) Languages L_1 = The empty set.

Let M_1 be the NFA that recognizes L_1.

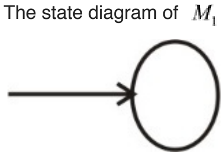
Let $L = L_1^*$

Let *M* be the NFA that recognizes *L*.

$L_1 = \text{The empty set}$

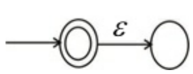
$L_1 = \phi = \{\ \}$

The state diagram of M_1 that recognizes L_1 is as follows:



L is the star of L_1.

The state diagram of *M* that recognizes *L* is as follows:



Comment