



# Conversion of RE to FA

To convert the RE to FA, we are going to use a method called the subset method. This method is used to obtain FA from the given regular expression. This method is given below:

**Step 1:** Design a transition diagram for given regular expression, using NFA with  $\epsilon$  moves.

**Step 2:** Convert this NFA with  $\epsilon$  to NFA without  $\epsilon$ .

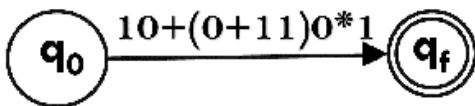
**Step 3:** Convert the obtained NFA to equivalent DFA.

## Example 1:

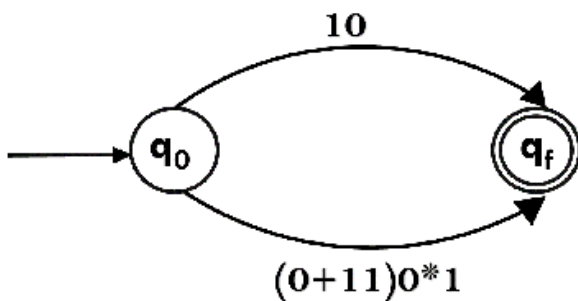
Design a FA from given regular expression  $10 + (0 + 11)0^*1$ .

**Solution:** First we will construct the transition diagram for a given regular expression.

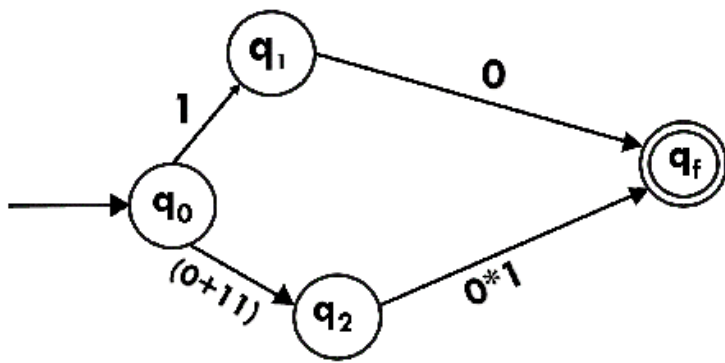
**Step 1:**



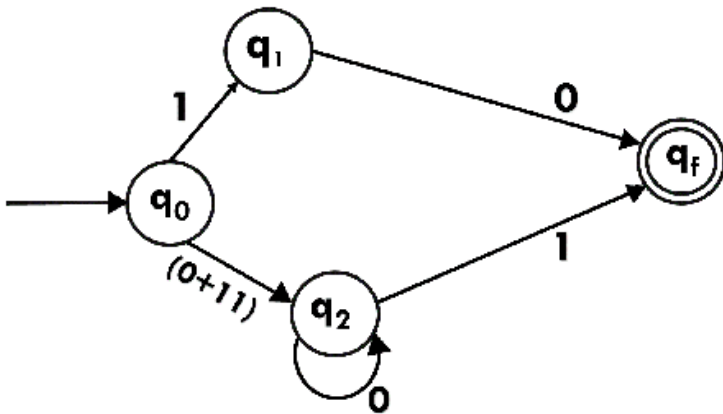
**Step 2:**



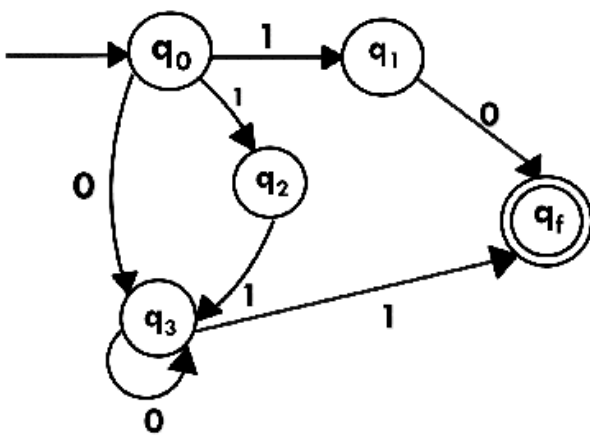
**Step 3:**



Step 4:



Step 5:



Now we have got NFA without  $\epsilon$ . Now we will convert it into required DFA for that, we will first write a transition table for this NFA.

State	0	1
$\rightarrow q_0$	$q_3$	$\{q_1, q_2\}$
$q_1$	$q_f$	$\phi$
$q_2$	$\phi$	$q_3$
$q_3$	$q_3$	$q_f$
$*q_f$	$\phi$	$\phi$

The equivalent DFA will be:

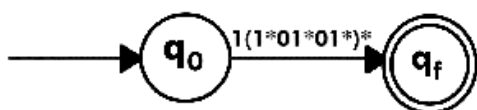
State	0	1
$\rightarrow [q_0]$	$[q_3]$	$[q_1, q_2]$
$[q_1]$	$[q_f]$	$\phi$
$[q_2]$	$\phi$	$[q_3]$
$[q_3]$	$[q_3]$	$[q_f]$
$[q_1, q_2]$	$[q_f]$	$[q_f]$
$*[q_f]$	$\phi$	$\phi$

## Example 2:

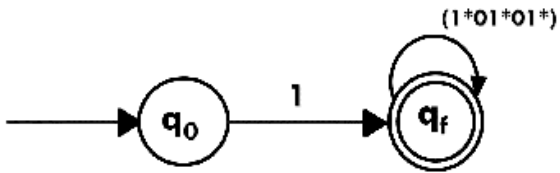
Design a NFA from given regular expression  $1(1^*01^*01^*)^*$ .

**Solution:** The NFA for the given regular expression is as follows:

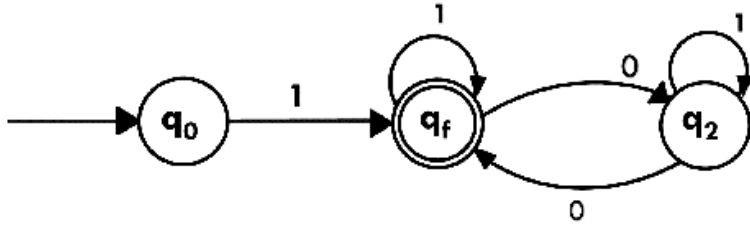
**Step 1:**



**Step 2:**



Step 3:



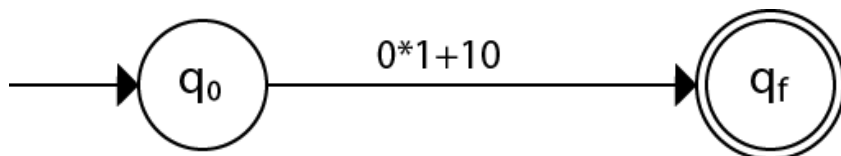
### Example 3:

Construct the FA for regular expression  $0^*1 + 10$ .

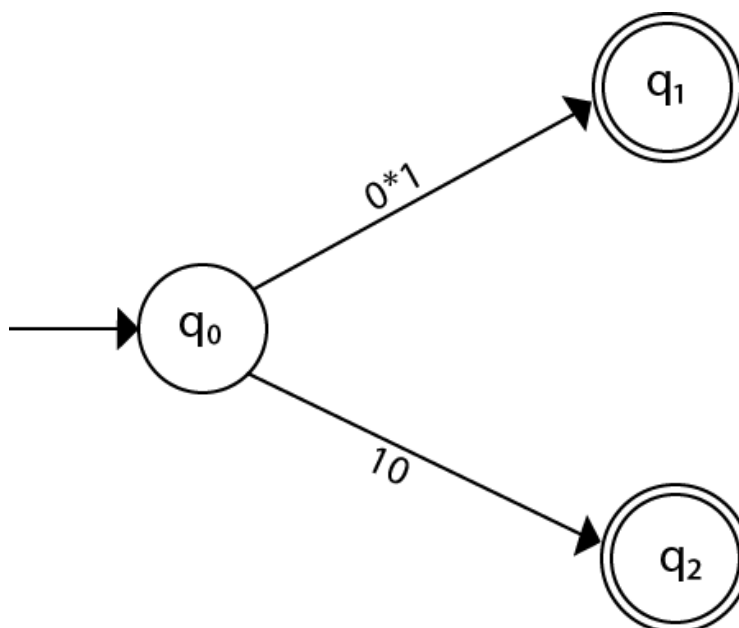
**Solution:**

We will first construct FA for  $R = 0^*1 + 10$  as follows:

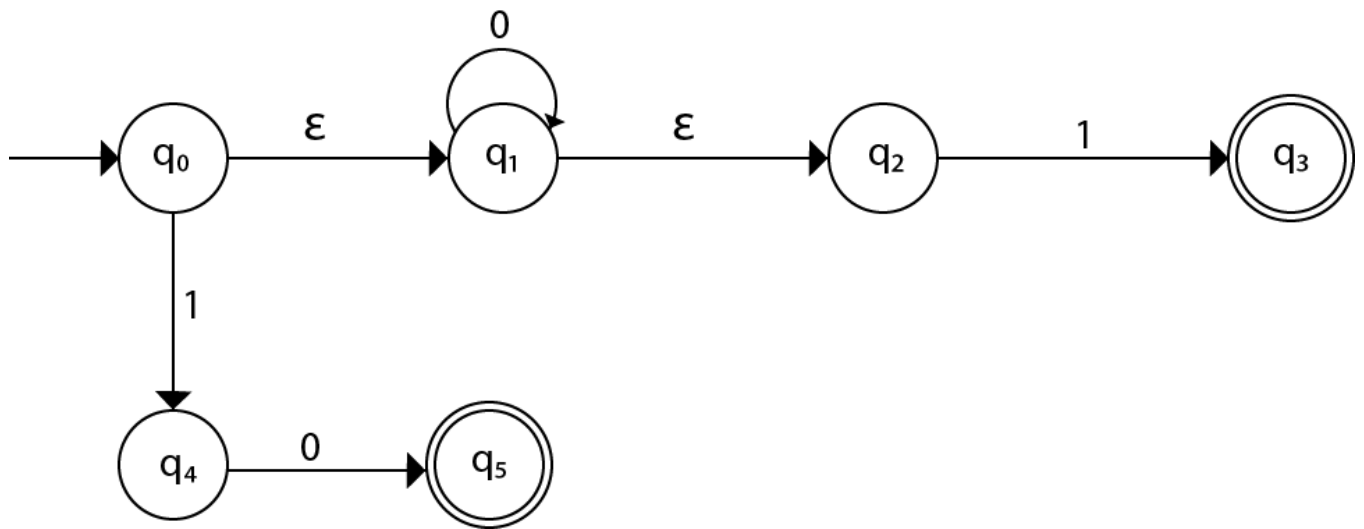
Step 1:



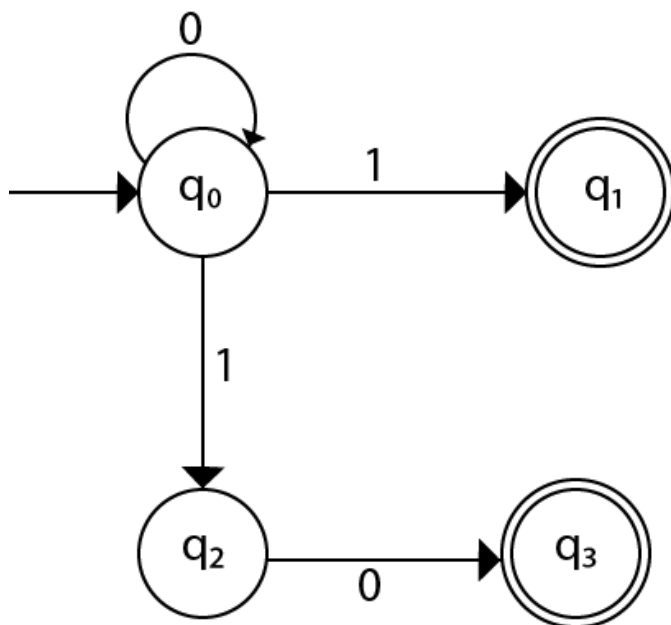
Step 2:



Step 3:



Step 4:



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