National University
Of Computer and Emerging Sciences

Assignment-04

In partial
fulfillment of the requirements
for the course of

CS-3005

Theory of Automata

By:

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BSCS-C

NOTE:

I used 1PDA for Parenthesis, double Word and a^{2^n} problems since they don't require the second stack. Ma'am Tajwar had allowed us to use 1-PDA for these specific questions of the assignment.

Start

Read

a

push$_1$a

pop$_1$

push$_1$a

a

b

c

pop$_2$

push$_2$c

push$_2$c

b

b

push$_1$b

pop$_1$

push$_1$b

a

c

pop$_2$

push$_2$b

push$_2$b

b

pop$_1$

a,b

Reject

b,c

pop$_2$

Accept

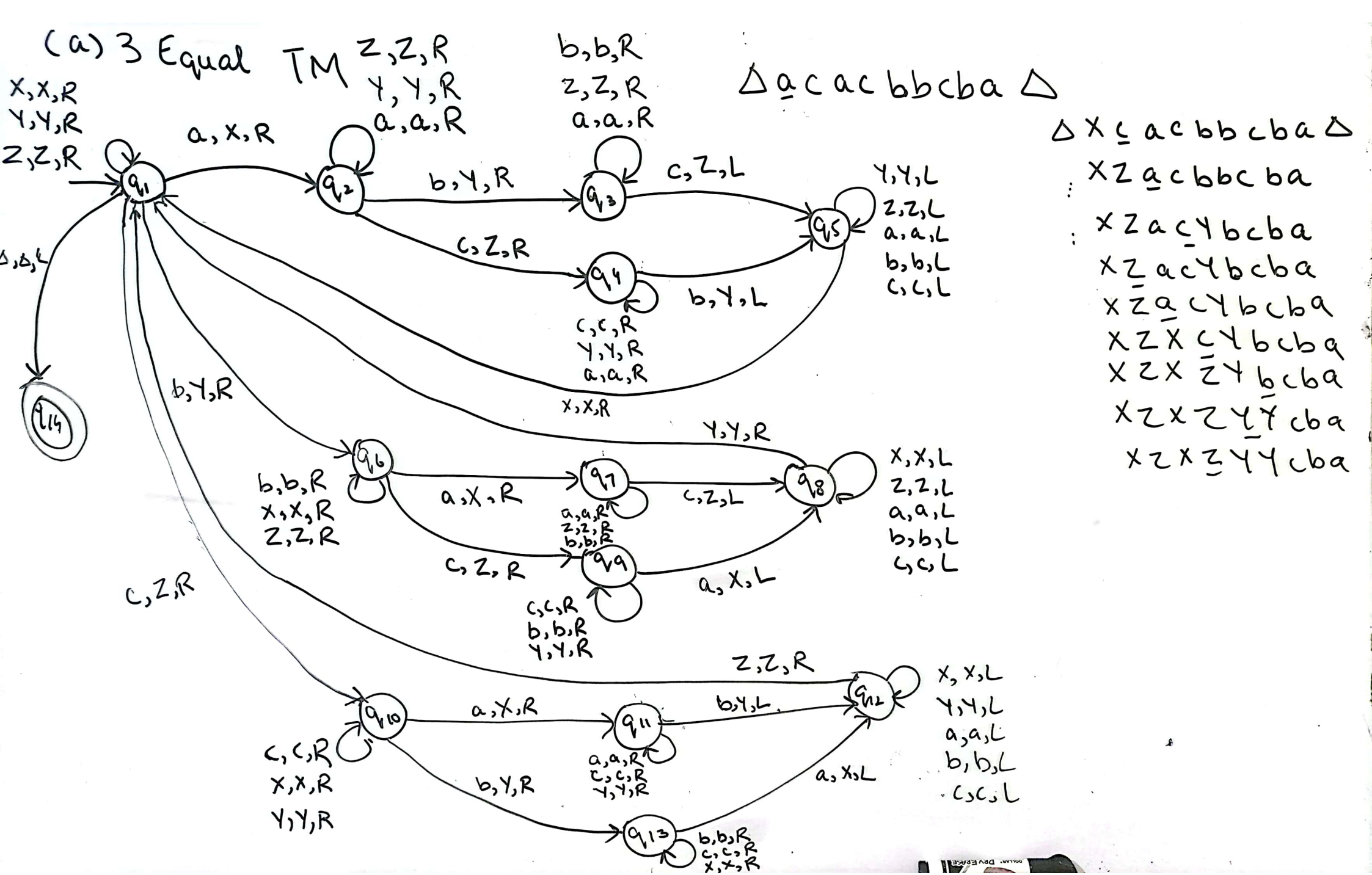
abbaca

1 2

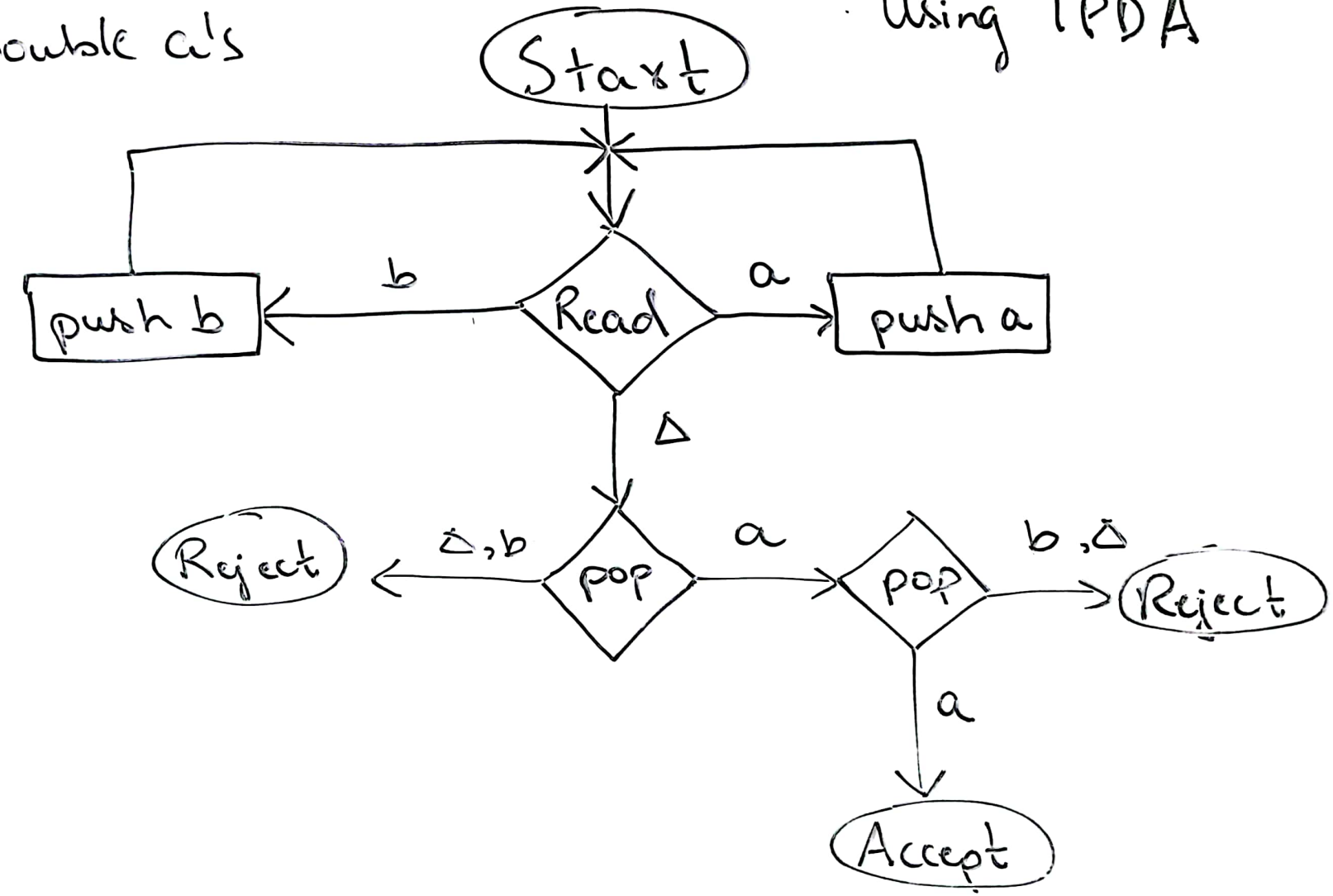
½

½ ½

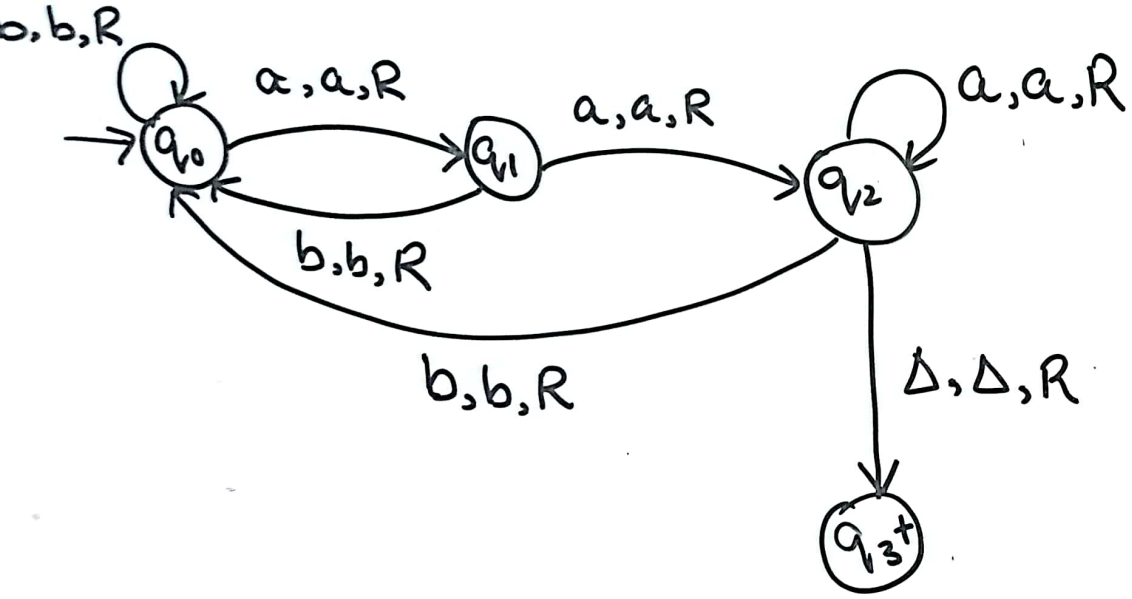
½ ½


(a) 3 Equal TM
Δ a c ac bbcba Δ
Δ X c ac bbcba Δ
X Z a c bbc ba
X Z a c Y bcba
X Z ac Y bcba
X Z a c Y bcba
X Z X c Y bcba
X Z X Z Y bcba
X Z X Z Y Y cba
X Z X Z Y Y cba
X,X,R
Y,Y,R
Z,Z,R
a,X,R
Z,Z,R
Y,Y,R
a,a,R
b,b,R
Z,Z,R
a,a,R
b,Y,R
c,Z,L
c,Z,R
Y,Y,L
Z,Z,L
a,a,L
b,b,L
c,c,L
b,Y,L
c,c,R
Y,Y,R
a,a,R
X,X,R
Δ,Δ,L
b,Y,R
Y,Y,R
b,b,R
X,X,R
Z,Z,R
a,X,R
a,a,R
Z,Z,R
b,b,R
c,Z,L
X,X,L
Z,Z,L
a,a,L
b,b,L
c,c,L
c,Z,R
a,X,L
c,c,R
b,b,R
Y,Y,R
c,Z,R
Z,Z,R
a,X,R
b,Y,L
X,X,L
Y,Y,L
a,a,L
b,b,L
c,c,L
c,c,R
X,X,R
Y,Y,R
b,Y,R
a,a,R
Z,Z,R
b,Y,R
a,X,L
b,b,R
c,c,R
X,X,R
q1
q2
q3
q4
q5
q6
q7
q8
q9
q10
q11
q12
q13
q14

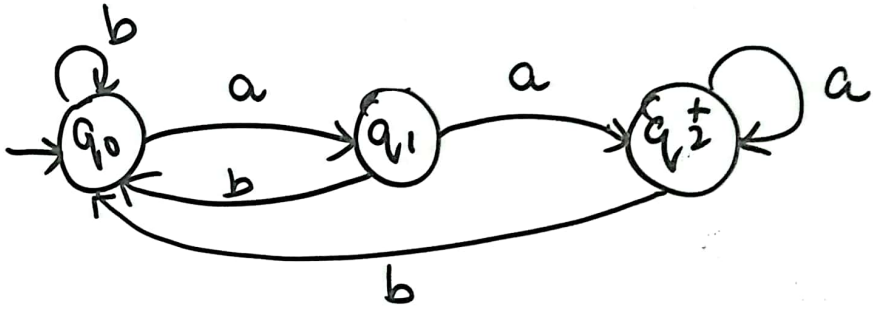
b) End with double a's : Using IPDA



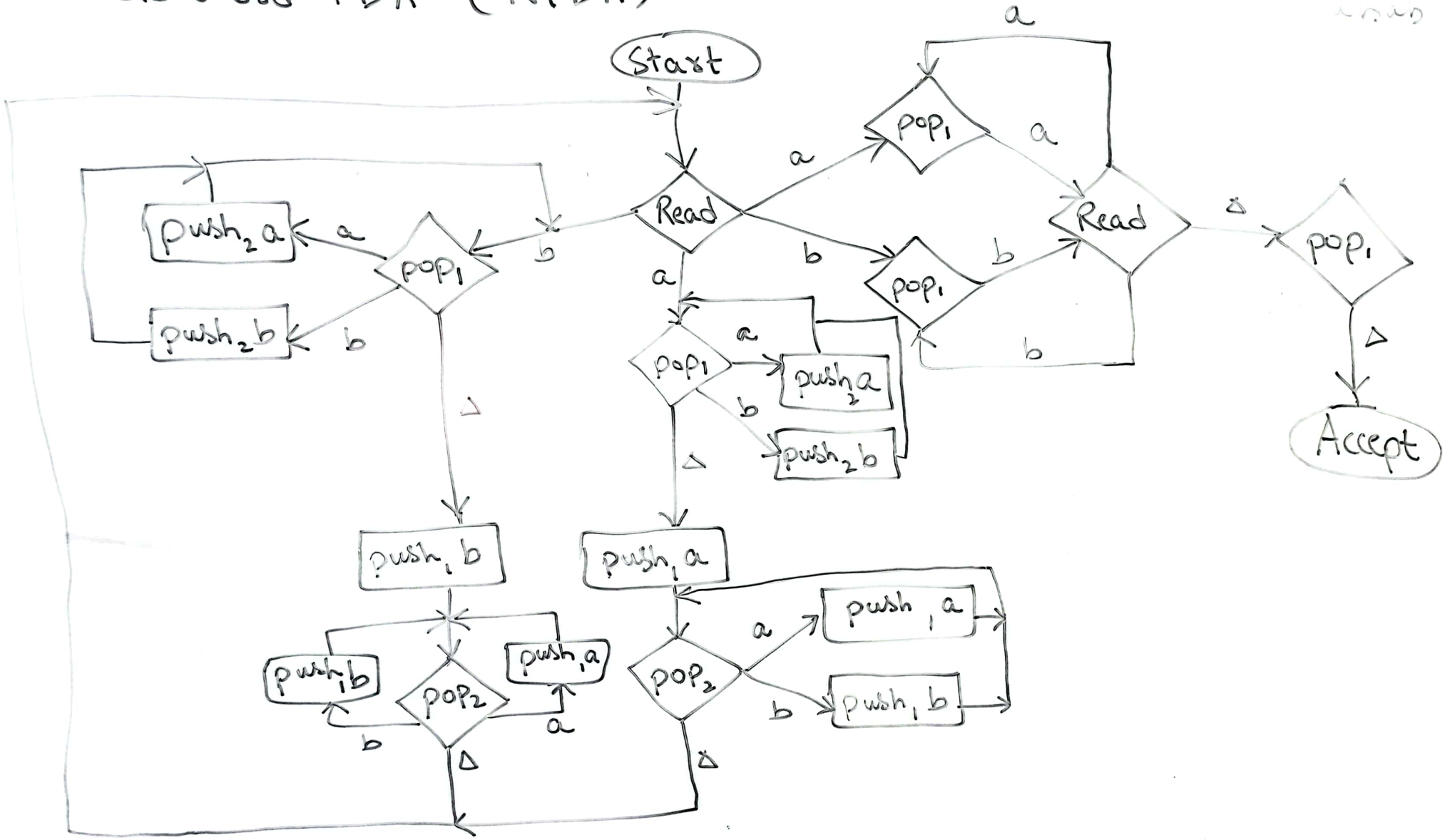
(b) End with double a's TM



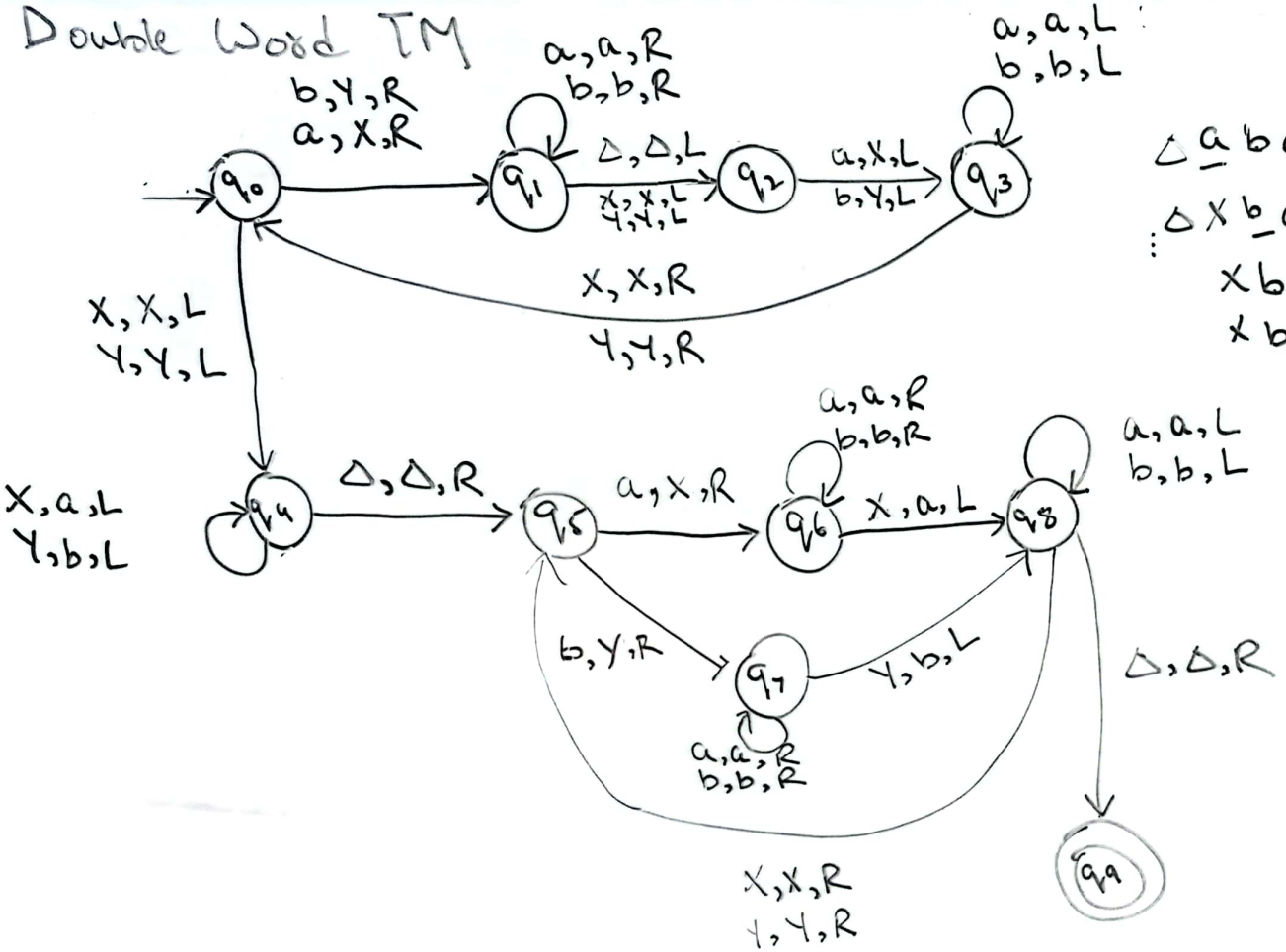
FA



Double Word PDA (NPDA)



(c) Double Word TM



ΔabaaXYXX

ΔXbaaXYXX

XbaaXYXX

XbaaaYXX

XYaaaYXX

XYaaaYXX

XYaaabXX

XYaaabXX

XYXaabXX

XYXaabXX

XYXaabaX

XYXaabaX

XYXaabaX

XYXXabaX

XYXXabaa

ΔXYXXabaaΔ

abaaabaaΔ

XbaaabaaΔ

XbaaabaXΔ

XbaaabaX

XbaaabaX

XYaaabaX

XYaaabaX

XYaaabXX

XYaaabXX

XYXaabXX

XYXaabXX

XYXaabXX

XYXaaXXX

XYXaaXXX

XYXXaYXX

XYXXaYXX

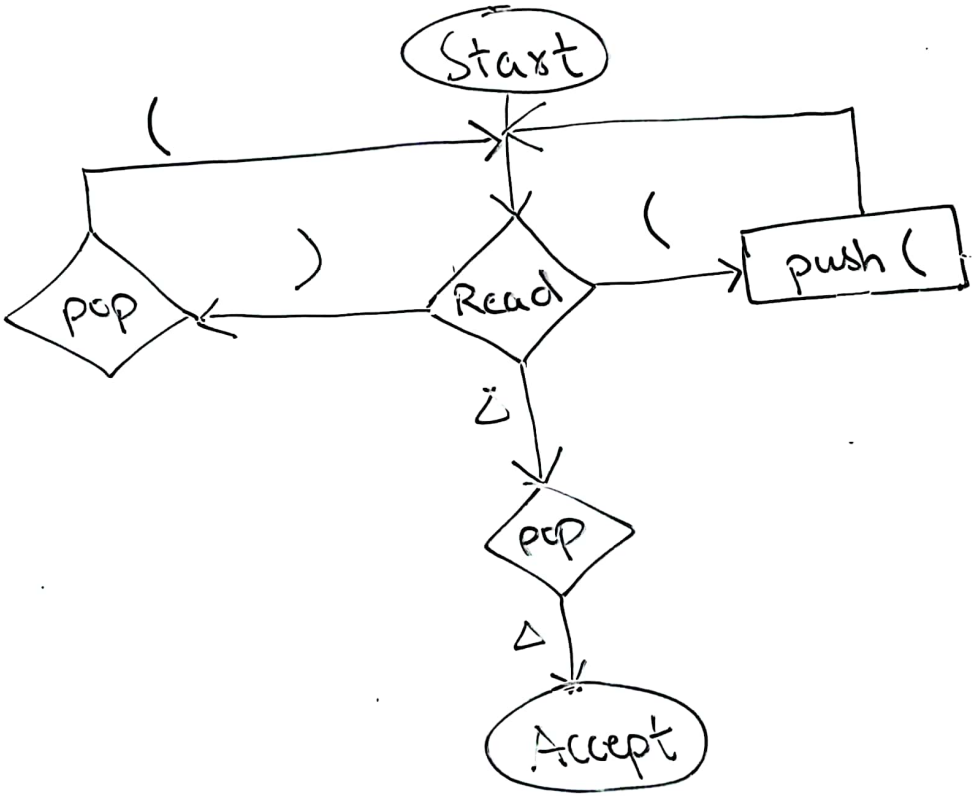
XYXXaYXX

XYXXaYXX

XYXXXYXX

XYXXXYXX

PDA Parenthesis using 1 PDA



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( )

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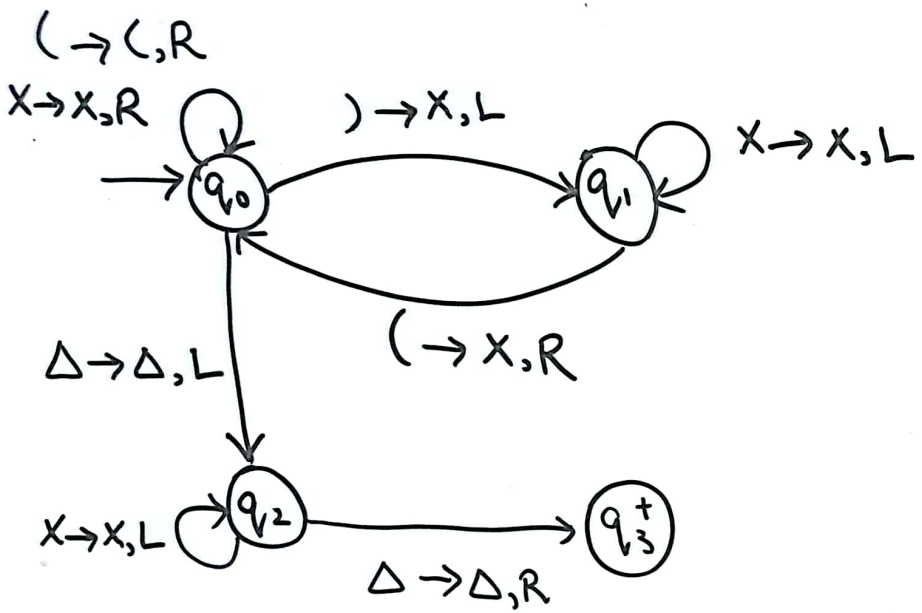
(c) Parenthesis TM



Δ (( ) ( )) ( ) Δ

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(X X (X) ( )

(X X X X) ( )

(X X X X) ( )

(X X X X X ( )

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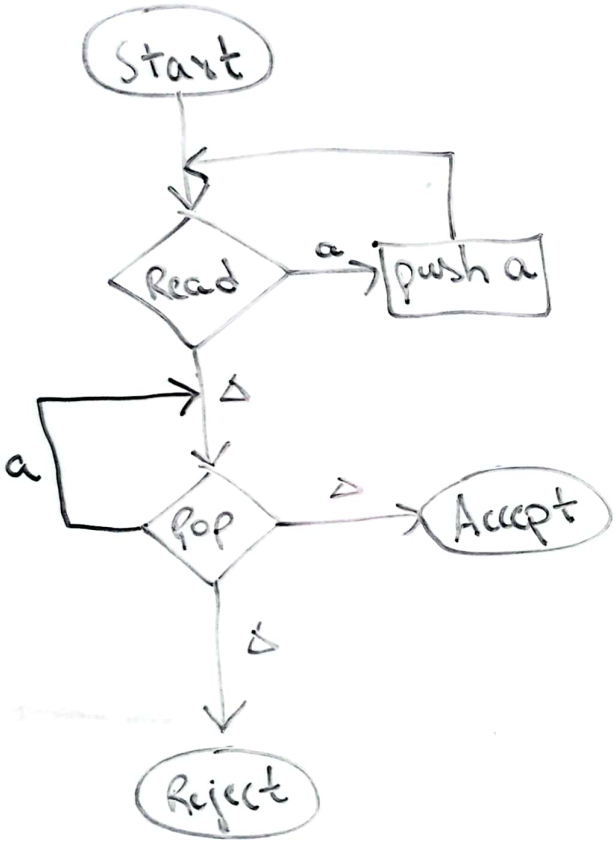
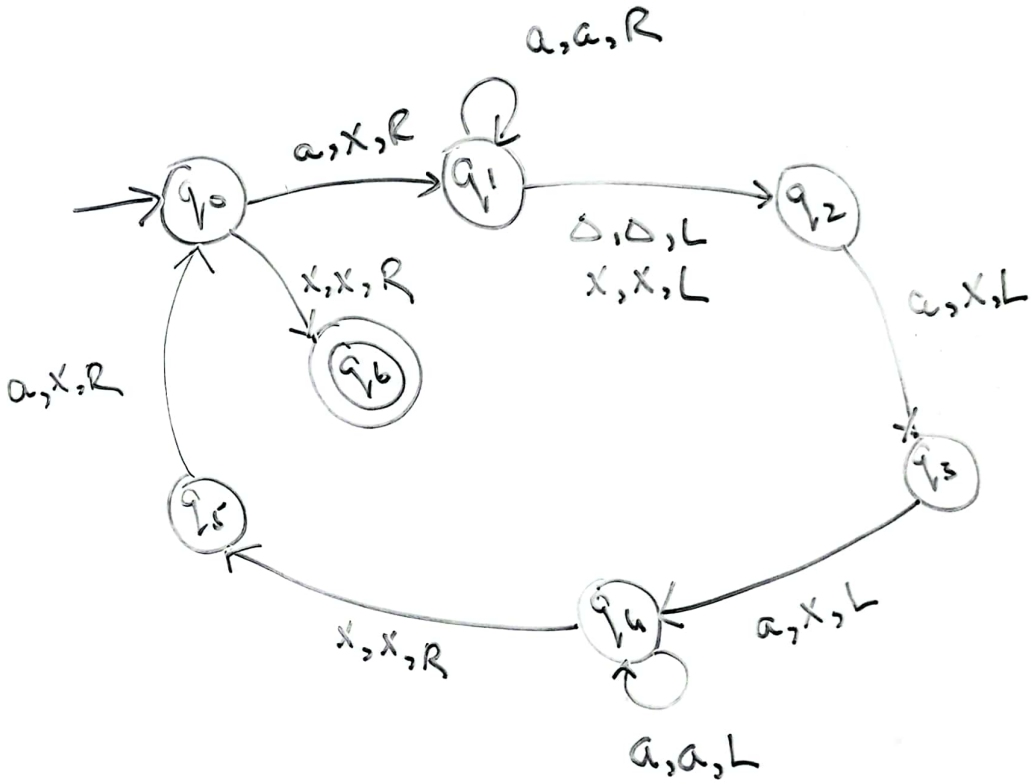
X X X X X X X Δ

Δ ✓

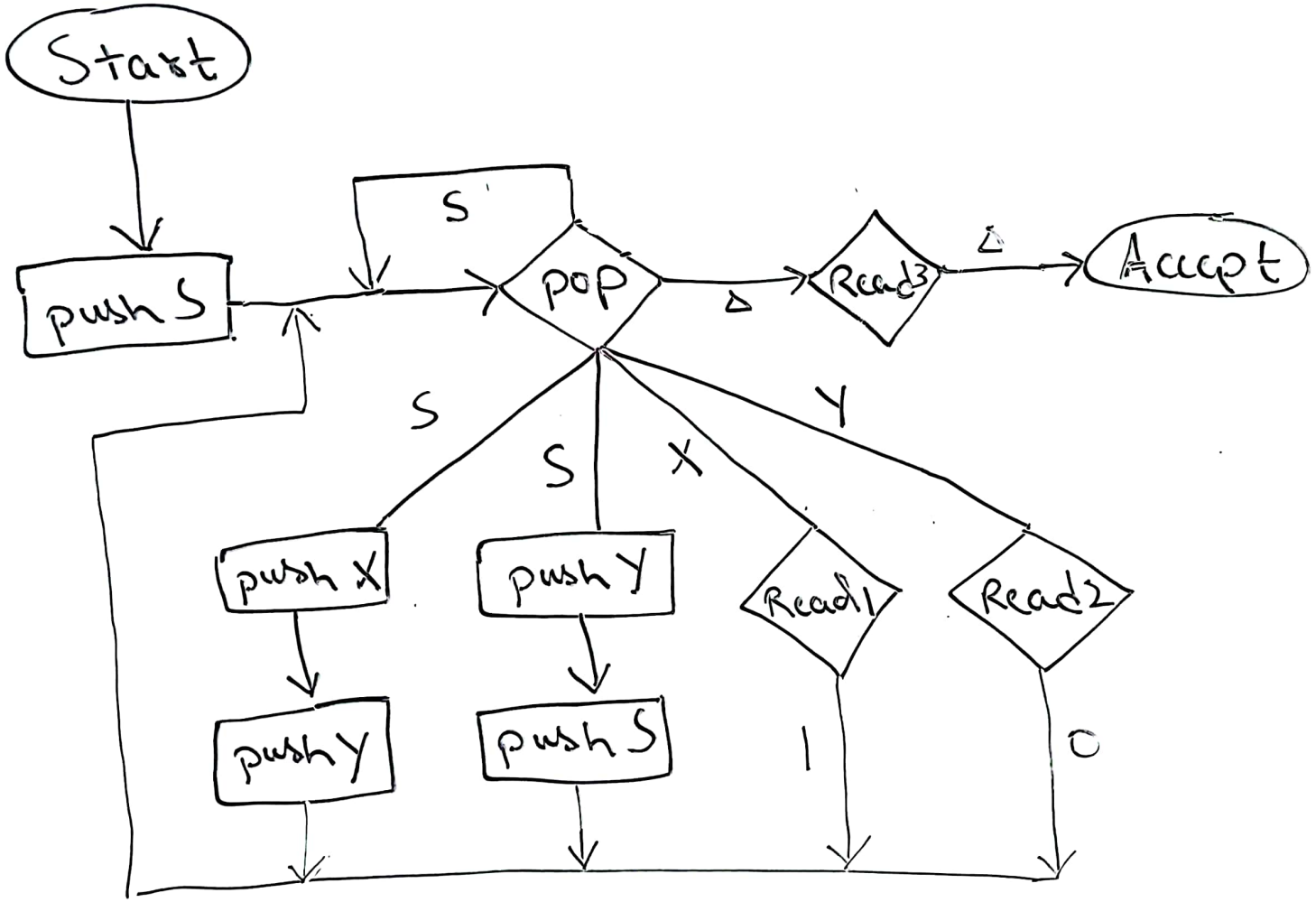
(c) a^{2^n} PDA (NPDA)



TM



Question:02 (a)



Question:02 (b)