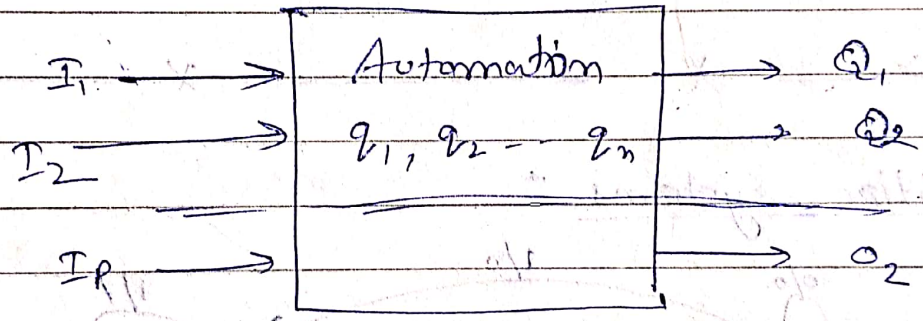
Automaton :

Automaton is defined as a system where energy, materials and information are transformed, transmitted and used for performing some functions without direct participation of man.

Automation $\xrightarrow{\text{means.}}$ discrete automaton.

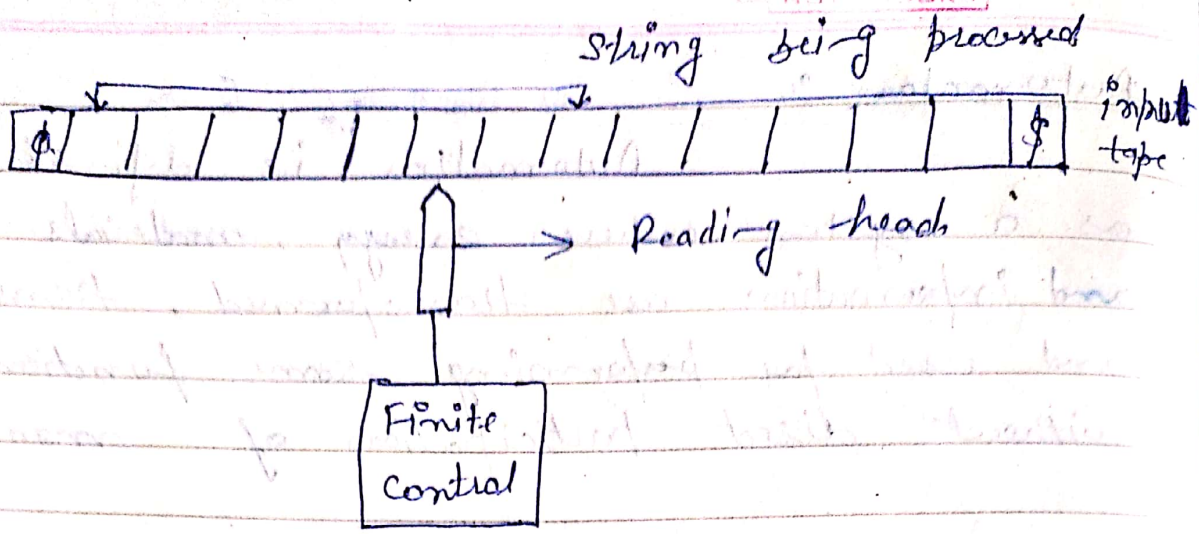


Input, Output, States.
State relation, Output relation.

Finite Automation (DFA) :- 5-tuples

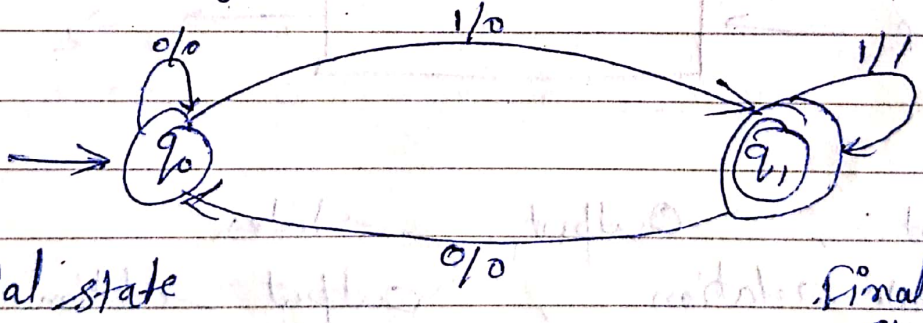
$$M = (Q, \Sigma, \delta, q_0, F)$$

$Q \rightarrow$ Finite nonempty set of states.
$\Sigma \rightarrow$ Finite nonempty set of input.
$q_0 \rightarrow$ Initial state
$F \rightarrow$ Final state
$\delta \rightarrow$ Transition Function $(Q \times \Sigma)$



① input tape ② Reading head
③ Finite control.

Transition systems :



Initial state

Final States

Properties of Transition ~~Syst~~ Functions :—

Prop 1 : $\delta(q, \Lambda) = q$

Prop 2 : $\delta'(q, aw) = \delta(\delta(q, a), w)$

Acceptability of a string :→

Final states are called accepting state.

Qu :→ $Q = \{q_0, q_1, q_2, q_3\}$, $\Sigma = \{0,1\}$, $F = \{q_0\}$

Σ	input	
states	0	1
→(q0)	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
q_3	q_1	q_2

(11010 1)

Sol :

$$\delta(q_0, \overset{\downarrow}{1}10101) = \delta(q_1, \overset{\downarrow}{1}0101)$$
$$= \delta(q_0, \overset{\downarrow}{0}101)$$
$$= \delta(q_2, \overset{\downarrow}{1}01)$$
$$= \delta(q_3, \overset{\downarrow}{0}1)$$
$$= \delta(q_1, 1)$$
$$= \delta(q_0, \Lambda)$$
$$= q_0 \quad [\because \text{By prop-1}]$$

Hence, $q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_0 \xrightarrow{0} q_2 \xrightarrow{1} q_3 \xrightarrow{0} q_1 \xrightarrow{1} q_0$

(NDFA)

Nondeterministic Finite State Machine

Using Five Tuple

$$M = (Q, \Sigma, \delta, q_0, F)$$

where.

$Q \rightarrow$ Finite nonempty set of states

$\Sigma \rightarrow$ ——— ——— ——— inputs.

$q_0 \rightarrow$ initial state

$F \rightarrow$ Final states.

$\delta \rightarrow$ $Q \times \Sigma$ into 2^Q.

diff. to DFA

Diff b/w NDFA & DFA

NDFA	DFA
(1) $\wedge$ can use	(1) $\wedge$ Cannot used
(2) $Q \times \Sigma = 2^Q$	(2) $Q \times \Sigma = Q$
(3) Only one final state	(3) More then one final state
(4) In NDFA for one input can give more then one state	(4) For each input symbol gives only one state.