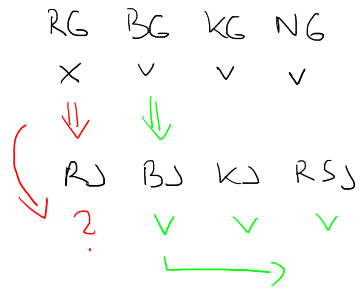


L1: a) $\rightarrow S \rightarrow \underline{0n} | \underline{0na} | \underline{0no}$



b) $\rightarrow S \rightarrow \sigma T$
 $T \rightarrow n | nU$
 $U \rightarrow a | \sigma$

RG \Rightarrow RJ
 v v

(1.1) $\rightarrow S \rightarrow 0 | 1T$
 $T \rightarrow 0T | 1T | \underline{0}$

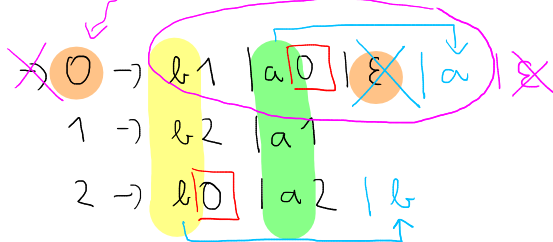
RG

(1.2) a) $\rightarrow S \rightarrow \underline{A} \underline{bA} \underline{bA} \underline{bA} S | \underline{\epsilon} \underline{A}$
 $A \rightarrow aA | \epsilon$

BG

b) $\rightarrow S \rightarrow \underline{\epsilon} | \underline{b1} | \underline{a0} | \underline{a}$

RG



(2.1) a) $\rightarrow S \rightarrow \underline{haba} T$
 $T \rightarrow aT | bT | \epsilon$

BG

b) $\rightarrow S \rightarrow \underline{bT}$
 $T \rightarrow \underline{aU}$
 $U \rightarrow \underline{bV}$
 $V \rightarrow \underline{aW} | \underline{a}$
 $W \rightarrow \underline{aW} | \underline{bW} | \underline{\epsilon} | \underline{b} | \underline{a}$

RG

2.4

$\rightarrow S \rightarrow bT \mid aS$
 $T \rightarrow aU \mid bT$
 $U \rightarrow bV \mid aU$
 $V \rightarrow aW \mid bV \mid a$
 $W \rightarrow aW \mid bW \mid a \mid b$

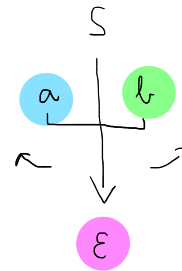
RG

3.1

$a^i b^i, i \geq 0$
 \lfloor
 $=$

$\rightarrow S \rightarrow aSb \mid \epsilon$

BG



3.4

$a^i b^j, i \geq j$
 \lfloor
 \geq

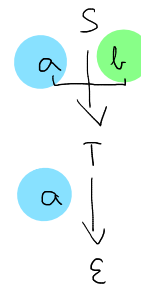
a) $\rightarrow S \rightarrow aSb \mid aS \mid \epsilon$

b) $\rightarrow S \rightarrow aSb \mid T$
 $T \rightarrow aT \mid \epsilon$

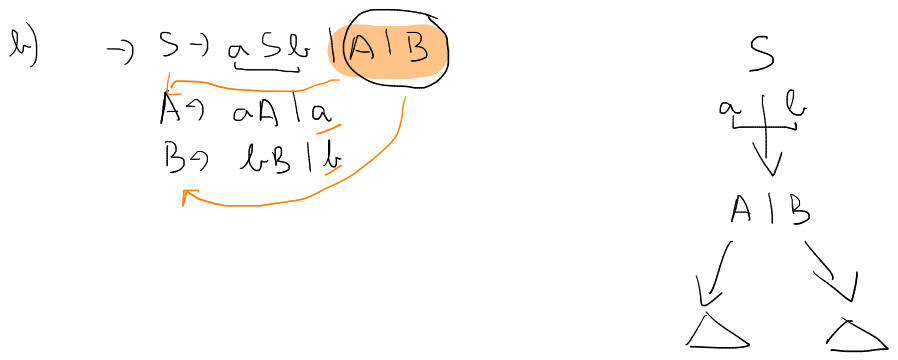
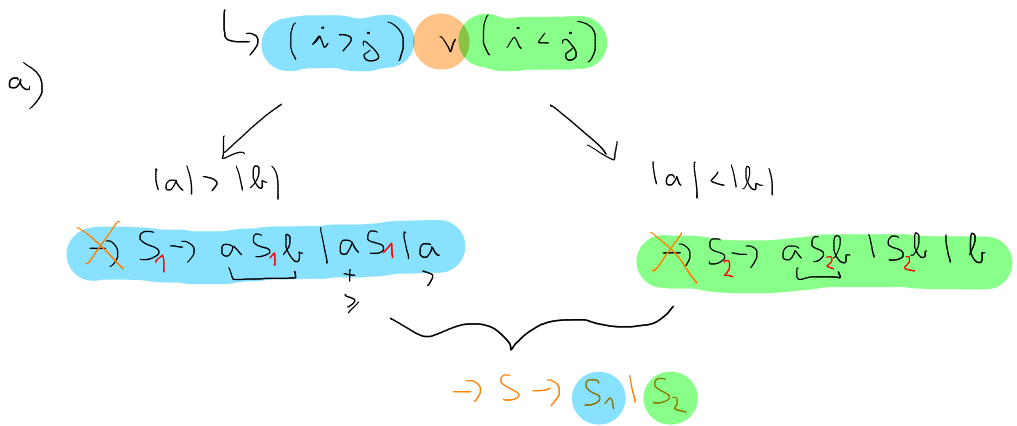
c) $\rightarrow S \rightarrow aS \mid T$
 $T \rightarrow aTb \mid \epsilon$

d) $\rightarrow S \rightarrow aSB \mid \epsilon$
 $B \rightarrow b \mid \epsilon$

e) $\rightarrow S \rightarrow ASb \mid \epsilon$
 $A \rightarrow aA \mid a$



3.5 $a^i b^j, i \neq j$



3.7 $a^i b^j$: $1 \leq j \leq i \leq 2j$

$\rightarrow S \rightarrow a S b \mid a a S b \mid a b \mid a a b$

4.4 $a^i b^j c^k, i \geq j, k = i - j$

$\hookrightarrow i = j + x, x \in \mathbb{N}_0$

$\hookrightarrow a^i b^j c^{i-j} = a^{j+x} b^j c^{(j+x)-j} = a^{j+x} b^j c^x = a^x \cdot a^j \cdot b^j \cdot c^x$

$\rightarrow S \rightarrow a S c \mid T$

$T \rightarrow a T b \mid \epsilon$

4.5 $m \in \mathbb{N} \vee n \in \mathbb{N}$: $|m|_a < |n|_b$

$\rightarrow S \rightarrow a S b \mid S b \mid c b \mid b S \mid S a$

5.1 $a^i b^i c^i$

I. ~~$S \rightarrow aSBC$~~ | ~~ϵ~~ | aBC
 $\rightarrow S' \rightarrow \epsilon | S$

II. ~~$CB \rightarrow BC$~~
 $CB \rightarrow CX$
 $CX \rightarrow BX$
 $BX \rightarrow BC$

III. ~~$B \rightarrow b$~~
 ~~$C \rightarrow c$~~
 $aB \rightarrow ab$
 $bB \rightarrow bb$
 $bC \rightarrow bc$
 $cC \rightarrow cc$
 ~~$cB \rightarrow ?$~~

$aaaBCBCBC$ } I.
 \downarrow
 $aaaBBCCBC$ } II.
 \downarrow
 $aaaBBBCCC$
 \downarrow
 $aaaBBBCCC$ } III.
 \downarrow
 $aaaBBCCBC$
 \downarrow
 ~~$aaaBBcBc$~~ \leftarrow
 \downarrow
 $aaaBBCCBC$
 $aaa bBCCBC$
 $aaa bbCCBC$
 $aaa bb cCBC$
 $aaa bbcc BC \Rightarrow ?$