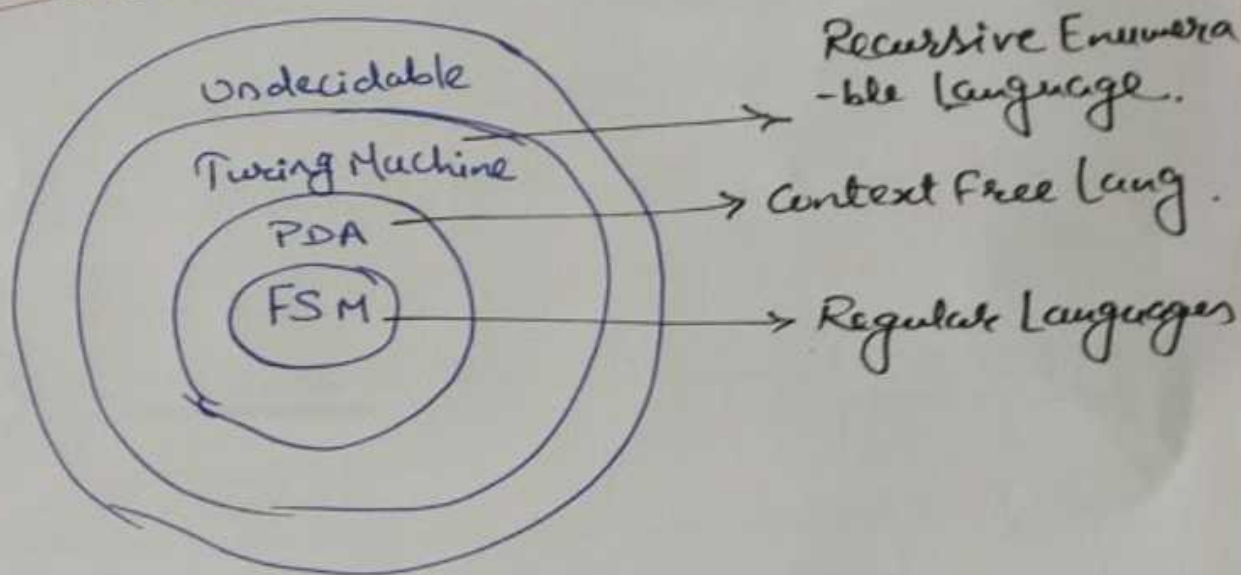


Turing Machine Model :-

It is an example of Computing Machine

There are three types of Machine which was discussed ~~later~~ -

- ① Finite State Machine
- ② Pushdown Automata
- ③ Post Machine



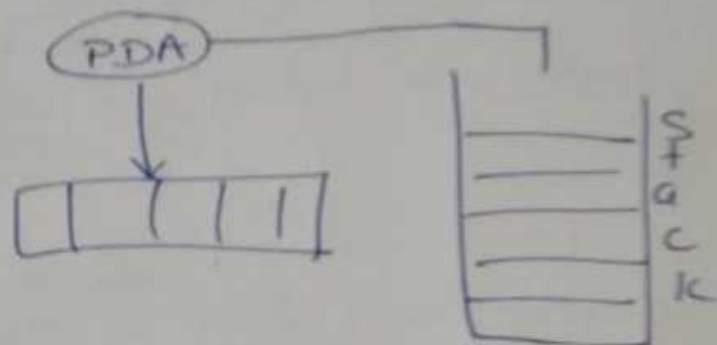
These machines have no control over the input & they ~~can~~ can not modify their own inputs.

⇒ TM is writing machine, it can modify its own input symbols. TM is more powerful than PDA.

FSM:- Input string \rightarrow

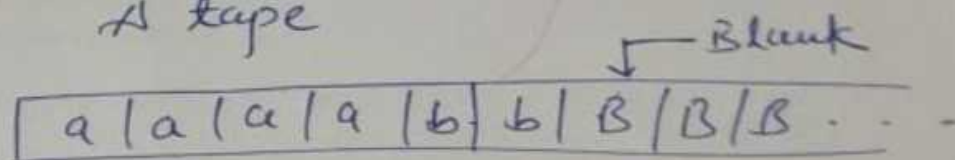
a	a	a	a	b	L
---	---	---	---	---	---

PDA:- \rightarrow Input string
 \rightarrow A stack



In PDA we have to ~~remember~~ use stack but it is little bit critical to remember the each & every inputs using this because of this TM is better.

Turing Machine:- A tape



TM is capable of performing computations on inputs & producing new results.

\therefore FA < DPDA < NPDA < Post Machine < TM

5. Turing Machine

Defⁿ :- The mathematical representation of recursive enumerable language is called as Turing Machine.

(OR)

The FA with tape & with read/write capabilities is called as Turing Machine (TM)

(OR)

Turing Machine is 7 tuple

$$M = \{Q, \Sigma, \Gamma, B, \delta, q_0, F\}$$

Where,

Q - Set of all states

Σ - I/p alphabet

Γ - Set of all tape symbols $\{\Sigma \subset \Gamma\}$

B - Blank symbol $\{B \in \Gamma\}$

$$\delta: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R, N\}$$

$N \rightarrow$ No movement

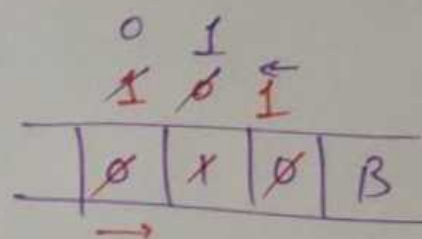
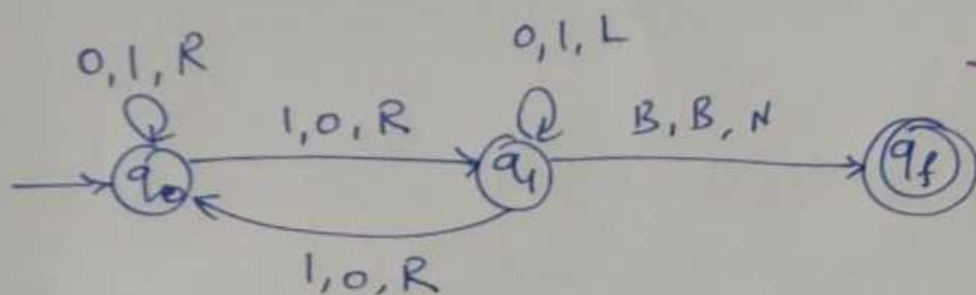
q_0 - Initial state ($q_0 \in Q$)

F - Set of all final states ($F \subseteq Q$)

* Representation of Turing Machine:-

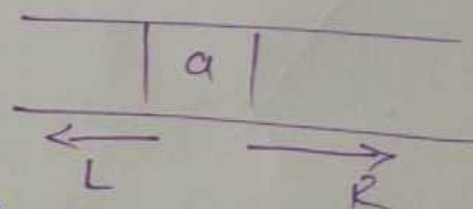
It can be represented in two ways

1) Transition diagram:-



2) Transition Table

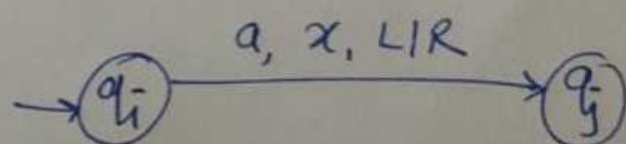
δ	0	1	B
q_0	$q_0, 1, R$	$q_1, 0, R$	Halt
q_1	$q_1, 1, L$	$q_0, 0, R$	q_f, B, R
q_f	Halt	Halt	Halt



⇒ The next move of TM depends on two entities

- 1) current state
- 2) current i/p symbol.

$$\delta(q_i, a) = (q_j, x, L|R)$$



Turing's Thesis:-

It states that any computation that can be carried out by mechanical means can be performed by some Turing Machine.

⇒ Turing Machine is a standard for computation, which will be done by computers, ~~which will~~

~~be done~~
i.e. Today's computers able to solve any problem then TM also solve the problem.

And if computer can't solve problem then

TM also can't solve it.

⇒ So, we are just increasing the speed of computation.

⇒ In Today's world ~~any~~ any computer don't have more power than TM, because it is ~~good~~ standard. TM is threshold in computation.

* Block diagram of Turing Machine! =

It consists of 3 components =

- 1) Infinite tape
- 2) R/W Header
- 3) Finite control unit.

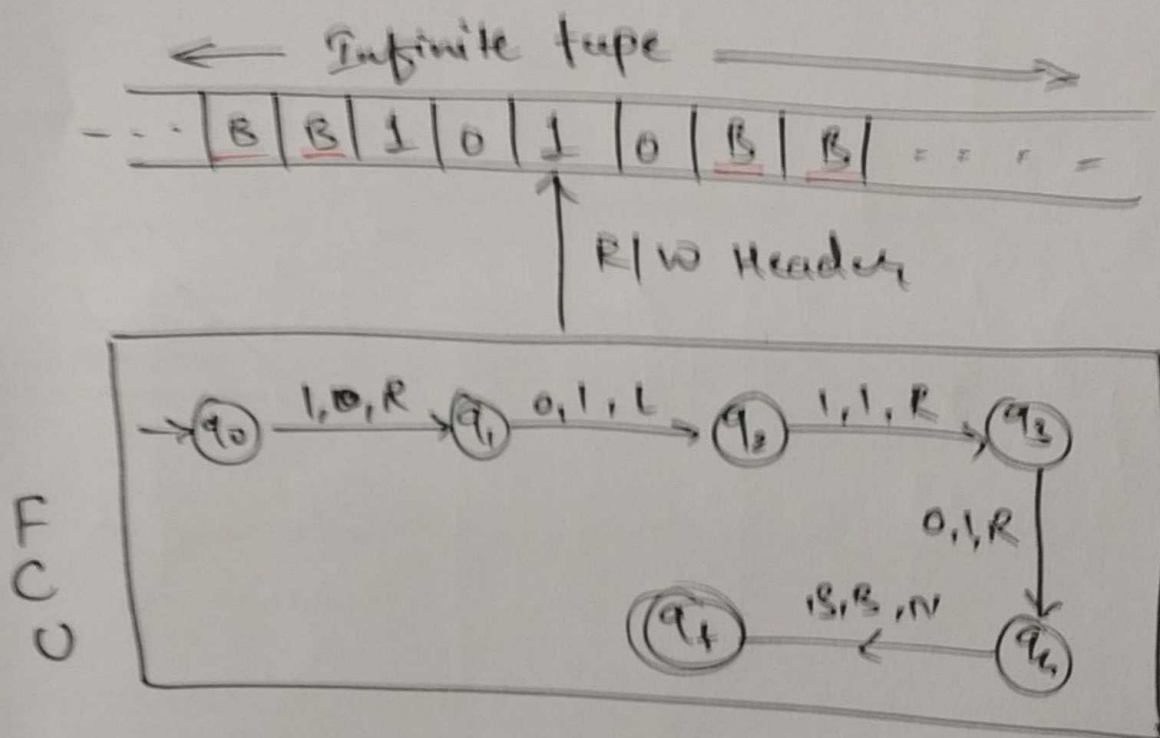


fig. Block dia. of TM.