## **RGPV 2002**

## Q. Write a short note on non-deterministic finite automta?

Ans. Non deterministic finite automata refere as NDFA or NFA allows a set of possible moves. For example from a state an input '1' can transit 0 times, 1 times or more than 1 times.

Its not determined in NFA like in DFA.

NDFA is defined as 5 tuple machine:

 $M = (Q, \Sigma, \delta, q0, F)$ 

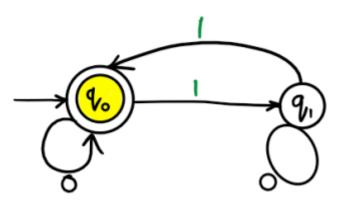
- 1. Q is a finite non empty set of states.
- 2.  $\Sigma$  is a finite non empty set of input symbols.
- 3.  $\delta$  is a transition function, QX $\Sigma$  int to  $2^{\circ}$
- 4. q0 is an initial state belong to Q.
- 5. F is the set of final states belong to Q.

To understood NDFA, lets compare it with DFA.

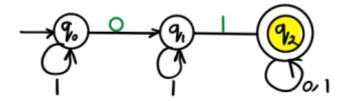
| NDFA                                       | DFA   |
|--|---|
| Non Deterministic Finite Automata          | Deterministic Finite Automata               |
| Empty String transition allowed in DDFA.   | Empty String transition not allowed in DFA. |
| In NDDFA, the next possible state is not   | In DFA, the next possible state is          |
| determined.                                | determined.                                 |
| For NDFA, DFA may or may not exist.        | For all DFA there exist NDFA                |
| NDFA is like combination of many machines. | DFA is like a single machine.               |
| NDFA is easy to construct.                 | DFA is touch to construct compare to NDFA.  |

## Some examples of NDFA:

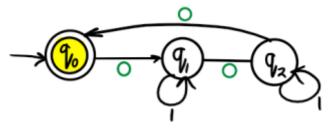
Problem 01: Construct a NDFA for the language accepting strings having even number of 1's over input alphabets  $\Sigma = \{0, 1\}$ .



Problem 02: Construct a NDFA for the language accepting strings containg '01' as substring over input alphabets  $\Sigma = \{0, 1\}$ .



Problem 03: Construct a NDFA for the language accepting strings containg '0' as divisible by 3 over input alphabets  $\Sigma = \{0, 1\}$ .



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- 18. NDFA accepting two consecutive a's or two consecutive b's.
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