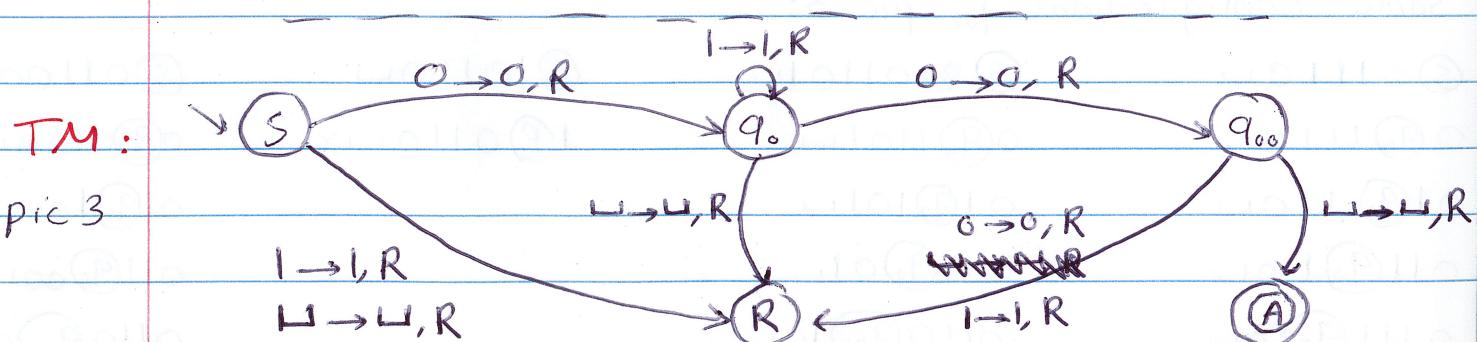
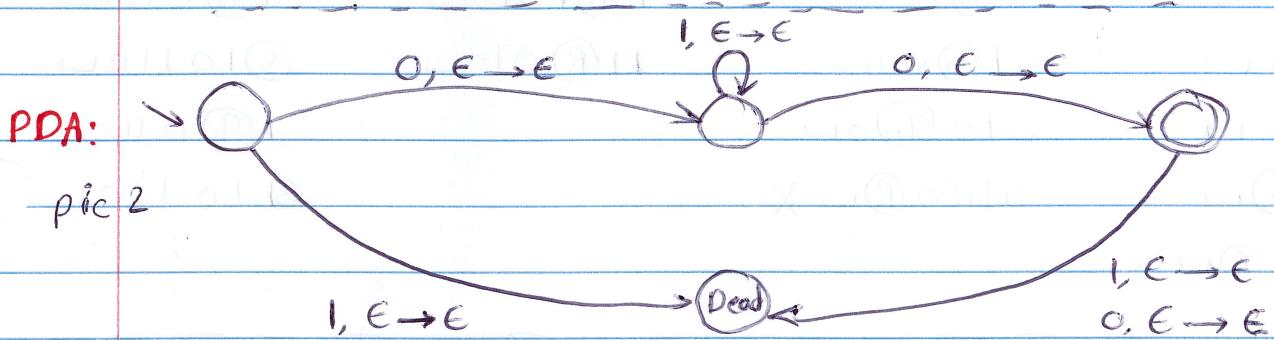
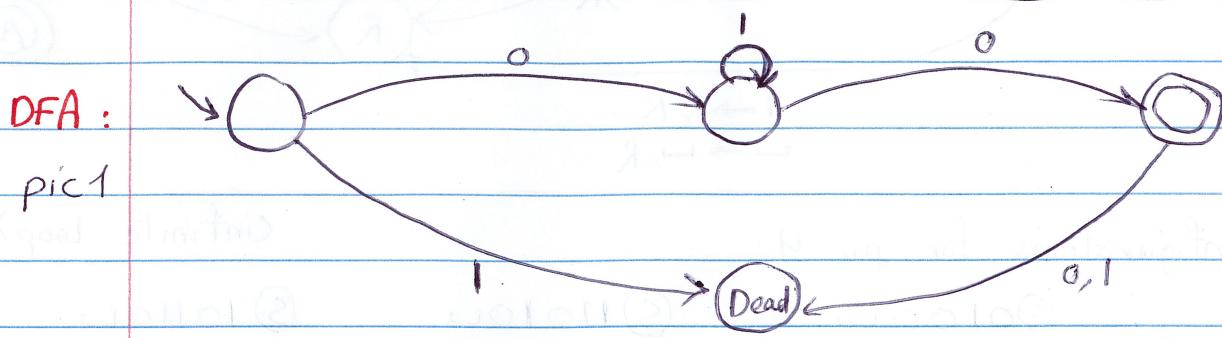


① example of TM for a regular language

$$L = \{ w \mid w = 0^* 1^* 0 \} = \{ 00, 01, 10, 010, 101, 0110, \dots \}$$

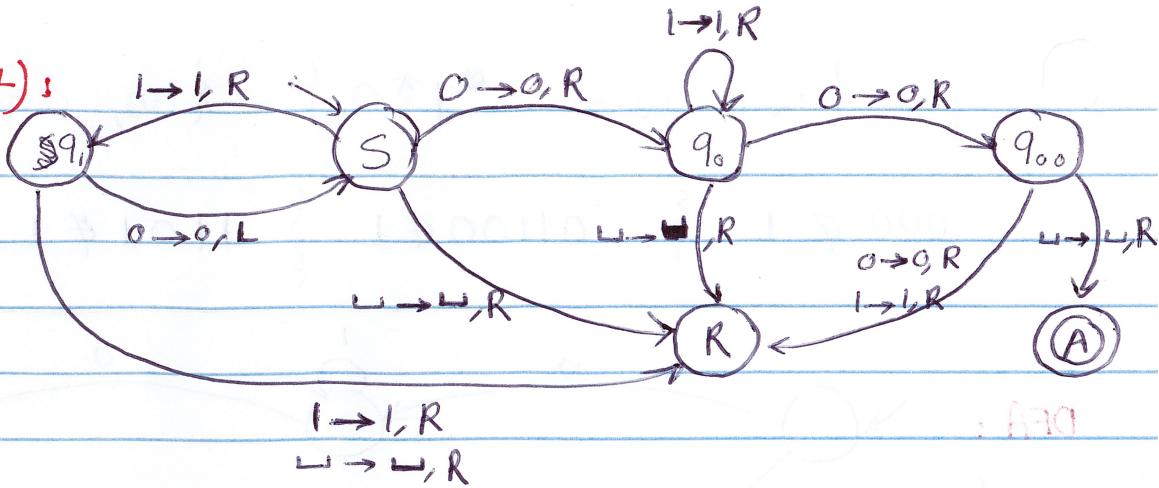
$000 \notin L$ $\{ 01100 \notin L \}$ $\{ 1101 \notin L \}$ $\{ 101110 \notin L \}$



② proposed solution is not MT for algorithms

TM (not efficient):

pic 4



Some configurations for pic 4:

\$0110L

0(q₀)110L

01(q₀)10L

011(q₀)0L

0110(q₀₀)L

0110L(A)X

\$0100L

0(q₀)100L

01(q₀)00L

010(q₀₀)0L

0100(q₀₀)L

0100(R)LX

\$11010L

1(q₁)1010L

11(R)010LX

10110L

1(q₁)0110L(q₁)

\$10110L

1(q₁)0110L

10110L

1(q₁)0110L(q₁)

\$10110L

! :

some configurations for pic 3:

\$01110L

0(q₀)1110L

01(q₀)110L

011(q₀)10L

0111(q₀)0L

01110(q₀₀)L

01110L(A)X

\$001101L

0(q₀)1101L

01(q₀)101L

011(q₀)01L

0110(q₀₀)1L

01101(R)LX

\$10110L

1(R)0110LX

0(q₀)1100L

01(q₀)100L

011(q₀)00L

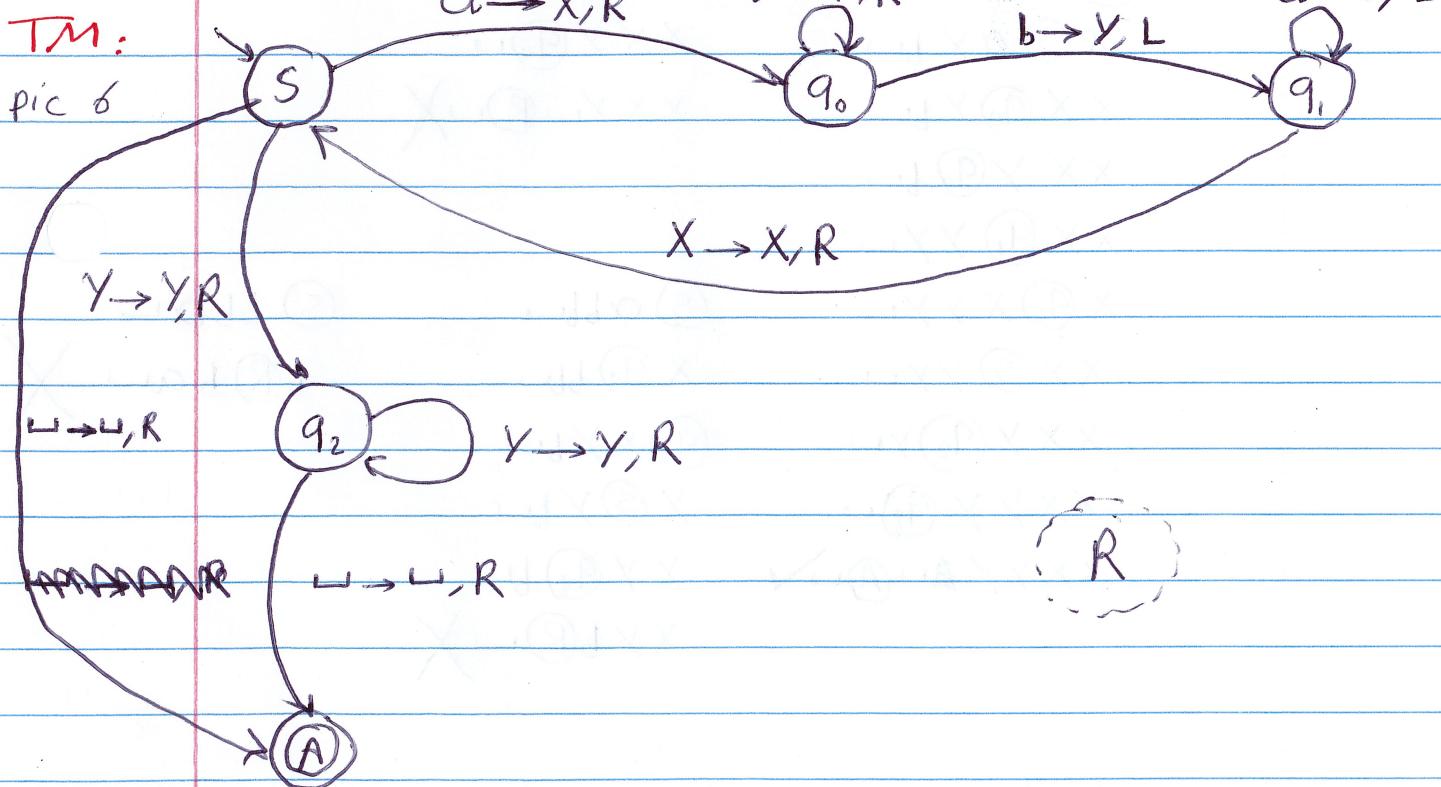
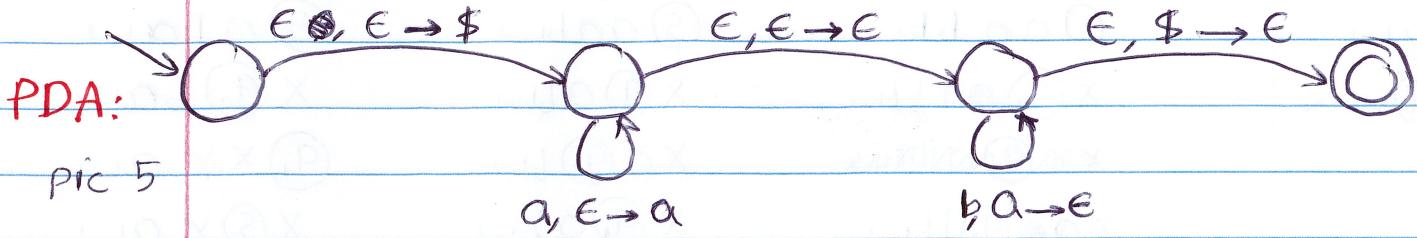
0110(q₀₀)0L

0110(R)L

③

example of a TM for a context-free language

$$L = \{w \mid w = a^n b^n, n \geq 0\} = \{\epsilon, aabb, aaabbb, \dots\}$$



④ panel

soft textures \rightarrow soft MT \rightarrow to algorithms

Some configurations for pic 6:

⑤ $\sqcup \sqcup$

$\sqcup A \sqcup \sqcup$

⑤ aabb

$X \textcircled{q}_0 aabb$

~~XXXXPXXXXX~~

$X a \textcircled{q}_0 bbb$

$X \textcircled{q}_1 a Y bb$

~~XXXXPXXXXX~~

$\textcircled{q}_1 X a Y b$

$X \textcircled{S} a Y b$

$XX \textcircled{q}_0 Y b$

$XX Y \textcircled{q}_0 b$

$XX \textcircled{q}_1 YY$

$X \textcircled{q}_1 X YY$

$XX \textcircled{S} YY$

$XX Y \textcircled{q}_2 YY$

$XXYY \textcircled{q}_2$

$XXYY \textcircled{A}$

⑤ aab

$X \textcircled{q}_0 ab$

$X a \textcircled{q}_0 b$

$X \textcircled{q}_1 a Y$

$\textcircled{q}_1 X a Y$

$X \textcircled{S} a Y$

$XX \textcircled{q}_0 Y$

$XX Y \textcircled{q}_0$

$XXY \textcircled{R} \sqcup X$

⑤ abb

$X \textcircled{q}_0 bb$

$\textcircled{q}_1 X Y b$

$X \textcircled{S} Y b$

$XY \textcircled{q}_2 b$

$XYb \textcircled{R} \sqcup X$

⑤ abaa

$X \textcircled{q}_0 ba$

$\textcircled{q}_1 XY a$

$X \textcircled{S} Y a$

$XY \textcircled{q}_2 a$

$XYa \textcircled{R} \sqcup X$

⑤ bbaa

$b \textcircled{R} ba$

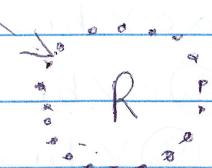
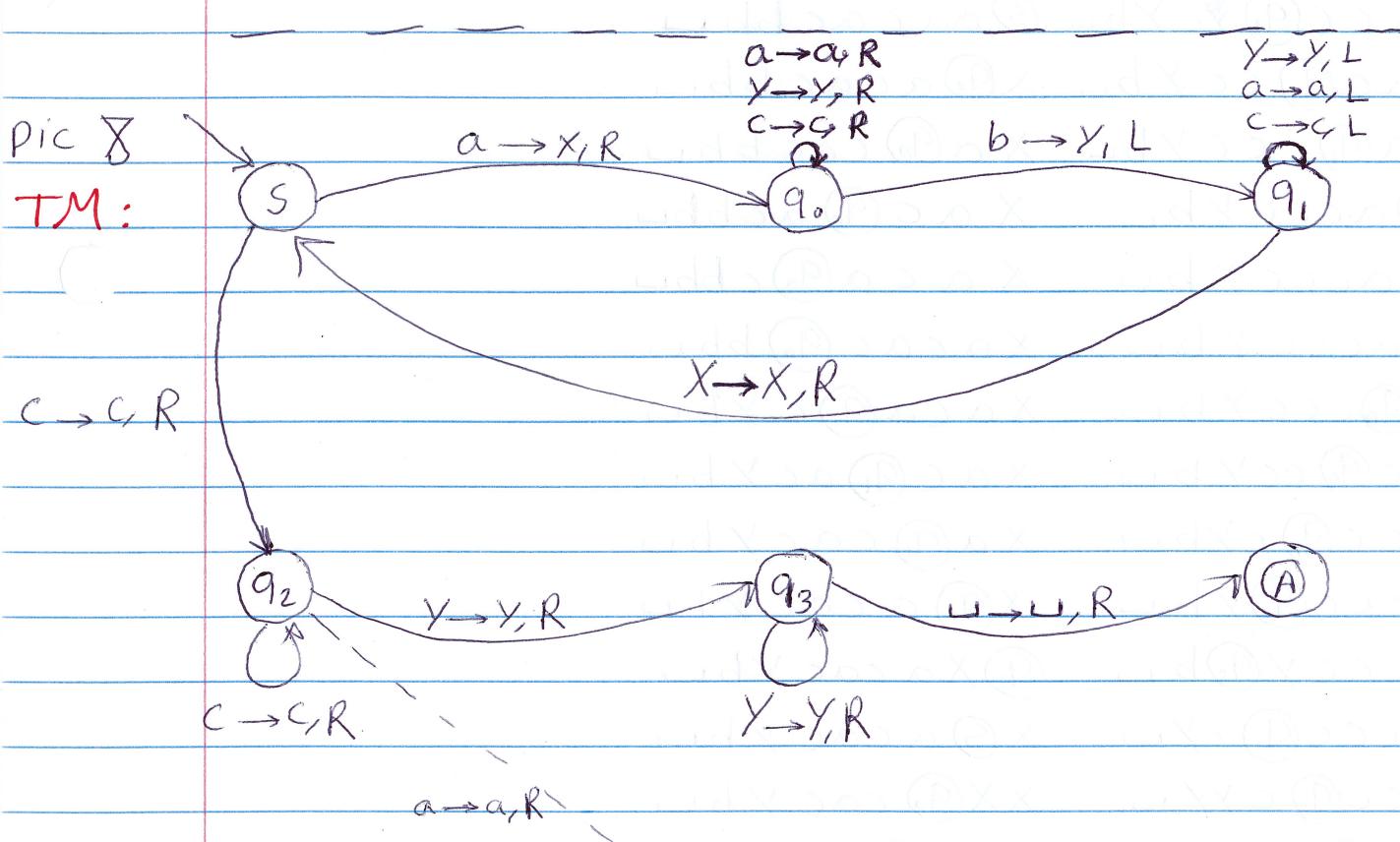
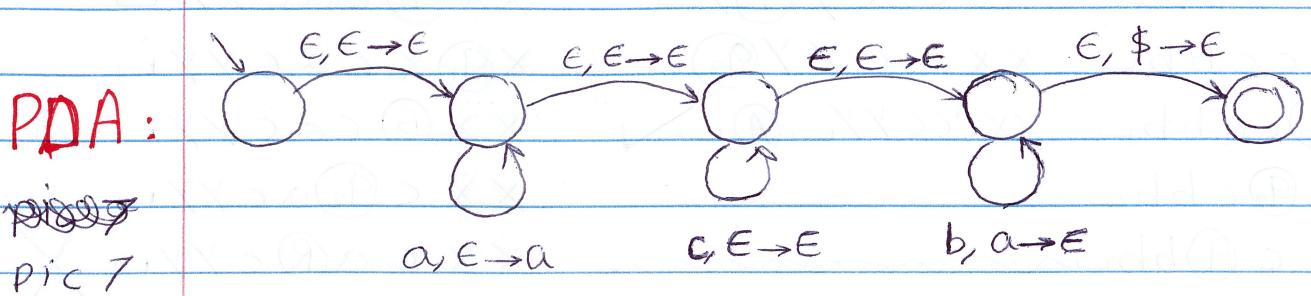
X

second example of a TM for a context-free

(5)

Language

$$L = \{ w \mid w = a^n c^m b^n, m, n > 0 \} = \{ ab, acb, accb, aabb, aacbb, aacbb, aaabbb, aaacbccc, \dots \}$$



⑥ Action of MT's to align DNA bases

spiral

Some configurations for pic 8:

⑤ aaccbb → XXccc_②YY → Xxc_①acyyy →

X_③accbb → XXccc_③Y → Xx_①cacyy →

Xa_④cccb → XXcccYY_③ → X_①Xcacyy →

Xac_④ccb → XXcccYY → A → Xx_⑤cacyy → A

Xacc_④cb → Xx_②cacyy →

Xa_④cc_④bb → Xx_③cacyy → X

Xacc_④c_④Yb → ⑤ aacacb →

Xac_④cc_④Yb → X_④acacb →

Xa_④cc_④YYb → Xa_④cacb →

X_④acc_④Yb → Xac_④acb →

④ Xacc_④Yb → Xaca_④cb →

X_④acc_④Yb → Xacac_④bb →

XX_④ccc_④Yb → Xaca_④c_④Yb →

XXc_④cc_④Yb → Xac_④acyb →

XXcc_④c_④Yb → Xa_④cacyb →

XXccc_④Yb → X_④acacyb →

XXccc_④Yb → ④ Xacacyb →

XXccc_④YY → X_④acacyb →

XXcc_④c_④YY → XX_④cac_④Yb →

XXc_④cc_④YY → XXc_④acyb →

X_④cc_④YY → XXcac_④Yb →

XX_④ccc_④YY → XXcacy_④b →

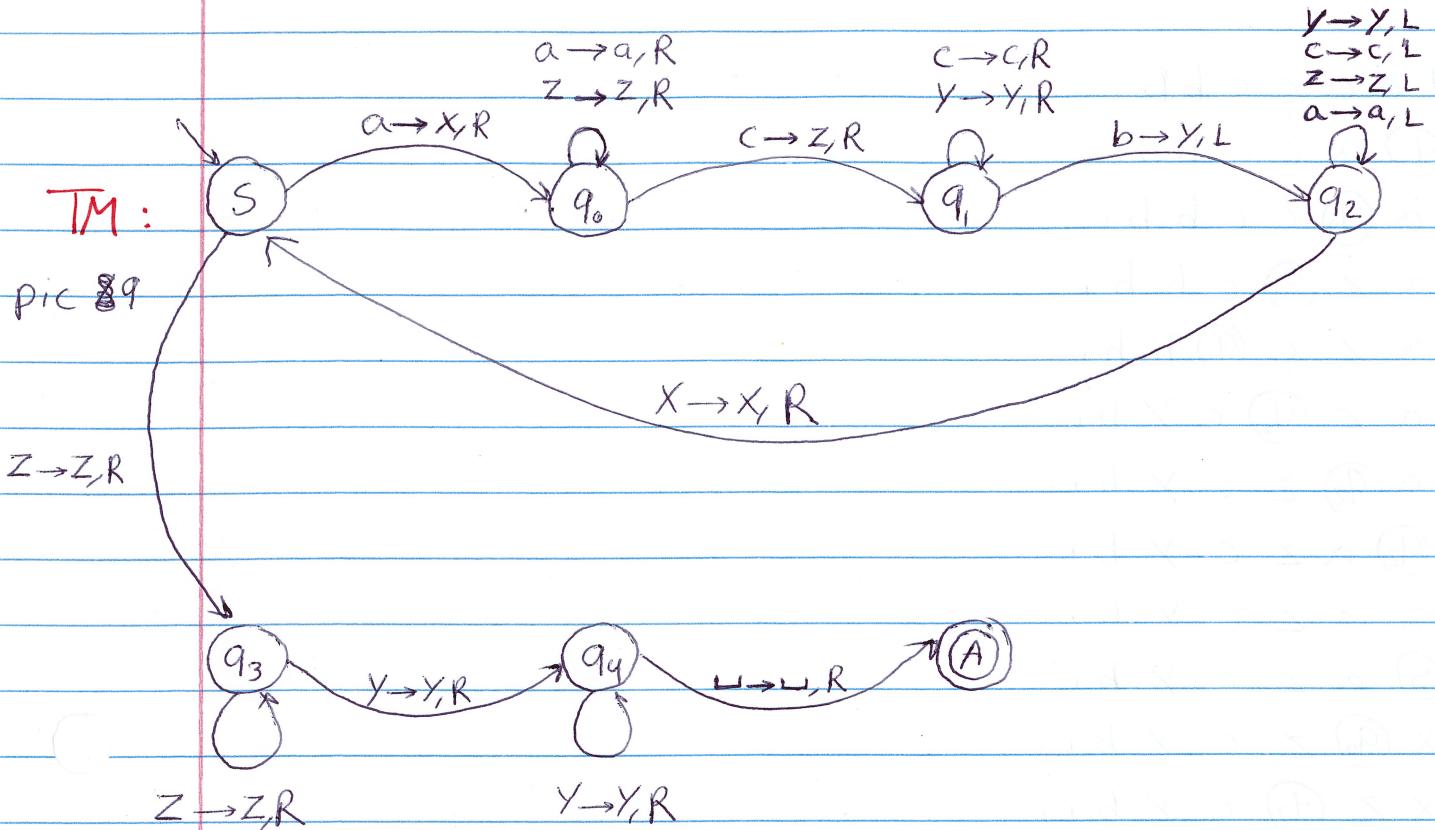
XXc_④cc_④YY → XXcac_④YY →

XXcc_④c_④YY → XXca_④c_④YY →

(7)

example of a TM for a decidable Language

$$L = \{w \mid w = a^n c^n b^n, n > 0\} = \{\text{aabb}, \text{aaccbb}, \text{aaacccbbb}, \dots\}$$



Some configurations for pic 89:

⑤ a a c c b b ..

X ⑨₀ a c c b b ..

X a ⑨₀ c c b b ..

X a z ⑨₁ c b b ..

X a z c ⑨₁ b b ..

X a z ⑨₂ c Y b ..

X a ⑨₂ z c Y b ..

X ⑨₂ a z c Y b ..

⑨₂ X a z c Y b ..

X ⑤ a z c Y b ..

XX ⑨₀ z c Y b ..

XX Z ⑨₀ c Y b ..

XX Z Z ⑨₁ Y b ..

XX Z Z Y ⑨₁ b ..

XX Z Z ⑨₂ Y Y ..

XX Z ⑨₂ Z Y Y ..

XX ⑨₂ Z Z Y Y ..

X ⑨₂ X Z Z Y Y ..

XX Z Z Z Y Y ..

XX Z Z Z ⑨₃ Y Y ..

XX Z Z Z Y ⑨₃ Y ..

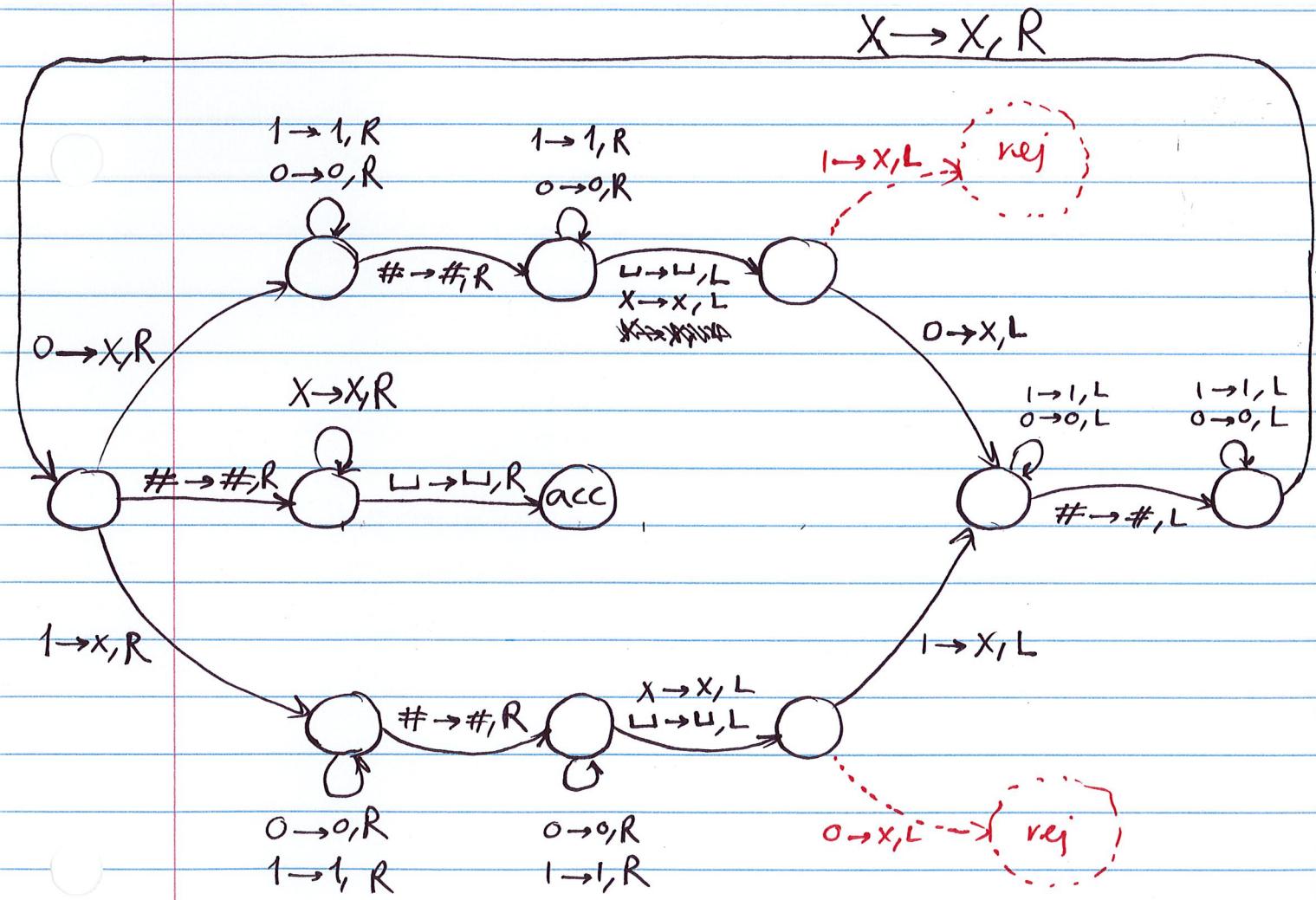
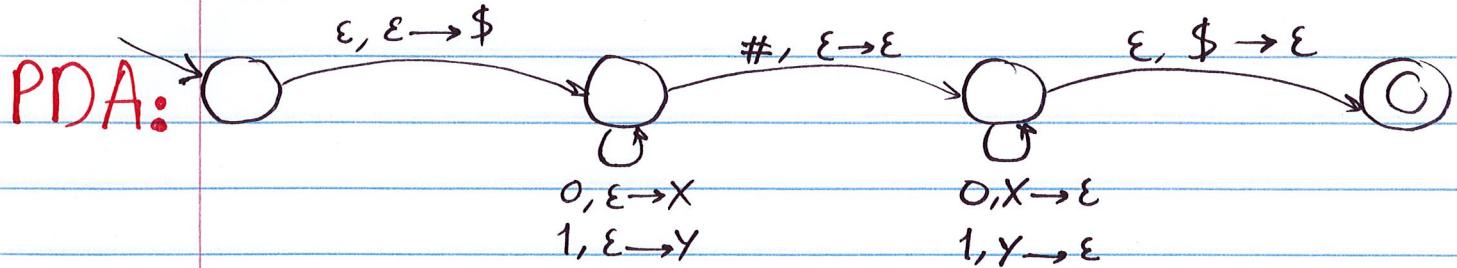
XX Z Z Z Y Y ⑨₄ ..

XX Z Z Z Y Y .. ⑨₄ ..

Example of a TM for a Context-free Language

$L = \{ w \mid w = u\#u^r, u \text{ is a binary string} \}$

⑨
 $= \{ \#, 0\#0, 0100\#0010, \dots \}$



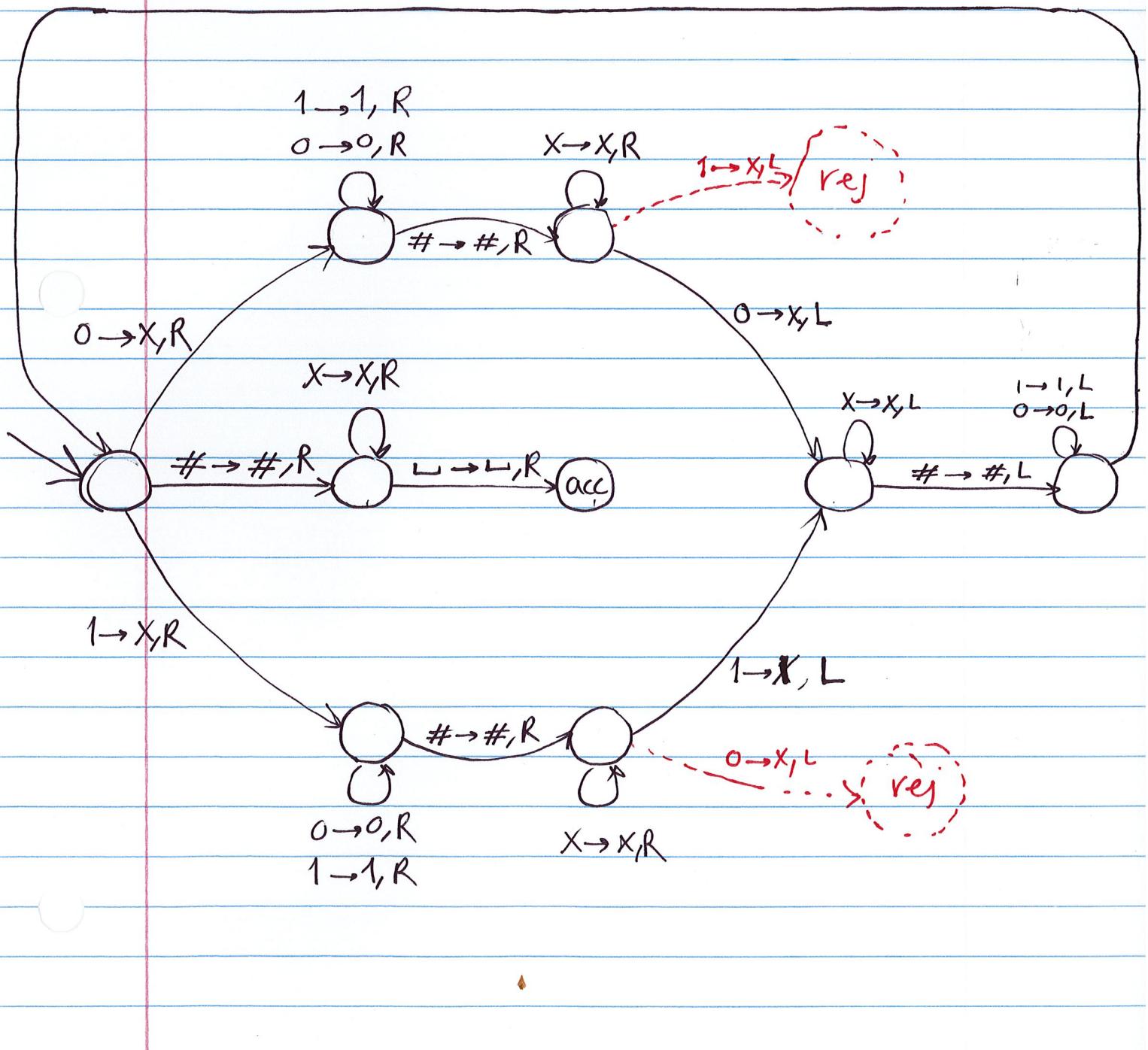
example of a TM for a decidable language

$L = \{ w \mid w = u\#u, u \text{ is a binary string} \}$

(10)

$= \{ \#, 0\#0, 0100\#0100, \dots \}$

$X \rightarrow X, R$

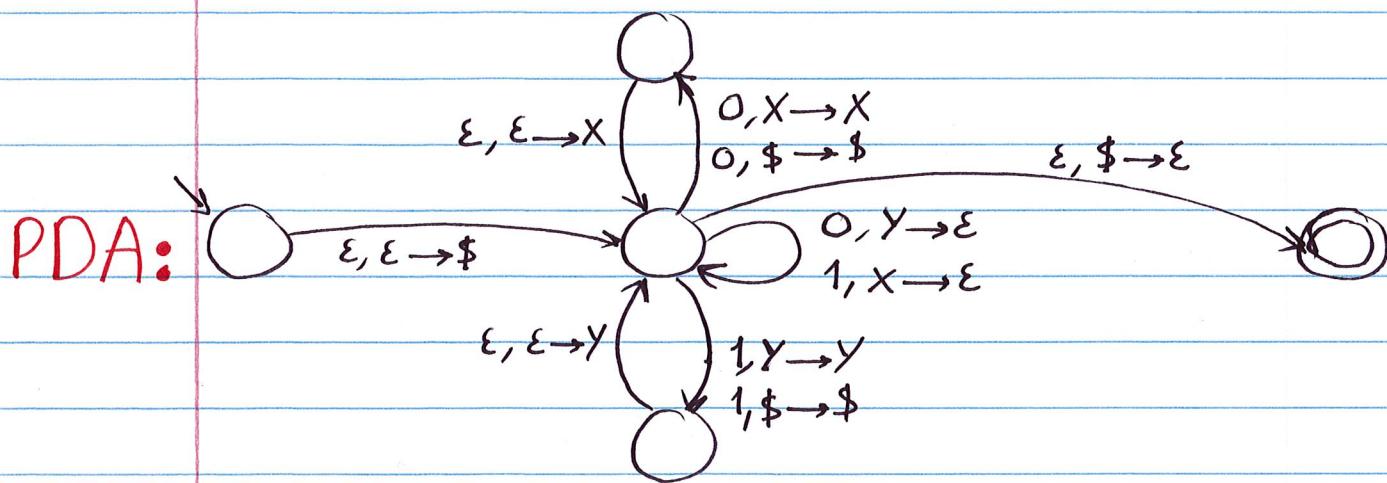


example of a TM for a Context-Free

$L = \{w \mid w \text{ has equal # of } 0_s \text{ and } 1_s\}$ Language

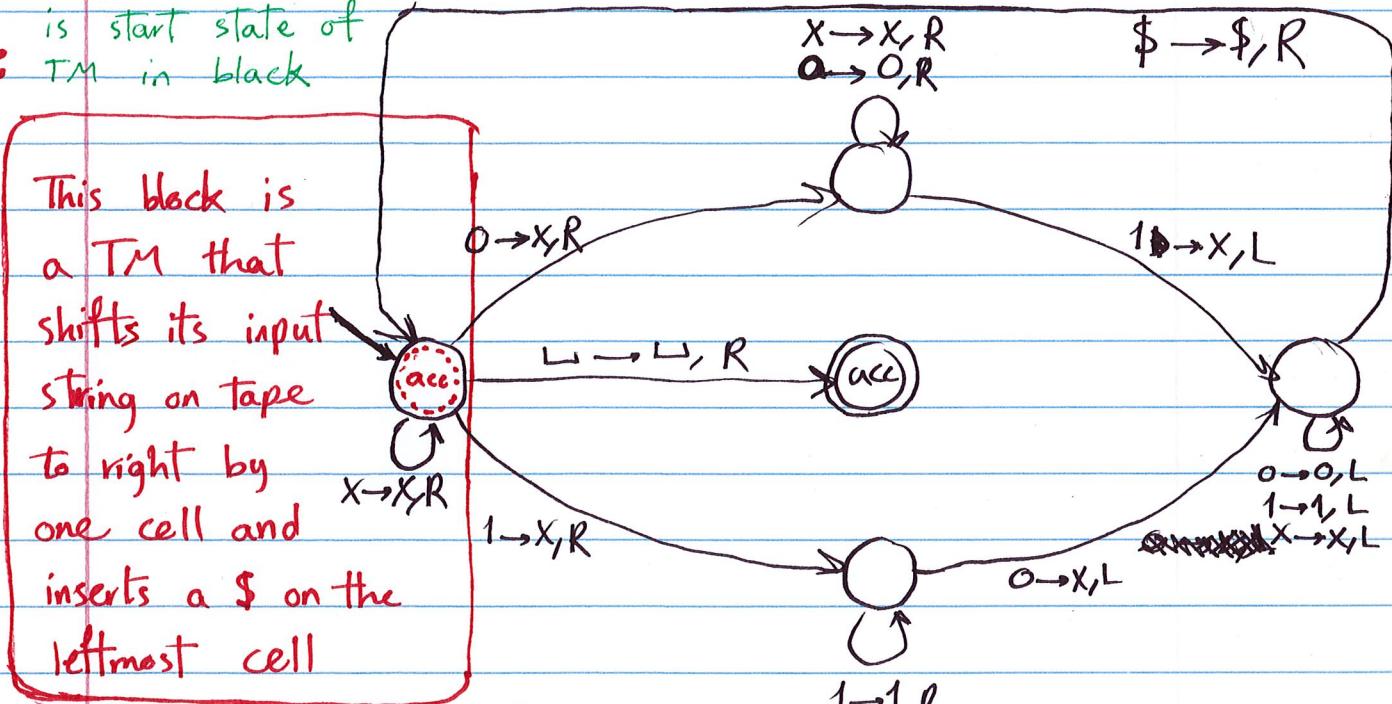
10

$= \{0011, 010101, 00010111, 1101100001, \epsilon, \dots\}$



accept state of red block

TM: is start state of
TM in black



note: TM in red block above

leaves the head of the tape on first symbol of original string after shifting to right, immediately after the \$ in the leftmost cell.

Go to file called: "examples for Turing Machine 2" on Canvas for more details