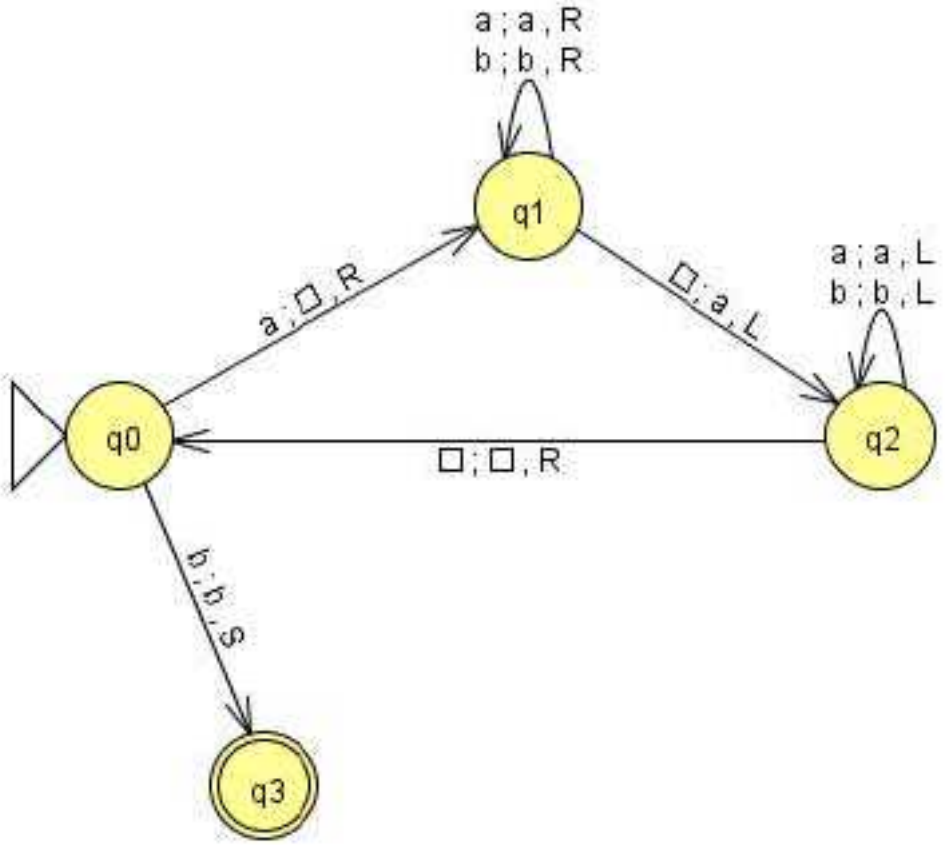
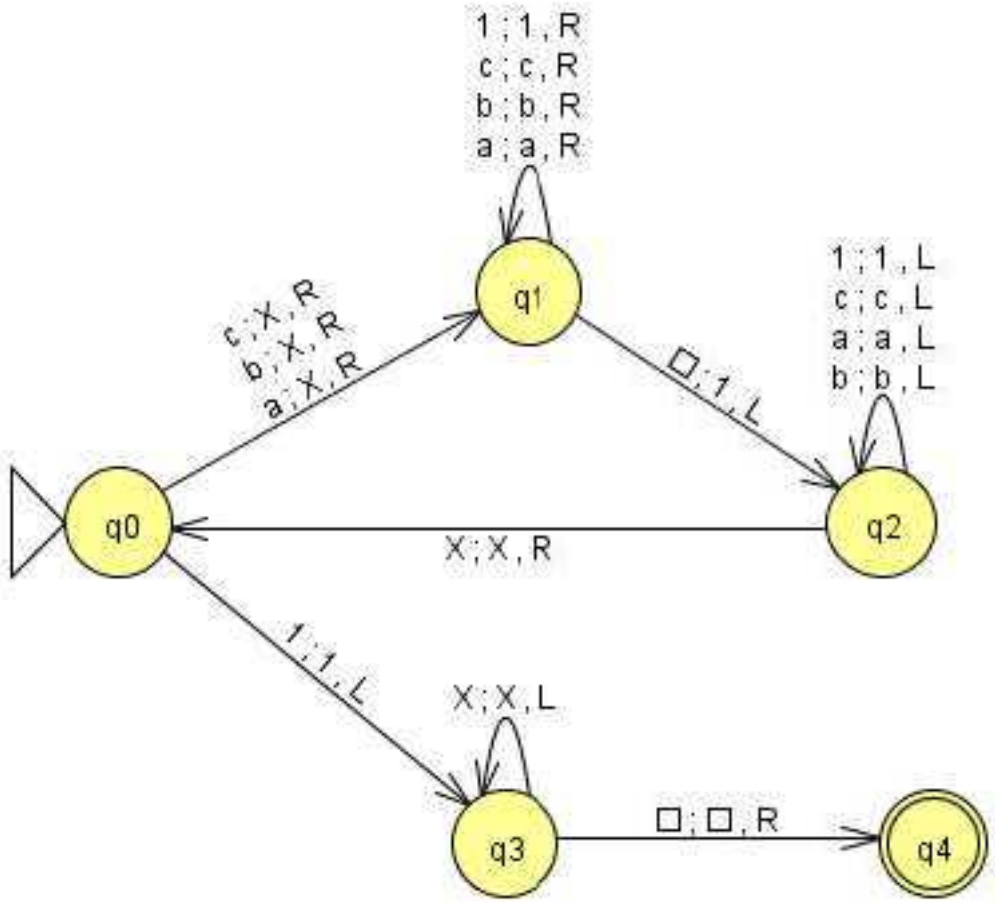
Turing Machines
Exercises

$a^n b^m \rightarrow b^m a^n$

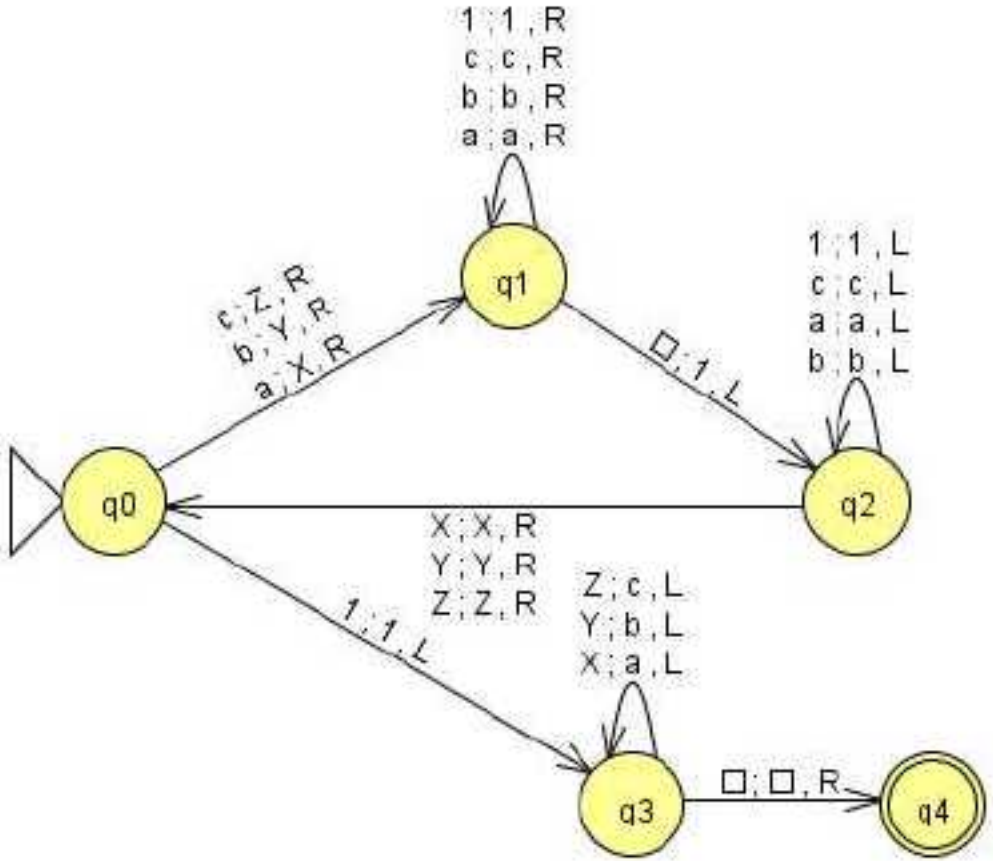


$(a+b+c)^n$ ➔ X^n1^n


1 ; 1 , R
c ; c , R
b ; b , R
a ; a , R
q1
1 ; 1 , L
c ; c , L
a ; a , L
b ; b , L
c ; X , R
b ; X , R
a ; X , R
□ ; 1 , L
q0
q2
X ; X , R
1 ; 1 , L
X ; X , L
q3
□ ; □ , R
q4

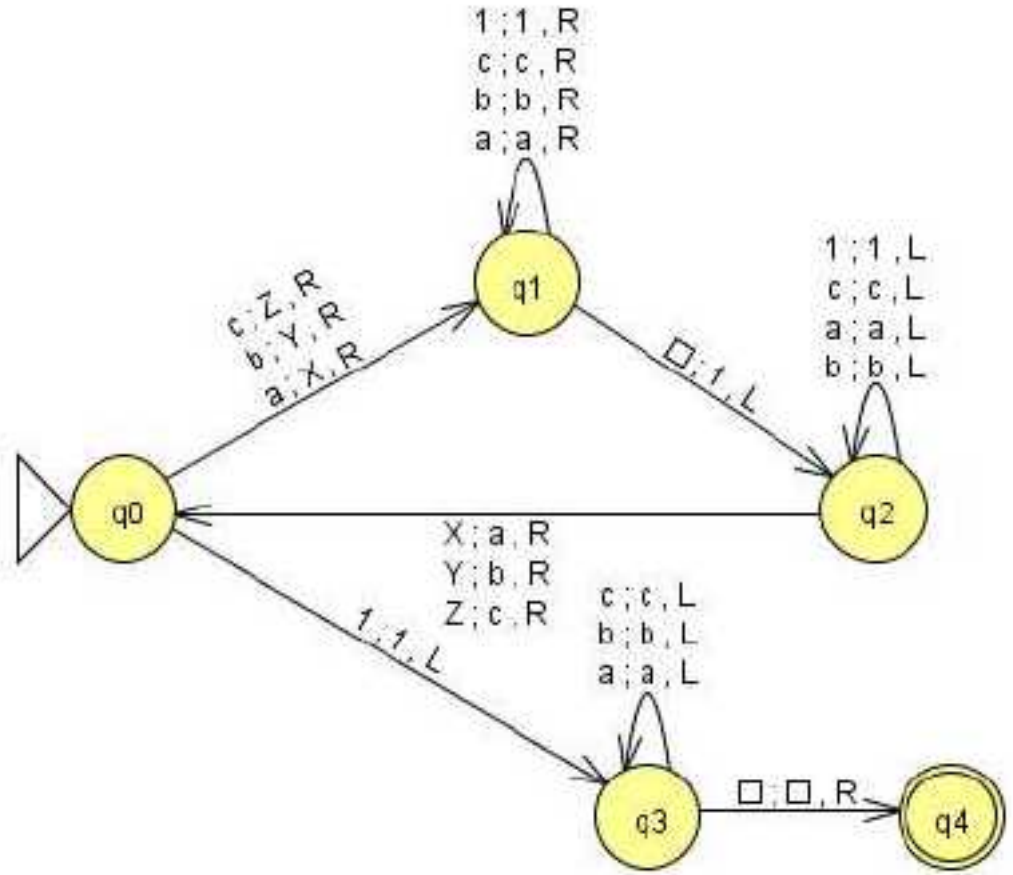
$w \in (a+b+c)^n$, $w \rightarrow w1^n$

a)

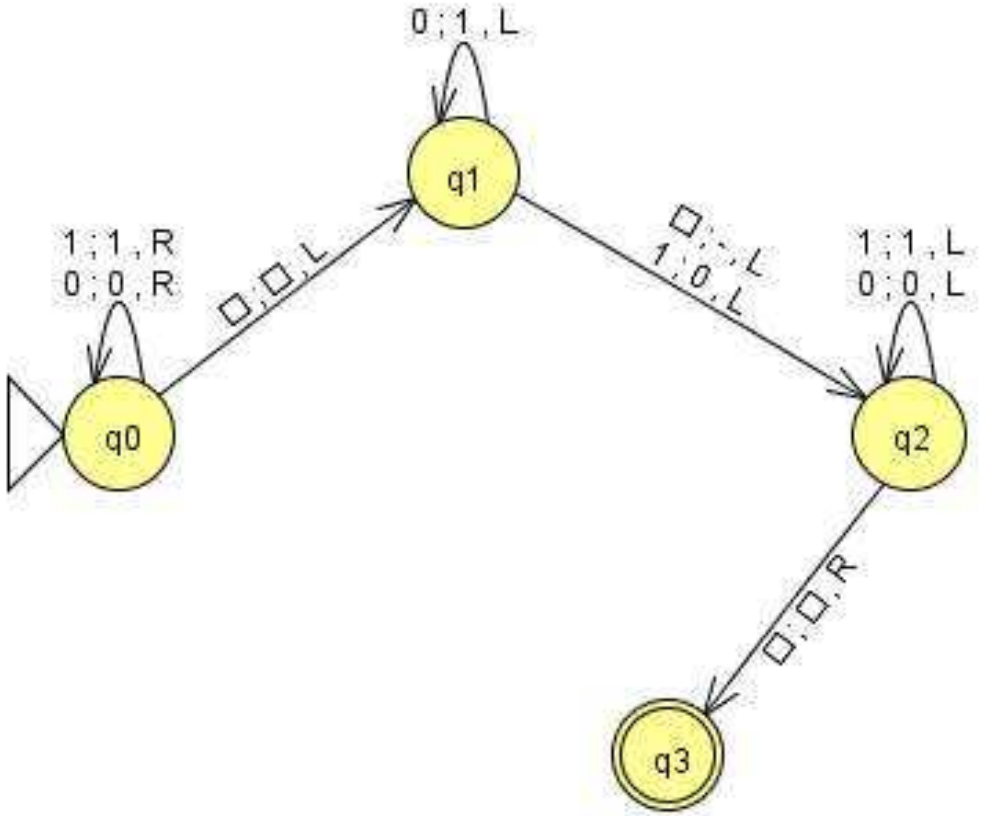


$w \in (a+b+c)^n$, $w \rightarrow w1^n$

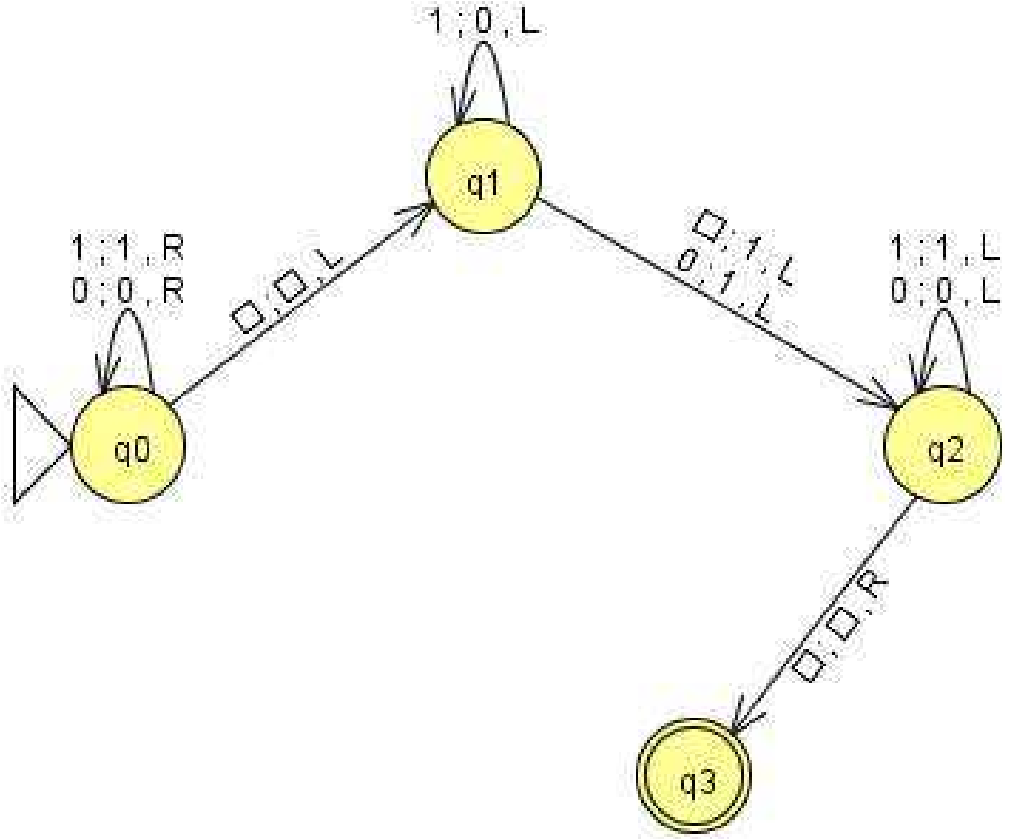
b)



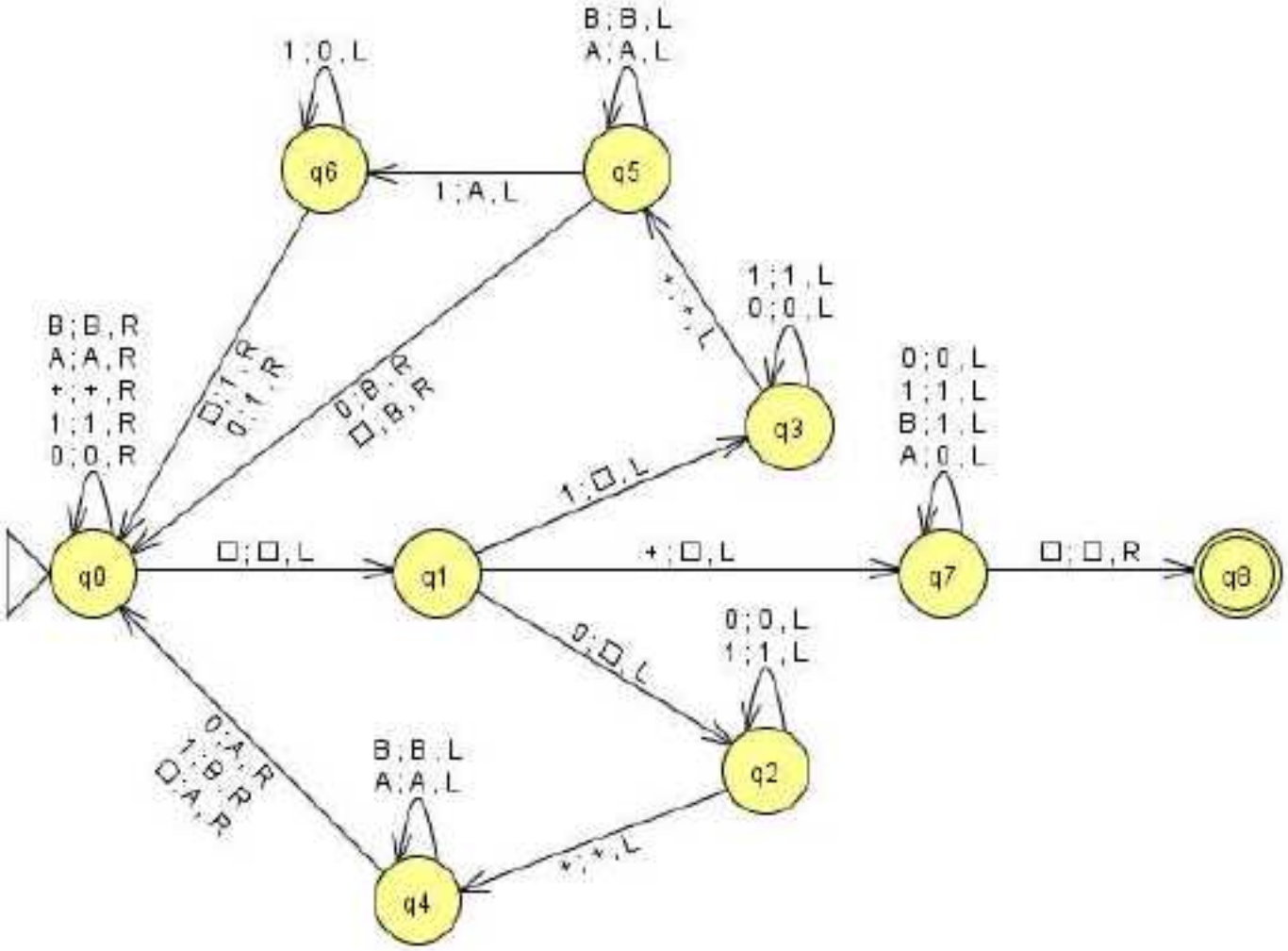
Predecessor in binary

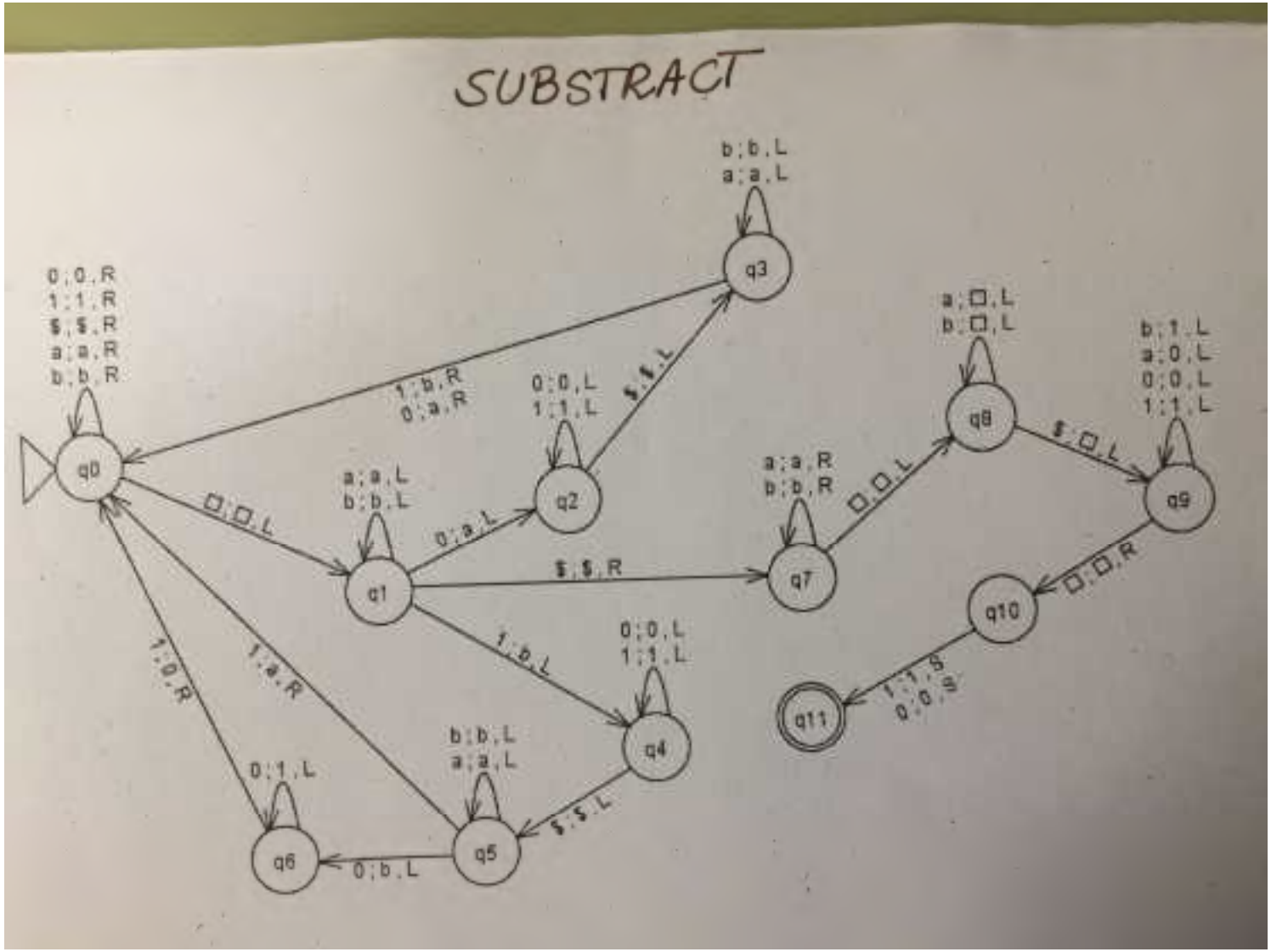


Successor in binary



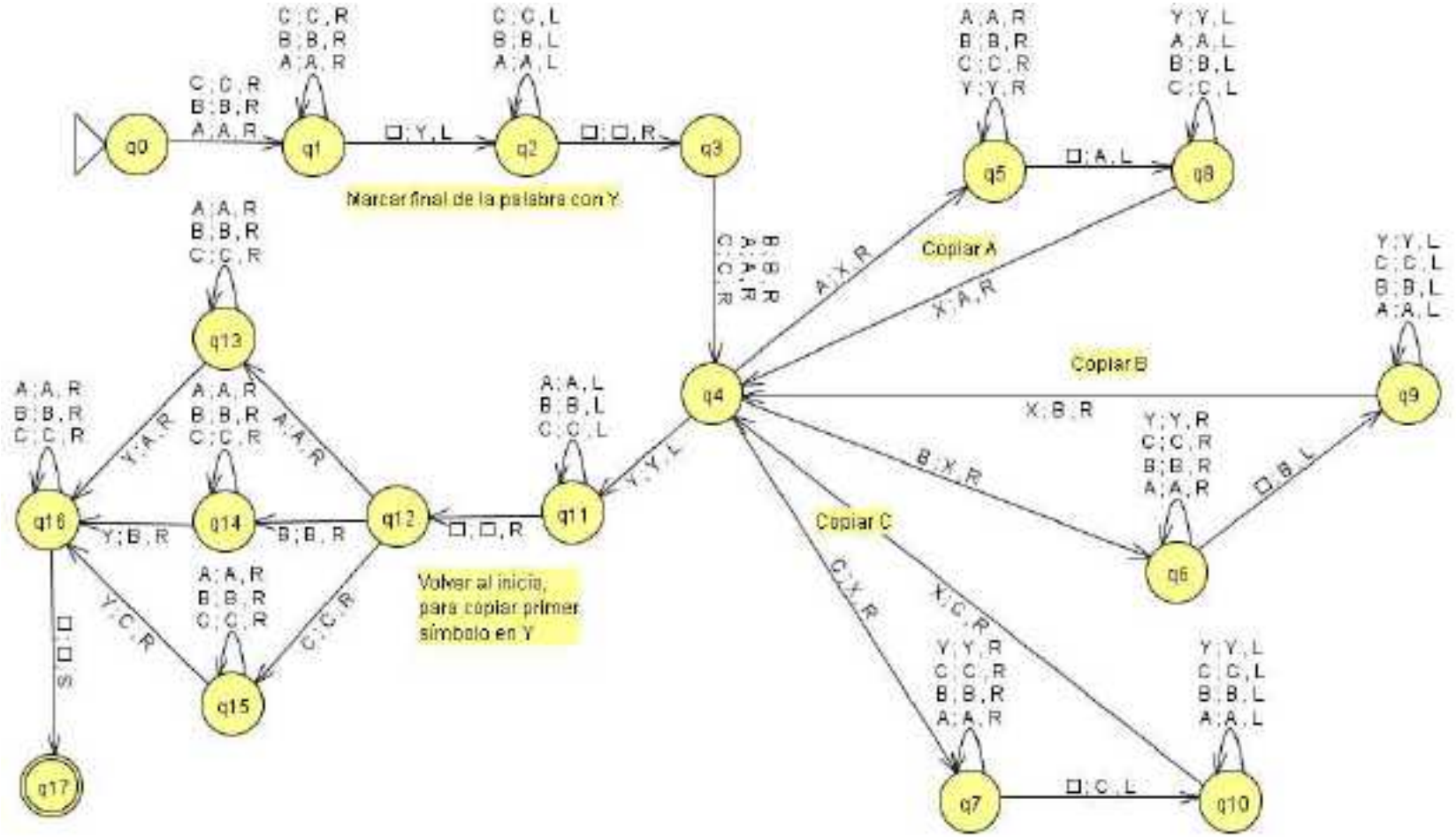
Binary adder




SUBSTRACT
q0
q1
q2
q3
q4
q5
q6
q7
q8
q9
q10
q11
0;0,R
1;1,R
$;$,R
a;a,R
b;b,R
1;b,R
0;a,R
0;0,L
1;1,L
$;$,L
b;b,L
a;a,L
□;□,L
0;a,L
$;$,R
1;b,L
1;0,R
1;a,R
0;1,L
0;b,L
a;□,L
b;□,L
b;1,L
a;0,L
0;0,L
1;1,L
$;□,L
□;□,R
1;1,S
0;0,S

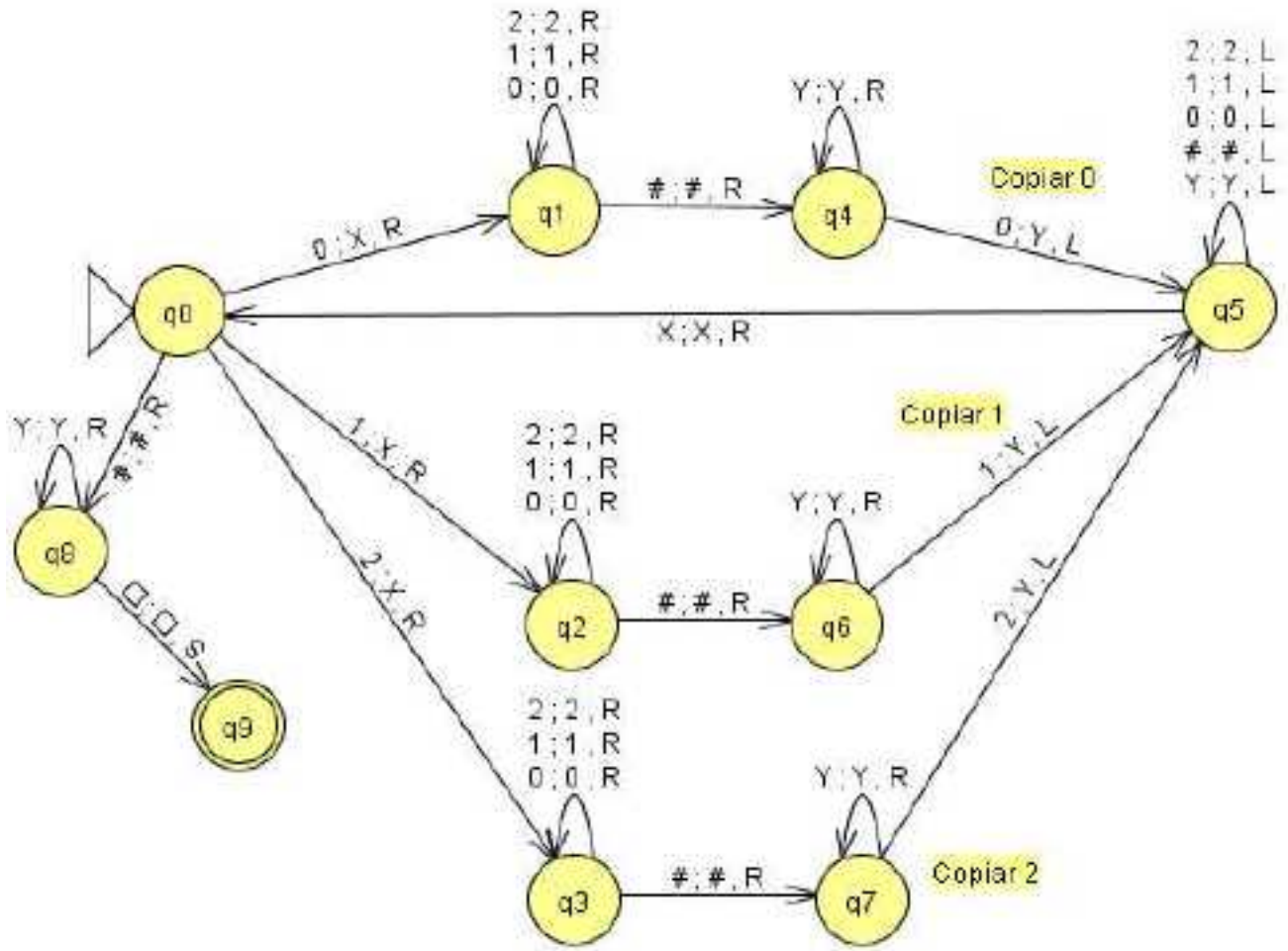
Copier

Copies a string over the alphabet {A,B,C}. No separation character between original and copy



Comparator

Input: two words over the alphabet {0,1,2}, separated by the symbol #
Output: Acceptance if the words are equal.
Example: b2101#2101b accepted



Accept palindrome

$\Sigma = \{a, b\}$