NFA to DFA Conversion

In NFA or NDFA machine can have zero, one or more than one move on a given input symbol

whereas,

In DFA, when a specific input is given to the current state, the machine goes to only one state. DFA has only one move on a given input symbol.

Steps to convert NFA to DFA :-

Step-1 Initially $Q' = \phi$

Q' is set of states of the DFA

T' is the new transition table of the DFA

Step-2 Add start state of the NFA to Q'

Add transitions of the start state to the transition table T'

If start states makes transition to multiple states for some input alphabet, then treat those multiple states as a single state in DFA.

→ In NFA, if the transition of the start state over some input alphabet is null.

→ then perform the transition of start state over that input alphabet to a dead state in the DFA.

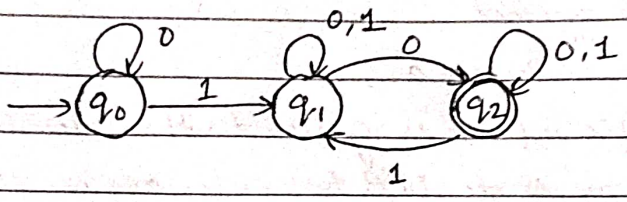
Step-3 If any new state is present in the transition table T'.

→ Add new state in Q'

→ Add transition of that state in the transition table T'.

Step-4 Keep repeating Step-03 until no new state is present in transition table T'.
Finally, the transition table T' so obtained is the complete transition table of the required DFA.

Example Convert NFA to DFA



Solution

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

Transition function for each state :-

$q_0 \rightarrow$
$\delta([q_0], 0) = [q_0]$
$\delta([q_0], 1) = [q_1]$

$q_1 \rightarrow$
$\delta([q_1], 0) = [q_1, q_2]$ new state
$\delta([q_1], 1) = [q_1]$

$q_2 \rightarrow$
$\delta([q_2], 0) = [q_2]$
$\delta([q_2], 1) = [q_1, q_2]$

Find transition for new generated state :-

$\delta([q_1, q_2], 0) = \delta(q_1, 0) \cup \delta(q_2, 0)$
$= \{q_1, q_2\} \cup \{q_1\}$
$= \{q_1, q_2\}$

$\delta([q_1, q_2], 1) = \delta(q_1, 1) \cup \delta(q_1, 1)$
$= \{q_1\} \cup \{q_1, q_2\}$
$= \{q_1, q_2\}$

Transition table :-

State	0	1
→ q_0	q_0	q_1
q_1	q_1, q_2	q_1
* q_2	q_2	q_1, q_2
* q_1, q_2	q_1, q_2	q_1, q_2