Automata Formal Languages & Logic

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Unit 1

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Approach to Construct a DFA that recognises a language L:

Step I : Enumerate Strings in the language:

* Specify the minimal String
* Enumerate Strings in the order of increasing length
* Discover a Pattern

Step II : Draw a DFA skeleton of the Automata(Machine) based on the Pattern Discovered.

Step III : Complete the DFA

Transition Function for a DFA

$\delta : Q \times \Sigma \rightarrow Q$

- For each state in the DFA, there must be exactly one transition defined for each symbol in Σ.
- This is the "deterministic" part of DFA
- At every point in the computation, there is exactly one choice that can be made.

M - Machine/Automata
Q - Set of States (finite)
Σ - Set of Input Symbols
δ - Transition Function
q_0 - Start State
F - Set of Final States
$F \subseteq Q$

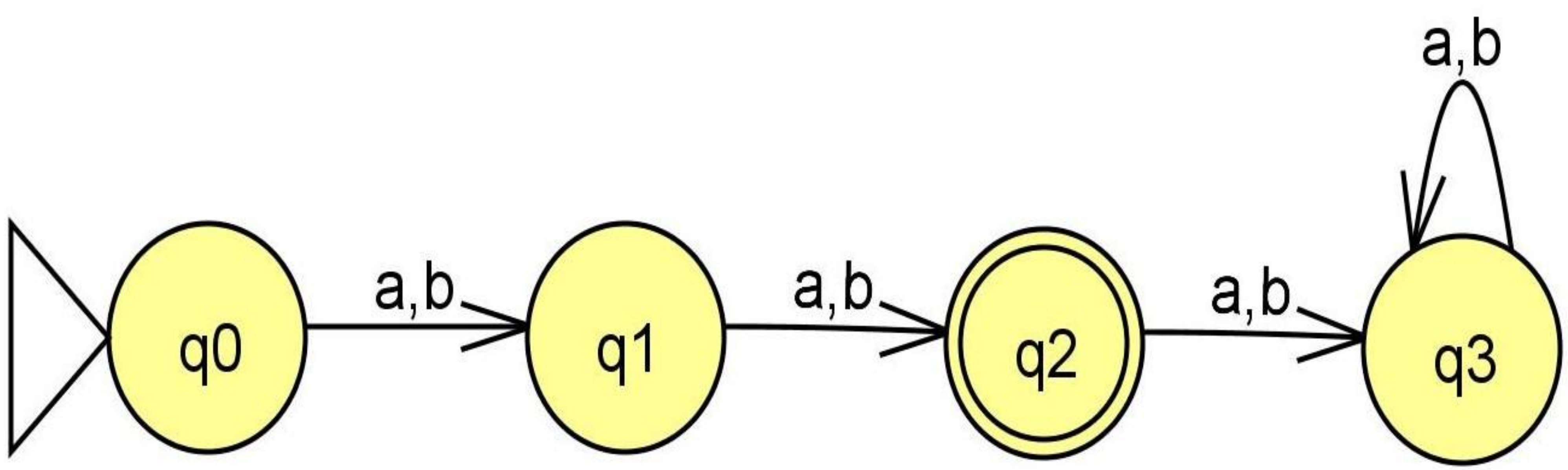
Acceptance by a FA :

- A finite automaton does not accept as soon as it enters an accepting state.

- A finite automaton accepts if it ends in an accepting state.

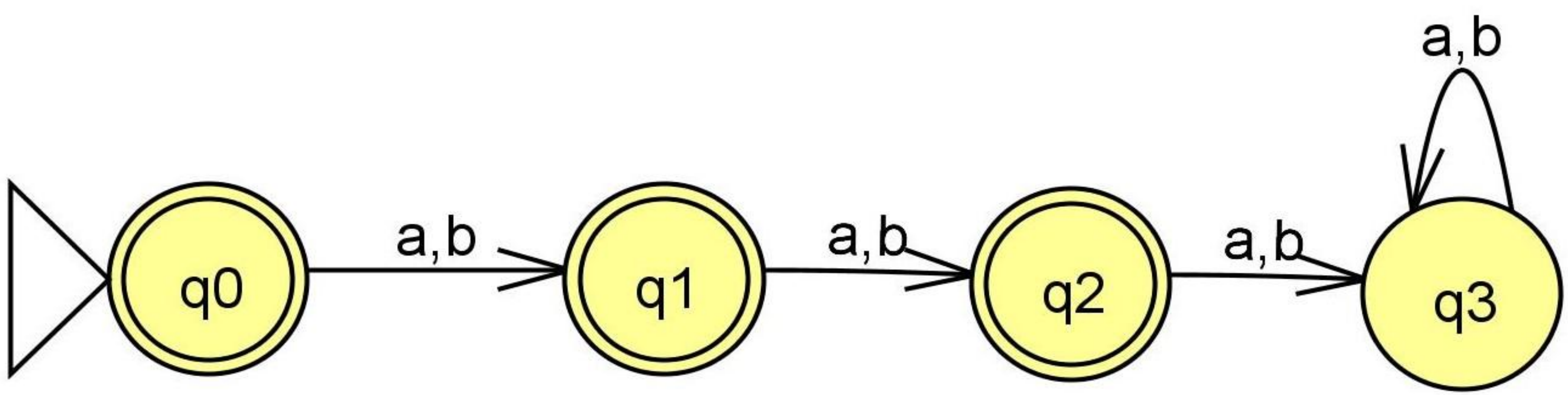
Example 1:
Construct DFA for the Language of strings of length 2 , over Σ ={a,b} .

Solution :



Example 2:
Construct DFA for the language of strings of length <=2 , over Σ ={a,b}.

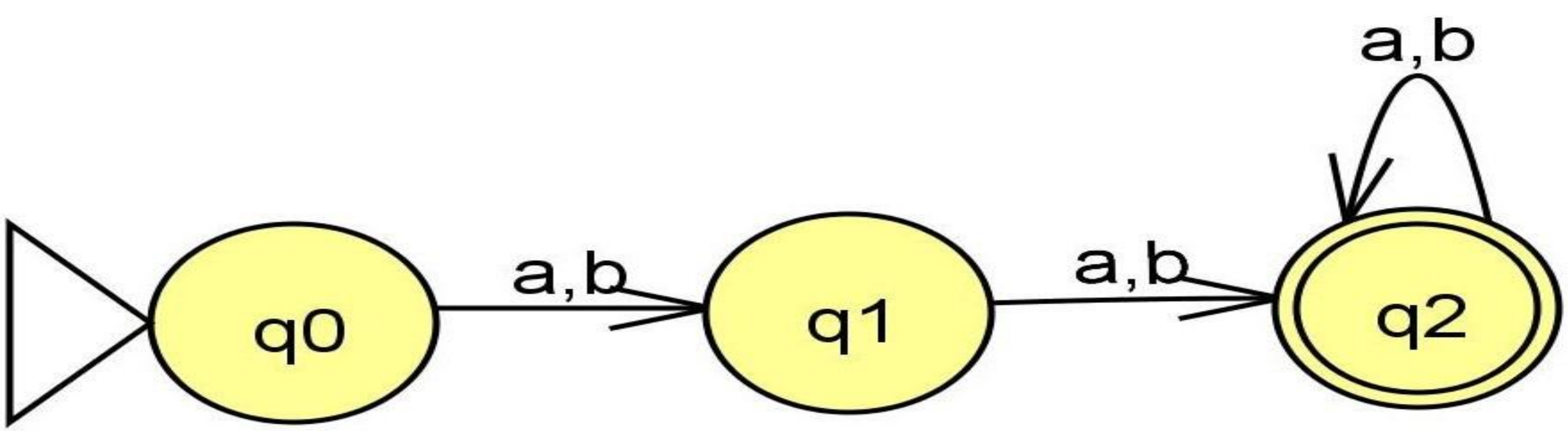
Solution :



Example 3:

Construct DFA for the language of strings of length >=2 , over Σ ={a,b}.

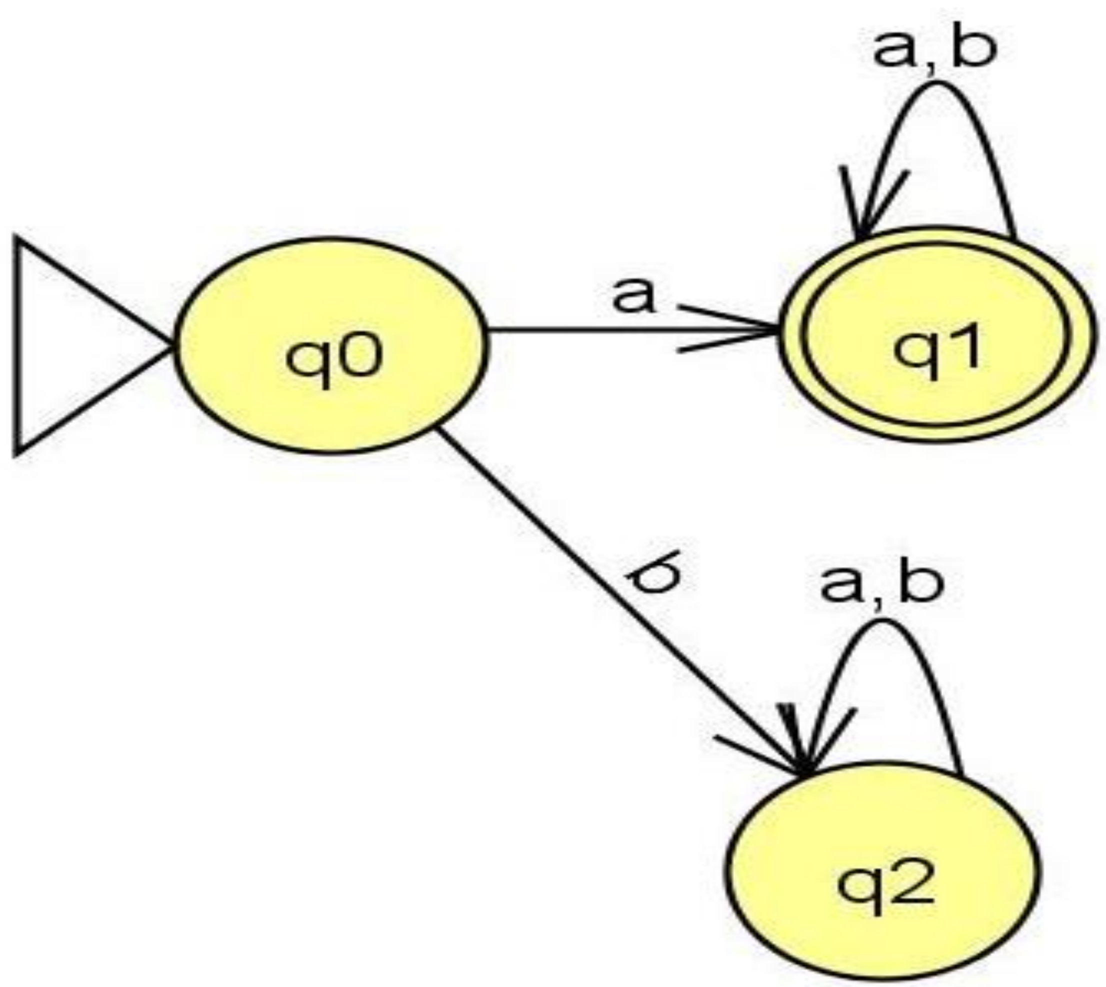
Solution :



Example 4:

Construct DFA for the language of strings which start with a ,over Σ ={a,b}.

Solution :



Example 5:

Construct DFA for the language with strings which start with a and end in b over Σ ={a,b}.

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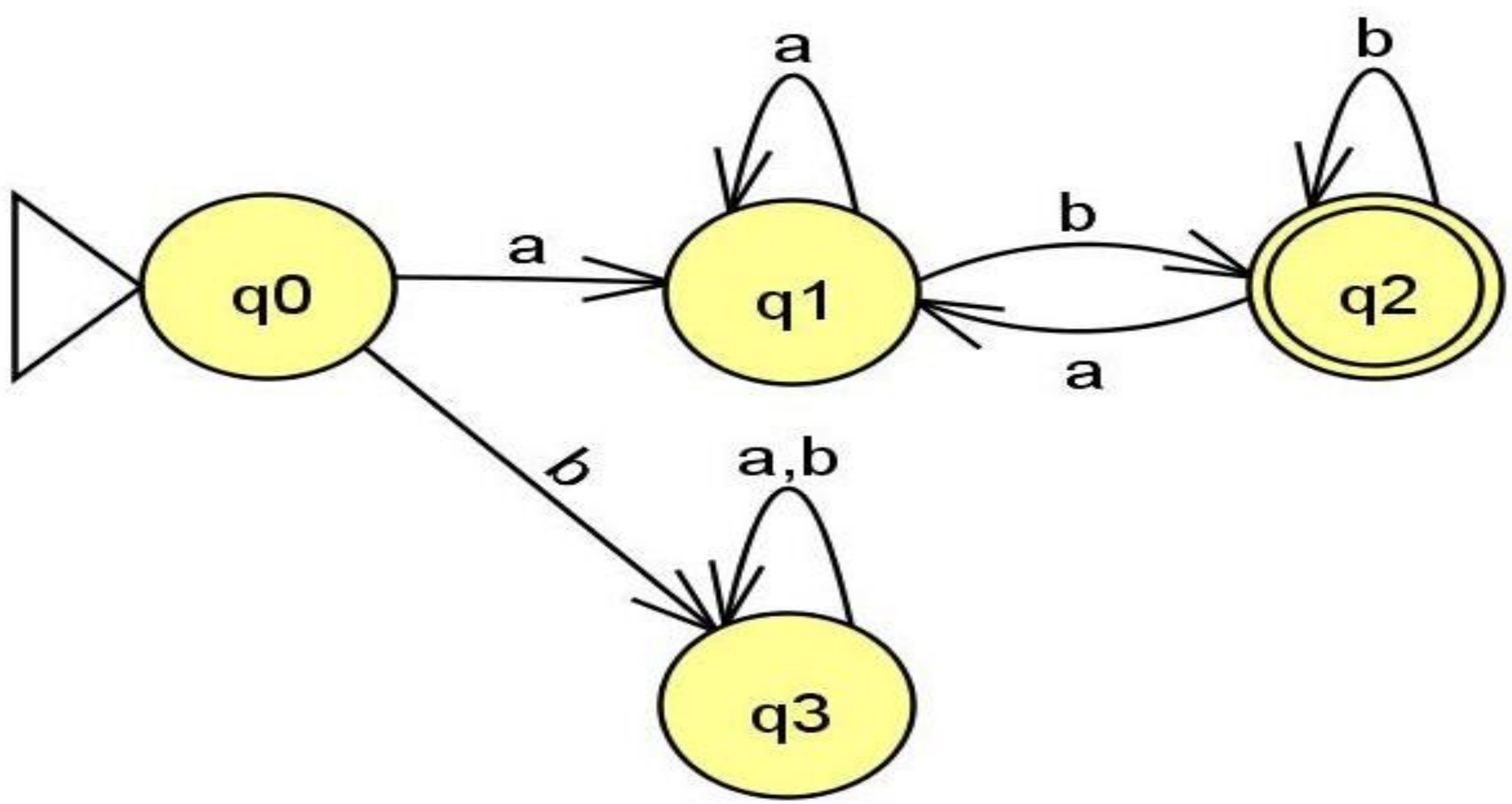
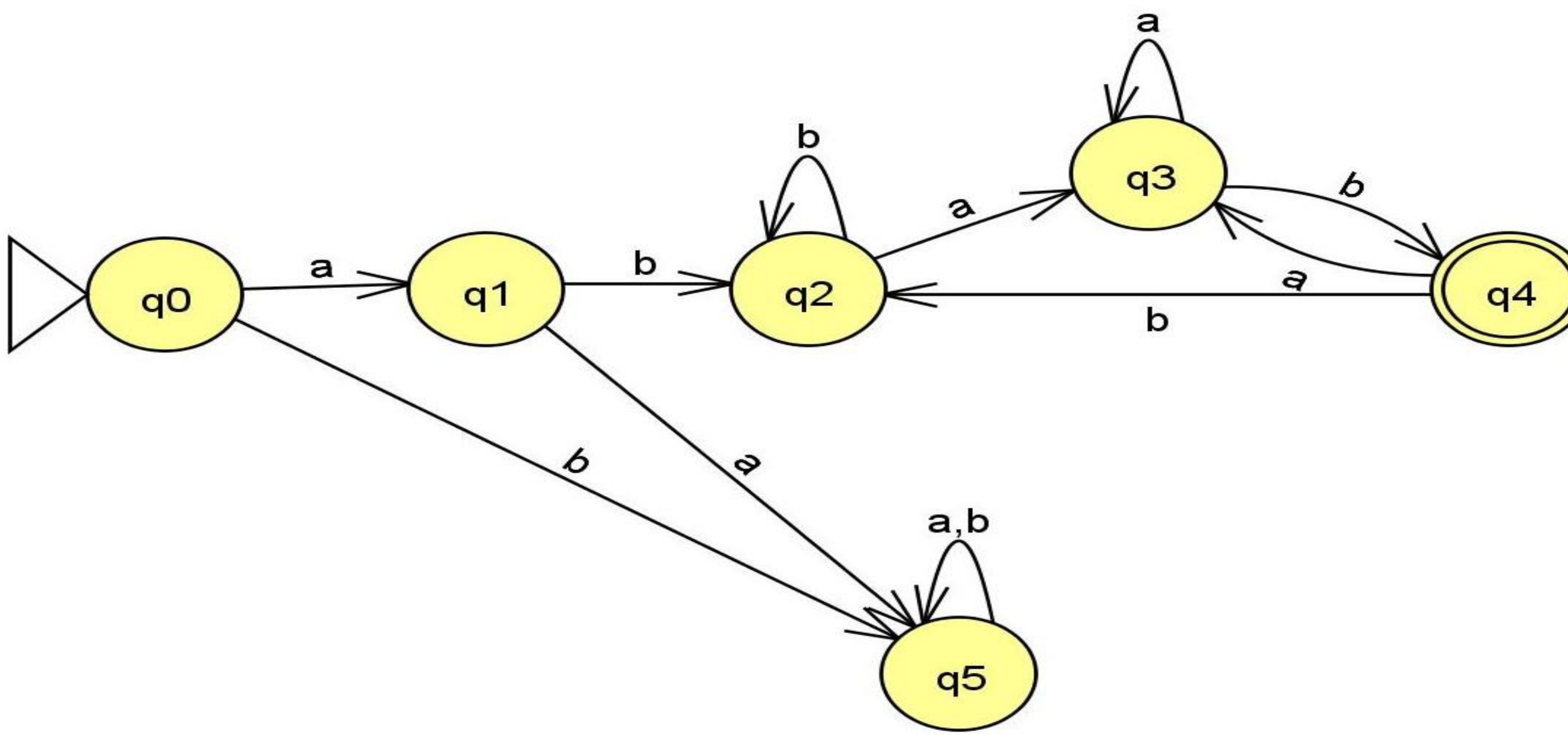


Example 6:

The language with strings over Σ ={a,b} where every string starts with ab and ends in ab, over Σ ={a,b}.

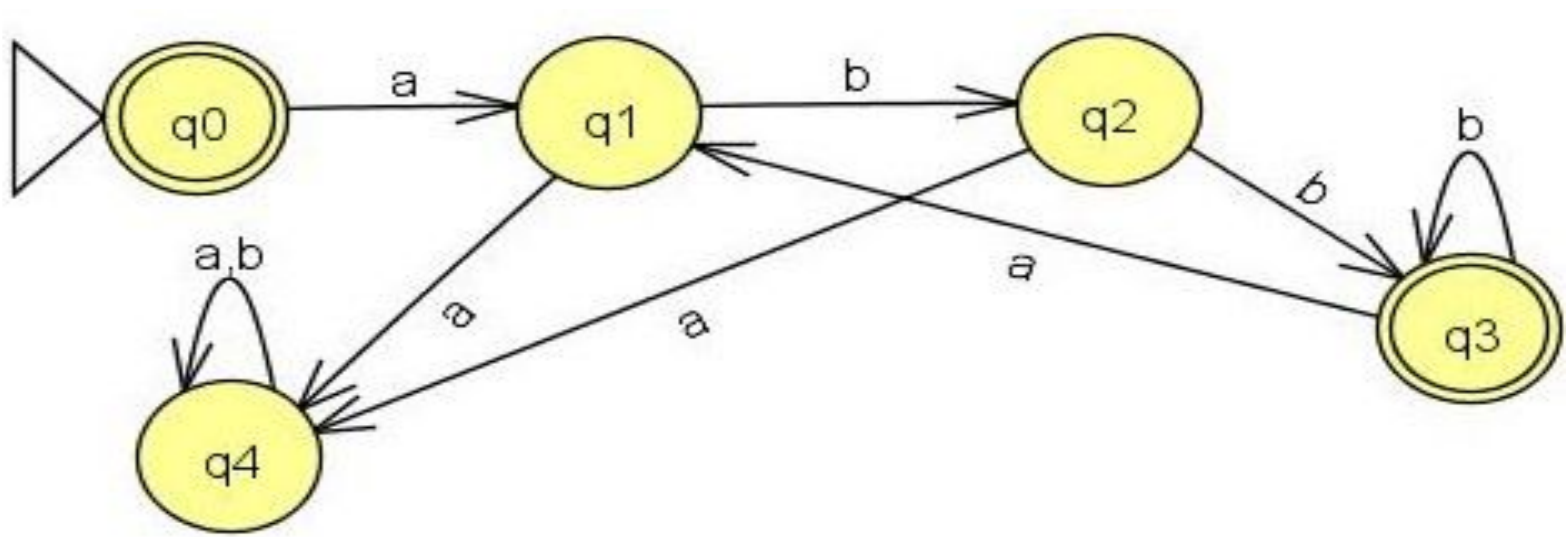
Solution:



Example 7:

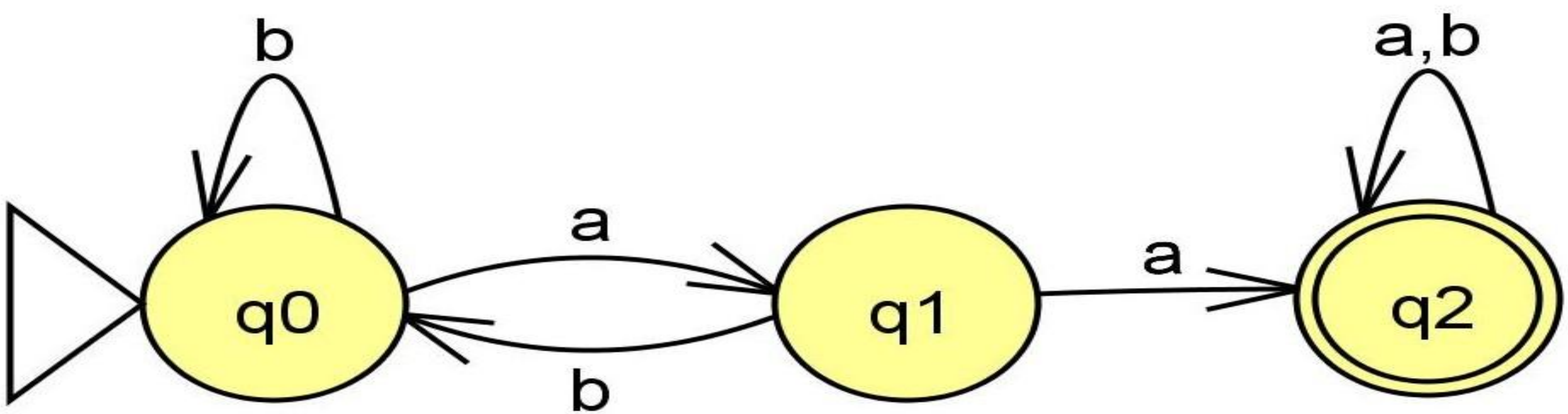
The language of strings over Σ ={a,b} where every a is followed by bb.

Solution :



Example 8:
The language of strings over Σ ={a,b} where every string must contain "aa" as the substring.

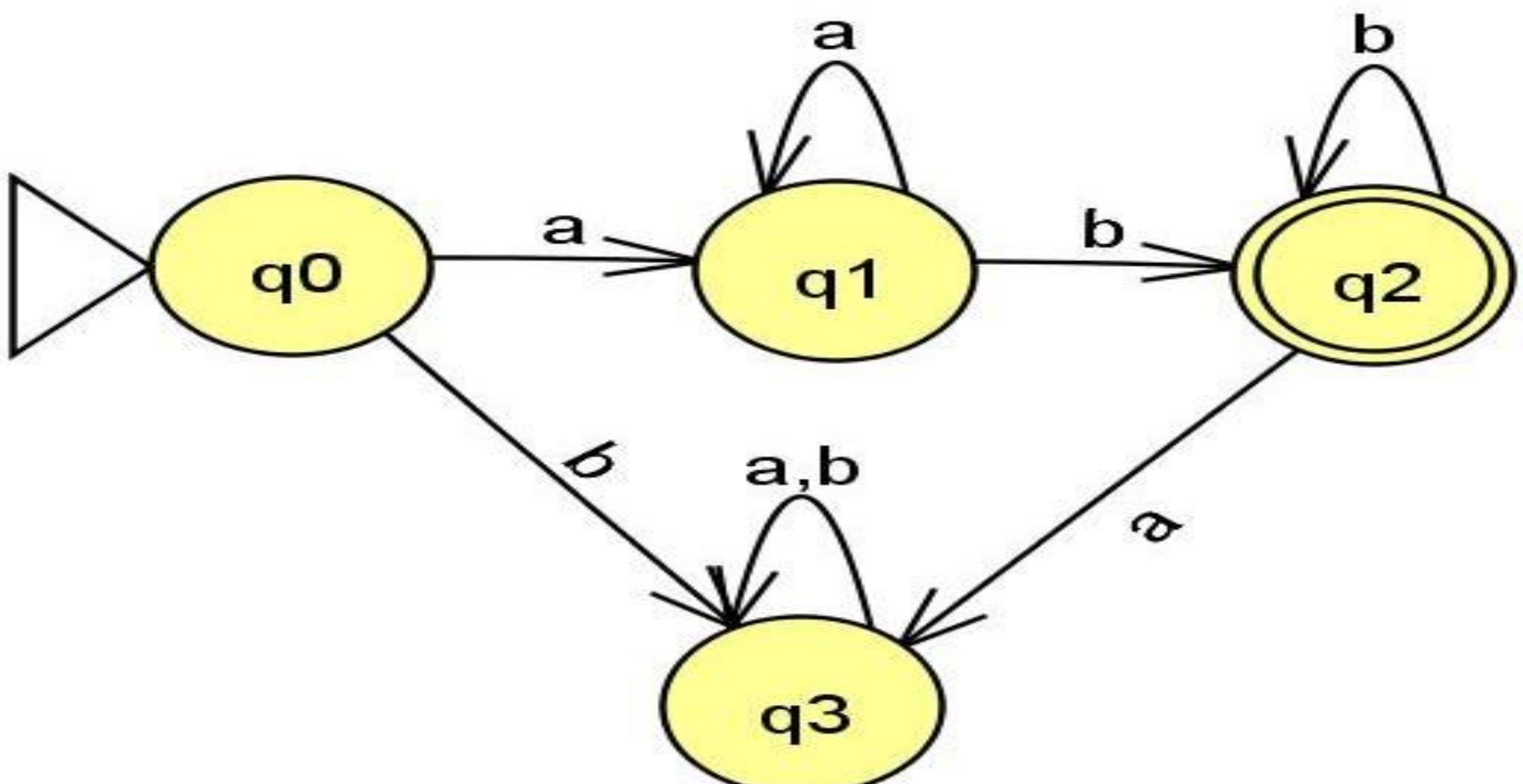
Solution :



Example 9:

Construct DFA for the the language of strings over Σ ={a,b} of the form $a^n b^m | n,m>=1$.

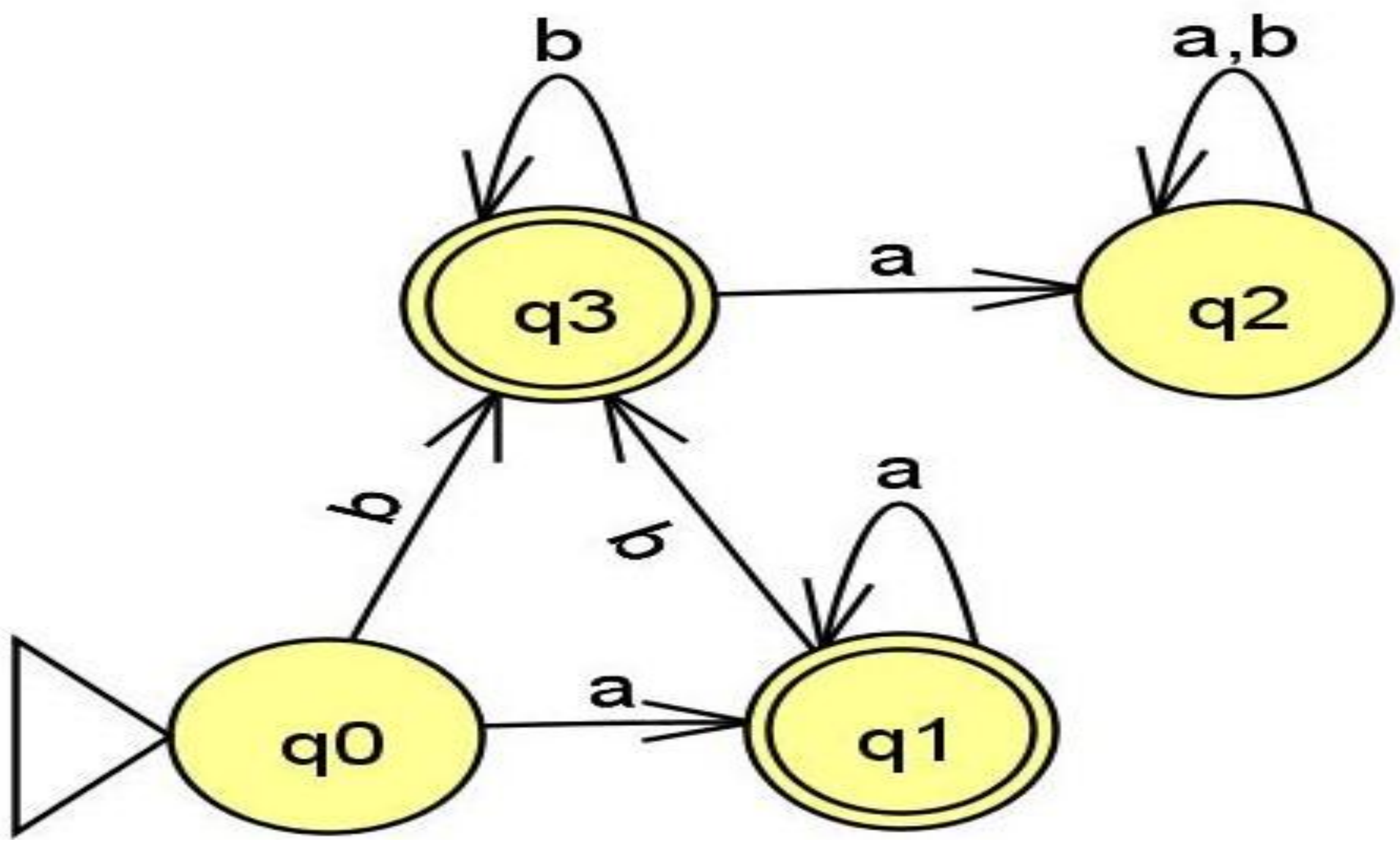
Solution :



Example 10:

Construct DFA for the language of strings over Σ={a,b} of the form $a^n b^m | n,m>=0$.

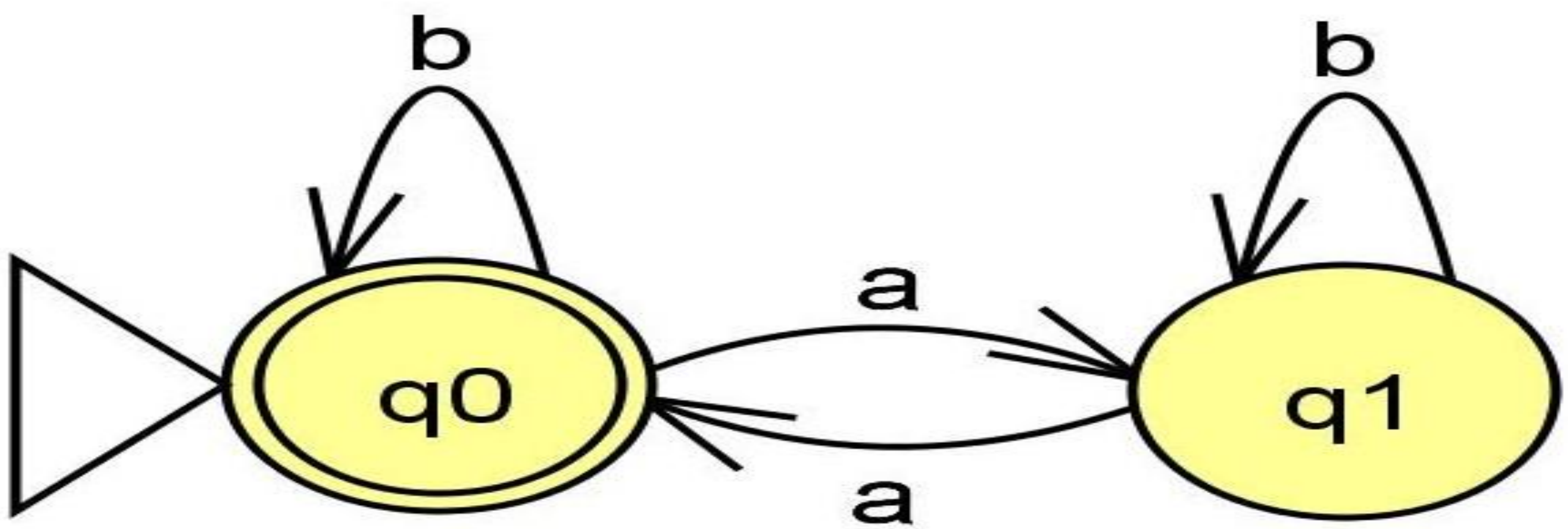
Solution :



Example 11:

Construct DFA for the language of strings over $\Sigma=\{a,b\}$ where, $n_a(w) \bmod 2=0$.

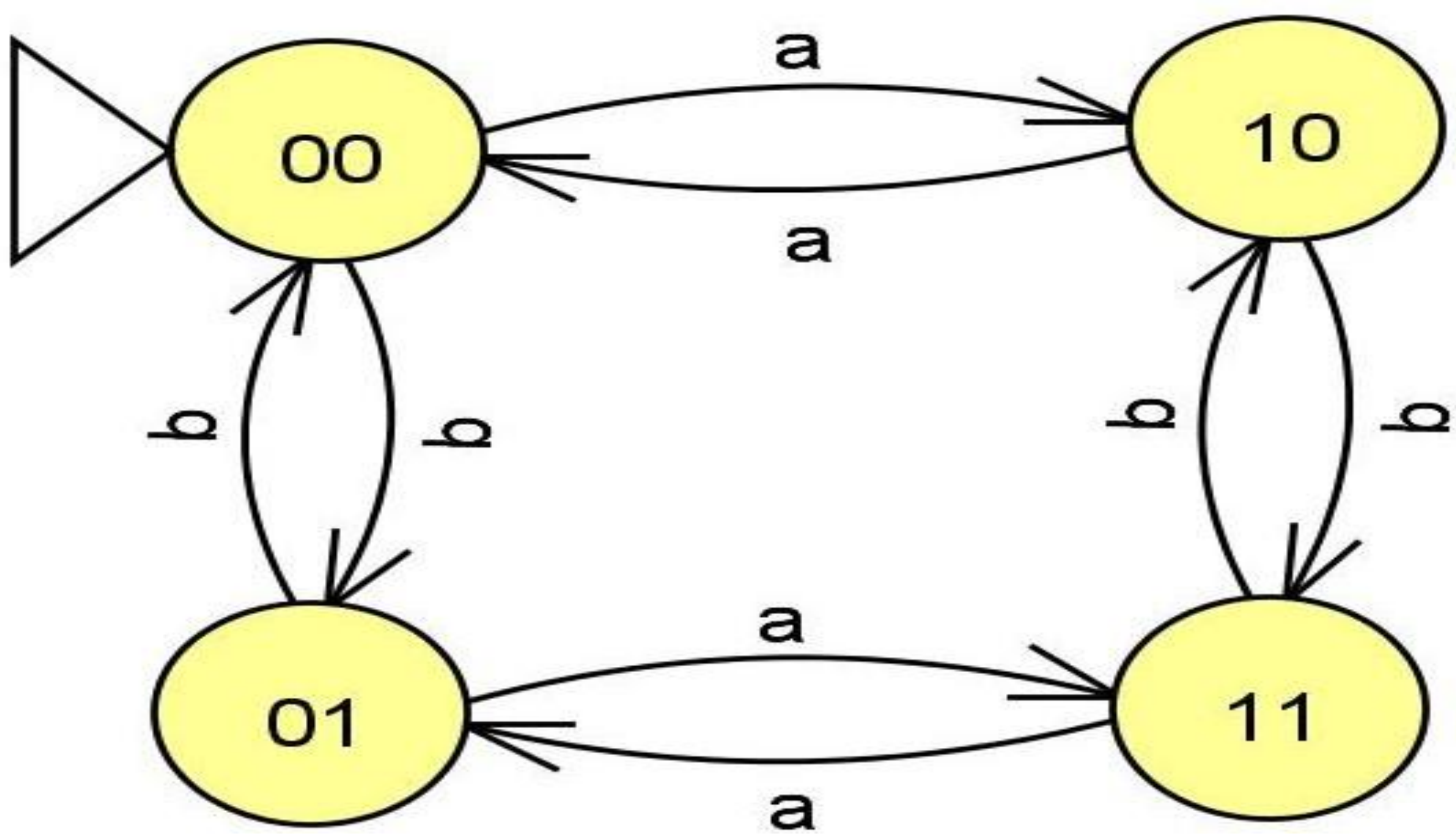
Solution :



Example 12:

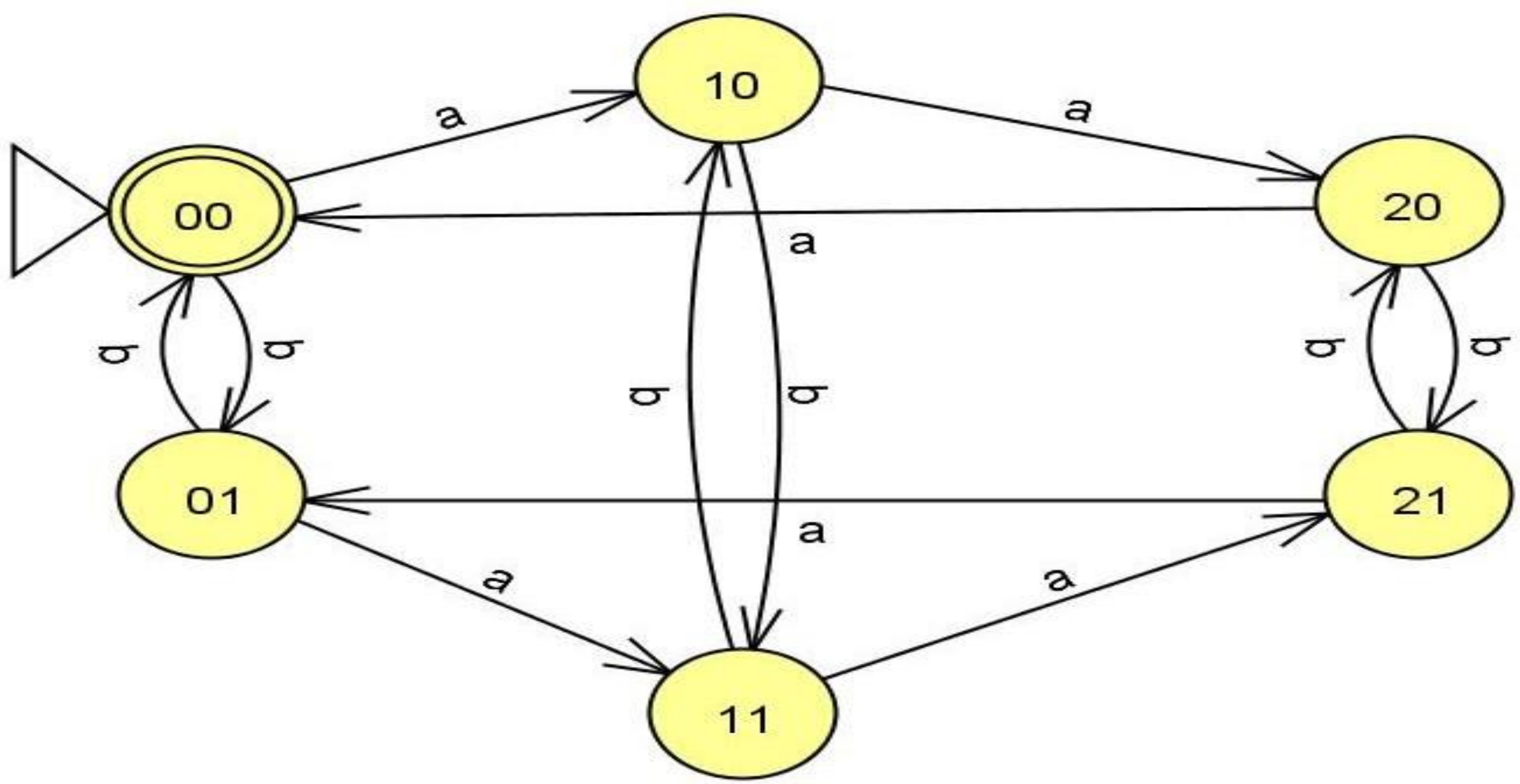
Construct DFA for the language of strings over $\Sigma=\{a,b\}$ where, $n_a(w) \bmod 2=0$ and $n_b(w) \bmod 2=0$

Solution :



Example 13:
Construct DFA for the language of strings over Σ={a,b} where, $n_a(w) \bmod 3=0$ and $n_b(w) \bmod 2=0$.

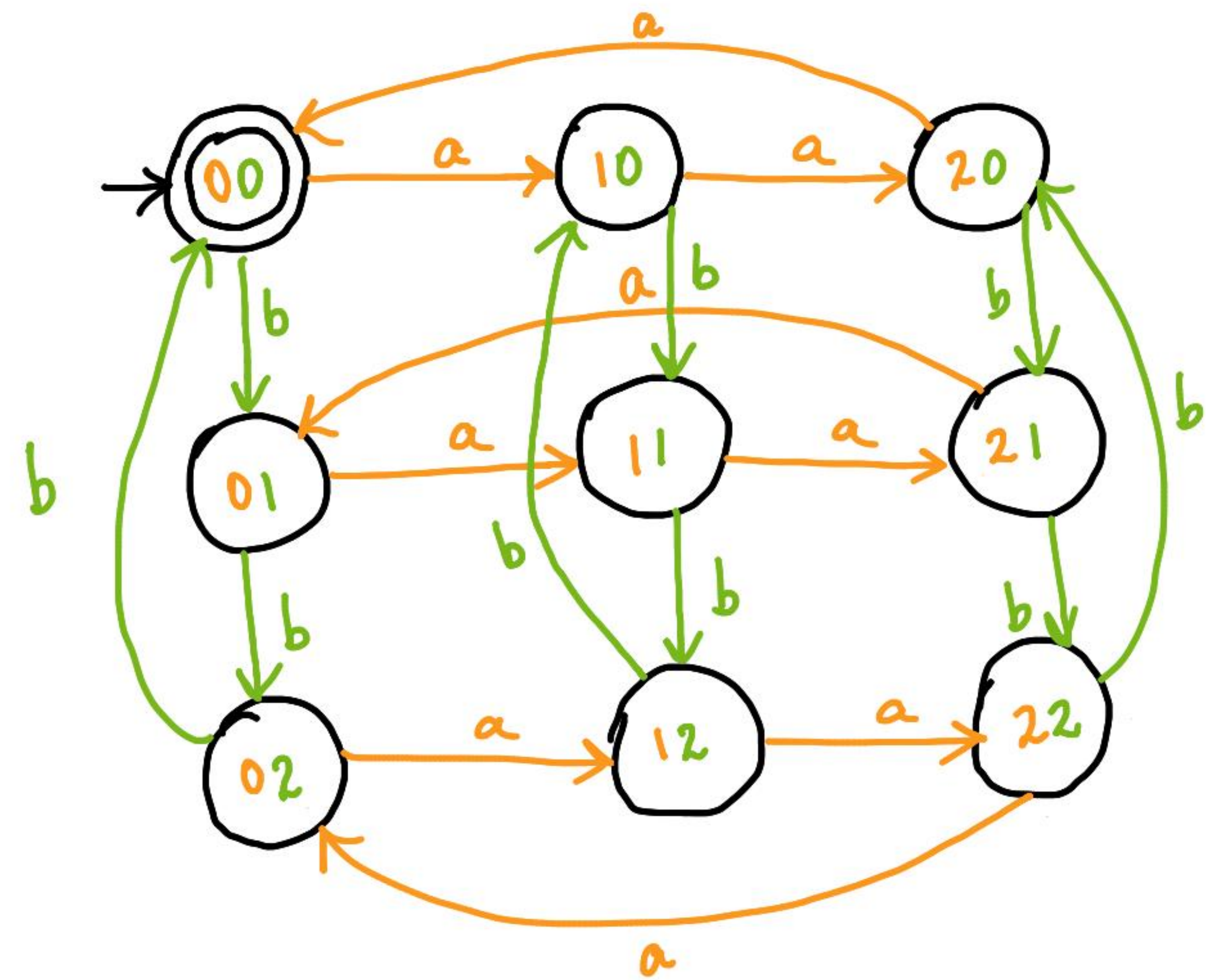
Solution :



Example 14:

Construct DFA for the language of strings over $\Sigma=\{a,b\}$ where, $n_a(w) \bmod 3=0$ and $n_b(w) \bmod 3=0$

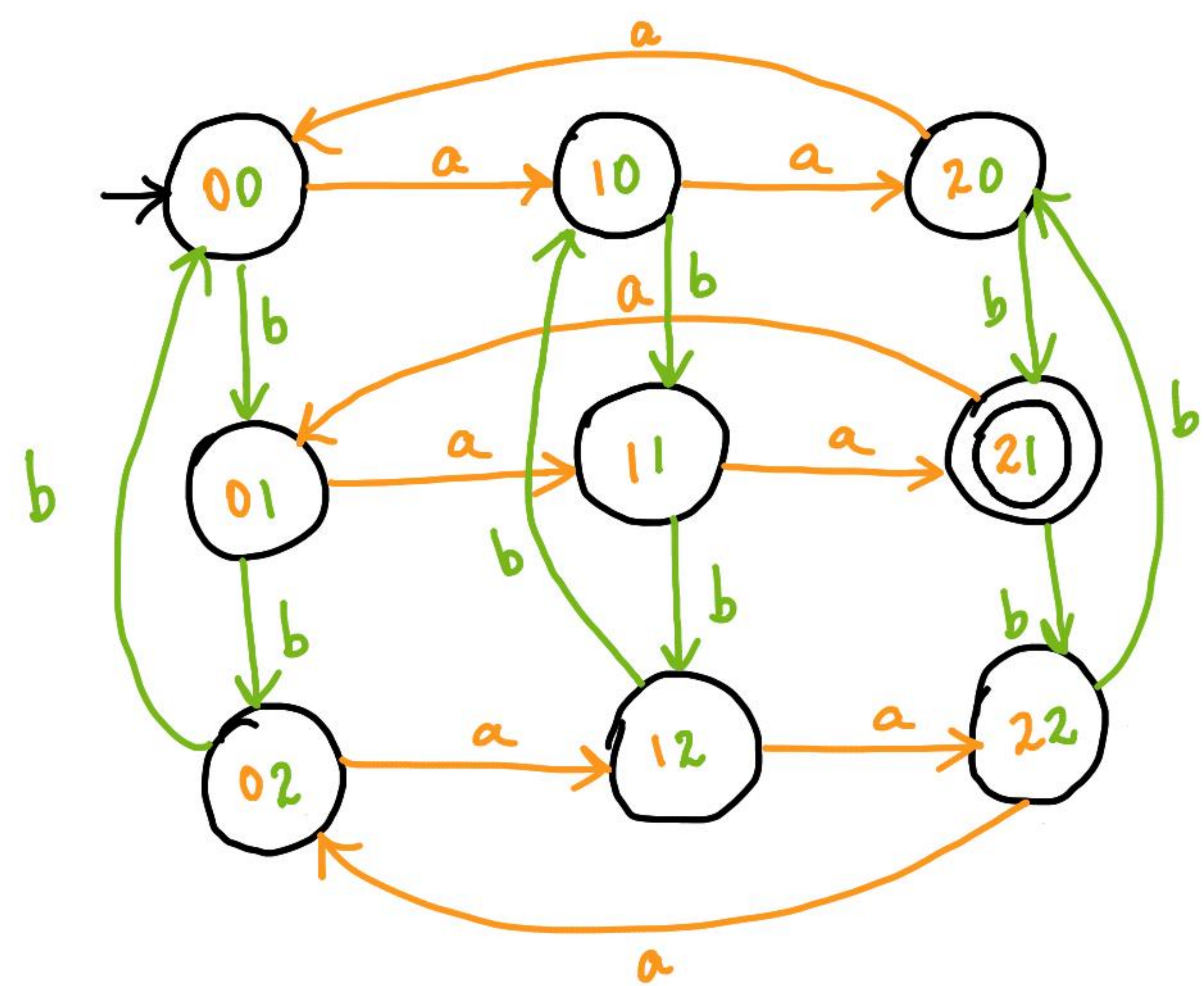
Solution :



Example 15:

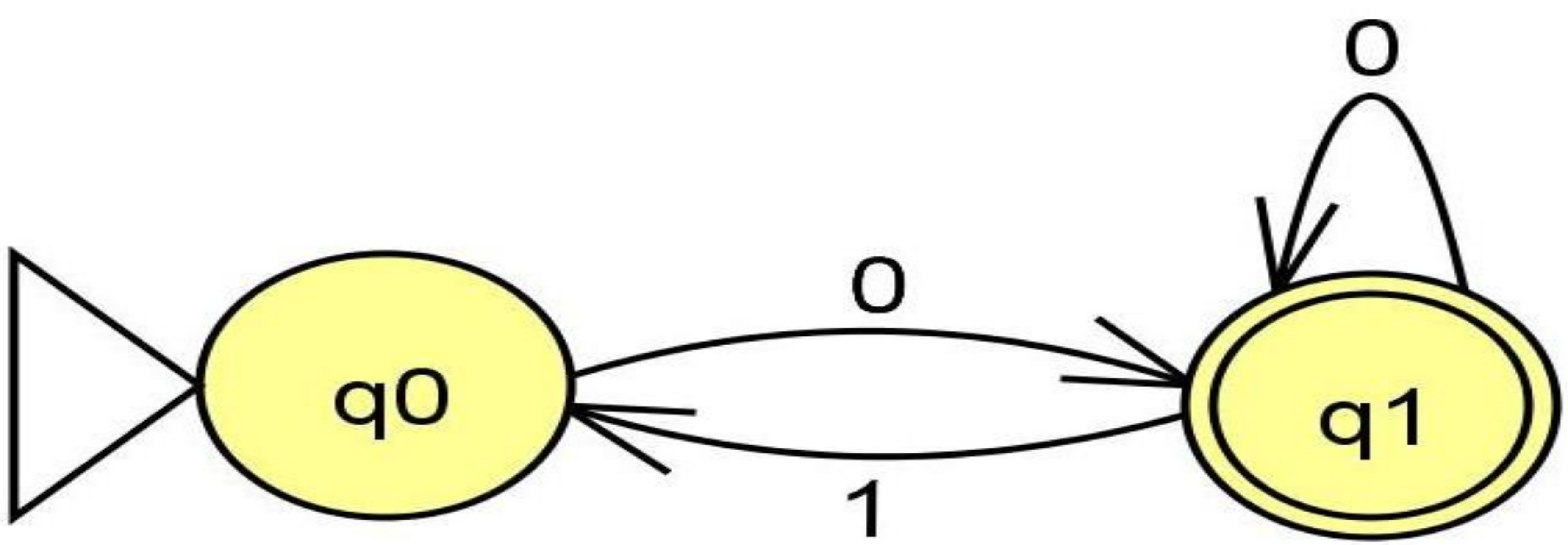
Construct DFA for the language of strings over $\Sigma=\{a,b\}$ where,
$n_a(w) \bmod 3 = 2$ and $n_b(w) \bmod 3 = 1$

Solution :



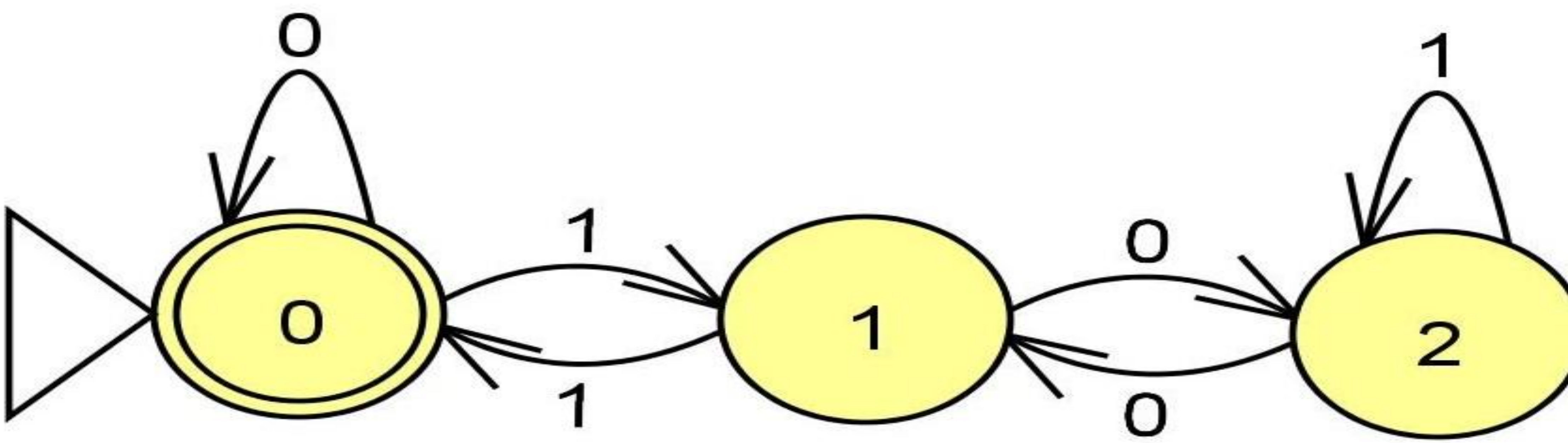
Example 16:
Construct DFA for binary number divisible by 2(w mod 2=0).

Solution :



Example 17:
Construct DFA for binary number divisible by 3(w mod 3=0).

Solution :



THANK YOU

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