Non-Deterministic Finite Automata (NFA)

* NFA is easy to design than DFA.
* FA is called NFA when there exist many paths for specific input from the current state to the next state.
* Every NFA is not DFA, but each NFA can be translated to DFA.
* NFA is defined in the same way as DFA but with the following two exceptions, it contains multiple next states, and it contains ϵ transition.

Formal Definition of an NDFA

$$\delta : Q \times \Sigma \rightarrow 2^Q$$

(Here the power set of Q (2^Q) has been taken because in case of NDFA from a state, transition can occur to any combination of Q states)

Eg:- $Q = \{a, b, c\}$

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

$q_0 = \{a\}$

$F = \{c\}$

State	Input 0	Input 1
a	a, b	b
b	c	a, c
c	b, c	c

Transition function :-

$\delta(a,0) = \{a,b\}$
$\delta(a,1) = \{b\}$
$\delta(b,0) = \{c\}$
$\delta(b,1) = \{a,c\}$
$\delta(c,0) = \{b,c\}$
$\delta(c,1) = \{c\}$

Representation :-