Module-4

Turing Machine.

Topics:-

1) Explain the function of TM with dig.
2) Design of TM

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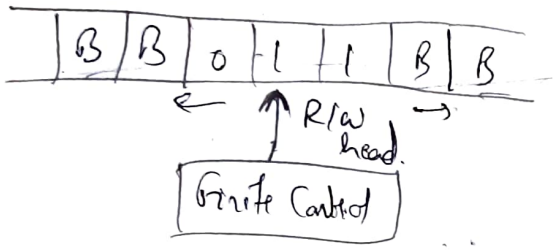
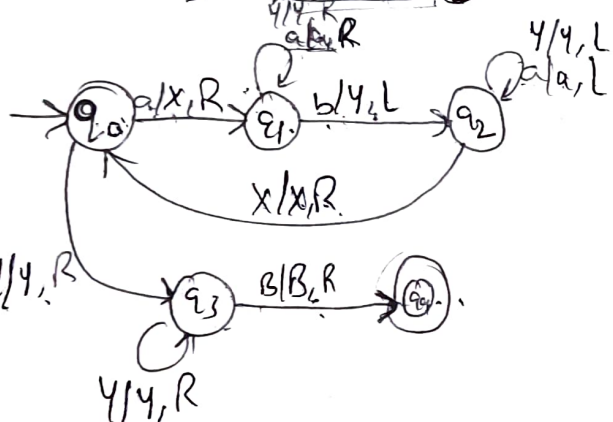
3) Multitape TM & Universal TM
4) Halting Problem of TM



1) Design a TM over $\Sigma = \{a, b\}$ for $L = \{a^n b^n \mid n \geq 1\}$

Ex:- a a b b B



a. X X Y Y B

a a b b. X a a Y b b

1) $\delta(q_0, a) = (q_1, X, R)$
2) $\delta(q_1, a) = (q_1, a, R)$
3) $\delta(q_1, Y) = (q_1, Y, R)$
4) $\delta(q_1, b) = (q_2, Y, L)$
5) $\delta(q_2, a) = (q_2, a, L)$
6) $\delta(q_2, Y) = (q_2, Y, L)$
7) $\delta(q_2, X) = (q_2, X, R)$
8) $\delta(q_0, Y) = (q_3, Y, R)$
9) $\delta(q_3, Y) = (q_3, Y, R)$
10) $\delta(q_3, B) = (q_4)$

ID :- $q_0 aaabbB \vdash X q_1 abbB \vdash Xa q_1 bbB \vdash X q_2 aYbB$

$\vdash q_2 XaYbB \vdash X q_0 aYbB \vdash XX q_1 YbB \vdash XX Y q_1 bB$

$\vdash XX q_2 YYB \vdash X q_2 XYYB \vdash X X q_0 YYB \vdash XXY q_3 YB$

$\vdash XXYY q_3 B \vdash XXYYB q_4$ (Accepted)

2) Design a TM over $L = \{a^n b^n c^n \mid n \geq 1\}$, show the ID for $\omega = aabbcc$

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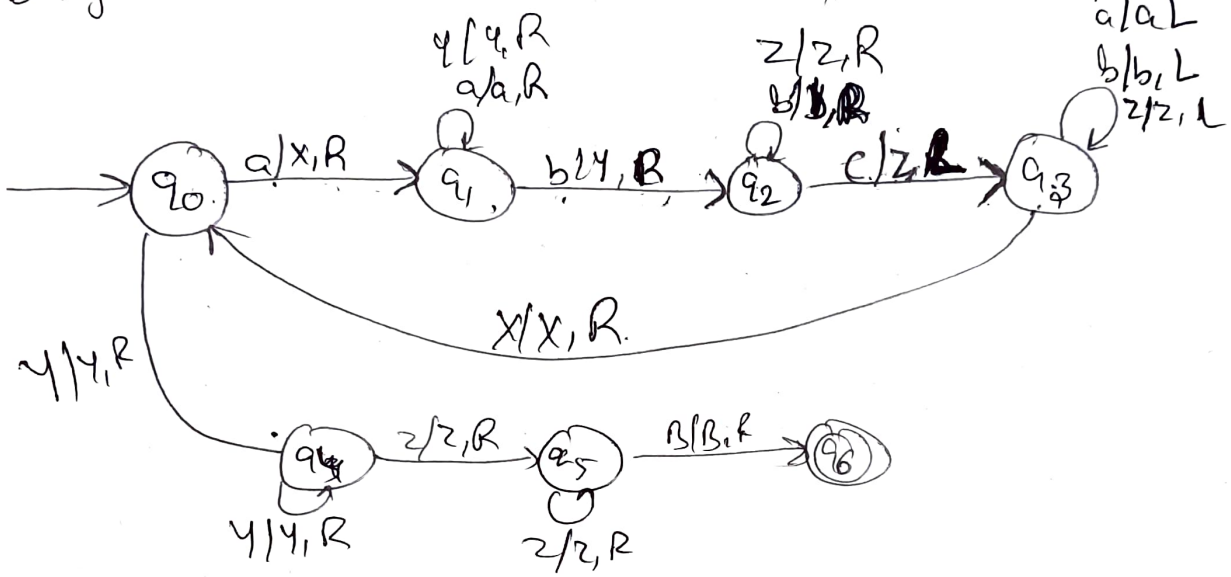

ID :- $q_0 aabbcc B \vdash X q_1 abbcc B \vdash Xa q_1 bbcc B \vdash Xa Y q_2 bcc B$

$\vdash Xa Y b q_2 cc B \vdash Xa Y b Z q_3 c B \vdash X q_0 a Y b Z c B$

$\vdash XX q_1 Y b Z c B \vdash XX Y q_1 b Z c B \vdash XX Y Y q_2 Z c B$

$\vdash XX Y Y Z q_2 c B \vdash XX Y Y Z Z q_3 B \vdash XX Y Y q_3 Z Z B \vdash XX q_0 Y Y Z Z B$

$\vdash XXY q_1 Y Z Z B \vdash XX Y Y q_2 Z Z B \vdash X X Y Y Z q_3 Z B$

$\vdash XX Y Y Z Z q_3 B \vdash X X Y Y Z Z B q_4$

3) Design a TM over $\Sigma = \{a,b\}$. $L = \{ww^R / w \in \{a,b\}^*\}$.

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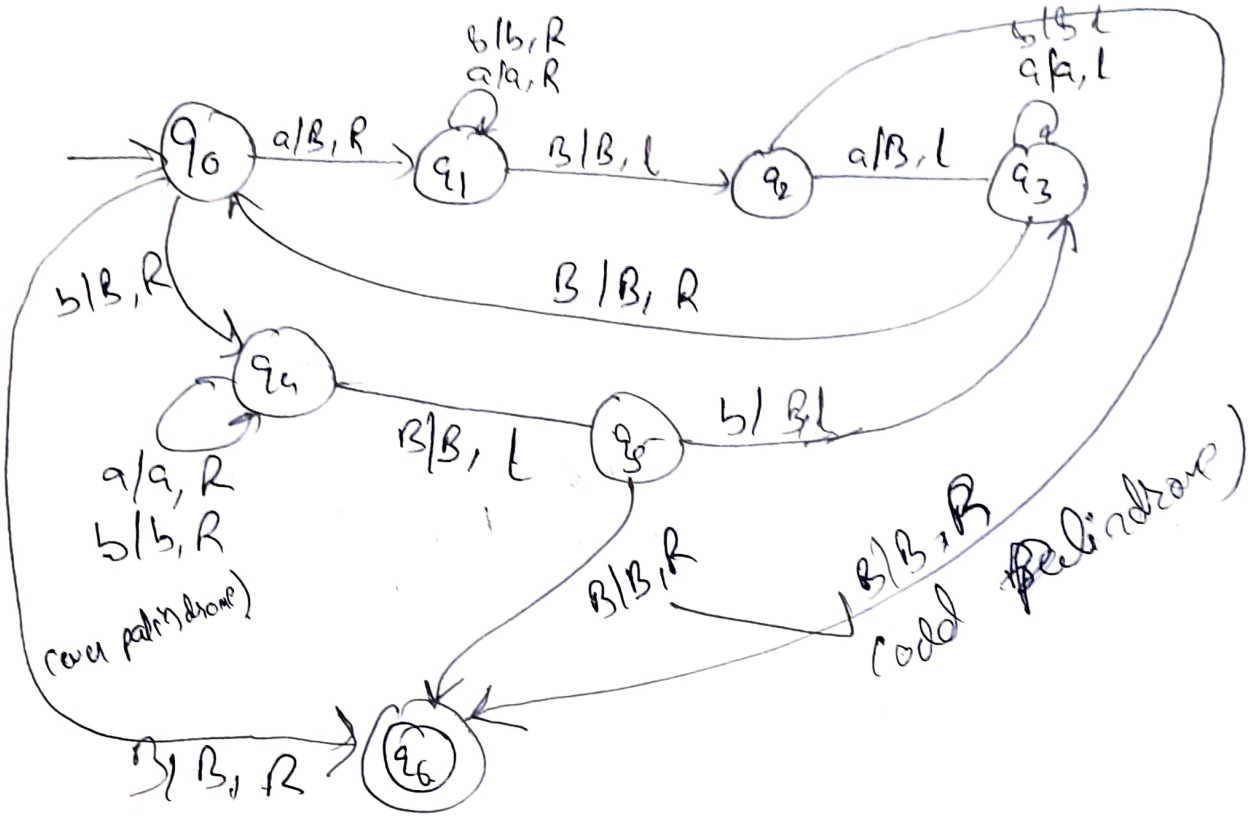
Ex :- a b b b b a B



4) Design a TM for palindrome (both odd & even)

5) Design a TM over $\Sigma = \{a,b\}$ which will accept the strings containing babb as a substring.

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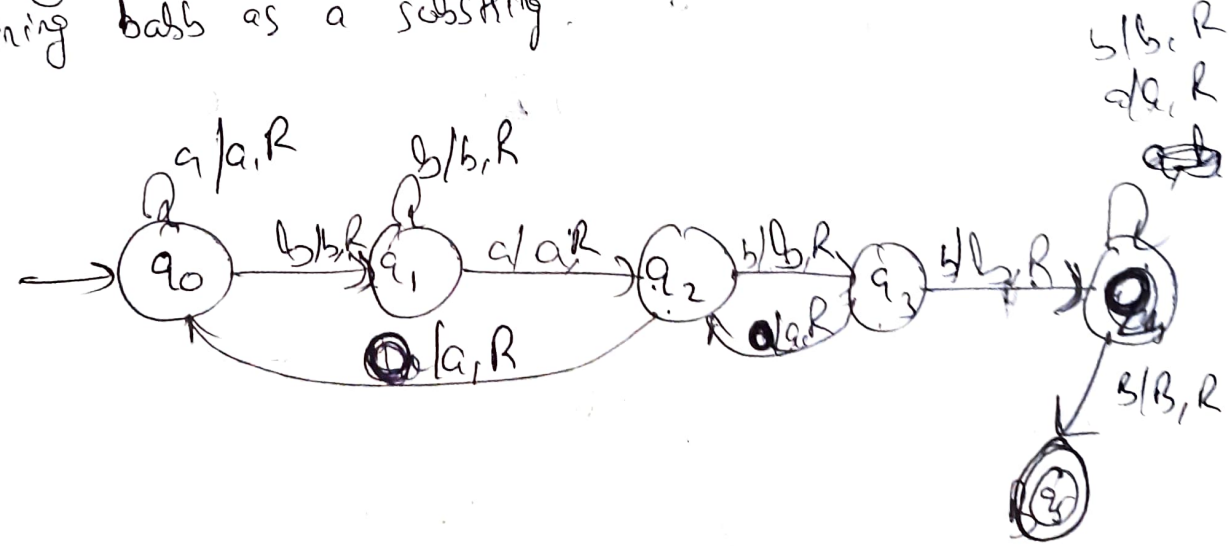

6) Design a TM over $\Sigma = \{a, b\}$ for $L = \{w \mid N_a(w) = N_b(w)\}$.

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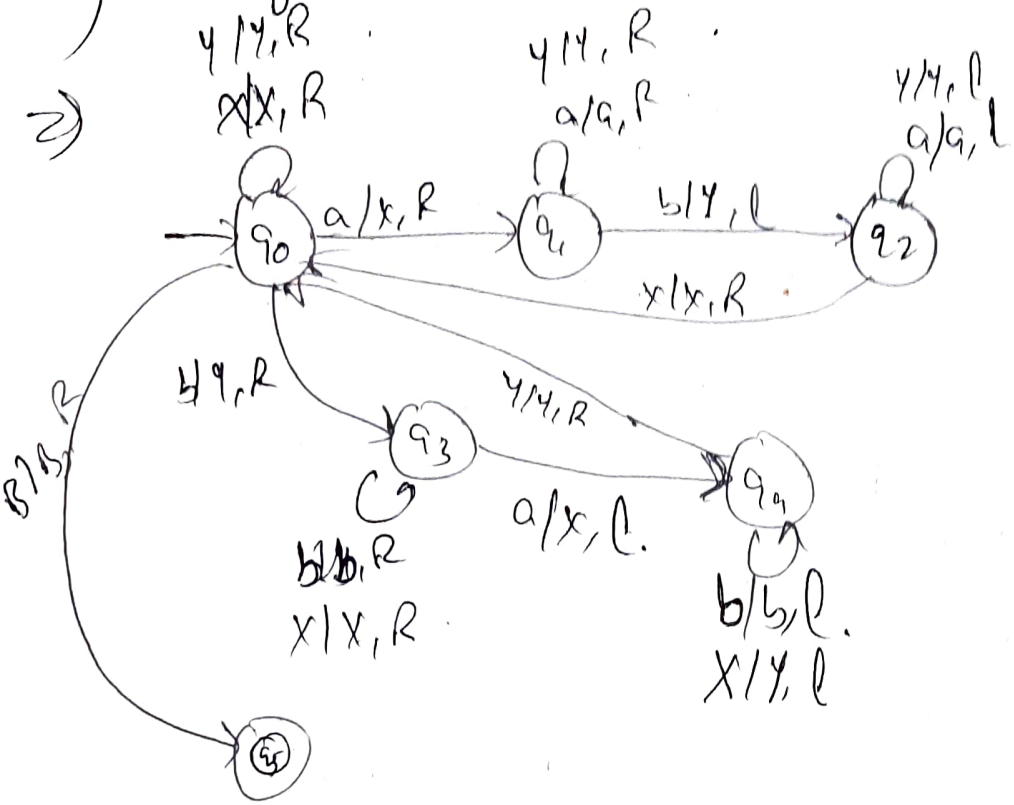

7) Design a TM to add two no.s

A = 5 , B = 3.

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