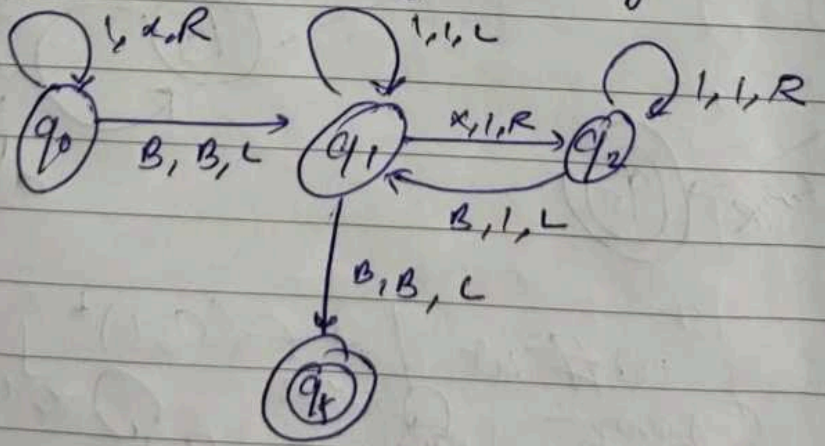
Yash Kumar Gupta
2015008
B-38

1 Comparative study of DFA, PDA & TM

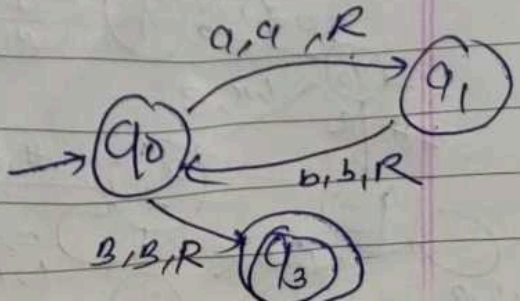
	→ DFA	→ PDA	→ TM
head	R-head	R-head	R-W-head
No. of tuple	5 tuple	6 tuple	7 tuple
transition	$Q \times \Sigma \to Q$	$\delta(q,a,a) = \{(q,\varepsilon)\}$ $Q \times \Gamma \to Q \times \Gamma \times \{L,R\}$	
head movement	Right	Right	Left Right both

2 Design a TM to compute the fun. $f(x) = 2x$

→ Let accepting strings are 11, 1111, 111111

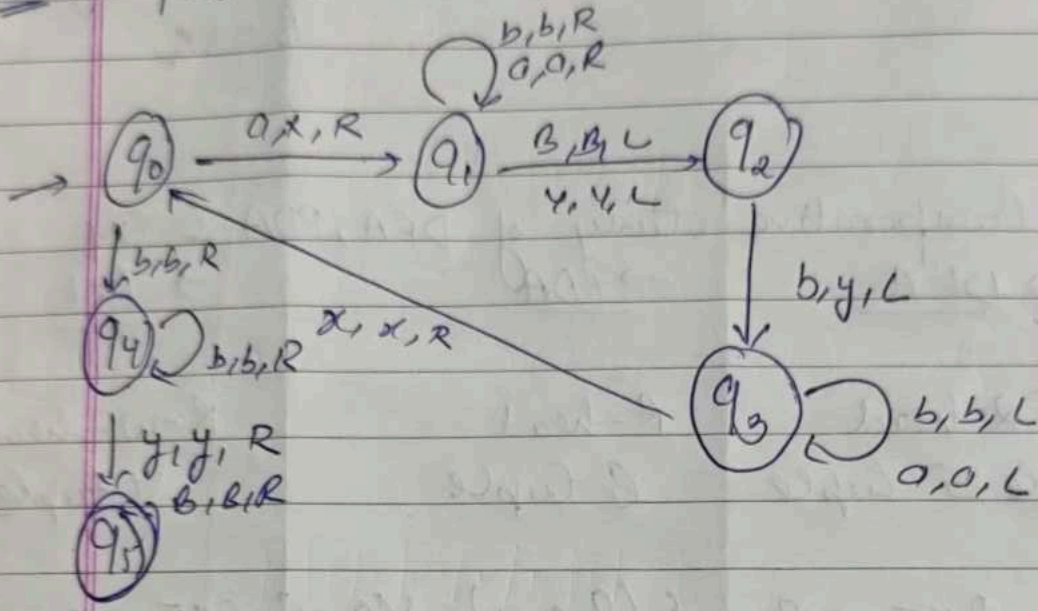


3 Design for $(ab)^*$

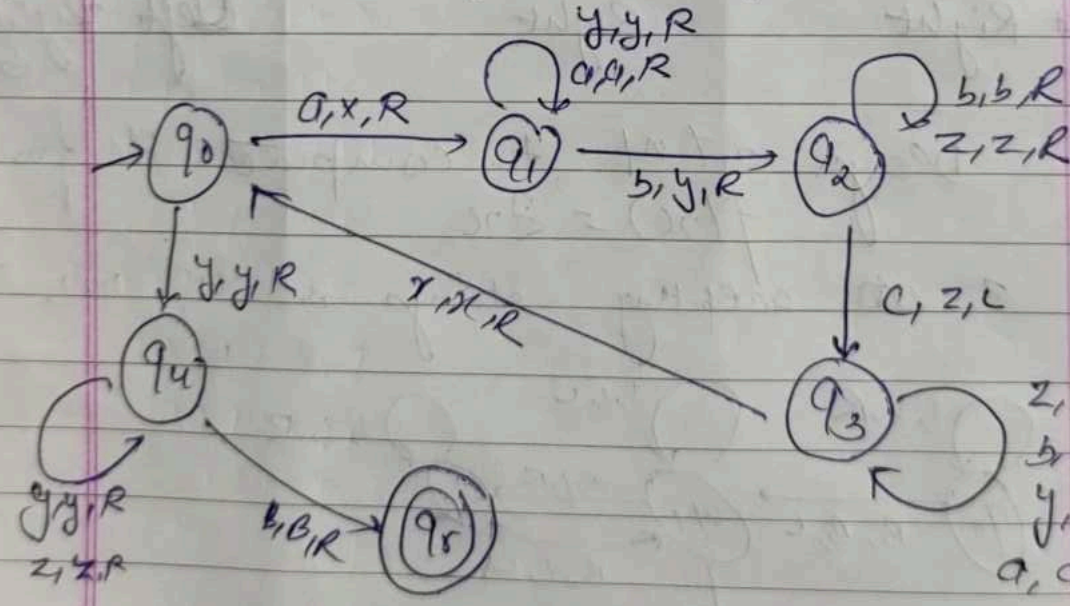


Yash Kumar Gupta
B-34 {2015088220}

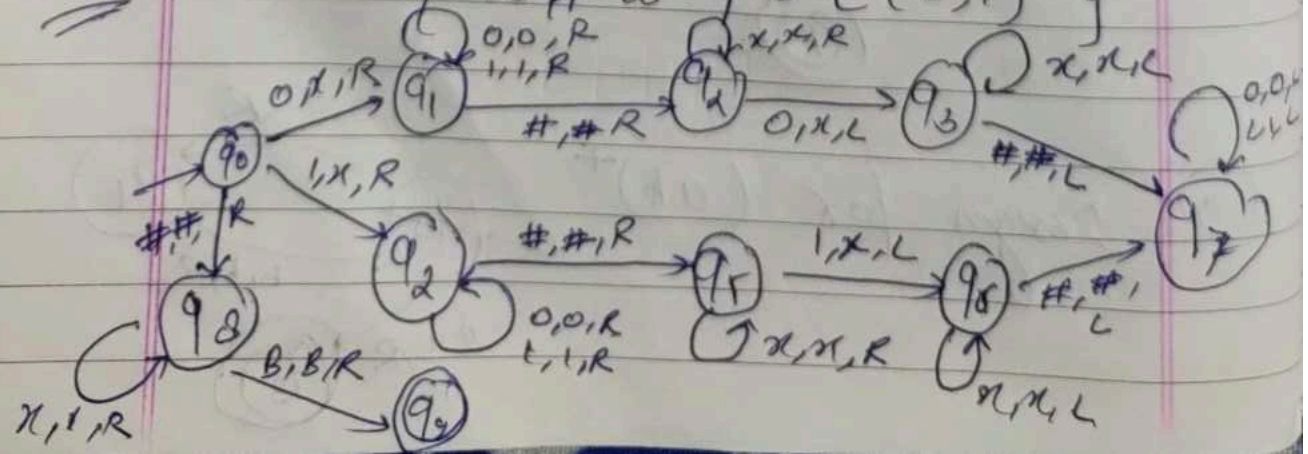
4 for $L = \{a^n b^m \mid m \geq n\}$



5 for $L = \{a^n b^n c^n \mid n \geq 0\}$

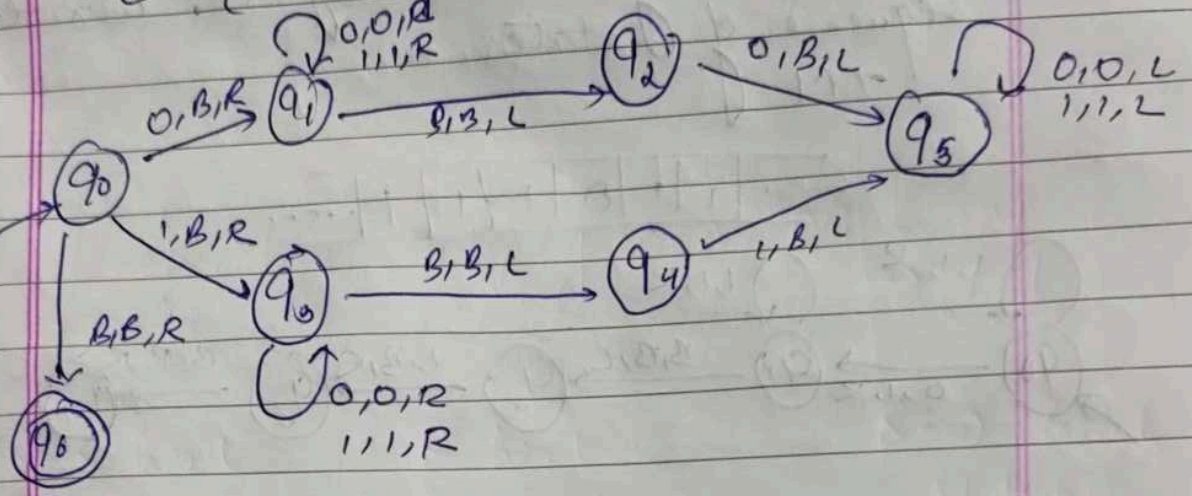


6 $L = \{w\#w \mid w \in (0,1)^*\}$

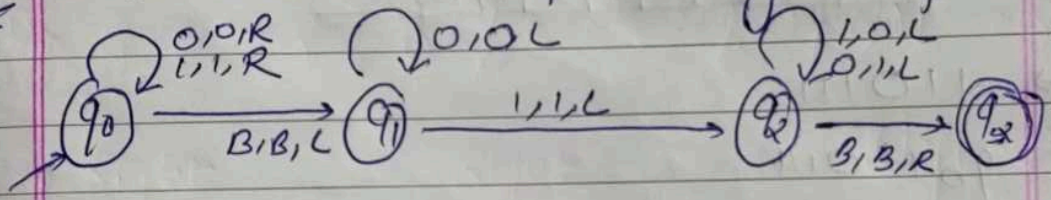


Yash Raj Gupta
B-34 {2015008220}

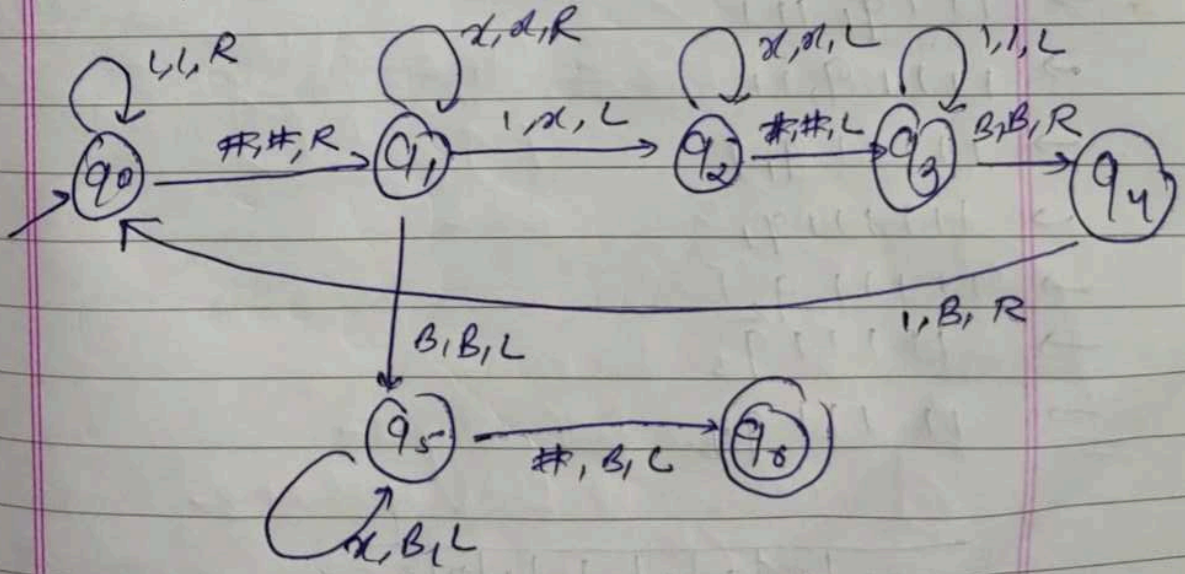
7. $L = \{ w w^R \mid w \in (0,1)^* \}$



8. Calculate 2's complement of an input binary



9. $f(m,n) = m - n$

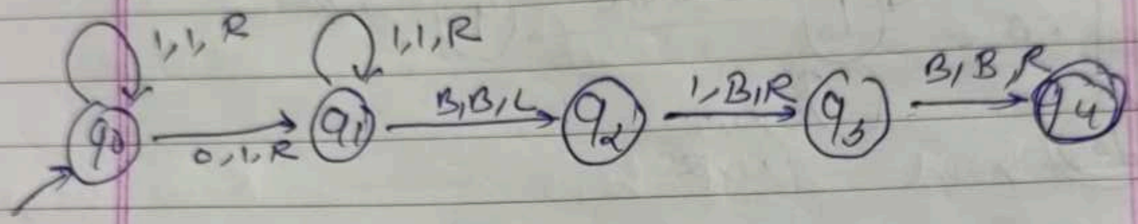


is like separating symbol.

Yash Kr. Gupta
B-34 [2018008[illegible]]

10 $f(x,y) = x+y$ where $x,y > 0$. Write sequence of states of TM — 11

1	1	0	1	1	1	....



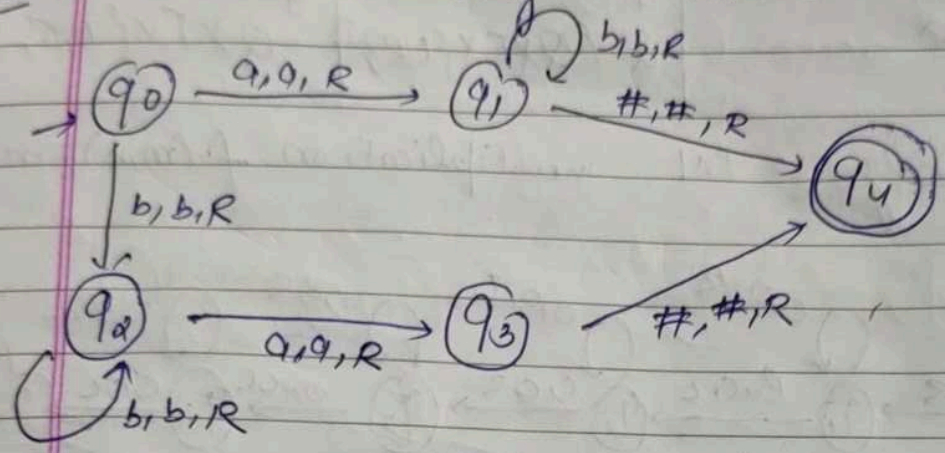
...	B	1	1	0	1	1	1	B	...

→ 110111
→ q_0 110111
→ 1 q_0 10111
→ 11 q_0 0111
→ 111 q_1 111
→ 1111 q_1 11
→ 11111 q_1 1
→ 111111 q_1
→ 11111 q_2 1
→ 11111 q_3
→ 11 111 q_4

...	B	1	1	1	1	1	B	...

Yash Kr. Gupta
2015008203 {B-34}

11 Rewrite missing transitions:



→ what is $\delta(q_2, a)$?
→ (q_3, a, R)

→ Describe the computation of M on input 'ab'

$L = \{ab\}$
$\delta(q_0, a) \longrightarrow (q_1, a, R)$
$\delta(q_1, b) \longrightarrow (q_1, b, R)$
$\delta(q_1, \#) \longrightarrow (q_4, \#, R)$
"ab is accepted"

→ what is the language recognized by 'M'.

$L = \{ab^* + b^+a\}$

12 Variants of TM

① Multitape TM/C

~~$Q X \Gamma^1 \Gamma^2 \Gamma^3 \longrightarrow Q X \Gamma^1 \Gamma^2$~~

$Q X \Gamma^K \longrightarrow Q X \Gamma^K X \{L, R\}$

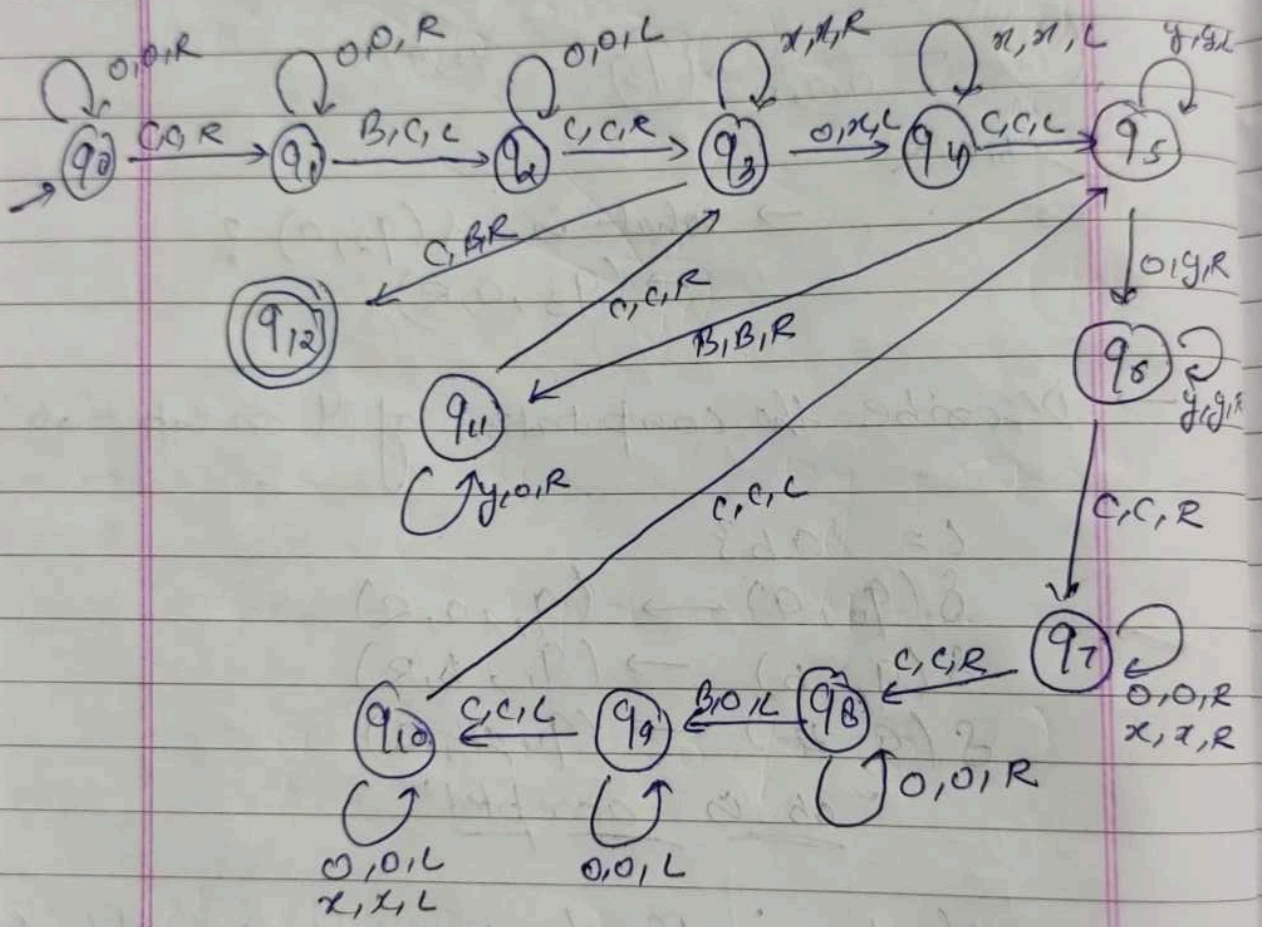
② Multitrack TM/C

$Q X \Gamma^1 \Gamma^2 \cdots \Gamma^n \longrightarrow Q X \Gamma^1 \Gamma^2 \cdots \Gamma^n X \{L, R\}$

Yash Kr. Gupta
{B-34} 2015008

Nondeterministic	Offline T/M/c	stay o/p on
$Q \times \Gamma \rightarrow 2^{(Q \times \Gamma \times \{L,R\})}$	$Q \times \Gamma \rightarrow$ $2^{\{Q \times \Gamma \times \{L,R\}\}}$	$Q \times \Gamma \rightarrow$ $Q \times \Gamma \times \{L,R,S\}$

13 Design a TM multiplication $f(m,n) = m \times n$.



14 Discuss the following :-

① Halting problem of TM :-

→ Problem in which, there is no any algo which gives the result in yes or no or Halting means termination, program or certain input will accept

Yash K... Gupta
2015000... EB-3...

it & halt or reject it and halt & never go into an infinite loop.

③ Church turing thesis :-

→ It is simply to say that any algorithmic procedure that can be carried out by human or a computer can be carried out by turing Machine.

④ RL or REL

→ Recursive language is, A language is recursive, if some turing M/c accepts it and halts on any input string.

→ Recursive enumerable language, if language halt at either final state or halts in non-final state or in loops forever.

⑤ Complexity classes

→ Complexity class is a collection of problems which can be solved by some computational model.

⑥ TM with Stay

→ when header get stayed over the same input point.

$\delta \times \Gamma \rightarrow \delta \times \Gamma \times \{L, R, S\}$

S → Stay.

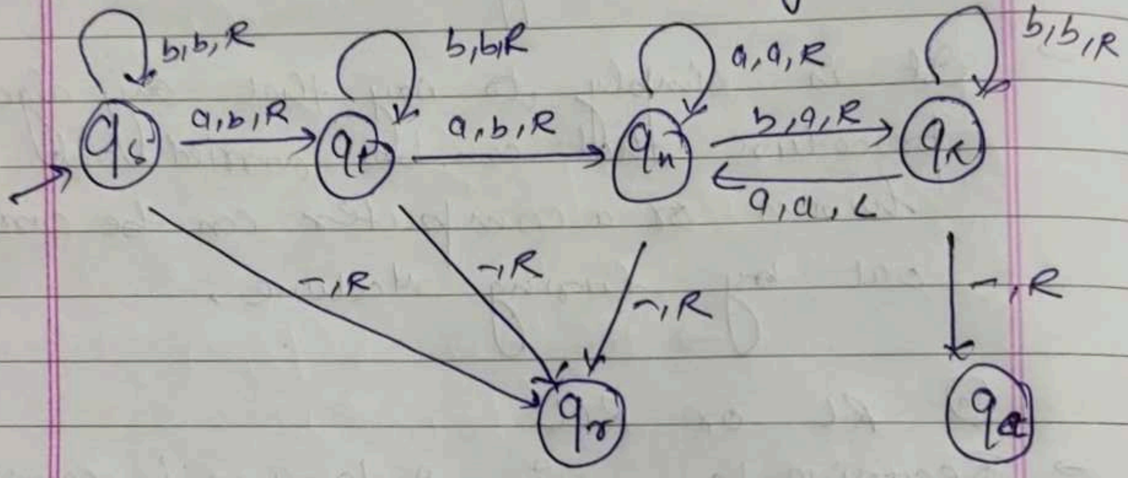
⑦ Non deterministic TM.

→ when the input / write tape get confuse over any state

$\delta \times \Gamma \rightarrow 2^{(\delta \times \Gamma \times \{L,R\})}$

Date / /
Page
Yash Ku Gupta
B34 {2015008?}

15 Considering q_n as final, then m/c accept string 'abba' else TM doesn't accept string 'abba'.



16 Tuples of TM. string $10^* + 01^*$.

there are 7 tuples in TM ...

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

where

M ⇒ Machine
Q ⇒ Set of finite variable
Σ → Set of input terminal
Γ → terminals
δ ⇒ transition function
q_0 → Initial
B → Blank
F → Accepting / Halting state