

1)

1)  $\overset{\downarrow}{(q_1)} 0 | 0 \rightarrow x \overset{\downarrow}{(q_2)} 1 0 \rightarrow x | \overset{\downarrow}{(q_2)} 0$

$\rightarrow x | 0 \sqsubset \text{reject} \sqsubset$

2)  $\overset{\downarrow}{(q_1)} 0 | \# 0 | \rightarrow x \overset{\downarrow}{(q_2)} 1 \# 0 | \rightarrow x | \overset{\downarrow}{(q_2)} \# 0 |$

$\rightarrow x | \# \overset{\downarrow}{(q_4)} 0 | \rightarrow x | \overset{\downarrow}{(q_6)} \# x | \rightarrow x \overset{\downarrow}{(q_7)} 1 \# x |$

$\rightarrow \overset{\downarrow}{(q_7)} x | \# x | \rightarrow x \overset{\downarrow}{(q_1)} | \# x | \rightarrow x x \overset{\downarrow}{(q_3)} \# x |$

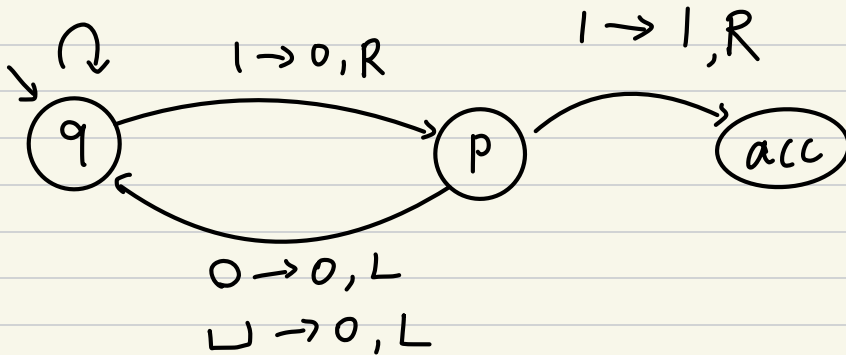
$\rightarrow x x \# \overset{\downarrow}{(q_5)} x | \rightarrow x x \# x \overset{\downarrow}{(q_5)} | \rightarrow x x \# \overset{\downarrow}{(q_6)} x x$

$\rightarrow x x \overset{\downarrow}{(q_6)} \# x x \rightarrow x \overset{\downarrow}{(q_7)} x \# x x \rightarrow x x \overset{\downarrow}{(q_1)} \# x x$

$\rightarrow x x \# \overset{\downarrow}{(q_8)} x x \rightarrow x x \# x \overset{\downarrow}{(q_8)} x \rightarrow x x \# x x \overset{\downarrow}{(q_8)} \sqsubset$

$\rightarrow x x \# x x \overset{\downarrow}{(q_8)} \sqsubset \text{accept} \sqsubset$

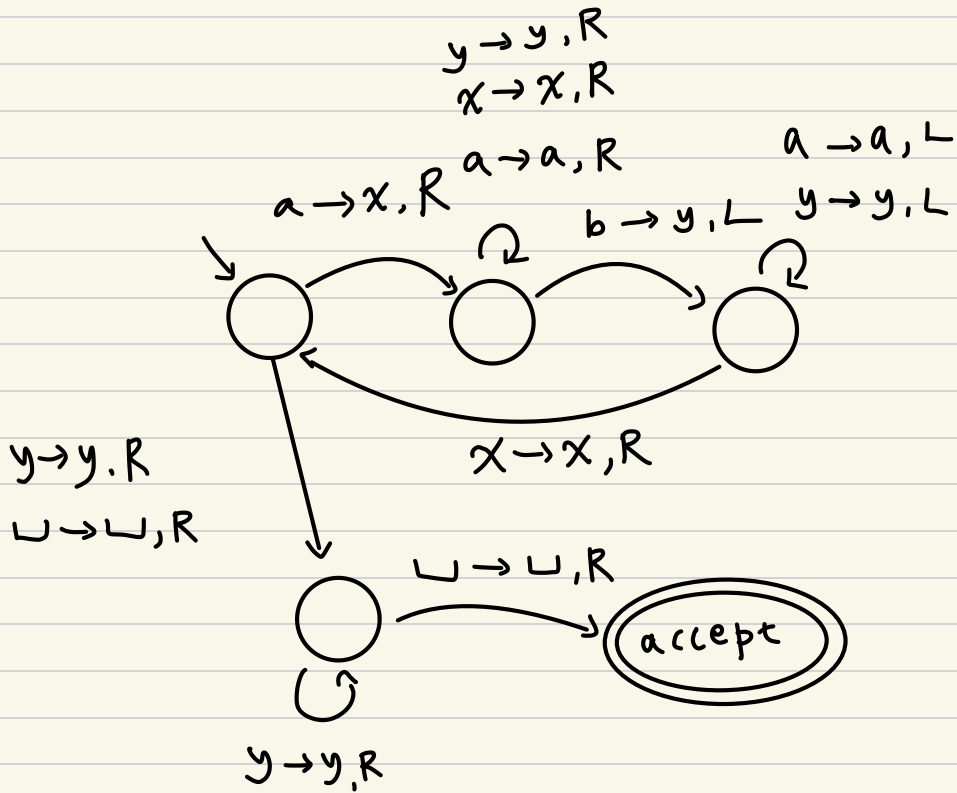
2)  $\sqcup \rightarrow \sqcup, R$   
 $0 \rightarrow 0, R$



$\downarrow$   
 $q | 0 | 0 | 1 | 0 \rightarrow 0 \downarrow p | 0 | 0 | 1 | 0 \rightarrow 0 0 \downarrow q | 1 | 0 | 1 | 0$   
 $\rightarrow 0 0 0 \downarrow p | 0 | 1 | 0 \rightarrow 0 0 0 0 \downarrow q | 1 | 1 | 0 \rightarrow 0 0 0 0 0 \downarrow p | 1 | 0$   
 $\rightarrow 0 0 0 0 0 | \downarrow acc | 0$

The TM,  $M$ , accepts the strings with  
 //

3)  $L_1 = \{ \varepsilon, ab, aabb, aaabbb, \dots \}$



2)  $L_2 = \{ \#, 0\#01, 1\#10, 11\#1010, \dots \}$

