

Sem 7 - LFTC

$$1) L = \{a^{2^n} \mid n \geq 0\}$$

Gramatica regulari (de tip 3)

$$S \rightarrow \epsilon$$

$$S \rightarrow aA$$

$$A \rightarrow a$$

$$A \rightarrow aB$$

$$B \rightarrow aA$$

Gram independente de context (de tip 2)

$$S \rightarrow \epsilon$$

$$S \rightarrow A$$

$$A \rightarrow aa$$

$$A \rightarrow aaA$$

$$\left| \begin{array}{l} S \rightarrow \epsilon \\ S \rightarrow aaS \end{array} \right.$$

Gram independente de context (de tip 1)

$$S \rightarrow \epsilon$$

$$S \rightarrow aa$$

$$S \rightarrow aAa$$

$$A \rightarrow aa$$

$$aAa \rightarrow aaAaa$$

$$\left| \begin{array}{l} S \rightarrow \epsilon \\ S \rightarrow aAa \\ S \rightarrow aa \\ aAa \rightarrow aaAaa \\ A \rightarrow aa \end{array} \right.$$

$$2) \Rightarrow L = \{ww \mid w \in \{a, b\}^*\}$$

\Rightarrow os începe cu un ex. mai simplu $L' = \{www' \mid w, w' \in \{a, b\}^*\}$, unde w' e oglinditul lui $w\}$

abbaaaaaaaabba $\in L'$

g.i.c pt L'

$$S \rightarrow aSa$$

$$S \rightarrow bSb$$

$$S \rightarrow \epsilon$$

$$L = \{ww \mid w \in \{a, b\}^*\}$$

⇒ oricără în vedere că există o relație între prima parte și a doua parte a cuvântului ⇒ ceea ce nu facem o gramatică de tip I, II sau III

$$S \rightarrow aSA \mid bSB \mid M$$

$$MA \rightarrow \underline{aA} \mid \underline{bB} \mid M_a$$

$$MB \rightarrow M_b$$

$$aA \rightarrow Aa$$

$$aB \rightarrow Ba$$

$$bA \rightarrow Ab$$

$$bB \rightarrow Bb$$

$$M \rightarrow \varepsilon$$

$$2) L = \{wxw \mid w \in \{a, b\}^*, x \in \{a, b\}^*\}$$

↳ cuvânt menit

$$S \rightarrow aSA \mid bSB \mid aMA \mid bMB$$

$$MA \rightarrow Ma$$

$$MB \rightarrow Mb$$

$$aA \rightarrow Aa$$

$$aB \rightarrow Ba$$

$$bA \rightarrow Ab$$

$$bB \rightarrow Bb$$

$$M \rightarrow aM$$

$$M \rightarrow bM$$

$$M \rightarrow \varepsilon \Rightarrow \text{gram de tip 0}$$

gic (de tip 2)

$$S \rightarrow aRa \mid bRb$$

$$R \rightarrow \varepsilon \mid aA \mid bB$$

3) $L = \{a^m b^m c^m \mid m \in \mathbb{N}^*\}$

$S \rightarrow aABC$

$A \rightarrow aABC$

$A \rightarrow E$

$aB \rightarrow ab$

$bC \rightarrow bc$

$cB \rightarrow BC$

$bB \rightarrow bb$

$cc \rightarrow cc$ de tip 0

$S \rightarrow aSBC \quad abc$

$cB \rightarrow BC$

$aB \rightarrow ab$

$bB \rightarrow bb$

de tip 1

4) $L = \{a^m b^m c^m d^n \mid m, n \in \mathbb{N}^*\}$

$S \rightarrow aABCD$

$A \rightarrow aABCD$

$A \rightarrow E$

$DB \rightarrow BD$

$CB \rightarrow BC$

$DC \rightarrow CD$

$aB \rightarrow ab$

$bB \rightarrow bb$

$bC \rightarrow bc$

$cC \rightarrow cc$

$cD \rightarrow cd$

$dd \rightarrow dd \rightarrow$ de tip 0

5) $L = \{a^{2^n} \mid n \in \mathbb{N}\}$

$S \rightarrow ABA$

$B \rightarrow a$

$A \rightarrow E$

$AB \rightarrow AC$

$CB \rightarrow BBC$

$CA \rightarrow BBA$

$S \Rightarrow ABA \Rightarrow ACA \Rightarrow ABBA \Rightarrow ACBA \Rightarrow ABBCA$
 $\Rightarrow ABBBBBA \Rightarrow ACBBCBA \Rightarrow ABBCBBCBA \Rightarrow ABBBBBBCBA$
 $\Rightarrow ABBBBBBBCA \Rightarrow ABBBBBBBBBA \Rightarrow BBBB BBBB$
 $\Rightarrow aaaaaaaaaa$ (omglicat de 8 ori Regula 3)

6) $L = \{ w \mid w \in \{a, b, c\}^*, m_a(w) = m_b(w) = m_c(w) \}$

$S \rightarrow ASBC \mid \epsilon$

$AB \rightarrow BA$

$BA \rightarrow AB$

$AC \rightarrow CA$

$CA \rightarrow AC$

$CB \rightarrow BC$

$BC \rightarrow CB$

$A \rightarrow a$

$B \rightarrow b$

$C \rightarrow c$

7) $L = \{ a^m b^m c^m d^m \mid m, m \in \mathbb{N} \}$

$S \rightarrow NM$

$N \rightarrow aNb$

$N \rightarrow \epsilon$

$M \rightarrow cMd$

$M \rightarrow \epsilon \Rightarrow \text{g.i.c. (tip 2)}$

8) $L = \{ a^m b^m c^m d^m \mid m, m \in \mathbb{N} \}$

$S \rightarrow aSd$

$S \rightarrow M$

$M \rightarrow bMc$

$M \rightarrow \epsilon \Rightarrow \text{g.i.c. (tip 2)}$

9) $L = \{ a^m b^m c^k \mid m, m, k \in \mathbb{N}, (m=m) \text{ and } (m=k) \}$

$S \rightarrow AMINC$

$S \rightarrow \epsilon$

$A \rightarrow AA \mid a$

$C \rightarrow CC \mid c$

$M \rightarrow bMc \mid \epsilon$

$N \rightarrow aNb \mid \epsilon$

10) $L = \{a^m b^m c^k \mid m, m, k \in \mathbb{N}, m+m=k\}$

$S \rightarrow aSc$

$S \rightarrow bVc$

$V \rightarrow bVc$

$S \rightarrow E$

$V \rightarrow E$ gic (tip 2)

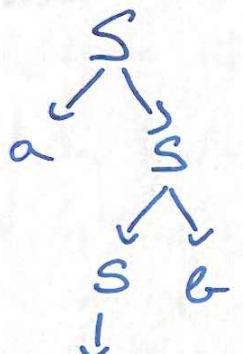
11) $L = \{w \in \{a, b\}^* \mid w \text{ incepe cu } a \text{ si se termina cu acelasi simbol}\}$

$S \rightarrow aSa \mid bXb \mid a \mid b$

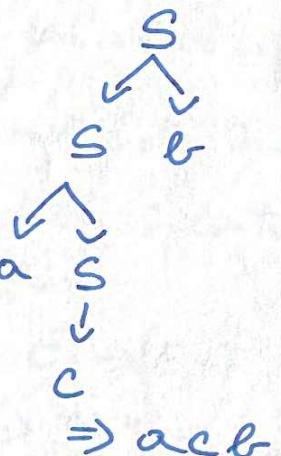
$X \rightarrow aX \mid bX \mid \epsilon$ \Rightarrow gic (tip 2)

II Gram omobiguo \Rightarrow 2 gramatici pt care exist mai multi arbore de derivare pt. aceeași propoziție

a) $S \rightarrow aS \mid Sb \mid c$



$\Rightarrow acb$



$\Rightarrow acb$

$S \Rightarrow aS \Rightarrow aSb \Rightarrow acb \text{ (1)}$

$S \Rightarrow Sb \Rightarrow aSb \Rightarrow acb \text{ (2)}$

Dim (1) \neq (2) \Rightarrow gram omobiguo

$L = \{a^m c b^m \mid m, m \in \mathbb{N}\}$

Gram neomobiguo.

$S \rightarrow ACB$

$A \rightarrow aA \mid \epsilon$

$B \rightarrow Bb \mid \epsilon$

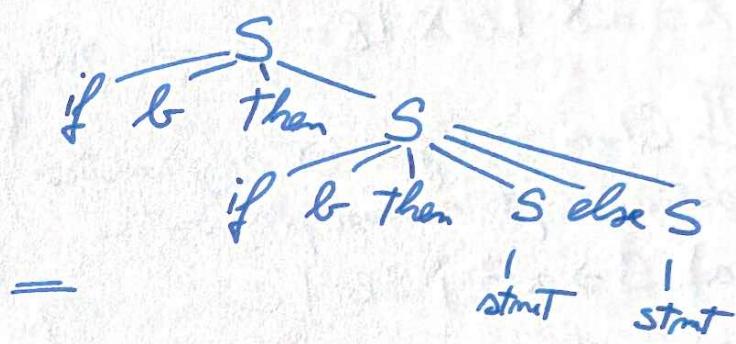
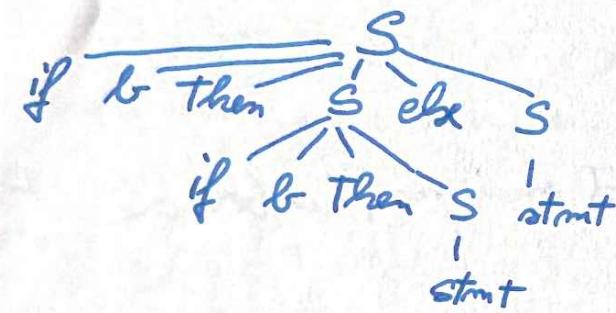
b) $S \rightarrow \text{if } b \text{ then } S \text{ else } S \mid \text{if } b \text{ then } S \mid \text{stmt}$

I $S \xrightarrow{1} \text{if } b \text{ then } S \text{ else } S \xrightarrow{2} \text{if } b \text{ then if } b \text{ then } S \text{ else } S \xrightarrow{3} \text{if } b \text{ then if } b \text{ then stmt else } S \xrightarrow{3} \text{if } b \text{ then if } b \text{ then stmt else stmt}$

II $S \xrightarrow{2} \text{if } b \text{ then } S \xrightarrow{1} \text{if } b \text{ then if } b \text{ then } S \text{ else } S \xrightarrow{3} \text{if } b \text{ then if } b \text{ then if } b \text{ then stmt else stmt}$

Avere due derivazioni molto diverse, cioè grammatica è ambigua

ma, in effetti:



\Rightarrow gram ambiguo

Gram nonambiguo

$S \rightarrow \text{if } b \text{ then } S' \text{ else } S$

$S \rightarrow \text{if } b \text{ then } S$

$S \rightarrow \text{stmt}$

$S' \rightarrow \text{if } b \text{ then } S' \text{ else } S'$

$S' \rightarrow \text{stmt}$

c) $S \rightarrow (S \mid S) \mid (S) \mid 1$

$S \xrightarrow{1} (S \xrightarrow{2} (S) \xrightarrow{3} ((S)) \xrightarrow{4} ((1))$

$S \xrightarrow{2} S \xrightarrow{3} (S) \xrightarrow{3} ((S)) \xrightarrow{4} ((1))$

$\left. \begin{array}{l} (I) \\ (II) \end{array} \right\} \Rightarrow \text{gram ambiguo}$

Gram nonambiguo equivalente

$S \rightarrow (S$

$S \rightarrow S')$

$S \rightarrow 1$

$S' \rightarrow 1$

$S' \rightarrow S')$

3) Fie gramatica:

$$G = (\{E, T, F\}, \{a, +, *, (,)\}, P, E)$$

$$P: E \rightarrow E + T$$

$$E \rightarrow T$$

$$T \rightarrow T * F$$

$$T \rightarrow F$$

$$F \rightarrow (E)$$

$$F \rightarrow a$$

a) Lista Linișto (Vectoriale)

\Rightarrow vom folosi o listă pt. a stoca fiecare producție a gram.

Fiecare elem din lista va reprezenta o regulă de producție

ex:

$["E \rightarrow E + T", "E \rightarrow T", "T \rightarrow T * F", "T \rightarrow F", "F \rightarrow (E)", "F \rightarrow a"]$
 \Rightarrow fiecare elem e un pas de caracter care descrie o regulă de producție.

b) cu ajutorul unei liste înlățuitoare gramificate

1) întărește lista dublu înlățuitor, fiecare nod os puncte reprezintă un simbol din gram

ex. pt. regulă $E \rightarrow E + T$

Nod-E : $E \leftrightarrow "+" \leftrightarrow \text{Nod T}$

Structura finală

$E \leftrightarrow "+" \leftrightarrow T$

$T \leftrightarrow "*" \leftrightarrow F$

$F \leftrightarrow "(" \leftrightarrow E \leftrightarrow ")"$

$F \leftrightarrow a$