

Practice Sheet - V

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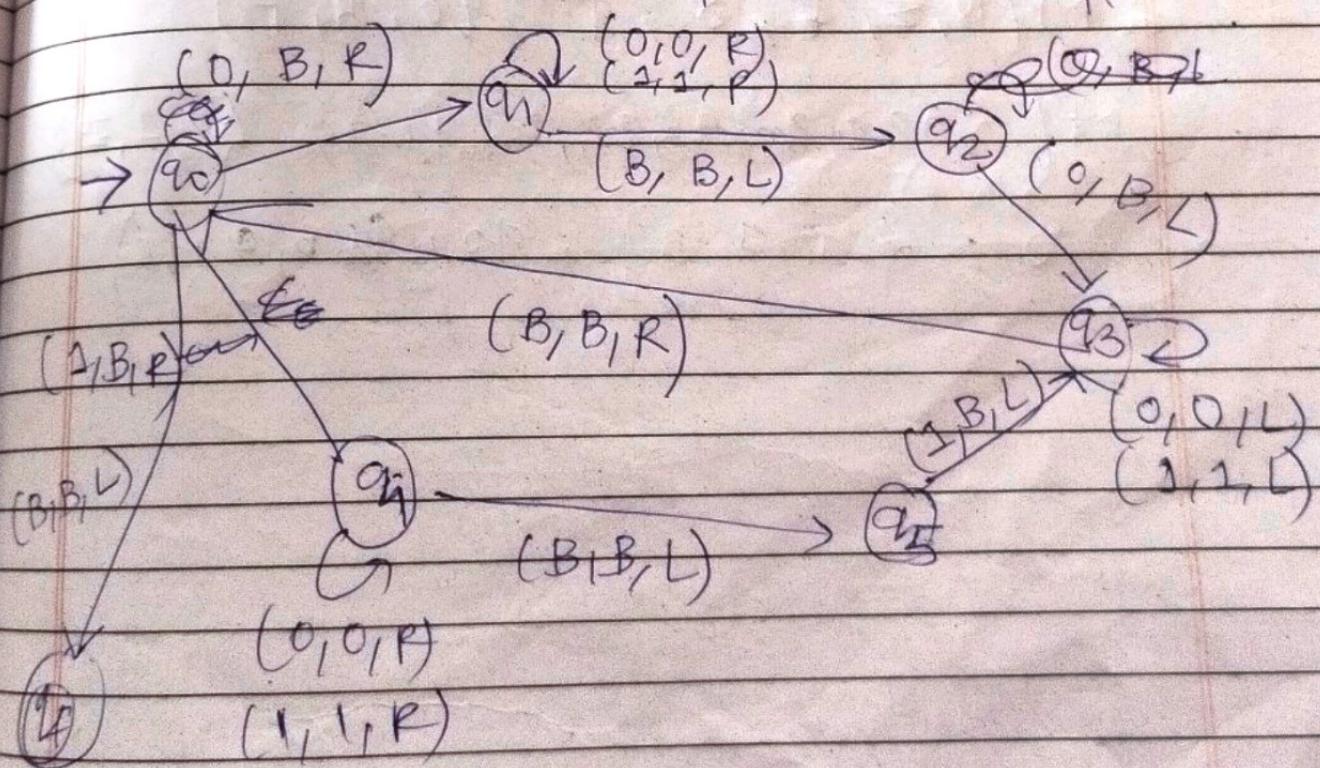
Design a Turing Machine for the language
 $L = S \{ 0, 1 \}^* | \text{reverse}(0+1)^*$
 R: Reverse String.

$$(0+1)^* = 0, 1, 01, 10, 010, 00101$$

$$L = \{ 00, 11, 0110, 1001, 0101010, \\ 0010110100 \}$$

~~↓~~ ~~QBB0010110400 BBBB~~

~~→ BB QBB → -- BB B 0101111010 B BBB →~~



Transition Table

	0	1	B
Q	0	1	B
q ₀	(q ₁ , B, R)	(q _n , B, R)	(q _f , B, L)
q ₁	(q ₁ , 0, R)	(q ₁ , 1, R)	(q ₂ , B, L)
q ₂	(q ₃ , B, L)	=	-
q ₃	(q ₃ , 0, L)	(q ₃ , 1, L)	(q ₀ , B, R)
q ₄	(q ₄ , 0, R)	(q _n , 1, R)	(q ₅ , B, L)
q ₅	-	(q ₃ , B, L)	-
q _f	-	-	-

M(Q, Σ, E, δ, q₀, B, F)

M({q₀, q₁, q_n, q₃, q₄, q₅, q_f}, {0, 1, B})

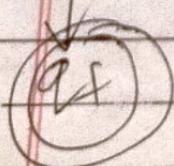
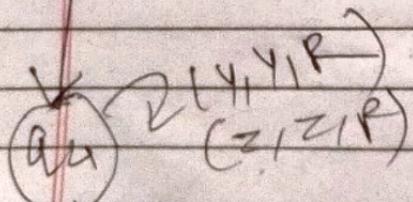
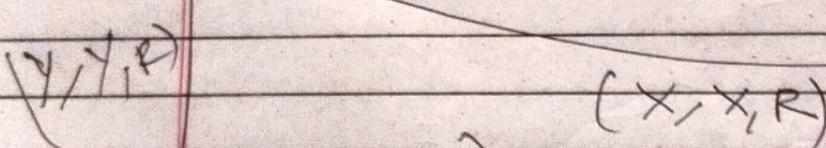
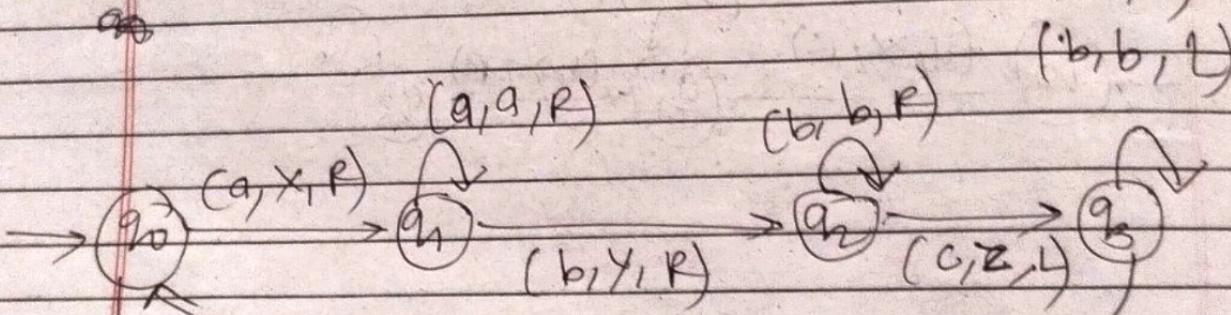
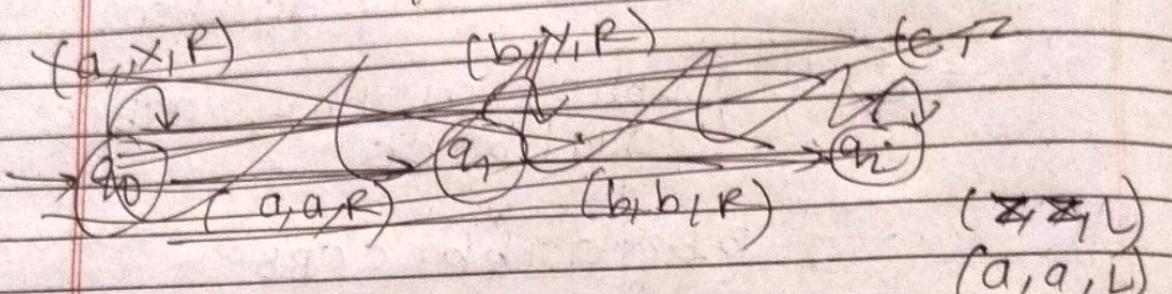
δ, {0, 1, B}, q₀, q_f, B, q_n, q_f)

(a) Design TM for $L = \{a^n b^m c^n | n \geq 1\}$

$\Rightarrow L = \{aabbc, abc, aabbccccc, \dots\}$

$\begin{matrix} a & a & b & b & c \\ \times & \nearrow & \searrow & \nearrow & \searrow \\ a & a & b & b & c \end{matrix}$

$\begin{matrix} a & a & b & b & c & c & c \\ \downarrow & \nearrow & \searrow & \nearrow & \searrow & \nearrow & \searrow \\ B & B & a & a & b & b & c & c & B & B & B \end{matrix}$



Transition Table

Q	a	b	x	y	z
q0	(q1, x1, R)	-	-	(q4, y1, R)	-
q1	(q1, x1, R)	(q2, y1, R)	-	-	-
q2	-	(q2, b1, R)	-	-	-
q3	(q3, a, L)	(q3, b, L)	(q0, x1, R)	(q3, y1, L)	(q3, z1, L)
q4	-	-	-	-	-
qf	-	-	-	-	-

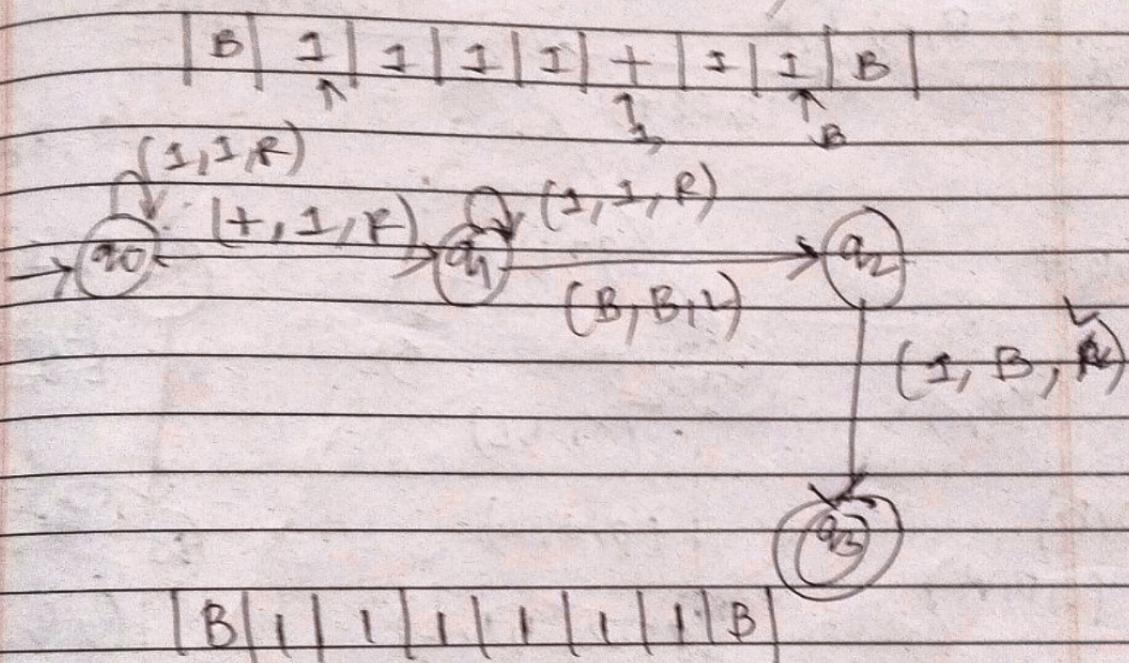
Q	a	b	c	x	y	z
q0	(q1, x1, R)	-	-	(q4, y1, R)	-	-
q1	-	-	-	-	-	-
q2	-	-	-	-	-	-
q3	-	-	-	-	-	-
q4	-	-	-	-	-	-
qf	-	-	-	-	-	-

Q	a	a	b	c	x	y	z	b
q0	(q1, x1, R)	-	-	-	(q4, y1, R)	-	-	-
q1	(q1, x1, R)	(q2, y1, R)	-	-	-	-	-	-
q2	-	-	(q2, b1, R)	(q3, z1, L)	-	-	-	-
q3	(q3, a, L)	(q3, b, L)	-	-	(q0, x1, R)	(q3, y1, L)	(q3, z1, L)	-
q4	-	-	-	-	-	(q4, y1, R)	(q4, z1, R)	(q4, b1, L)
qf	-	-	-	-	-	-	-	-

Q24) Design TM to compute the function
 $f(m, n) = m+n$

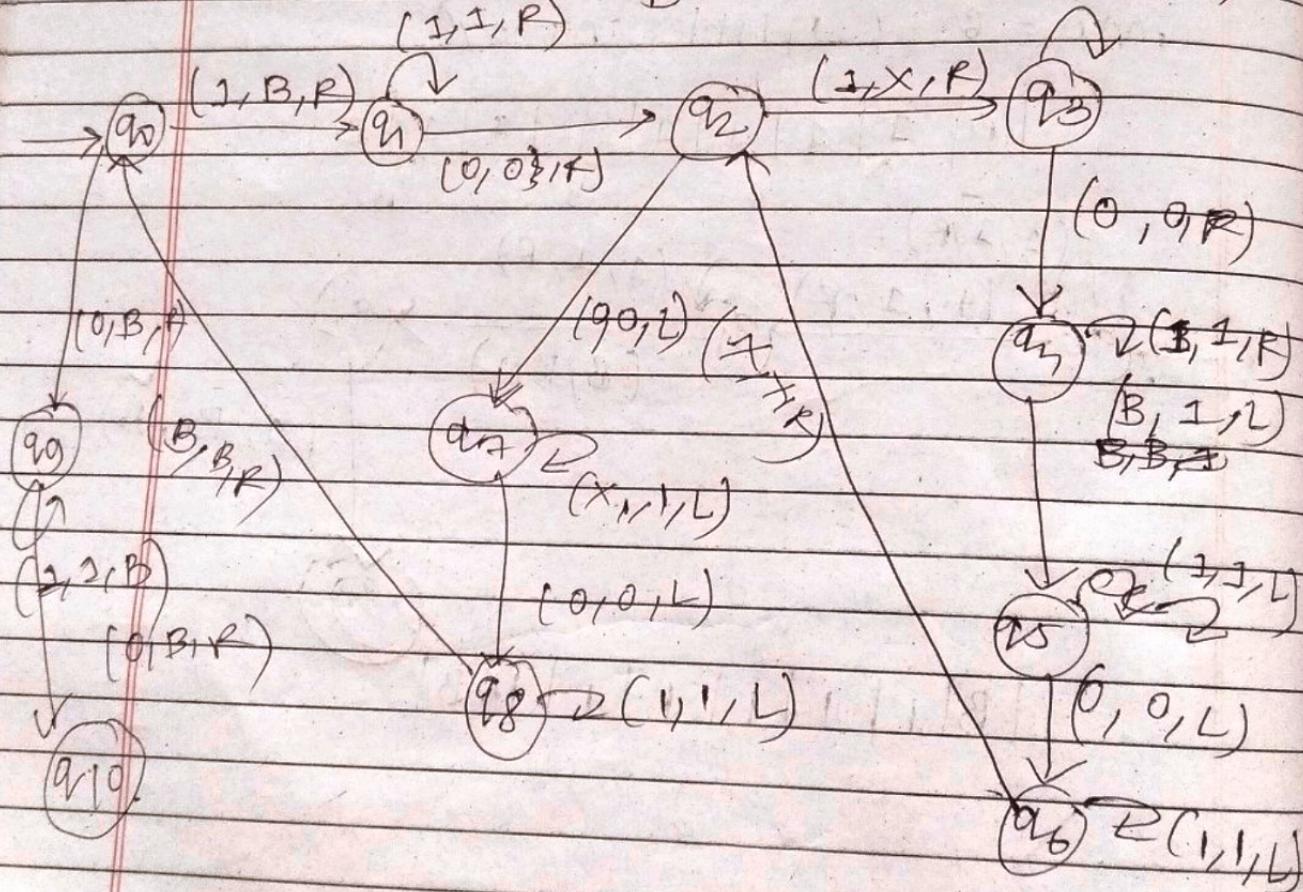
$$\Rightarrow f(m, n) = m+n$$

Let $m=4$ (1111 in unary form)
 $n=2$ (11 in unary form)
 $m+n=6$ (11111 in unary)



a. 6) TM ~~can~~ to perform multiplication of two unary numbers -

$$\Rightarrow \begin{array}{ccccccccc} & & x=2 & & x=3 \\ & 2 \times 3 = 6 & \xrightarrow{\text{B B}} & \xrightarrow{\text{X X X}} & \xrightarrow{\text{1 1 1}} & & & & \\ & B & B & \xrightarrow{\text{X X X}} & & \xrightarrow{\text{1 1 1}} & \xrightarrow{\text{1 1 1}} & \xrightarrow{\text{1 1 1}} & \xrightarrow{\text{1 1 1}} \\ B & B & \xrightarrow{\text{1 1 0}} & 1 & 1 & 1 & 0 & B & B \\ \uparrow & & B & B & B & \downarrow & & & \\ (1, 1, R) & & & & & B & & & (1, 1, R) \end{array}$$



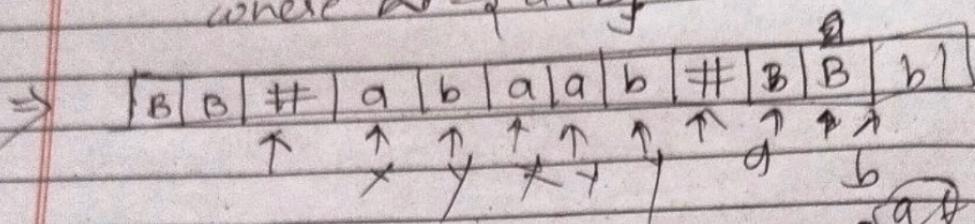
Chair Bike

Q.12) Design a TM

INPUT $\rightarrow \# W \#$

OUTPUT $\rightarrow \# W \# b^*$

where $b = \{a+b\}^*$



Transition of TM

state q_0

