$L = \{a^n bc \mid n > 0\} \cup \{b^n cb \mid n \geq 0\} \cup \{ca^n \mid n > 0\}$

1) Write a grammar for L
2) Is L LL(1)?
3) If L is LL(1), give the table of a top-down predictive parser and parse the strings cb and caa

1) $S \to aA \mid bB \mid cC$

$A \to aA \mid bc$

$B \to bB \mid cb$

$C \to aD \mid b$

$D \to aD \mid \varepsilon$

Let us verify that this grammar is LL(1).

FIRST(S) = {a, b, c}
FIRST(A) = {a, b}
FIRST(B) = {b, c}
FIRST(C) = {a, b}
FIRST(D) = {a, ε}

FOLLOW(S) = {\$}
FOLLOW(A) = {\$}
FOLLOW(B) = {\$}
FOLLOW(C) = {\$}
FOLLOW(D) = {\$}

	a	b	c	\$
S	$S \to aA$	$S \to bB$	$S \to cC$	
A	$A \to aA$	$A \to bc$		
B		$B \to bB$	$B \to cb$	
C	$C \to aD$	$C \to b$		
D	$D \to aD$			$D \to \varepsilon$

There are not multiply defined entries, thus the grammar is LL(1). The language L is LL(1) because there exists a grammar for the language that is LL(1), this grammar.

Parsing of cb

STACK	INPUT	ACTION
$S	cb$	S → cC
$Cc	cb$	match
$C	b$	C → b
$b	b$	match
$	$	ACCEPT

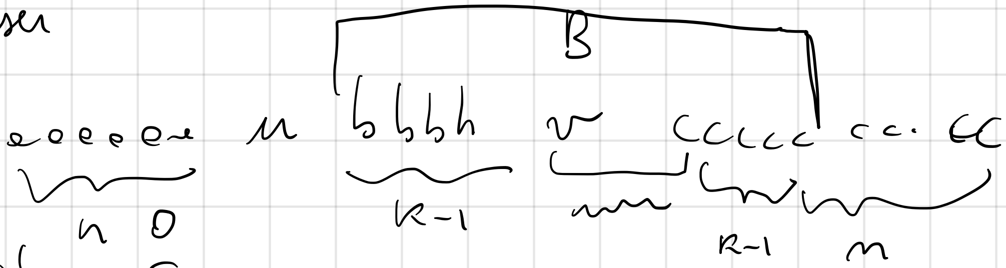
Parsing of caa

STACK	INPUT	ACTION
$S	caa$	S → cC
$Cc	caa$	match
$C	aa$	C → aD
$Da	aa$	match
$D	a$	D → aD
$Da	a$	match
$D	$	D → ε
$	$	ACCEPT

$L = \{ a^n u b^{k-1} v c^m \mid n, k, m > 0 \text{ and } m = n+k \}$

1) Give a grammar for L
2) Is L LR?
3) If L is LR, give a table for a bottom-up shift-reduce parser

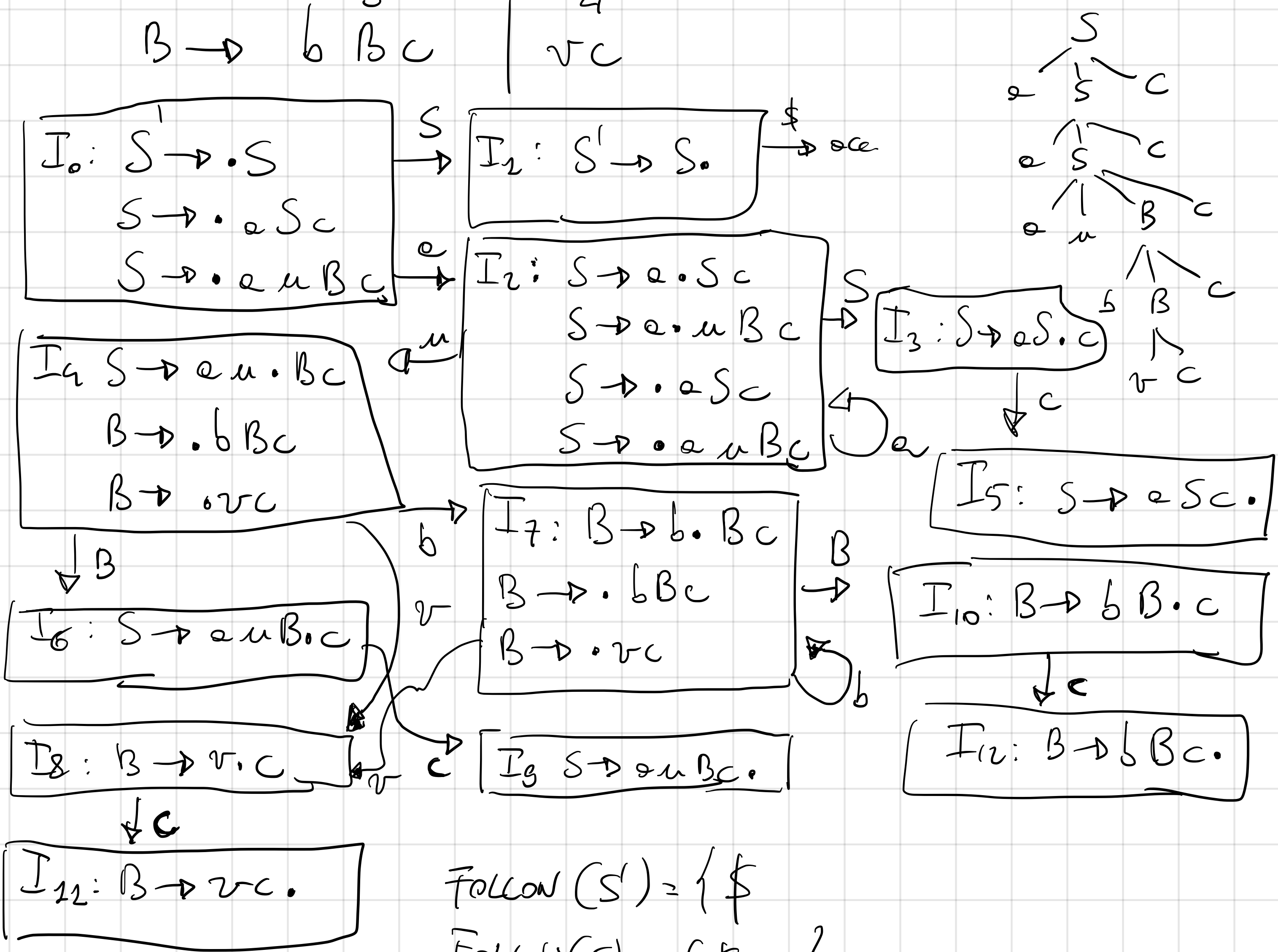
1)



$S' \to S$

$S \to a S c \overset{1}{} \mid a u B c \overset{2}{}$ aaaubvccccc

$B \to b B c \overset{3}{} \mid v c \overset{4}{}$



FOLLOW(S') = {$

FOLLOW(S) = {$, c}

FOLLOW(B) = {c}

	c	a	b	u	v	$	S	B
0		S2					1	
1						acc		
2		S2		S4			3	
3	S5							
4			S7		S8			6
5	r1					r1		
6	S9							
7			S7		S8			10
8	S11							
9	r1					r1		
10	S12							
11	r4							
12	r3							

The grammar is SLR(1)
so it is also LR(1)

The language L is LR(1)
because of the existence of
this grammar.