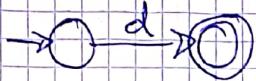


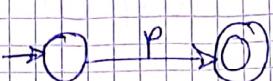
Ejemplo Thompson

dd^*pd^*

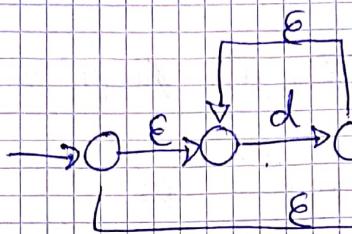
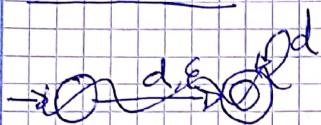
d



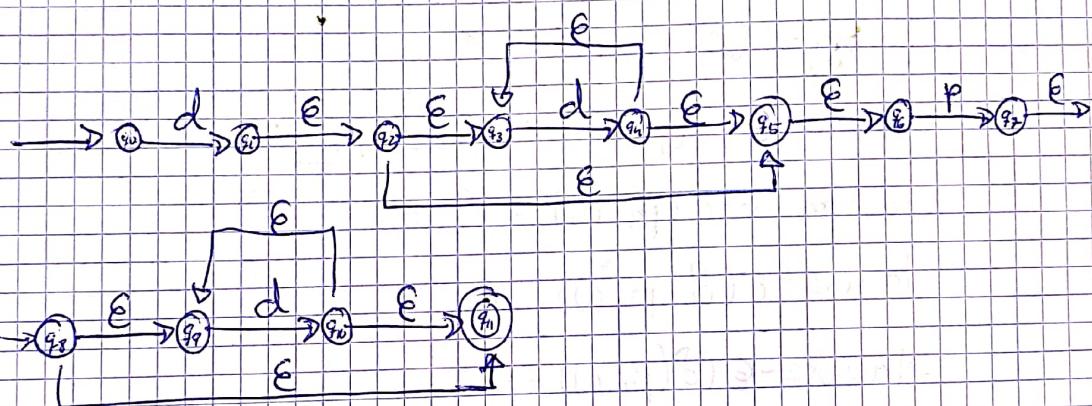
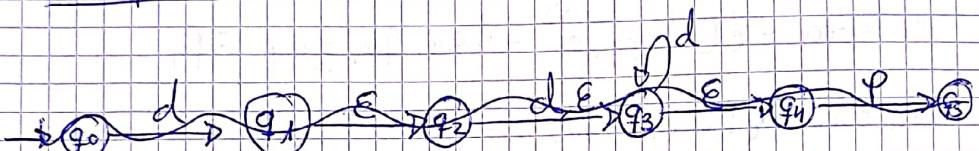
p



d^*

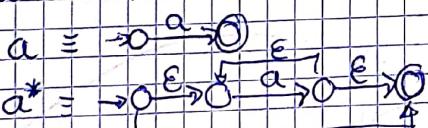


dd^*pd^*



Ejemplo 2

$a^*(b+c)a^*$



$b \equiv$

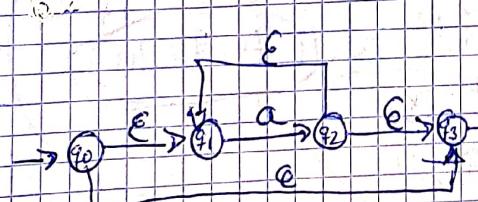
$\rightarrow 0 \xrightarrow{b} \textcircled{0}$

$c \equiv$

$\rightarrow 0 \xrightarrow{c} \textcircled{0}$

$b+c \equiv$

$\rightarrow 0 \xrightarrow{\epsilon} \textcircled{0} \xrightarrow{b} \textcircled{0} \xrightarrow{\epsilon} \textcircled{0}$



$b \equiv$

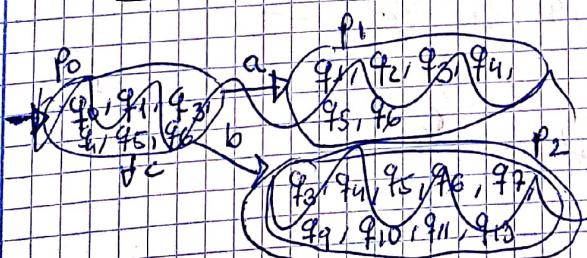
$\rightarrow 0 \xrightarrow{b} \textcircled{0}$

$c \equiv$

$\rightarrow 0 \xrightarrow{c} \textcircled{0}$

$b+c \equiv$

$\rightarrow 0 \xrightarrow{\epsilon} \textcircled{0} \xrightarrow{b} \textcircled{0} \xrightarrow{\epsilon} \textcircled{0}$



$b \equiv$

$\rightarrow 0 \xrightarrow{b} \textcircled{0}$

$c \equiv$

$\rightarrow 0 \xrightarrow{c} \textcircled{0}$

$b+c \equiv$

$\rightarrow 0 \xrightarrow{\epsilon} \textcircled{0} \xrightarrow{b} \textcircled{0} \xrightarrow{\epsilon} \textcircled{0}$

$$p_0 = \text{clausura} - \epsilon(\delta(q_0, \phi)) = \{q_0, q_1, q_3, q_4, q_5, q_6\}$$

$$p_1 = \text{clausura} - \epsilon(\delta(p_0, a)) = \{q_1, q_2, q_3, q_4, q_5, q_6\}$$

$$p_2 = \text{clausura} - \epsilon(\delta(p_0, b)) = \{q_5, q_7, q_9, q_{10}, q_{11}, \underline{q_{13}}\}$$

$$p_3 = \text{clausura} - \epsilon(\delta(p_0, c)) = \{q_6, q_8, q_9, q_{10}, q_{11}, \underline{q_{13}}\}$$

$$p_4 = \text{clausura} - \epsilon(\delta(p_1, a)) = \emptyset p_1$$

$$\text{clausura} - \epsilon(\delta(p_1, b)) = p_2$$

$$\text{clausura} - \epsilon(\delta(p_1, c)) = p_3$$

$$\text{clausura} - \epsilon(\delta(p_2, a)) = \{q_{11}, q_{12}, \underline{q_{13}}\} = p_4$$

$$\text{clausura} - \epsilon(\delta(p_2, b)) = \emptyset p_2$$

$$\text{clausura} - \epsilon(\delta(p_2, c)) = \emptyset$$

$$\text{clausura} - \epsilon(\delta(p_3, a)) = \{q_{11}, q_{12}, \underline{q_{13}}\} = p_4$$

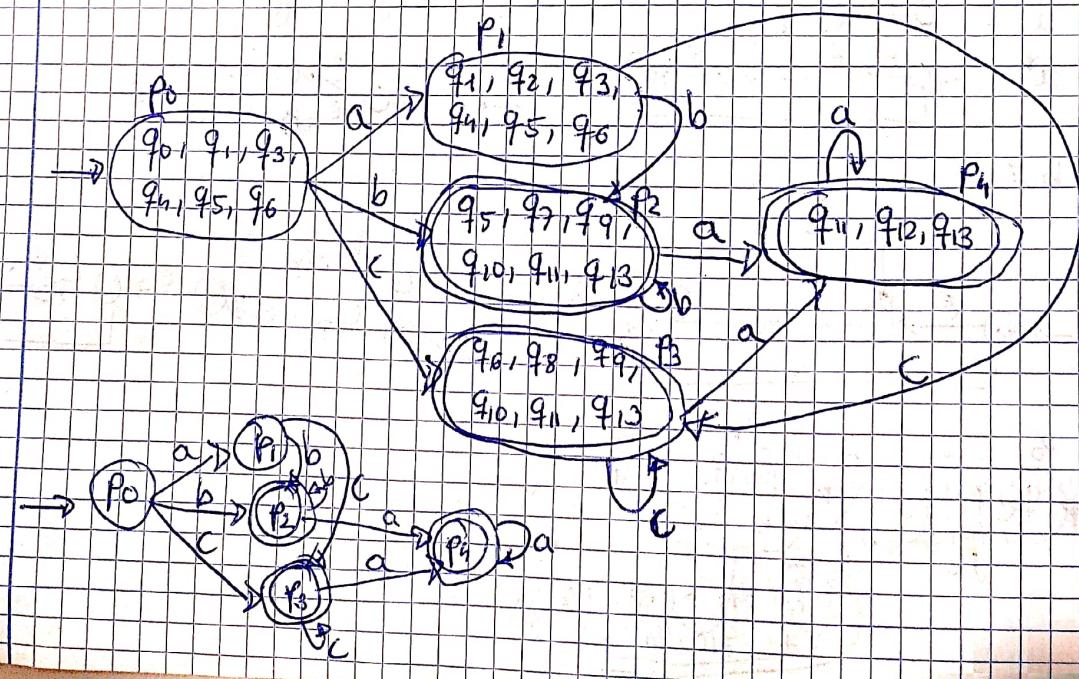
$$\text{clausura} - \epsilon(\delta(p_3, b)) = \emptyset$$

$$\text{clausura} - \epsilon(\delta(p_3, c)) = p_3$$

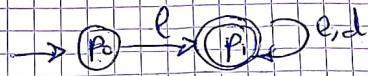
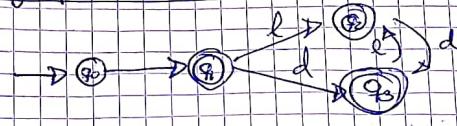
$$\text{clausura} - \epsilon(\delta(p_4, a)) = p_4$$

$$\text{clausura} - \epsilon(\delta(p_4, b)) = \emptyset$$

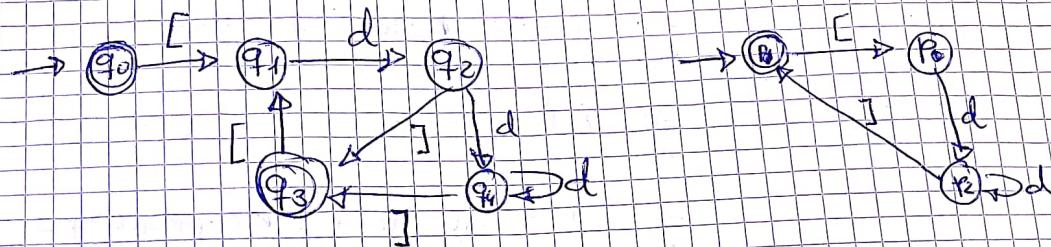
$$\text{clausura} - \epsilon(\delta(p_4, c)) = \emptyset$$



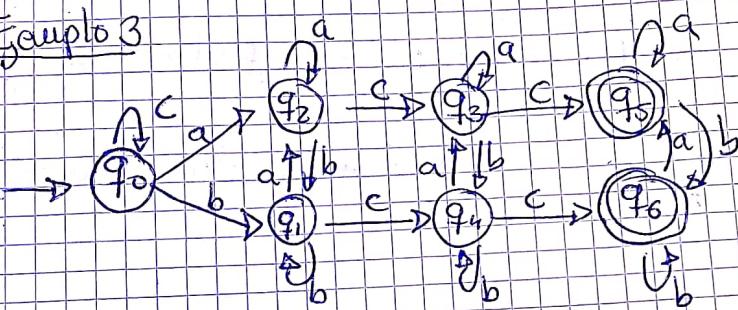
Ejemplo: Autómata cociente



Ejemplo 2



Ejemplo 3



$$c^*(a+b)^+c(a+b)^*c(a+b)^*$$

Ejercicio

$$d = n * (id + id)$$

$\angle \text{asignación} \rangle \Rightarrow id = \langle \text{expresión} \rangle$

$\Rightarrow id = \langle \text{sumando} \rangle$

$\Rightarrow id = \langle \text{sumando} \rangle * \langle \text{factor} \rangle$

$\Rightarrow id = \langle \text{sumando} \rangle * \langle \text{factor} \rangle$

$\Rightarrow id = \langle \text{sumando} \rangle * \langle \text{factor} \rangle$

$\Rightarrow id = \langle \text{sumando} \rangle * (\langle \text{expresión} \rangle)$

$\Rightarrow id = \langle \text{sumando} \rangle * (\langle \text{expresión} \rangle + \langle \text{sumando} \rangle)$

2.

$\Rightarrow id = \langle \text{sumando} \rangle * (\langle \text{sumando} \rangle + \langle \text{sumando} \rangle)$

3.

$\Rightarrow id = \langle \text{sumando} \rangle * (\langle \text{factor} \rangle + \langle \text{factor} \rangle)$

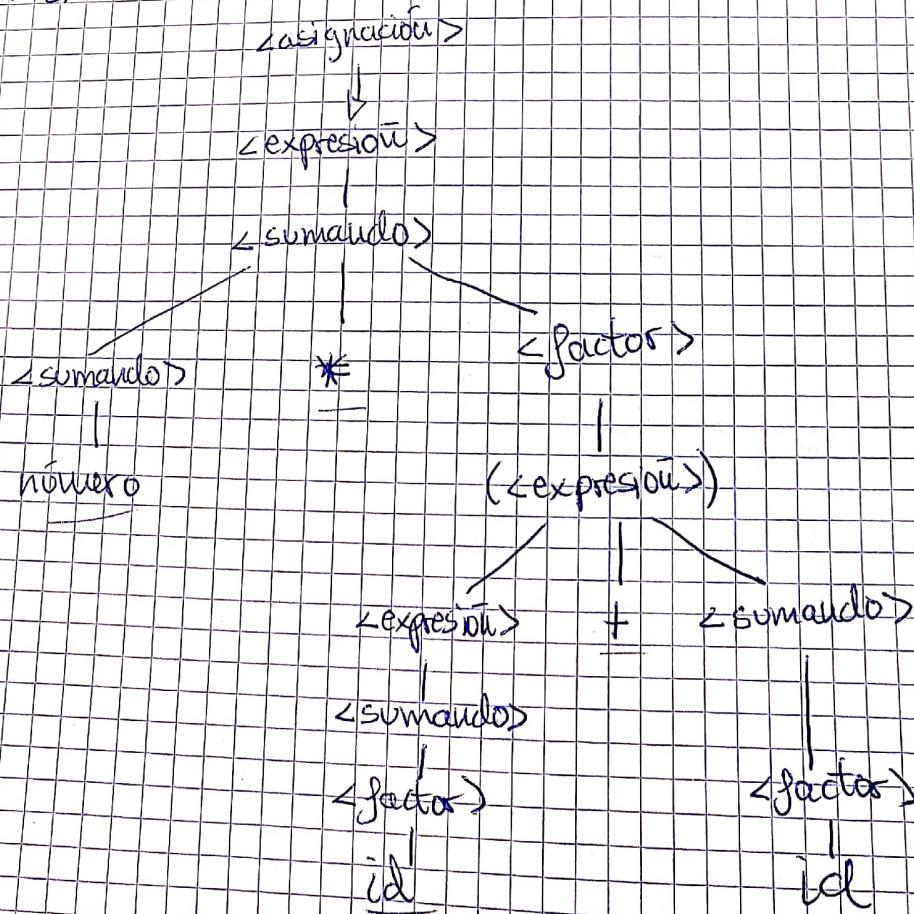
4.

$\Rightarrow id = \langle \text{sumando} \rangle * (\text{id} + \text{id})$

5.

Paso a paso →

Árbol sintáctico.



Ejercicio pg 93

- 1) $S \rightarrow SD$
- 2) $S \rightarrow D$
- 3) $D \rightarrow :T L ;$
- 4) $T \rightarrow int$
- 5) $T \rightarrow float$
- 6) $L \rightarrow id L'$
- 7) $L' \rightarrow \epsilon$
- 8) $L \rightarrow , L$

$S \Rightarrow SD$
 $\xrightarrow{1} D D$
 $\xrightarrow{2} :T L ; D$
 $\xrightarrow{3} int L ; D$
 $\xrightarrow{4} int id L' ; D$
 $\xrightarrow{5} int id, L ; D$
 $\xrightarrow{6} int id, id L' ; D$
 $\xrightarrow{7} int id, id, T L ;$
 $\xrightarrow{8} int id, id ; float L ;$
 $\xrightarrow{9} int id, id ; float id L' ;$
 $\xrightarrow{10} int id, id ; float id ;$

Ejercicio pg. 94

- 1) $S \rightarrow SD$
2) $S \rightarrow D$
3) $D \rightarrow TL;$
4) $T \rightarrow int$
5) $T \rightarrow float$
6) $L \rightarrow Pid L'$
7) $P \rightarrow \epsilon$
8) $P \rightarrow *P$
9) $L' \rightarrow \epsilon$
10) $L' \rightarrow , L$
- int a, **b;
 $\xrightarrow{2} T L;$
 $\xrightarrow{3} int L;$
 $\xrightarrow{4} int Pid L';$
 $\xrightarrow{5} int : id L';$
 $\xrightarrow{6} int id L';$
 $\xrightarrow{7} int id, L;$
 $\xrightarrow{8} int id, Pid L';$
 $\xrightarrow{9} int id, * P id L';$
 ~~$\xrightarrow{10} int id, * id L';$~~
 $\xrightarrow{10} int id, * * id L';$
 ~~$\xrightarrow{10} int id, * * id;$~~
 $\xrightarrow{9} int id, * * id;$

Ejercicio pg 95

- 1) $S \rightarrow SD$
- 2) $S \rightarrow D$
- 3) $D \rightarrow T L ;$
- 4) $T \rightarrow \text{int}$
- 5) $T \rightarrow \text{float}$
- 6) $L \rightarrow \text{id } CL'$
- 7) $L' \rightarrow \epsilon$
- 8) $L' \rightarrow , L$
- 9) $C \rightarrow \epsilon$
- 10) $C \rightarrow [n] C$

Ejercicio pg 96

- 1) $S \rightarrow SD$
- 2) $S \rightarrow D$
- 3) $D \rightarrow T L ;$
- 4) $T \rightarrow \text{int}$
- 5) $T \rightarrow \text{float}$
- 6) $L \rightarrow P \text{id } CL'$
- 7) $L' \rightarrow \epsilon$
- 8) $L' \rightarrow , L$
- 9) $P \rightarrow \epsilon$
- 10) $P \rightarrow P^*$
- 11) $C \rightarrow \epsilon$
- 12) $C \rightarrow [n] C$

Ejercicio pg. 97

1) $S \rightarrow SD$

2) $\$ \rightarrow D$

3) $D \rightarrow TF(L)$;

4) $T \rightarrow int$

5) $T \rightarrow float$

6) $F \rightarrow P id$

7) $P \rightarrow \epsilon$

8) $P \rightarrow P^*$

9) $L'' \rightarrow \epsilon$

10) $L \rightarrow T P id (L')$

11) $C \rightarrow \epsilon$

12) $C \rightarrow [n] C$

13) $L' \rightarrow \epsilon$

14) $L' \rightarrow , L$

15) $L'' \rightarrow L$

para emitir

$int id (int id, ,)$;

$int f();$

$int g(int a);$

$int * h(int a, int * b);$

$S \xrightarrow{1} D$

$\xrightarrow{3} TF(L');$

$\xrightarrow{5} int F(L');$

$\xrightarrow{6} int P id (L');$

$\xrightarrow{8} int P^* id (L');$

$\xrightarrow{9} int * id (L');$

$\xrightarrow{10} int * id (L),$

$\xrightarrow{10} int * id (T P id (L')),$

$\xrightarrow{11} int * id (int P id (L'));$

$\xrightarrow{7} int * id (int id (L'));$

$\xrightarrow{11} int * id (int id (L'));$

$\xrightarrow{14} int * id (int id, L);$

$\xrightarrow{10} int * id (int id, T P id (L'));$

$\xrightarrow{7} int * id (int id, int P id (L'));$

$\xrightarrow{7} int * id (int id, int * id (L'));$

$\xrightarrow{11} int * id (int id, int * id (L'));$

$\xrightarrow{13} int * id (int id, int * id),$

$D \rightarrow T \notin C(L)$;

$L \rightarrow \epsilon$

$L \rightarrow T P id C L'$

$L' \rightarrow \epsilon$

$L' \rightarrow , L$

$L \rightarrow L'$

$L' \rightarrow T P id C L''$

$L'' \rightarrow \epsilon$

$L'' \rightarrow) L'$

$4 = (H \cup d^2)$

$L_3 = \{a^{2i} b^i \mid i \geq 0\} = \{aab, aaaaabb, aaaaaabbb \dots\}$

1) $S \rightarrow aa S b$ $S \xrightarrow[1]{} a a S b \xrightarrow[2]{} a a a a b b$

2) $S \rightarrow a a b$

Ejercicio

- $$P = \{ \begin{array}{l} 1) S \rightarrow aAb \\ 2) A \rightarrow ab \\ 3) A \rightarrow abB \\ 4) B \rightarrow cBdd \\ 5) B \rightarrow e \\ 6) B \rightarrow ec \end{array}$$

- $$\begin{array}{l} 7) C \rightarrow aD \\ 8) C \rightarrow aC \\ 9) D \rightarrow bC \end{array}$$

{

Paso	Viejo	Nuevo
0		{ } A, B }
1	{ } A, B }	{ } A, B, S }
2	{ } A, B, S }	{ } S, A, B }

- $$P' = \{ \begin{array}{l} 1) S \rightarrow aAb \\ 2) A \rightarrow ab \\ 3) A \rightarrow abB \\ 4) B \rightarrow cBdd \\ 5) B \rightarrow e \end{array}$$

{

h.- H2

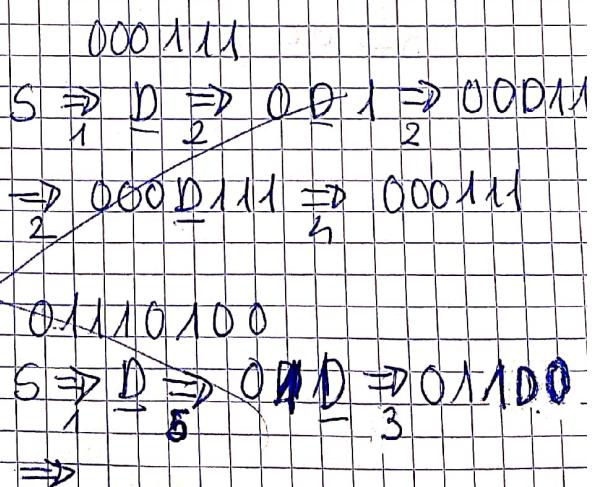
$$L_4 = \{ a^i b^j c^k \mid i, j, k > 0 \wedge j = i + k \}$$

- $$P_4 = \{ \begin{array}{l} 1) S \rightarrow AC \\ 2) A \rightarrow aAb \\ 3) A \rightarrow E \\ 4) C \rightarrow bCc \\ 5) C \rightarrow E \end{array}$$

{

$L_5 = \{ x \mid x \text{ tiene igual número de ceros que de unos} \}$

- $$\begin{array}{l} P_5 = \{ 1) S \rightarrow D \\ 2) D \rightarrow 0D1 \\ 3) D \rightarrow 1D0 \\ 4) D \rightarrow E \\ 5) D \rightarrow 01D \\ 6) D \rightarrow 10D \\ 7) D \rightarrow DD \\ 8) D \rightarrow D10 \end{array}$$



- $P_S = \{$
- 1) $S \rightarrow D$
 - 2) $D \rightarrow DD$
 - 3) $D \rightarrow 1D0D$
 - 4) $D \rightarrow \epsilon$
- $\}$

$L_6 = \{ w w^R \mid w \in \{0, 1\}^*$ y w^R es la palabra inversa de $w \}$

$P_6 = \{ 1) S \rightarrow A$

2) $A \rightarrow 0A0$

3) $A \rightarrow 1A1$

4) $A \rightarrow \epsilon$

$\}$

$\underline{\underline{011}} \underline{\underline{110}}$

$$\begin{aligned} S &\xrightarrow{1} A \xrightarrow{2} 0A0 \xrightarrow{3} 01A10 \Rightarrow \\ &\xrightarrow{4} 011A110 \xrightarrow{5} 011110 \end{aligned}$$

5. H2

• $(a == b) \& \& (c != 0 \text{ || } d >= 1)$

1) $S \rightarrow CR$

2) $C \rightarrow (T OT \beta)$

3) $T \rightarrow id$

4) $T \rightarrow n$

5) $O \rightarrow =$

6) $O \rightarrow !=$

7) $O \rightarrow >=$

8) $R \rightarrow LCR$

9) $R \rightarrow \epsilon$

10) $L \rightarrow \& \&$

11) $L \rightarrow ||$

12) $C \rightarrow TOTR$

$S \xrightarrow{1} C R \xrightarrow{2} (T O T R) R \xrightarrow{3}$

$\xrightarrow{4} (id \underline{OTR}) R \xrightarrow{5} (id == \underline{TR}) R$

$\xrightarrow{6} (id == id) \underline{R} \xrightarrow{7} (id == id) R$

$\xrightarrow{8} (id == id) L \underline{CR} \xrightarrow{9} (id == id) \& \& CR$

$\xrightarrow{10} (id == id) \& \& (TOTR) R$

$\xrightarrow{11} (id == id) \& \& (id \underline{OTR}) R$

$\xrightarrow{12} (id == id) \& \& (id \underline{id} == \underline{TR}) R$

$\xrightarrow{13} (id == id) \& \& (id \underline{id} == n \underline{R}) R$

$\xrightarrow{14} (id == id) \& \& (id \underline{id} == u \underline{LCR}) R$

$\xrightarrow{15} (id == id) \& \& (id \underline{id} == u \underline{||} (R) R)$

$\xrightarrow{16} (id == id) \& \& (id \underline{id} == u \underline{||} TOTRR) R$

$\xrightarrow{17} (id == id) \& \& (id \underline{id} == u \underline{||} id >= n \underline{RR}) R$

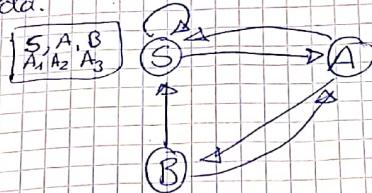
$\xrightarrow{18} (id == id) \& \& (id \underline{id} == u \underline{||} id >= u)$

$\xrightarrow{19, 20}$

Ejemplo: Factorización izquierda.

- $P = \{ \}$
- 1) $S \rightarrow Sa$
 - 2) $S \rightarrow AB$
 - 3) $A \rightarrow Sb$
 - 4) $A \rightarrow BC$
 - 5) $B \rightarrow Sa$
 - 6) $B \rightarrow Ab$
 - 7) $B \rightarrow C$

recursividad izquierda.



$$S \xrightarrow{\alpha} AB \xrightarrow{\beta} BCB \xrightarrow{\gamma} SacB$$

\boxed{S} Eliminar la recursividad inmediata de S

$$S \rightarrow Sa \mid AB$$

$$\hookrightarrow \left\{ \begin{array}{l} S \rightarrow AB \mid AB^S \\ S^I \rightarrow a \mid aS^I \end{array} \right.$$

\boxed{A}

$$3) A \rightarrow Sb$$

$$\hookrightarrow \left\{ \begin{array}{l} A \rightarrow AB \xrightarrow{\alpha_1} b \\ A \rightarrow BS^I \xrightarrow{\alpha_2} b \end{array} \right. \mid AB^S \xrightarrow{\beta} b$$

Eliminar la recursividad inmediata de A .

$$A \rightarrow ABb \mid ABS^I b \mid BC$$

$$\xrightarrow{\alpha_1} \quad \xrightarrow{\alpha_2} \quad \xrightarrow{\beta}$$

$$\hookrightarrow \left\{ \begin{array}{l} A \rightarrow BC \mid BCA^I \\ A^I \rightarrow Bb \mid BS^I b \\ Bba^I \mid BS^I bA^I \end{array} \right.$$

\boxed{B}

Eliminas la recursividad inmediata de B

$$B \rightarrow C \mid CB'$$

$$B' \rightarrow cBa \mid cBs'a \mid cb \mid cAb \mid cA'BS'a \mid cA'b \mid cBaB' \mid cBs'aB' \mid cbB' \mid cAbB' \mid cA'BS'AB' \mid cA'bbB'$$

Ejercicio: Factorización por la izquierda

$$P' = P$$

S \rightarrow identificadores = E

$$E \rightarrow T^* F \mid (E) \mid id \mid u$$

$$T^* FE' \mid (E) F' \mid id E' \mid u E'$$

$$E' \rightarrow + T \mid + TE'$$

$$T \rightarrow (E) \mid id \mid u$$

$$(E) T' \mid id T' \mid u T'$$

$$T' \rightarrow * F \mid * FT'$$

$$F \rightarrow (E) \mid id \mid u$$

{

$$\boxed{E} \quad E \rightarrow T^* F \mid (E) \mid id \mid u$$

$$\quad \quad \quad \boxed{T^* FE'} \mid (E) E' \mid id E' \mid u E'$$

$$\quad \quad \quad \rightarrow \boxed{E \rightarrow T^* FE''} \mid (E) \mid id \mid u \mid (E) E' \mid id E' \mid u E'$$

$$E'' \rightarrow \epsilon \mid E'$$

$$\quad \quad \quad \downarrow \quad \quad \quad \boxed{E \rightarrow E \rightarrow T^* FE''} \mid (E) E'' \mid id E'' \mid u E''$$

$$E'' \rightarrow \epsilon \mid E'$$

$$\boxed{E'}$$

$$E' \rightarrow + T E''$$

$$\boxed{T}$$

$$T \rightarrow (E) T'' \mid id T'' \mid u T''$$

$$T'' \rightarrow \epsilon \mid T'$$

$$\boxed{T'}$$

$$T' \rightarrow * FT''$$

$$\boxed{F}$$

$$F \rightarrow (E) \mid id \mid u$$

Ejemplo: Recursividad y factORIZACIÓN.

- 1) $S \rightarrow SD$
- 2) $S \rightarrow D$
- 3) $D \rightarrow TL;$
- 4) $T \rightarrow int$
- 5) $L \rightarrow L, id$
- 6) $L \rightarrow id$

$$S \rightarrow SD \quad | \quad D$$
$$\alpha \quad \beta$$
$$\Downarrow \quad \left\{ \begin{array}{l} S \rightarrow DS \\ S' \rightarrow DS' |\epsilon \end{array} \right.$$

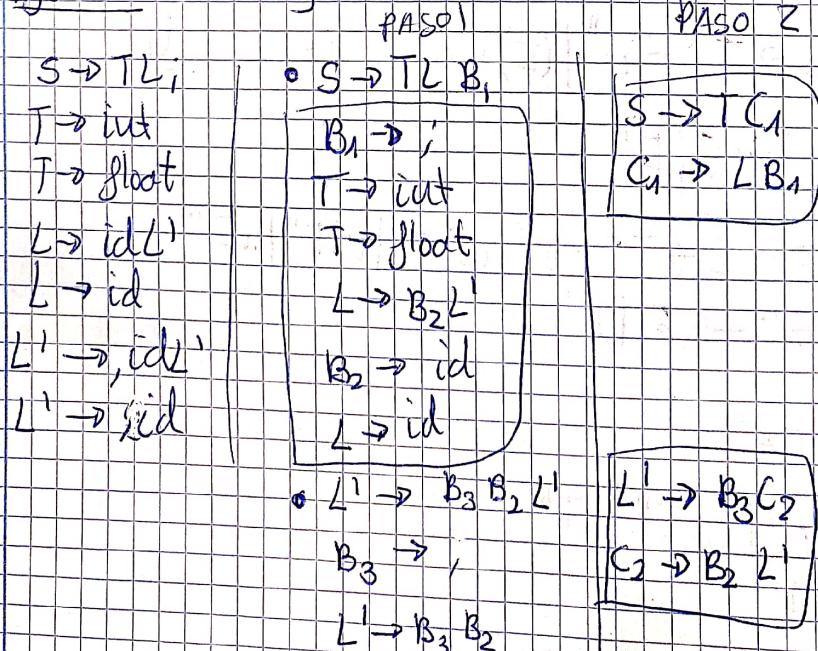
$$\boxed{D \rightarrow TL;}$$
$$T \rightarrow int$$

$$L \rightarrow L, id \quad | \quad id$$
$$\alpha \quad \beta$$
$$\Downarrow \quad \left\{ \begin{array}{l} L \rightarrow id L' \\ L' \rightarrow , id L' |\epsilon \end{array} \right.$$

Ejemplo: gramática re. por la derecha.

- 1) $S \rightarrow DS$
- 2) $S \rightarrow D$
- 3) $D \rightarrow TL;$
- 4) $T \rightarrow int$
- 5) $L \rightarrow id L'$
- 6) $L' \rightarrow , id L'$
- 7) $L' \rightarrow \epsilon$

Ejercicio: Chomsky



Ejercicio 2

$$\begin{aligned} S &\rightarrow T \text{id}(P) \\ T &\rightarrow \text{int} \\ P &\rightarrow \text{id} P' \\ P &\rightarrow \text{id} \\ P' &\rightarrow , \text{id} P' \\ P' &\rightarrow , \text{id} \end{aligned}$$

$$\begin{aligned} S &\rightarrow T B_1 B_2 P B_3 B_4 \\ B_1 &\rightarrow \text{id} \\ B_2 &\rightarrow (\\ B_3 &\rightarrow) \\ B_4 &\rightarrow ; \\ T &\rightarrow \text{int} \\ P &\rightarrow B_1 P' \\ P &\rightarrow \text{id} \\ P' &\rightarrow B_5 B_1 P' \\ B_5 &\rightarrow , \\ P' &\rightarrow B_5 B_1 \end{aligned}$$

$$\begin{aligned} S &\rightarrow T C_1 \\ C_1 &\rightarrow B_1 C_2 \\ C_2 &\rightarrow B_2 C_3 \\ C_3 &\rightarrow P C_4 \\ C_4 &\rightarrow B_3 B_4 \end{aligned}$$

$$\begin{aligned} P' &\rightarrow B_5 C_5 \\ C_5 &\rightarrow B_1 P' \end{aligned}$$

Ejercicio pg 835

$$\begin{aligned} S &\rightarrow T \text{id}(P) \\ T &\rightarrow \text{int} \\ P &\rightarrow \text{id} P' \quad P \rightarrow \text{id} \\ P' &\rightarrow , \text{id} P' \\ P' &\rightarrow , \text{id} \end{aligned}$$

$$\begin{aligned} S &\rightarrow T B_1 B_2 P B_3 B_4 \\ B_1 &\rightarrow \text{id} \\ B_2 &\rightarrow (\\ B_3 &\rightarrow) \\ B_4 &\rightarrow ; \\ T &\rightarrow \text{int} \\ P &\rightarrow B_1 P' \\ P &\rightarrow \text{id} \\ P' &\rightarrow B_5 B_1 P' \\ B_5 &\rightarrow , \\ P' &\rightarrow B_5 B_1 \end{aligned}$$

$$S, T, P, P', B_1, B_2, B_3, B_4, B_5, C_1, \dots, C_5$$

$$\begin{aligned} S &\rightarrow T C_1 \\ C_1 &\rightarrow B_1 C_2 \\ C_2 &\rightarrow B_2 C_3 \\ C_3 &\rightarrow P C_4 \\ C_4 &\rightarrow B_3 B_4 \end{aligned}$$

$$\begin{aligned} P' &\rightarrow B_5 C_5 \\ C_5 &\rightarrow B_1 P' \end{aligned}$$

PASO 1: Eliminar la recursividad general.

$$\begin{array}{llll} S \rightarrow T C_1 & B_1 \rightarrow \text{id} & C_1 \rightarrow \text{id} C_2 & C_5 \rightarrow \text{id} P' \\ X T \rightarrow \text{int} & X B_2 \rightarrow (& C_2 \rightarrow (C_3 & \\ X P \rightarrow B_1 P' & X B_3 \rightarrow) & C_3 \rightarrow B_1 P' C_4 & \\ X P \rightarrow \text{id} & B_4 \rightarrow ; & C_3 \rightarrow \text{id} C_4 & \\ P' \rightarrow B_5 C_5 & B_5 \rightarrow) & C_3 \rightarrow \text{id} P' C_4 & \\ P' \rightarrow B_5 B_1 & C_4 \rightarrow) B_4 & & \end{array}$$

$$C_5 \rightarrow \text{id} P'$$

$P^1 \rightarrow D \quad C_5$

$P^1 \rightarrow I \quad B_1$

$P \rightarrow id \quad P^1$

$S \rightarrow int \quad C_1$

Ejemplo: análisis predictivo (pg 221)

$$id = n^*(id + id) \quad \$$$

$$S \Rightarrow id = E$$

$$\Rightarrow id = T E'$$

$$\Rightarrow id = F T' E'$$

$$\Rightarrow id = u T' E'$$

$$\Rightarrow id = u^* F T' E'$$

$$\Rightarrow id = u^* (E) T' E'$$

$$\Rightarrow id = u^* (T E) T' E'$$

$$\Rightarrow id = u^* (F T' E) T' E'$$

$$\Rightarrow id = n^* (id T' E) T' E'$$

$$\Rightarrow id = n^* (id E') T' E'$$

$$\Rightarrow id = n^* (id + T E') T' E'$$

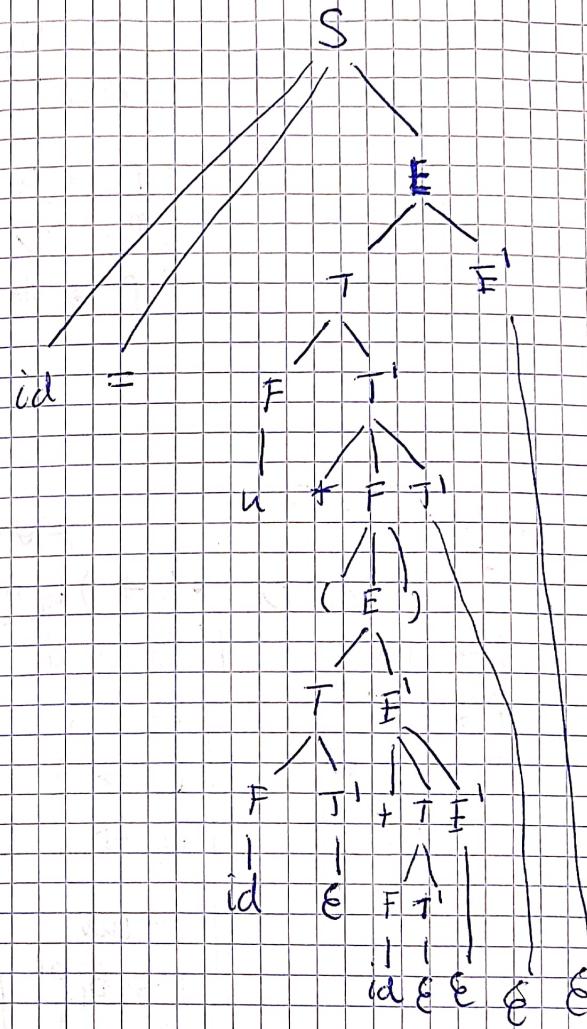
$$\Rightarrow id = n^* (id + F T' E) T' E'$$

$$\Rightarrow id = n^* (id + id T' E) T' E'$$

$$\Rightarrow id = n^* (id + id E') T' E'$$

$$\Rightarrow id = n^* (id + id) T' E'$$

$$\Rightarrow id = n^* (id + id)$$



Ejercicio pg 294

- $P = \{1) S \rightarrow DS$
 2) $S \rightarrow E$
 3) $D \rightarrow T \text{ id } (P);$
 4) $T \rightarrow i \text{nt}$
 5) $T \rightarrow f \text{loat}$
 6) $P \rightarrow E$
 7) $P \rightarrow \text{id} L$
 8) $L \rightarrow E$
 9) $L \rightarrow , \text{id} L$
 10)

EXAMEN

S	$\epsilon, \text{int}, \text{float}$
D	int, float
T	int, float
P	ϵ, id
L	$\epsilon, " "$

$$1) \text{Primer}(\text{D}) - \{ \epsilon \} \subseteq \text{Primer}(\text{S})$$

$$3) \text{Primer}(\text{T}) - \{ \epsilon \} \subseteq \text{Primer}(\text{D})$$

Ejercicio pg 295

$$1) S \rightarrow A B C$$

$$\text{Primer}(A) - \{ \epsilon \} \subseteq \text{Primer}(S)$$

$$2) A \rightarrow a A$$

$$3) A \rightarrow \epsilon$$

$$\text{Primer}(B) - \{ \epsilon \} \subseteq \text{Primer}(S)$$

$$4) B \rightarrow b B$$

$$5) B \rightarrow \epsilon$$

$$\text{Primer}(C) - \{ \epsilon \} \subseteq \text{Primer}(S)$$

$$6) C \rightarrow c C$$

$$7) C \rightarrow \epsilon$$

S	a, b, c, ϵ
A	a, ϵ
B	b, ϵ
C	c, ϵ

Ejercicio pg 380

$$1) S \rightarrow D S$$

$$\text{Primer}(S) - \{ \epsilon \} \subseteq \text{Siguiente}(D)$$

Como $\epsilon \in \text{Primer}(S)$

entonces $\text{Siguiente}(S) \subseteq \text{Siguiente}(D)$

$$3) D \rightarrow T \text{ id } (P)$$

	Primer	Siguiente
S	$\epsilon, \text{int}, \text{float}$	\$
D	int, float	\$
T	int, float	id
P	ϵ, id	"")
L	$\epsilon, " "$	"")"

7) $P \rightarrow \text{id} L$

Siguiente (P) \subseteq Siguiente (L)

8) $L \rightarrow \text{id} \underline{\underline{L}}$

Ejercicio pg 83)

$$1) S \xrightarrow{\alpha} A \frac{BC}{B} \beta$$

Primer (BC) - $\{ \epsilon \} \subseteq$ Siguiente (S)

$$\hookrightarrow = \{ b, c, \epsilon \}$$

$$1) S \xrightarrow{\alpha} A \frac{BC}{\epsilon}$$

Siguiente (S) \subseteq Siguiente (A)

	Primer	Siguiente
S	a, b, c, ϵ	$\$$
A	a, ϵ	$b, c, \$$
B	b, ϵ	$c, \$$
C	c, ϵ	$\$$

$$1) S \xrightarrow{\alpha} A \frac{B}{A} C$$

Primer (C) - $\{ \epsilon \} \subseteq$ Siguiente (B)

$$1) S \xrightarrow{\alpha} A \frac{B}{\epsilon} C$$

Como $\epsilon \in$ Primer (C) entonces Siguiente (S) \subseteq Siguiente (B)

$$1) S \xrightarrow{\alpha} A B \underline{\underline{C}}$$

Siguiente (S) \subseteq Siguiente (C)

$$2) \underline{A} \xrightarrow{\alpha} \underline{A}$$

$$4) \underline{B} \xrightarrow{\beta} \underline{B}$$

$$6) \underline{C} \xrightarrow{\gamma} \underline{C}$$

Ejercicio pg 352

1) $S \rightarrow DS$

Primeros (DS) = Primeros (D) =
 $\{ \text{int}, \text{float} \}$

2) $S \rightarrow E$

Siguiente (S) = { \$ }

3) $D \rightarrow T \text{id}(P);$

6) $P \rightarrow \epsilon$

Siguiente (P) = { } { }

8) $L \rightarrow \epsilon$

Siguiente (L) = { } { }

	id	()	;	int	float	\$
S					1	1	2
D					3	3	
T					4	5	
P							
L					8		9

Ejercicio pg 353

1) $S \rightarrow ABC$

Primeros (ABC) = { a, b, c } { }

2) $A \rightarrow aA'$

3) $A \rightarrow \epsilon$

Siguiente (A) = { b, c, \$ }

	a	b	c	\$
S	1	1	1	
A	2	3	3	3
B		4	5	5
C			6	7

Ejercicio (factorizar pg 361)

$P^1 = \{ 1 \} S \rightarrow aA$

2) $A \rightarrow aA'$

3) $A' \rightarrow A$

4) $A' \rightarrow B$

5) $B \rightarrow bB'$

6) $B' \rightarrow B$

7) $B' \rightarrow C$

8) $C \rightarrow cC'$

9) $C' \rightarrow C$

10) $C' \rightarrow \epsilon$

8

	Primeros	Siguiente	a	b	c	\$
S	a	\$	1			
A	a	A	2			
A'	a, b	\$	3			
B	b	\$		5		
B'	b, c	\$	6	7		
C	c	\$			8	
C'	c, e	\$	9	10		

Ejercicio pg 863

	Primero	Siguiente	ig	then	instrucción	else	condición	\$
S	if, inst	\$, else						
S'	else, €	\$, else					(3,4)	
C	condicinal	then				.	5	

Siguiente (S) ⊆ Siguiente (S')

Primero (S') - {€} ⊆ Siguiente (S)

Ejercicio pg 541

Pila	Entrada	Acción	
\$ S	<u>id = n * (id + id)</u>	1) S → id = E	$S \Rightarrow id = E$
\$ E =	<u>id = n * (id + id)</u>	Emparejar	$\Rightarrow id = TE^1$
\$ E =	<u>= n * (id + id)</u>	Emparejar	$\stackrel{2}{\Rightarrow} id = FT^1 \pm 1$
\$ E T	<u>n * (id + id)</u>	2) E → TE ¹	$\stackrel{5}{\Rightarrow} id = nT^1 E^1$
\$ E T F	<u>n * (id + id)</u>	5) T → FT ¹	$\stackrel{10}{\Rightarrow} id = n * FT^1 E^1$
\$ E T U	<u>n * (id + id)</u>	10) F → U	$\stackrel{6}{\Rightarrow} id = n * FT^1 E^1$
\$ E T	<u>U * (id + id)</u>	Emparejar	$\stackrel{7}{\Rightarrow} id = U * (E) T^1 E^1$
\$ E T F *	<u>* (id + id)</u>	6) T ¹ → * FT ¹	$\stackrel{8}{\Rightarrow} id = n * (TE^1) T^1 E^1$
\$ E T F	<u>* (id + id)</u>	Emparejar	$\stackrel{9}{\Rightarrow} id = n * (FT^1 E^1) T^1 E^1$
\$ E T) E (<u>(id + id)</u>	8) F → (E)	$\stackrel{5}{\Rightarrow} id = n * (FT^1 E^1) T^1 E^1$
\$ E T) F	<u>(id + id)</u>	Emparejar	$\stackrel{9}{\Rightarrow} id = n * (id T^1 E^1) T^1 E^1$
\$ E T) E T	<u>(id + id)</u>	2) E → TE ¹	$\stackrel{7}{\Rightarrow} id = n * (id E^1) T^1 E^1$
\$ E T) E T F	<u>(id + id)</u>	5) T → FT ¹	$\stackrel{8}{\Rightarrow} id = n * (id + TE) T^1 E^1$
\$ E T) E T id	<u>(id + id)</u>	9) F → id	$\stackrel{3}{\Rightarrow} id = n * (id + FT^1 E^1) T^1 E^1$
\$ E T) E T T	<u>+ (id)</u>	7) T ¹ → E	$\stackrel{5}{\Rightarrow} id = n * (id + FT^1 E^1) T^1 E^1$
\$ E T) E T	<u>+ (id)</u>	3) E ¹ → + TE ¹	$\stackrel{9}{\Rightarrow} id = n * (id + id T^1 E^1) T^1 E^1$
\$ E T) E T +	<u>+ (id)</u>	Emparejar	$\stackrel{7}{\Rightarrow} id = n * (id + id E^1) T^1 E^1$
\$ E T) E T	<u>(id)</u>	5) T → FT ¹	$\stackrel{7}{\Rightarrow} id = n * (id + id E^1) T^1 E^1$
\$ E T) E T F	<u>(id)</u>	9) F → id	$\stackrel{4}{\Rightarrow} id = n * (id + id) T^1 E^1$
\$ E T) E T id	<u>(id)</u>	Emparejar	$\stackrel{7}{\Rightarrow} id = n * (id + id) E^1$
\$ E T) E T T	<u>)</u>	7) T ¹ → E	$\stackrel{7}{\Rightarrow} id = n * (id + id) E^1$
\$ E T) E T	<u>)</u>	4) E ¹ → E	$\stackrel{4}{\Rightarrow} id = n * (id + id)$
\$ E T)	<u>)</u>	Emparejar	
\$ E T)	<u>)</u>	7) T ¹ → E	
\$ E T)	<u>)</u>	5) E ¹ → E	
\$ E T)	<u>)</u>	Acceptar	

Ejercicio pg 54

	Primer	Siguiente
$\rightarrow S$	$\epsilon, \text{int}, \text{float}$	$\$$
$\rightarrow D$	int, float	$\text{int}, \text{float}, \$$
$\rightarrow T$	int, float	id
$\rightarrow P$	$\epsilon, \text{int}, \text{float}$	$)$
$\rightarrow L$	$\text{", "}, \epsilon$	$)$

Primer

$$1) S \rightarrow DS$$

$$\text{Primer}(D) - \{\epsilon\} \subseteq \text{Primer}(S)$$

$$2) S \rightarrow \epsilon$$

$$\epsilon \in \text{Primer}(S)$$

$$3) D \rightarrow T \text{id} (P);$$

$$\text{Primer}(T) - \{\epsilon\} \subseteq \text{Primer}(D)$$

$$4) T \rightarrow \text{int}$$

$$\text{int}, \text{float} \in \text{Primer}(T)$$

$$5) T \rightarrow \text{float}$$

- 6) $P \rightarrow \epsilon$ $\epsilon \in \text{Primer}(P)$
 7) $P \rightarrow T \text{id} L$ $\text{Primer}(T) - \{\epsilon\} \subseteq \text{Primer}(P)$
 8) $L \rightarrow , T \text{id} L$ $, , \in \text{Primer}(L)$
 9) $L \rightarrow \epsilon$ $\epsilon \in \text{Primer}(L)$

Siguiente Nos fijamos en las reglas que tengan algún símbolo no terminal

$$1) S \rightarrow DS$$

$$\text{Primer}(S) - \{\epsilon\} \subseteq \text{Siguiente}(D)$$

(Como $\epsilon \in \text{Primer}(S)$ entonces $\text{Siguiente}(S) \subseteq \text{Siguiente}(D)$)

$$3) D \rightarrow T \text{id} (P); \quad \text{id} \in \text{Siguiente}(T) ;) \in \text{Siguiente}(P)$$

$$7) P \rightarrow T \text{id} L \quad \text{id} \in \text{Siguiente}(T); \quad \text{Siguiente}(P) \subseteq \text{Siguiente}(L)$$

$$8) L \rightarrow , T \text{id} L$$

Tabla predictiva

	id	()	;	int	float)	\$
S	2*	2*	2*	2*	1	1	2*	2
D					3			Sinc.
T	Sinc.				5			
P	6*	6*	6	6*	7	7	6*	6*
L	9*	9*	9	9*	9*	8	9	

$$1) S \rightarrow DS$$

$$\text{Primer}(A) = \text{Primer}(DS) = \\ = \text{Primer}(D) = \{\text{int}, \text{float}\}$$

$$2) S \rightarrow \epsilon$$

$$\text{Siguiente}(S) = \{\$\}$$

$$3) D \rightarrow T \text{id} (P);$$

$$\text{Primer}(T) = \{\text{int}, \text{float}\}$$

$$4) T \rightarrow \text{int}$$

$$5) T \rightarrow \text{float}$$

$$6) P \rightarrow \epsilon \quad \text{Siguiente}(P) = \{(\}$$

$$7) P \rightarrow T \text{id} L \quad \text{Primer}(T) = \{\text{int}, \text{float}\}$$

$$8) L \rightarrow , T \text{id} L$$

$$9) L \rightarrow \epsilon \quad \text{Siguiente}(L) = \{)\}$$

Análisis sintáctico (int id, float id); \$

Pila	Entrada	Acción
\$ S	int id (int id, float id); \$	1) S → DS
\$ SD	int id (int id, float id); \$	3) D → T id (P);
\$ SD) P (id T	int id (int id, float id); \$	5) T → int
\$ SD) P (id int	int id (int id, float id); \$	Emparejar
\$ SD) P (id	id (int id, float id); \$	Emparejar
\$ SD) P ((int id, float id); \$	Emparejar
\$ SD) P	int id, float id); \$	7) P → T id L
\$ SD) L id T	int id, float id); \$	

Ejemplo

Pila	Entrada	Acción
\$ S	int id int); \$	1) S → DS
\$ SD	int id int); \$	3) D → T id (P);
\$ SD) P (id T	int id int); \$	5) T → int
\$ SD) P (id int	int id int); \$	Emparejar
\$ SD) P (id	id int); \$	Emparejar
\$ SD) P (int); \$	ERROR: Falta "(" y se extrae.
\$ SD) P	int); \$	7) P → T id L
\$ SD) L id T	int); \$	

Fausto: Método nivel de frase

Pila	Entrada	Acció
\$ S	id n * id \$	1) $S \rightarrow id = E$
\$ E = id	id n * id \$	Emparejar
\$ E =	n * id \$	E6: Insertar = en entrada
\$ E =	= n * id \$	Emparejar
\$ E =	n * id \$	2) $E \rightarrow TE'$
\$ E T	n * id \$	5) $T \rightarrow FT'$
\$ E' T'	n * id \$	10) $F \rightarrow u$
\$ E' T' u	n * id \$	Emparejar
\$ E' T' -	* id \$	6) $T' \rightarrow *FT'$
\$ E' T' -	* id \$	Emparejar
\$ E' T' F *	id \$	9) $F \rightarrow id$
\$ E' T' F	id \$	Emparejar
\$ E' T' id	id \$	7) $T' \rightarrow E$
\$ E' T'	\$	8) $E' \rightarrow E$
\$ E'	\$	Aceptar
\$	\$	

Ejercicio pg 606

	;	int	float	id	,	\$
S	a*	1	1	a*	2*	2
D	E ₁	3	3	E ₂	E ₁	E ₃
T	E ₁	4	5	E ₂	E ₁	E ₃
L	E ₁	E ₁	E ₁	6	E ₁	E ₃
L'	7	7*	7*	7*	7*	7*
→ ;	F _{4p}	F ₅	F ₆	E ₁	E ₁	F ₃
int	F _{4p}	F ₅	F ₆			
float			F _{7p}			
→ id	E ₇	F ₁	E ₁	F _{8p}	E ₁	E ₃
						Jmp
→ \$	F ₁	E ₁	E ₁	E ₁	E ₁	Aceptar

E₁: símbolo inesperado.
se elimina de entrada.

E₂: falta tipo.
se inserta 'int'.

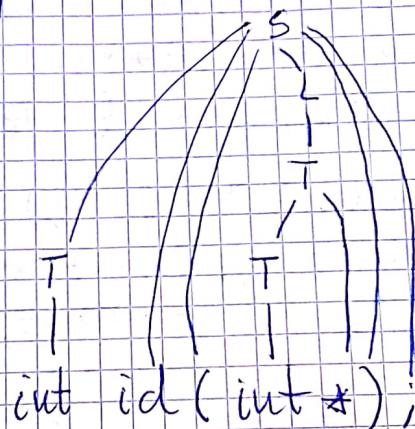
E₃: fin de cadena inesperado
eliminar de la pila.

E₄: falta id.
se inserta en la entrada.

E₅: insertar ';' en entrada.

JEMAS

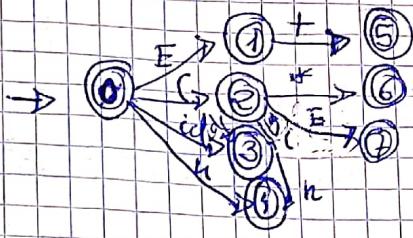
Pila	Entrada	Acción
0	int id (int *), \$	d3
0 int 3	id (int *), \$	r3: T → int
0 T 2	id (int *), \$	d4
0 T 2 id 4	(int *), \$	d6
0 T 2 id 4 (6	int *), \$	d3
0 T 2 id 4 (6 int 3,); \$	r3: T → int
0 T 2 id 4 (6 T 8); \$	d5
0 T 2 id 4 (6 T 8 * 5); \$	r2: T → T*
0 T 2 id 4 (6 T 8); \$	r5: L → T
0 T 2 id 4 (6 L 7); \$	d9
0 T 2 id 4 (6 L 7) 9	; \$	d11
0 T 2 id 4 (6 L 7) 9; 11	\$	r1: S → T id (2); Aceptar
0 S 1	\$	



Ejercicio Pg 17)

$$I_0 = \text{clausura } (\exists E^1 \rightarrow \bullet E^1) =$$

$$= \{ E^1 \rightarrow E, E \rightarrow \bullet E + E, \\ E \rightarrow \bullet E * E, E \rightarrow \bullet (E), \\ E \rightarrow \bullet id, E \rightarrow \bullet u \}$$



$$\rho^1 = \{ 1) E^1 \rightarrow E$$

$$2) E \rightarrow E + E$$

$$3) E \rightarrow E * E$$

$$4) E \rightarrow (E)$$

$$5) E \rightarrow id$$

$$6) E \rightarrow u$$

$$Tr-a(I_0, E) = I_1$$

$$Tr-a(I_0, " ") = I_2$$

$$Tr-a(I_0, id) = I_3$$

$$Tr-a(I_0, u) = I_4$$

$$Tr-a(I_1, \top) = \text{clausura } (\exists E \rightarrow E + \bullet E) =$$

$$= \{ E \rightarrow E + \bullet E, E \rightarrow \bullet E + E, E \rightarrow \bullet E * E, \\ E \rightarrow \bullet (E), E \rightarrow \bullet id, E \rightarrow \bullet u \} = I_5$$

$$Tr-a(I_1, *) = \text{clausura } (\exists E \rightarrow E * \bullet E) =$$

$$= \{ E \rightarrow E * \bullet E, E \rightarrow \bullet E + E,$$

$$E \rightarrow \bullet E * E, E \rightarrow \bullet (E),$$

$$E \rightarrow \bullet id, E \rightarrow \bullet u \} = I_6$$

$$Tr-a(I_2, E) = \text{clausura } (\exists E^1 \rightarrow (E \circ)) =$$

$$= \{ E^1 \rightarrow (E \circ) \circ E, E \rightarrow E \circ \bullet E \} =$$

$$= \{ E^1 \rightarrow (E \circ), E \rightarrow E \circ + E, E \rightarrow E \circ * E \} = I_7$$

$$Tr-a(I_2, " ") = \text{clausura } (\exists E \rightarrow (\bullet E)) = I_2$$

$$Tr-a(I_2, id) = \text{clausura } (\exists E \rightarrow id \circ) = \{ E \rightarrow id \circ \} = I_3$$

$$Tr-a(I_2, u) = \text{clausura } (\exists E \rightarrow u \circ) = \{ E \rightarrow u \circ \} = I_4$$

Ejercicio Pg(7) (11)

$$\begin{aligned} I_0 &= \text{clausura}(\{E^1 \rightarrow \cdot E\}) = \\ &= \{E^1 \rightarrow \cdot E, E \rightarrow \cdot E + E, E \rightarrow \cdot E * E, \\ &\quad E \rightarrow \cdot (\cdot E), E \rightarrow \cdot id, E \rightarrow \cdot u\} \end{aligned}$$

$$\begin{aligned} Tr-a(I_0, E) &= \text{clausura}(\{E^1 \rightarrow E^0, E \rightarrow E^0 + E, \\ &\quad E \rightarrow E^0 * E\}) = \{E^1 \rightarrow E^0, E \rightarrow E^0 + E, \\ &\quad E \rightarrow E^0 * E\} = I_1 \end{aligned}$$

$$\begin{aligned} P' &= \{E^1 \rightarrow E\} \\ 1) & E \rightarrow E + E \\ 2) & E \rightarrow E * E \\ 3) & E \rightarrow (E) \\ 4) & E \rightarrow id \\ 5) & E \rightarrow u \end{aligned}$$

4

$$\begin{aligned} Tr-a(I_0, "(\cdot)") &= \text{clausura}(\{E \rightarrow (\cdot E)\}) = \\ &= \{E \rightarrow (\cdot E), E \rightarrow \cdot E + E, E \rightarrow \cdot E * E, E \rightarrow \cdot (E), E \rightarrow \cdot id, E \rightarrow \cdot u\} = I_2 \end{aligned}$$

$$Tr-a(I_0, id) = \text{clausura}(\{E \rightarrow id \cdot E\}) = \{E \rightarrow id \cdot E\} = I_3$$

$$Tr-a(I_0, u) = \text{clausura}(\{E \rightarrow u \cdot E\}) = \{E \rightarrow u \cdot E\} = I_4$$

$$\begin{aligned} Tr-a(I_1, "+") &= \text{clausura}(\{E \rightarrow E + \cdot E\}) = \\ &= \{E \rightarrow E + \cdot E, E \rightarrow \cdot E + E, E \rightarrow \cdot E * E, E \rightarrow \cdot (E), E \rightarrow \cdot id, E \rightarrow \cdot u\} = I_5 \end{aligned}$$

$$\begin{aligned} Tr-a(I_1, "*") &= \text{clausura}(\{E \rightarrow E * \cdot E\}) = \\ &= \{E \rightarrow E * \cdot E, E \rightarrow \cdot E + E, E \rightarrow \cdot E * E, E \rightarrow \cdot (E), E \rightarrow \cdot id, E \rightarrow \cdot u\} = I_6 \end{aligned}$$

$$\begin{aligned} Tr-a(I_2, E) &= \text{clausura}(\{E \rightarrow (E^0), E \rightarrow E^0 + E, E \rightarrow E^0 * E\}) = \\ &= \{E \rightarrow (E^0), E \rightarrow E^0 + E, E \rightarrow E^0 * E\} = I_7 \end{aligned}$$

$$Tr-a(I_2, "(\cdot)") = \text{clausura}(\{E \rightarrow (\cdot E)\}) = I_2$$

$$Tr-a(I_2, id) = \text{clausura}(\{E \rightarrow id \cdot E\}) = I_3$$

$$Tr-a(I_2, u) = \text{clausura}(\{E \rightarrow u \cdot E\}) = I_4$$

$$\begin{aligned} Tr-a(I_5, E) &= \text{clausura}(\{E \rightarrow E + E^0, E \rightarrow E^0 + E, E \rightarrow E^0 * E\}) = \\ &= \{E \rightarrow E + E^0, E \rightarrow E^0 + E, E \rightarrow E^0 * E\} = I_8 \end{aligned}$$

$$Tr-a(I_5, "(\cdot)") = \text{clausura}(\{E \rightarrow (\cdot E)\}) =$$

$$(= \{E \rightarrow (\cdot E), E \rightarrow \cdot E + E, E \rightarrow \cdot E * E, E \rightarrow \cdot (E), E \rightarrow \cdot id, E \rightarrow \cdot u\} = I_2)$$

$$Tr-a(I_5, id) = \text{clausura}(\{E \rightarrow id \cdot E\}) = I_3$$

$$Tr-a(I_5, u) = \text{clausura}(\{E \rightarrow u \cdot E\}) = I_4$$

$$\begin{aligned} Tr-a(I_6, E) &= \text{clausura}(\{E \rightarrow E * E^0, E \rightarrow E^0 + E, E \rightarrow E^0 * E\}) = \\ &= \{E \rightarrow E * E^0, E \rightarrow E^0 + E, E \rightarrow E^0 * E\} = I_9 \end{aligned}$$

$$Tr-a(I_6, "(\cdot)") = \text{clausura}(\{E \rightarrow (\cdot E)\}) = I_2$$

$$Tr-a(I_6, id) = \text{clausura}(\{E \rightarrow id \cdot E\}) = I_3$$

$$Tr-a(I_6, u) = \text{clausura}(\{E \rightarrow u \cdot E\}) = I_4$$

$$Fr-a(I_7, "i") = \text{clausura}(\exists E \rightarrow (E) \circ (e)) = \exists E \rightarrow (E) \circ (e) = I_0$$

$$Fr-a(I_7, "+") = \text{clausura}(\exists E \rightarrow E + \circ E(e)) = I_5$$

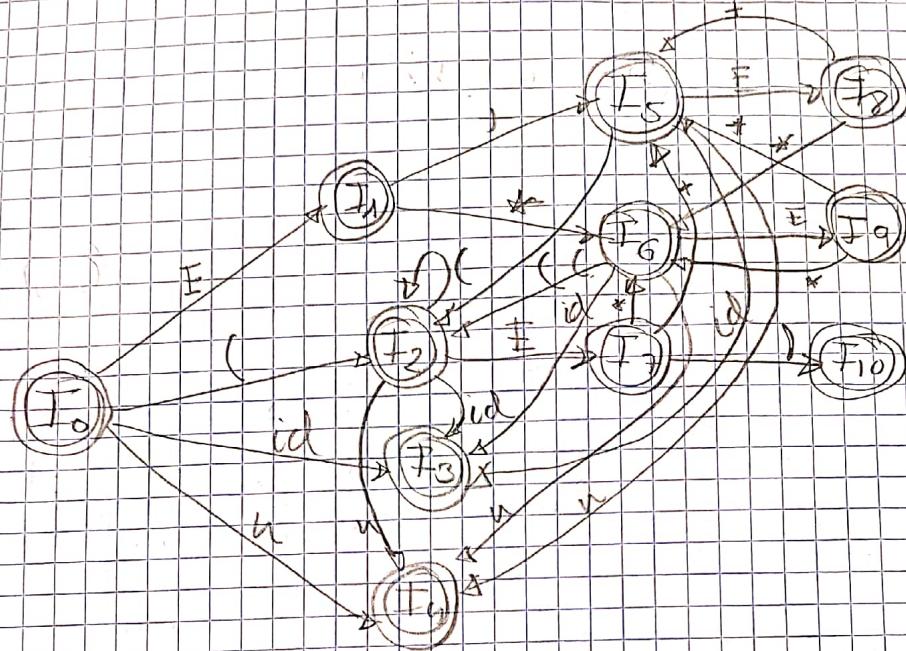
$$Fr-a(I_7, "\ast") = \text{clausura}(\exists E \rightarrow E \ast \circ E(e)) = I_6$$

$$Fr-a(I_7, "\wedge") = \text{clausura}(\exists E \rightarrow E \wedge \circ E(e)) = I_5$$

$$Fr-a(I_8, "\ast") = \text{clausura}(\exists E \rightarrow E \ast \circ E(e)) = I_6$$

$$Fr-a(I_8, "+") = \text{clausura}(\exists E \rightarrow E + \circ E(e)) = I_5$$

$$Fr-a(I_8, "\wedge") = \text{clausura}(\exists E \rightarrow E \wedge \circ E(e)) = I_5$$



	E'	E	*	()	id	u
0	1	1	2	2	3	3	4
1			5	6			
2		7		2	3	3	4
3							
4							
5		8		2	3	3	4
6		9		2	3	3	4
7			5	6	10		
8			5	6			
9			5	6			
10							

	Primeros	Siguientes
$\triangleright E'$	"(", id, n	\$
F	"(", id, n)", "+", "

- $P_1 = \{1'\} \quad E' \rightarrow E -$
 1) $E \rightarrow E + E$:
 2) $E \rightarrow E * E$:
 3) $E \rightarrow (E)$:
 4) $E \rightarrow id$
 5) $E \rightarrow n$

Primeros (E) - 366 \subseteq Primeros (E') por (1)
 "(" \in Primeros (E) por (3)
 id \in Primeros (F) por (4)
 n \in Primeros (E) por (5)

Siguiente (E') \subseteq Siguiente (E) por (1)
 ")" \in Siguiente (E) por (3)
 "+" \in Siguiente (E) por (1)
 "*" \in Siguiente (E) por (2)

	+	*	()	id	n	\$	E'	E
0			d2		d3	d4			1
1	d5	d6						A	
2			d2		d3	d4			7
3	r1	r4			r1				
4	r5	r5			r5				10
5			d2		d3	d4			8
6			d2		d3	d4			9
7	d5	d6		d10					
8	d5,1	d6,1		r1					11
9	d5,r2	d6,r2		r2					12
10	r3	r3		r3					13

Ejemplo pg 890

$I_0 = \text{clausura}([S^* \rightarrow S, \$]^\ell) = [S \rightarrow S, \$], [S \rightarrow R, \$],$
 $\quad [R \rightarrow]$
 $I_0 = \text{clausura}([S^* \rightarrow S, \$]^\ell) = [S^* \rightarrow S, \$] [S \rightarrow L = R, \$],$
 $[S \rightarrow R, \$], [L \rightarrow *R], [L \rightarrow id], [R \rightarrow L, \$],$
 $[L \rightarrow *R, \$], [L \rightarrow id, \$]^\ell$
 $[S \rightarrow L = R, \$]$
 $\text{primero}(\beta\sigma) = \text{primero}(= R \$) = \beta = q$

$$J_{\sigma-a}(I_0, *) = \text{clausura}(\{[L \rightarrow * \circ R, \$]\}^\ell)$$

Ejemplo

	enam	id	3	{	}	;	,	\$	S	D	L
0	r2	r2	r2	r2	r2	r2	r2	r2			
1	d3	E1	E2	E2	E2	E2	E2	E2	Aceptar		
2	F1	r1									
3	E3	d4	E4	E5	E5	E5	E6				
4	E8	E7	d5	E8	E8	E8	E8	E8			
5		d7									
6											
7											
8											
9											
10											
11											

E1: símbolo inesperado.
 falta enam
 insertar "enam" en la entrada.

E2: símbolo inesperado
 eliminar de entrada.
 se esperaba enam

E3: símbolo inesperado.
 se esperaba id.
 Eliminar de entrada.

Ejemplo pg 389

	a	d	\$	s	c	
0	d3	d4	E1	1	z	
1	F2	E2	Aceptar			
2	d6	d7	E1			
3	d3	d4	E1			
4	r3	r3	(F3)			
5	E2	E2	r1			
6	d6	d7	E1	9		
7	(F2)	(F3)	r3			
8	r2	r2	F2			
9	(F2)	(F2)	r2			

E1 : Fin inesperado.
Fin del análisis.

E2 : Símbolo inesperado.
Se elimina de la entrada.

(E3 : Fin inesperado.
Insertar "c" en la entrada).

Pila	Entrada	Acción
0	add add \$	d3
0 a 3	ddadd \$	d4
0 a 3 d4	dadd \$	r3 : C → d
0 a 3 C	d add \$	r2 : C → aC
0 C 2	dadd \$	d7
0 C 2 d7	add \$	r3 : C → d
0 C 2 C 5	add \$	r1 : S → CC
0 S 1	add \$	E2
0 S 1	dd \$	E2
0 S 1	d \$	E2
0 S 1	\$	Aceptar.

5.- (H1)

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

$$1) (L_1 \cup L_2)^* \neq L_1^* \cup L_2^*$$

$$L_1 = \{a\} \quad (L_1 \cup L_2)^* = \{a, b\}^* \cup \{a, ab, ba, bba, aba, abb, baa, aab, aab, aaaa, aabb, abaa, abba, baaa, baa, aab, bab, aabb, abba, baaa, aaaa, aabb, abaa, abba, baaa, aaaa, aabb, bab\}$$

$$L_2 = \{b\}$$

$$L_1^* = \{a, aa, aaa, aaaa\}$$

$$L_2^* = \{b, bb, bbb, bbbb, \dots\}$$

$$L_1^* \cup L_2^* = \{a, aa, aaa, aaaa, b, bb, bbb, bbbb, \dots\} \neq (L_1 \cup L_2)^*$$

$$2) L_1(L_2, L_2 \cup L_1)^* \quad (L_1 \cup L_2)^* = L_1^* \cup L_2^*$$

$$L_1 = \{\epsilon, a\} \quad (L_1 \cup L_2)^* = \{\epsilon, a, \epsilon a, a\epsilon, \dots\} = \{\epsilon, a\}$$

$$L_2 = \{89\} \quad L_1^* = \{a, aa, aaa, \dots\}$$

$$L_2^* = \{89, 889, 8889, \dots\} = \{\epsilon\}$$

$$(L_1^* \cup L_2^*)^* = \{\epsilon, a, aa, aaa, \dots\} = (L_1 \cup L_2)^*$$

$$3) L_3 \cdot (L_2 - L_1) \neq L_3 L_2 - L_3 L_1$$

$$L_1 = \{a\}$$

$$L_2 = \{a\}$$

$$L_3 = \{a\}$$

$$L_2 - L_1 = \emptyset$$

$$L_3 (L_2 - L_1) = \{a\}$$

$$L_2 L_2 = \{aa\}$$

$$L_3 L_1 = \{aa\}$$

$$L_3 L_2 - L_3 L_1 = \emptyset$$

6.- (H1)

$$L = \{\epsilon, a\epsilon b, a\epsilon a\epsilon b, \dots, a\epsilon b a \epsilon b, \dots\}$$

11.- (H1)

a) 001^*

b) $(1+0)^* 00 (1+0)^*$

c) $(1+00)^* 0 (1+00)^*$

d) $(1+011)^*$

12.- (H1)

a) $a(a+b+c)^*a$

b) $(a(a+b+c)^*a^*) + ((a+b+c)^*a)$

c) $b^*(ab)^*b^*$

d) $(aa+b)^*a(aa+b)^*$

13.- (H1)

a) $aa(a+b)^* + (a+b)^*b$

b) $ab(a+b)^* + ba(a+b)^* + aa(a+b)^* + bb(a+b)^*$
 $(a+b)(a+b)^*$

14.- (H1)

• $(0+1)(0+1+2+3+4+5+6+7+8+9)(0+1+2+3+4+5+6+7+8+9)^*$

• $(1+2+3+4+5+6+7+8+9)^*(0+2+4+6+8)$

• $(1+2+3+4+5+6+7+8+9)^*(1+3+5+7+9)$

• $(\text{cero}+\epsilon)(\text{digito}^*\text{cero}^*\text{punto}+\text{punto})(\text{digito}\text{cero}^*)^* + \text{cero}\text{digito}^*$

15.- (H1)

identificadores: $(\text{guion}+\text{litteral})^*(\text{guion}+\text{litteral}+\text{digito})^*$

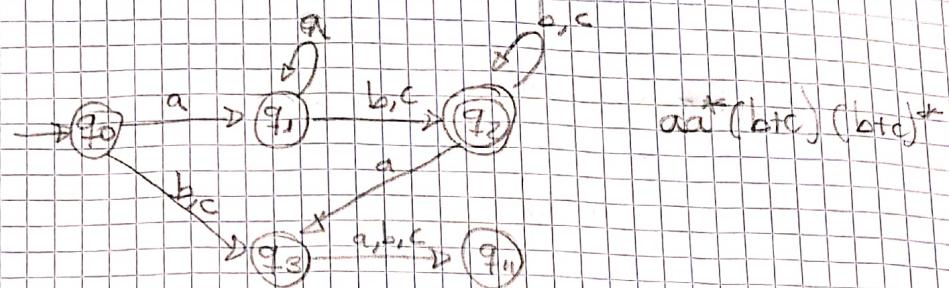
palabra clave: $(\text{void}+\text{struct}+\text{int}+\text{do}+\dots)^*$

número: $(\text{digito})^*$

asignación: $=$

18.- (H1)

a)



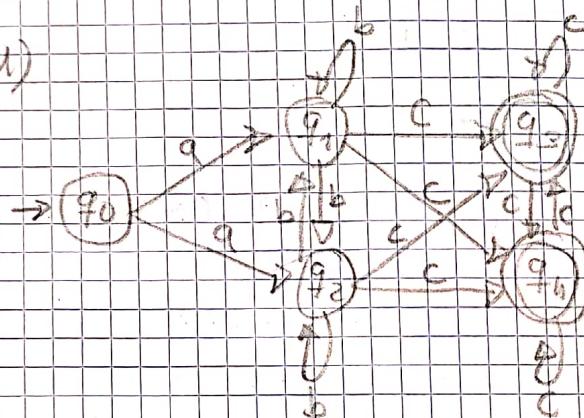
$$aa^*(b,c)(b,c)^*$$

$$(q_0, abcc) \vdash (q_1, abc) \vdash (q_1, bcc) \vdash (q_2, cc) \\ \vdash (q_2, c) \vdash (q_2, \emptyset)$$

$$(q_0, abca) \vdash (q_1, bca) \vdash (q_2, ca) \vdash (q_2, a) \vdash (q_3, \emptyset)$$

19.- (H1)

a)



$$\hat{\delta}(q_0, abcc) = \text{clausura} - \epsilon \left(\bigcup_{q' \in \delta(q_0, ab)} \delta(q', c) \right) = \\ = \text{clausura} - \epsilon(\emptyset) = \emptyset$$

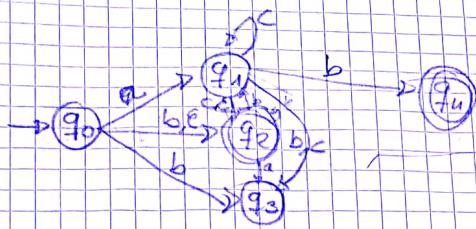
$$\hat{\delta}(q_0, abb) = \text{clausura} - \epsilon \left(\bigcup_{q' \in \delta(q_0, ab)} \delta(q', b) \right) = \\ = \text{clausura} - \epsilon(\emptyset) = \emptyset.$$

$$\hat{\delta}(q_0, ab) = \text{clausura} - \epsilon \left(\bigcup_{q' \in \delta(q_0, a)} \delta(q', b) \right) = \\ = \text{clausura} - \epsilon(\emptyset) = \emptyset.$$

$$\hat{\delta}(q_0, a) = \text{clausura} - \epsilon \left(\bigcup_{q' \in \delta(q_0, \emptyset)} \delta(q', b) \right) = \\ = \text{clausura} - \epsilon(\delta(q_0, b)) = \text{clausura} - \epsilon(\emptyset) = \emptyset$$

$$\hat{\delta}(q_0, \emptyset) = \text{clausura} - \epsilon(q_0) = \{q_0\}$$

b)



$$\hat{\delta}(q_0, abc) = \text{clausura} - \mathcal{E}\left(\bigcup_{q \in \delta(q_0, abc)} \delta(q, c)\right) =$$

$$= \text{clausura} - \mathcal{E}(\{q_1, q_2, q_3, q_4\}) = \{q_1, q_2, q_3, q_4\}$$

$$\hat{\delta}(q_0, ab) = \text{clausura} - \mathcal{E}\left(\bigcup_{q \in \delta(q_0, ab)} \delta(q, b)\right) =$$

$$= \text{clausura} - \mathcal{E}(\{q_2, q_3, q_4\}) = \{q_2, q_3, q_4\} = \{q_1, q_2, q_3, q_4\}$$

$$\hat{\delta}(q_0, ac) = \text{clausura} - \mathcal{E}\left(\bigcup_{q \in \delta(q_0, ac)} \delta(q, c)\right) = \text{clausura} - \mathcal{E}(\{q_3, q_4\}) =$$

$$= \{q_0, q_1, q_2, q_3, q_4\}$$

$$\hat{\delta}(q_0, a) = \text{clausura} - \mathcal{E}\left(\bigcup_{q \in \delta(q_0, a)} \delta(q, a)\right) =$$

$$= \text{clausura} - \mathcal{E}(\{\delta(q_0, a) \cup \delta(q_1, a) \cup \delta(q_2, a) \cup \delta(q_3, a) \cup \delta(q_4, a)\}) =$$

$$= \text{clausura} - \mathcal{E}(\{q_0, q_1, q_2, q_3, q_4\}) = \{q_0, q_1, q_2, q_3, q_4\}$$

$$\hat{\delta}(q_0, \epsilon) = \text{clausura} - \mathcal{E}(\{q_0\}) = \{q_0, q_1, q_2, q_3, q_4\} =$$

$$= \{q_0, q_1, q_2, q_3, q_4\}$$

~~$\hat{\delta}(q_0, abc) \cap F = \{q_2, q_4\} \neq \emptyset$~~

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$$b) p_0 = \text{clausura} - \mathcal{E}(q_0) = \{q_0, q_2, q_3, q_4, q_1\} = \{q_0, q_1, q_2, q_3, q_4\}$$

$$\text{clausura} - \mathcal{E}\left(\bigcup_{q \in p_0} \delta(q, a)\right) = \text{clausura} - \mathcal{E}(\{q_1, q_3, q_4\}) =$$

$$= \{q_0, q_1, q_2, q_3, q_4\} = p_1 \Rightarrow \delta_D(p_0, a) = \{q_0, q_1, q_2, q_3, q_4\} = p_0$$

$$\text{clausura} - \mathcal{E}\left(\bigcup_{q \in p_0} \delta(q, b)\right) = \text{clausura} - \mathcal{E}(\{q_1, q_2, q_3, q_4\}) =$$

$$= \{q_1, q_2, q_3, q_4\} = \delta_D(p_0, b) = p_1$$

$$\text{clausura} - \mathcal{E}\left(\bigcup_{q \in p_0} \delta(q, c)\right) = \text{clausura} - \mathcal{E}(\{q_1, q_2, q_3, q_4\}) =$$

$$= p_1 = \delta_D(p_0, c)$$

$$\text{clausura} - \bar{\epsilon}(\delta(p_1, a)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_1} \delta(q, a)\right) =$$

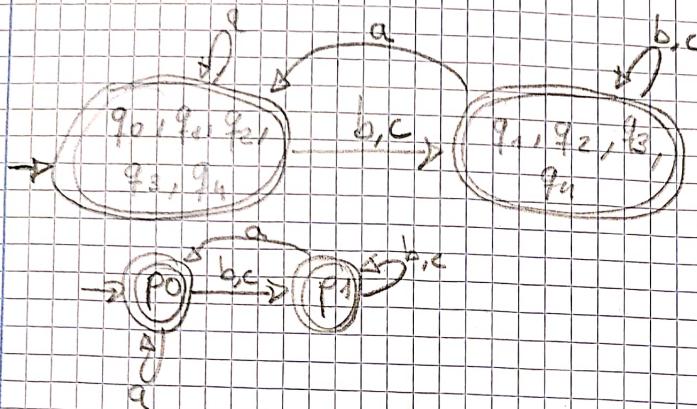
$$= \text{clausura} - \bar{\epsilon}(q_3, q_4, b) = \{q_0, q_1, q_2, q_3, q_4\} = \delta_D(p_1, a) = p_0$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_1, b)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_1} \delta(q, b)\right) =$$

$$= \text{clausura} - \bar{\epsilon}(q_1, q_3, q_4, q_2, b) = \{q_1, q_2, q_3, q_4\} = \delta_D(p_1, b) = p_1$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_1, c)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_1} \delta(q, c)\right) =$$

$$= \text{clausura} - \bar{\epsilon}(q_1, q_2, q_3, q_4, c) = \delta_D(p_1, c) = p_1$$



$$(p_0, abc) \vdash (p_0, abc) \vdash (p_0, bcd) \vdash (p_1, c) \vdash (p_1, c)$$

a)

$$p_0 = \text{clausura} - \bar{\epsilon}(q_0, c) = \{q_0\}$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_0, a)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_0} \delta(q, a)\right) =$$

$$= \text{clausura} - \bar{\epsilon}(q_1, q_2, b) = \{q_1, q_2\} = p_1 = \delta_D(p_0, a)$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_0, b)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_0} \delta(q, b)\right) =$$

$$= \text{clausura} - \bar{\epsilon}(\emptyset) = \emptyset = \delta_D(p_0, b)$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_0, c)) = \emptyset = \delta_D(p_0, c)$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_1, a)) = \text{clausura} - \bar{\epsilon}\left(\bigcup_{q \in p_1} \delta(q, a)\right) =$$

$$= \text{clausura} - \bar{\epsilon}(\emptyset) = \emptyset$$

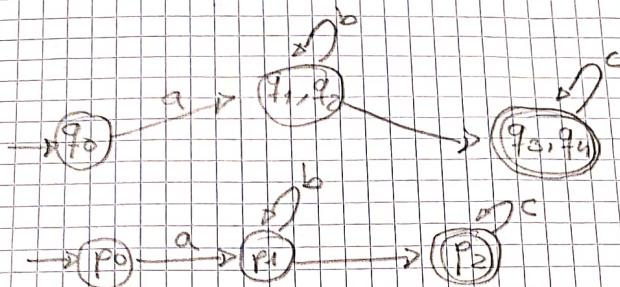
$$\text{clausura} - \bar{\epsilon}(\delta^*(p_1, b)) = \text{clausura} - \bar{\epsilon}(q_1, q_2, b) = \{q_1, q_2\} = p_1 = \delta_D(p_1, b)$$

$$\text{clausura} - \bar{\epsilon}(\delta^*(p_1, c)) = \{q_1, q_2\} = p_2 = \delta_D(p_1, c)$$

$$\text{clausura} - \epsilon(\delta(p_2, a)) = \emptyset = \delta_p(p_2, a)$$

$$\text{clausura} - \epsilon(\delta(p_2, b)) = \emptyset = \delta_p(p_2, b)$$

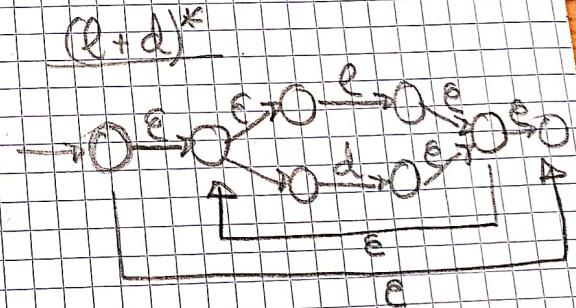
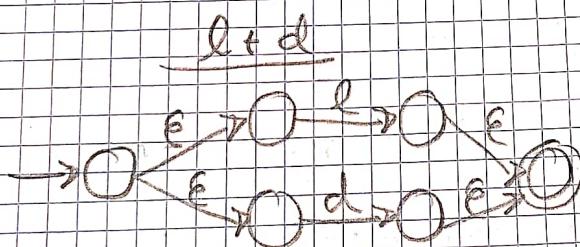
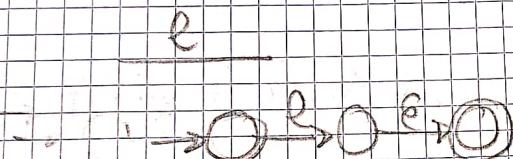
$$\text{clausura} - \epsilon(\delta(p_2, c)) = \{q_3, q_4\} = p_2 = \delta_p(p_2, c)$$



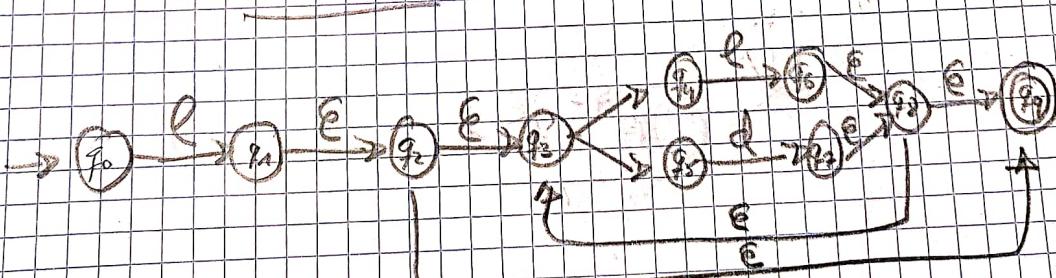
$$(p_0, abbcc) \vdash (p_1, bbcc) \vdash (p_1, bcc) \vdash (p_1, cc) \vdash (p_2, c) \vdash (p_2, \epsilon)$$

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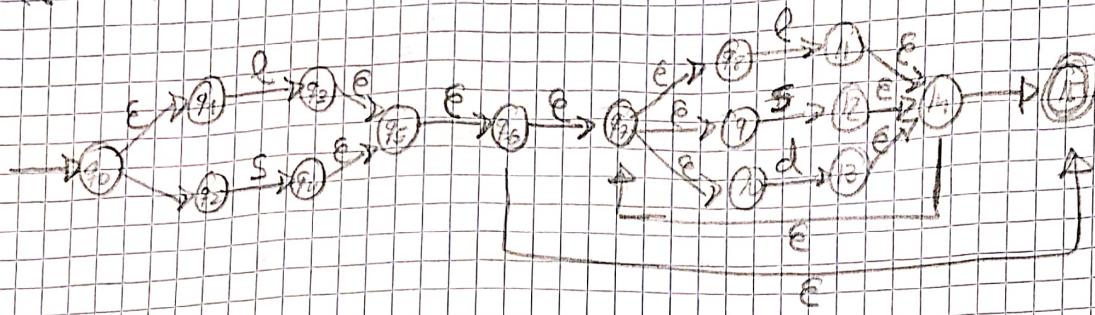
$$a) l(l+d)^*$$



$$\underline{l(l+d)^*}$$



$$(l+s)(l+s+d)^*$$



b) $\underline{l(l+d)}^*$

$$p_0 = \text{clausura} - \bar{e}(3q_0q) = 3q_0q$$

$$\begin{aligned} \text{clausura} - \bar{e}(\hat{d}(p_0, l)) &= \text{clausura} - \bar{e}(3q_1q) = 3q_1, q_2, q_3, q_4, q_5, q_6 \\ &= p_1 = \delta_D(p_0, l) \end{aligned}$$

$$\text{clausura} - \bar{e}(\hat{d}(p_0, d)) = \text{clausura} - \bar{e}(\emptyset) = \emptyset$$

$$\begin{aligned} \text{clausura} - \bar{e}(\hat{d}(p_1, l)) &= \text{clausura} - \bar{e}(3q_6q) = 3q_6, q_8, q_9, q_{10}, q_{11}, q_{12} \\ &= 3q_3, q_4, q_5, q_6, q_7, q_8, q_9 = p_2 = \delta_D(p_1, l) \end{aligned}$$

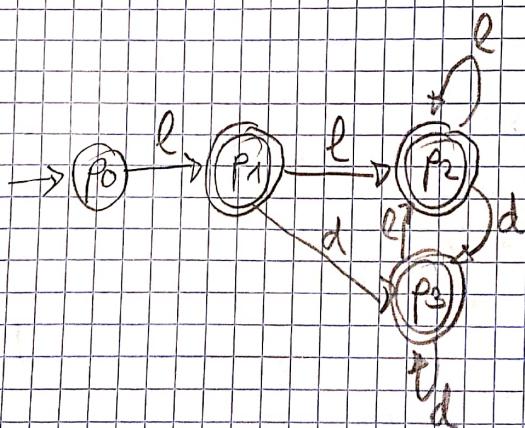
$$\text{clausura} - \bar{e}(\hat{d}(p_1, d)) = \text{clausura} - \bar{e}(3q_7q) =$$

$$= 3q_3, q_4, q_5, q_6, q_7, q_8, q_9 = p_3 = \delta_D(p_1, d)$$

$$\text{clausura} - \bar{e}(\hat{d}(p_2, l)) = \text{clausura} - \bar{e}(3q_6q) = p_2 = \delta_D(p_2, l)$$

$$\text{clausura} - \bar{e}(\hat{d}(p_2, d)) = \text{clausura} - \bar{e}(3q_7q) = p_3 = \delta_D(p_2, d)$$

$$\text{clausura} - \bar{e}(\hat{d}(p_3, l)) = \text{clausura} - \bar{e}(3q_6q) = p_2 = \delta_D(p_3, l)$$

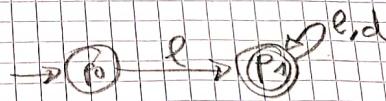


c) $p_0 = \{q_0\}$ $\delta_E(p_0, e) = E[\delta(q_0, e)] = E[q_1] = p_1$
 $p_1 = \{q_1, q_2, q_3\}$ $\delta_E(p_0, d) = -$

p_1	l	d
q_1	p_1	p_1
q_2	p_1	p_1
q_3	p_1	p_1

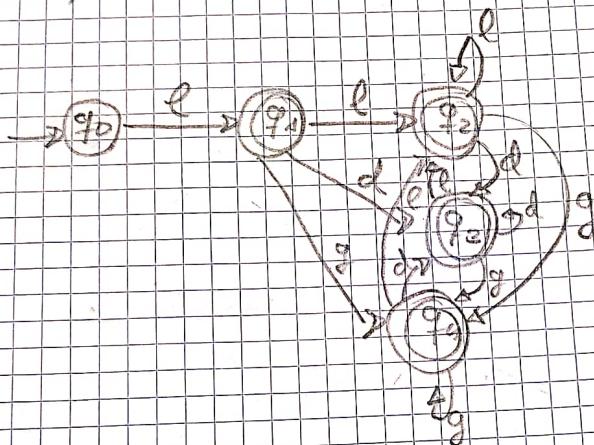
$$\delta_E(p_1, e) = p_1$$

$$\delta_E(p_1, d) = p_1$$



d) $(p_0, \text{data}) \vdash (q_1, \text{data}) \vdash (p_1, \text{t}_0) \vdash (p_1, \text{d}) \vdash (p_1, \text{e})$

22.-(ii)



$$p_0 = \{q_0\} \quad \delta_E(p_0, l) = E[q_1] = p_1 \quad \delta_E(p_0, d) = -$$

$$\delta_E(p_0, g) = -$$

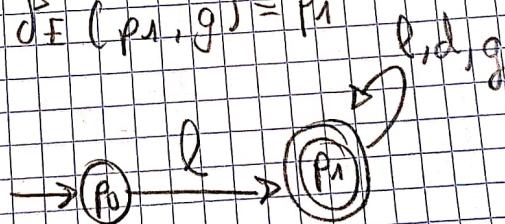
$$p_1 = \{q_1, q_2, q_3, q_4\}$$

p_1	l	d	g
q_1	p_1	p_1	p_1
q_2	p_1	p_1	p_1
q_3	p_1	p_1	p_1
q_4	p_1	p_1	p_1

$$\delta_E(p_1, l) = p_1$$

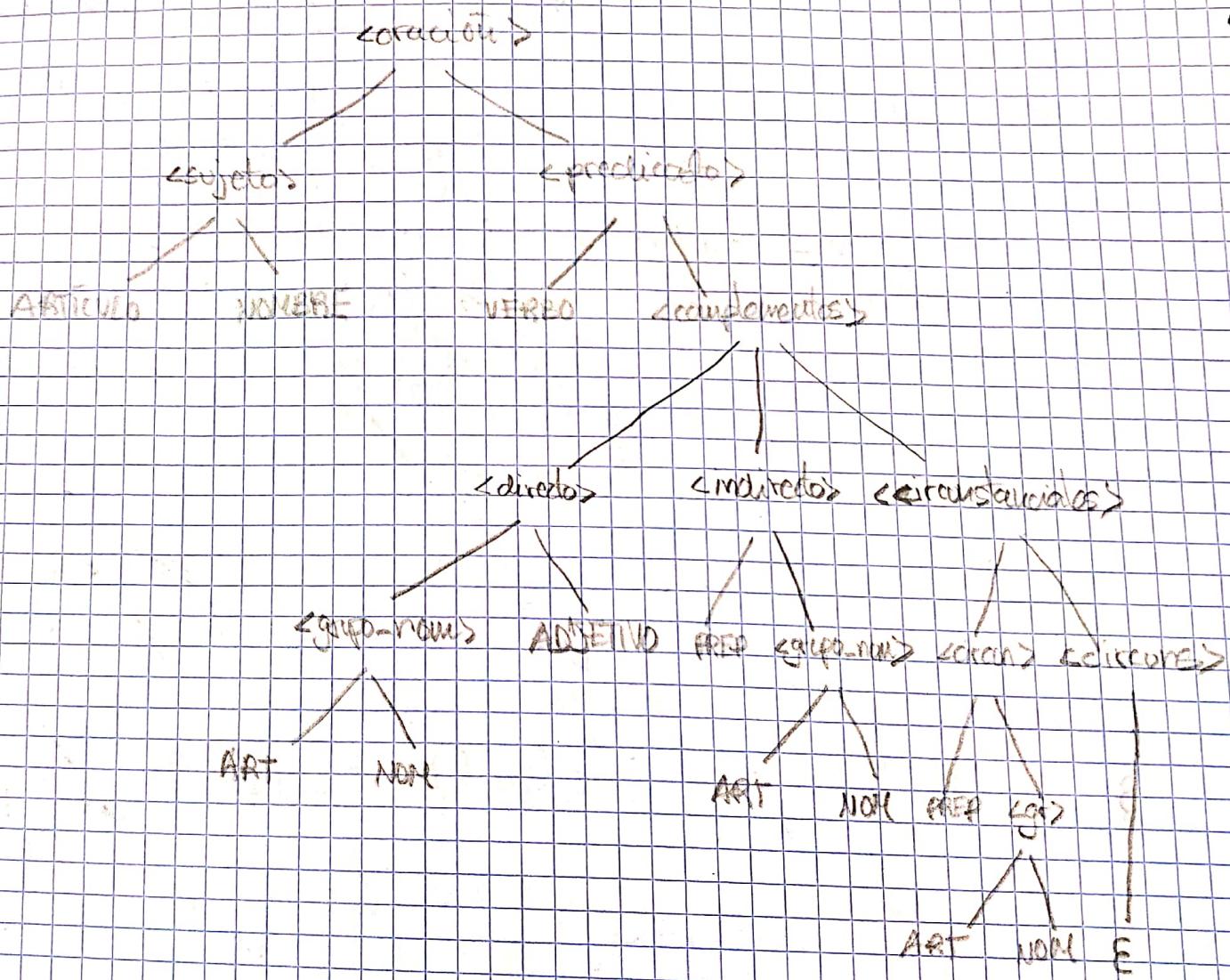
$$\delta_E(p_1, d) = p_1$$

$$\delta_E(p_1, g) = p_1$$



1. (412)

coración \Rightarrow < sujeto > < predicados > \Rightarrow grupo - nominal > < predicados >
 \Rightarrow ARTÍCULO NOMBRE < predicados > \Rightarrow ARTÍCULO NOMBRE VERBO < complementos >
 \Rightarrow ARTÍCULO NOMBRE VERBO < directo > < indirecto > < circunstanciales >
 \Rightarrow ARTÍCULO NOMBRE VERBO < grupo - nom > < adj > < indic > < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. < indic > < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP < grupo - nom > < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP ART. NOM < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP ART. NOM < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP ART. NOM < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP ART. NOM < circuns >
 \Rightarrow ART. NOM VER ART. NOM ADJ. PREP ART. NOM < circuns >



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d) $(+ (* \alpha \alpha) (* b b))$

E2DA

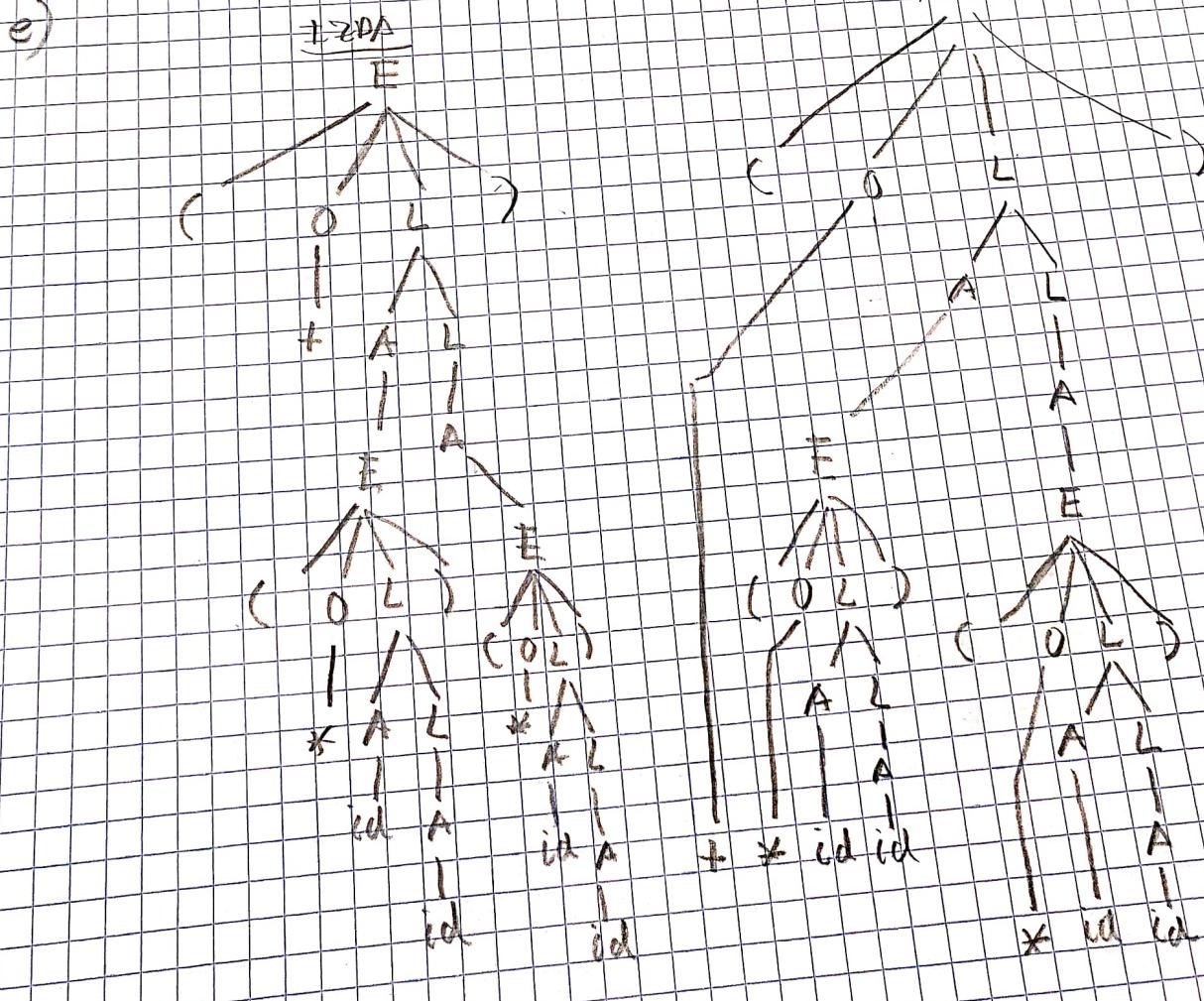
$$\begin{aligned}
 E &\xrightarrow{1} (OL) \xrightarrow{2} (+L) \xrightarrow{3} (+AL) \\
 &\xrightarrow{10} (+EL) \xrightarrow{1} (+((OL)L)) \xrightarrow{5} (+(*L)L) \xrightarrow{3} (+(*AL)L) \\
 &\xrightarrow{2} (+(*idL)L) \xrightarrow{5} (+(*idA)L) \xrightarrow{3} (+(*idid)L) \\
 &\xrightarrow{6} (+(*ididA)) \xrightarrow{10} (+(*ididE)) \xrightarrow{1} (+(*idid)(OL)) \\
 &\xrightarrow{3} (+(*idid)(*L)) \xrightarrow{7} (+(*idid)(*AL)) \xrightarrow{8} (+(*idid)(*idL)) \\
 &\xrightarrow{9} (+(*idid)(*idA))
 \end{aligned}$$

$$\begin{aligned}
 P = 3 & \lambda E \Rightarrow (OL) \\
 \Rightarrow & OL \Rightarrow + \\
 \Rightarrow & + \Rightarrow * \\
 \Rightarrow & * \Rightarrow / \\
 \Rightarrow & / \Rightarrow A \\
 \Rightarrow & A \Rightarrow id \\
 \Rightarrow & id \Rightarrow A \\
 \Rightarrow & A \Rightarrow id \\
 \Rightarrow & id \Rightarrow A
 \end{aligned}$$

DCHIA

$$\begin{aligned}
 E &\xrightarrow{1} (OL) \xrightarrow{2} (OAL) \xrightarrow{6} (OA A) \xrightarrow{10} (OAE) \xrightarrow{1} (OA(OL)) \\
 &\xrightarrow{3} (OA(OAL)) \xrightarrow{5} (OA(OAA)) \xrightarrow{8} (OA(OAd)) \\
 &\xrightarrow{2} (OA(Oidid)) \xrightarrow{5} (OA(*idid)) \xrightarrow{10} (OE(+idid)) \\
 &\xrightarrow{4} (O(OL)(+idid)) \xrightarrow{3} (O(OL)(*idid)) \\
 &\xrightarrow{5} (O(OAA)(*idid)) \xrightarrow{8} (O(OAid)(*idid)) \\
 &\xrightarrow{2} (O(Oidid)(*idid)) \xrightarrow{5} (O(*idid)(*idid)) \\
 &\xrightarrow{9} (+(*idid)(*idid))
 \end{aligned}$$

e)



5-H2

$$L_1 = \{x \mid x = a^i b^j \wedge i, j \in \{0, 1\}\}$$

- 1) $S \rightarrow A$
- 2) $A \rightarrow aAb$
- 3) $A \rightarrow ab$

$$L_2 = \{a^i c^j b^l \mid i, j, l \geq 0\}$$

- 1) $S \rightarrow aAb$
- 2) $A \rightarrow cB$
- 3) $A \rightarrow ab$
- 4) $B \rightarrow cc$

$$L_3 = \{a^i b^l \mid i, l \geq 0\}$$

- 1) $S \rightarrow A$
- 2) $A \rightarrow aab$
- 3) $A \rightarrow aaAb$

$$L_4 = \{a^i b^j c^k \mid i, j, k \geq 0\}$$

- 1) $S \rightarrow AB$
- 2) $A \rightarrow aAb$
- 3) $A \rightarrow ab$
- 4) $B \rightarrow bBc$
- 5) $B \rightarrow bC$

$$L_5 = \{x \mid x \text{ tiene igual n\'um de } 0's \text{ que de } 1's\}$$

- 1) $S \rightarrow A$
- 2) $A \rightarrow 0A1A$
- 3) $A \rightarrow \epsilon$
- 4) $A \rightarrow 1A0A$

111000

$$\begin{array}{l} S \xrightarrow{1} A \xrightarrow{3} 1A0A \xrightarrow{3} 11A0A0A \xrightarrow{3} 111A0A10A0A \\ \xrightarrow{5} 111000 \end{array}$$

$$L_6 = \{ww^R \mid w \in \{0, 1\}^*\} \quad w^R \text{ es el\'eo de } w$$

- 1) $S \rightarrow A$
- 2) $B \rightarrow 0A0$
- 3) $B \rightarrow 1A1$
- 4) $A \rightarrow \epsilon$

5-HR

- $(a == b \& \& (c != 0 || d >= 1))$

- 1) $S \rightarrow L$
- 2) $L \rightarrow (L)$
- 3) $L \rightarrow C$
- 4) $L \rightarrow C \ O \ L$

- 5) $C \rightarrow A \ R \ A$
- 6) $A \rightarrow id$
- 7) $A \rightarrow n$
- 8) $O \rightarrow \& \&$

- 9) $O \rightarrow ||$
- 10) $R \rightarrow =$
- 11) $R \rightarrow !=$
- 12) $R \rightarrow >=$

$S \xrightarrow{1} L \xrightarrow{2} (L) \xrightarrow{3} ((C \ O \ L)) \xrightarrow{4} ((A \ R \ A) \ O \ L) \xrightarrow{5} ((A \ R \ A) \ O \ L)$
 $\xrightarrow{6} (id \ R \ A \ O \ L) \xrightarrow{7} (id == A \ O \ L) \xrightarrow{8} (id == id \ O \ L)$
 $\xrightarrow{9} (id == id \ \& \& L) \xrightarrow{10} (id == id \ \& \& (L)) \xrightarrow{11} (id == id \ \& \& (A \ R \ A \ O \ L))$
 $\xrightarrow{12} (id == id \ \& \& (id \ R \ A \ O \ L)) \xrightarrow{13} (id == id \ \& \& (id == A \ O \ L))$
 $\xrightarrow{14} (id == id \ \& \& (id != n \ O \ L)) \xrightarrow{15} (id == id \ \& \& (id != n \ || \ L))$
 $\xrightarrow{16} (id == id \ \& \& (id != n \ || \ ())) \xrightarrow{17} (id == id \ \& \& (id != n \ || \ (A \ R \ A)))$
 ~~$\xrightarrow{18} (id == id \ \& \& (id != n \ || \ (id >= n)))$~~

6-H2

- Variables simples

- 1) $S \rightarrow S$
- 1) $S \rightarrow DS$
- 2) $D \rightarrow L : T$
- 3) $D \rightarrow L : T := u$

- 4) $L \rightarrow id$
- 5) $L \rightarrow id, L$
- 6) $T \rightarrow integer$
- 7) $T \rightarrow real$

7-H2

1) $S \rightarrow a$

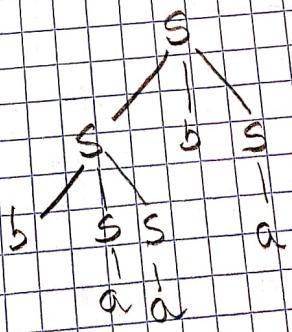
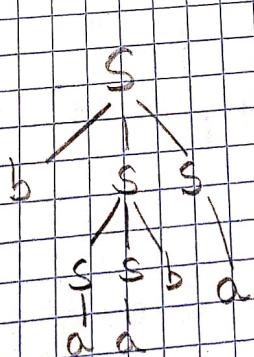
2) $S \rightarrow Sa$

3) $S \rightarrow bSS$

4) $S \rightarrow SbS$

5) $S \rightarrow Sbs$

$S \xrightarrow{3} bSS \xrightarrow{4} bSSbS \xrightarrow{5} babab$
 $S \xrightarrow{5} Sbs \xrightarrow{3} bSSbS \xrightarrow{4} bababa$



8.- H2

- $P = \{$
- 1) $S \rightarrow A$
 - 2) $S \rightarrow B$
 - 3) $A \rightarrow aAb$
 - 4) $A \rightarrow ab$
 - 5) $B \rightarrow abB$
 - 6) $B \rightarrow E$

k

$$L(G) = \{aaaabb, ab, ababab, \dots\}$$

$$S \xrightarrow{1} A \xrightarrow{4} ab$$

$$S \xrightarrow{2} B \xrightarrow{5} abB \xrightarrow{6} ab$$

$$1') S \rightarrow B$$

- $P_1 = \{$
- 1) $S \rightarrow A$
 - 2) $A \rightarrow aAb$
 - 3) $B \rightarrow abB$
 - 4) $A \rightarrow ab$

l

9.- H2

- 1) $A \rightarrow Aa$
- 2) $A \rightarrow bA$

$$A \xrightarrow{1} Aa \xrightarrow{2} bAa$$

$$A \xrightarrow{2} bA \xrightarrow{1} bAa$$

10.- H2

- $P = \{$
- 1) $S \rightarrow ACBd$
 - 2) $S \rightarrow BabB$
 - 3) $A \rightarrow Ad$
 - 4) $A \rightarrow BCa$
 - 5) $A \rightarrow ab$
 - 6) $B \rightarrow bBb$
 - 7) $B \rightarrow a$
 - 8) $C \rightarrow CAC$
 - 9) $C \rightarrow ACC$

l

	Viejo	Nuevo
	\emptyset	$3A, Bf$
Gru.	$3A, Bf$	$3A, B, Sf$
	$3A, B, Sf$	$3A, B, g_f$

Se quitan 8) y 9)
y portanto 1) y 4)

Así $3Sf$ $3S, B, aG, c, dG$
 $3S, B, aG$ $3S, B, a, bG$ \Rightarrow Se dejan todos

• P = 3 - - 9

Viejo	Nuevo
\emptyset	$3A^q$
$3A^q$	$3A^q$
$3A^q$	$3A, a, b, q$

Se dejan solo las
reglas de A

M = 112

1º

a)

Viejo	Nuevo
\emptyset	$3L^k$
$3L^k$	$3L^k$

$S \rightarrow L \text{id} := E ;$

$\hookrightarrow S \rightarrow L \text{id} := E ;$

$\hookrightarrow S \rightarrow \text{id} := E ;$

$L \rightarrow L \text{id} :=$

$\hookrightarrow L \rightarrow L \text{id} :=$

$\hookrightarrow L \rightarrow \text{id} :=$

$P' = \{ 1) S \rightarrow L \text{id} := E ; \}$

2) $S \rightarrow \text{id} := E ;$

3) $L \rightarrow L \text{id} :=$

4) $L \rightarrow \text{id} :=$

5) $E \rightarrow E + T$

6) $E \rightarrow T$

7) $T \rightarrow \text{id}$

8) $T \rightarrow u$

f

b)

Viejo	Nuevo
\emptyset	$3E^q$
$3E^q$	$E + T^q$
$3E, T^q$	$3E, T^q$

Se quita 6)

$M_S = 3S^q$

$NE = 3E, T^q$

$N_L = 3L^q$

$NT = 3T^q$

$P'' = \{ 1) S \rightarrow L \text{id} := E ; \}$

2) $S \rightarrow \text{id} := E ;$

3) $E \rightarrow E + T$

4) $E \rightarrow \text{id}$

5) $E \rightarrow u$

6) $L \rightarrow L \text{id} :=$

7) $L \rightarrow \text{id} :=$

8) $T \rightarrow \text{id}$

9) $T \rightarrow u$

8

12-HZ

$P = \emptyset$

$S \rightarrow (O \ L)$

$O \rightarrow < \ | \ \leq \ = \ | \ \geq \ | \ \geq \ =$

$L \rightarrow L \ A \ | \ A$

$A \rightarrow n \ | \ id$

(ε)

Ordenadas: {S, A, L, O}

- S no tiene símbolos menores.

- S no tiene rec. inmediata.

- A no tiene símbolos menores

- A no tiene rec. inmediata.

$L \rightarrow L \ n \ | \ L \ id \ | \ n \ | \ id$

$\alpha_1 \quad \alpha_2 \quad \beta_1 \quad \beta_2$

No tiene rec. inmediata por los 2 quinientos.

$L \rightarrow n \ | \ id \ |$

$n \ L \ | \ id \ L \ |$

$L' \rightarrow n \ | \ id \ |$

$n \ L' \ | \ id \ L' \ |$

- O no tiene símbolos menores

- O no tiene rec. inmediata.

$P' = \{ S \rightarrow (O \ L) \}$

$O \rightarrow < \ | \ \leq \ = \ | \ \geq \ | \ \geq \ =$

$L \rightarrow n \ | \ id \ | \ n \ L' \ | \ id \ L \ |$

$L' \rightarrow n \ | \ id \ | \ n \ L'' \ | \ id \ L'' \ |$

$(A \rightarrow n \ | \ id \)$

P

Factorizar

$L \rightarrow n \ L'' \ | \ id \ L'' \ |$

$L'' \rightarrow L' \ | \ e$

$L' \rightarrow n \ L'' \ | \ id \ L'' \ |$

F. Pg 280 (T3)

$E \rightarrow T \# F E'' | (E) E'' | id E'' | n E''$

$E'' \rightarrow F' | E$

$E' \rightarrow + T E''$

$T \rightarrow (E) T'' | id T'' | n T''$

$T'' \rightarrow T' | E$

$T' \rightarrow * F T''$

$F \rightarrow (E) | id | n$

15: H2

S → T L ;

T → int

T → float

L → id

L → id L'

L' → , id

L' → , id L'

S → T L B₁

B₁ → ;

T → int

T → float

L → id

L → B₂ L'

B₂ → id

L' → B₃ B₂ L

B₃ → ;

L' → B₃ B₂ L

1) S → T C₁

2) C₁ → L B₁

3) B₁ → ;

4) T → int

5) T → float

6) L → id

7) L → B₂ L'

8) B₂ → id

9) L' → B₃ B₂ L

10) B₃ → ;

11) L' → B₃ C₂

12) L' → B₂ L'

b) {S, T, L, L', B₁, B₂, B₃, C₁, C₂}

C₁ → id ; | id L' ; ;

C₂ → id ; | id, id ; | id, id L'

Ejercicio (pg 32) T3

$$P = \{ S \rightarrow AB \}$$

$$A \rightarrow SB$$

$$A \rightarrow a$$

$$B \rightarrow BA$$

$$B \rightarrow d$$

6

$\{ S, A, B \}$

$$1) A \rightarrow ABB$$

$$\downarrow \quad \left\{ \begin{array}{l} A \rightarrow aA' | a \\ A' \rightarrow BB | BBA' \end{array} \right.$$

$$B \rightarrow BA' | d$$

$$\downarrow \quad \left\{ \begin{array}{l} B \rightarrow d | dB \\ B' \rightarrow A | AB' \end{array} \right.$$

$$P_1 = \{ S \rightarrow AP \}$$

$$A \rightarrow aA' | a$$

$$A' \rightarrow BB | BBA'$$

$$B \rightarrow d | dB'$$

$$B' \rightarrow A | AB'$$

6

2)

$$S \rightarrow aB | aA'B$$

$$P_2 = \{ S \rightarrow aB | aA'B \}$$

$$A \rightarrow a | aA'$$

$$A' \rightarrow BB | BBA'$$

$$B \rightarrow d | dB'$$

$$B' \rightarrow A | AB'$$

6

3)

$$A' \rightarrow dB | dB A' | dB B | dB' B A'$$

$$B' \rightarrow a | aA' | ab | aA' B'$$

13. 112

/ 3 A, E, T, P, F \

$$E \rightarrow E + T \mid T$$

\swarrow \searrow

a_i c_i

$$\left. \begin{array}{l} E \rightarrow TE' \\ E' \rightarrow +TE' \mid \epsilon \end{array} \right|$$

$$T \rightarrow T^* P \mid P$$

\swarrow \searrow

a_i c_i

$$\left. \begin{array}{l} T \rightarrow PT' \\ PT' \rightarrow *PT' \mid \epsilon \end{array} \right|$$

$$\begin{aligned} P = ? & \quad A \rightarrow id = E \\ & E \rightarrow T \mid FT \\ & T \rightarrow P \mid T^* P \\ & P \rightarrow FT^* P \\ & T^* \rightarrow (E) \mid n \mid id \end{aligned}$$

$$F \rightarrow (T) \mid (E+T) \mid n \mid id$$

$$\begin{aligned} P' = ? & \quad 1) A \rightarrow id = E \quad 7) T^* \rightarrow \epsilon \\ & 2) E \rightarrow TE' \quad 8) F \rightarrow (T) \\ & 3) E' \rightarrow TTE \quad 9) F \rightarrow (ET) \\ & 4) E' \rightarrow \epsilon \quad 10) F \rightarrow n \\ & 5) T \rightarrow PT \quad 11) F \rightarrow id \\ & 6) T \rightarrow *PT \quad 12) P \rightarrow F \\ & \quad \quad \quad 13) P \rightarrow T^* P \end{aligned}$$

$$5) h = (a^2 + b^2)^{0.5}$$

$$\begin{aligned} A &\stackrel{1}{\Rightarrow} id = E \stackrel{2}{\Rightarrow} id = TT \stackrel{3}{\Rightarrow} id = PT \stackrel{4}{\Rightarrow} id = FT^* PT \\ &\stackrel{5}{\Rightarrow} id = (E+T)^* PT \stackrel{6}{\Rightarrow} id = (TE' + T)^* PT \\ &\stackrel{7}{\Rightarrow} id = (AT'E' + T)^* PT \stackrel{8}{\Rightarrow} id = (FT^* PT'E' + T) \end{aligned}$$

7-113

$$\begin{aligned}
 P &= \{ S \rightarrow id := P \\
 &\quad P \rightarrow P \text{ or } D \\
 &\quad P \rightarrow D \\
 &\quad D \rightarrow D \text{ and } C \\
 &\quad D \rightarrow C
 \end{aligned}$$

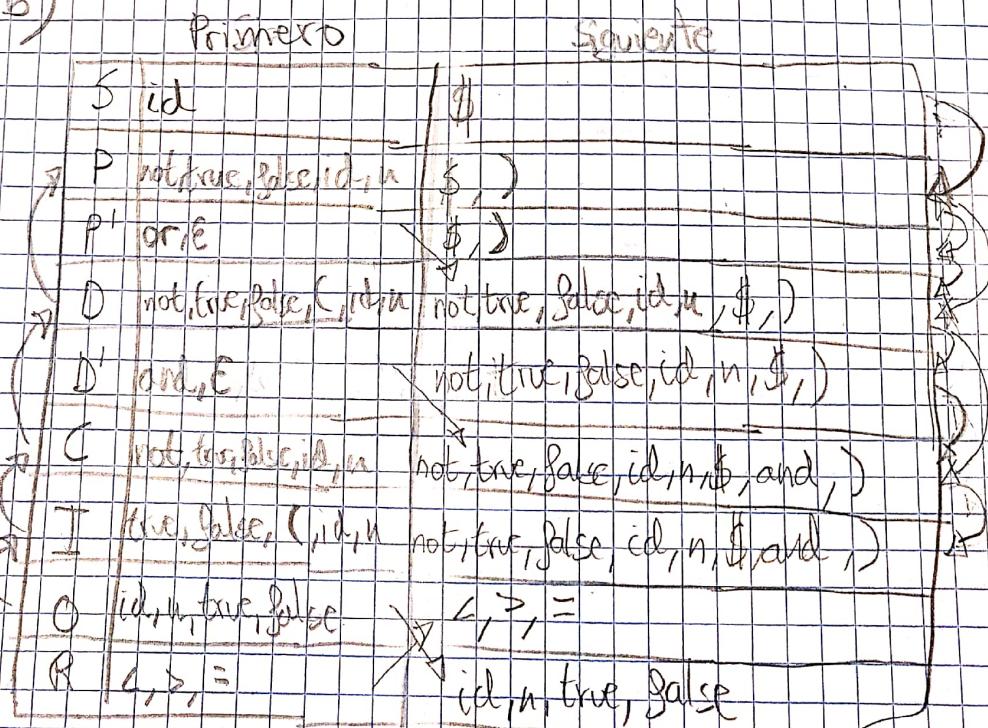
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a) {S, P, D, C, I, O, R}

$$\begin{aligned}
 P &\rightarrow P \text{ or } D \mid D \\
 &\quad \xrightarrow{\alpha} \quad \xrightarrow{\beta} \\
 \downarrow & \quad P \rightarrow DP^1 \\
 P^1 &\rightarrow \text{or } DP^1 \mid E
 \end{aligned}$$

$$\begin{aligned}
 D &\rightarrow D \text{ and } C \mid C \\
 &\quad \xrightarrow{\alpha} \quad \xrightarrow{\beta} \\
 \downarrow & \quad D \rightarrow CD^1 \\
 D^1 &\rightarrow \text{and } CD^1 \mid E
 \end{aligned}$$

b)



$$\begin{aligned}
 C &\rightarrow I \mid \text{not } (P) \\
 I &\rightarrow O \text{ R } O \\
 I &\rightarrow \text{true } \mid \text{false } \mid (f) \\
 O &\rightarrow id \mid n \mid \text{true } \mid \text{false} \\
 R &\rightarrow < \mid > \mid =
 \end{aligned}$$

$$\begin{aligned}
 C &\rightarrow I \mid \text{not } (DP^1) \mid \text{not} \\
 I &\rightarrow O \text{ R } O \mid \text{true } \mid \text{false } \mid (f)
 \end{aligned}$$

$$P^1 = \{ S \rightarrow id := P$$

$$P \rightarrow DP^1$$

$$P^1 \rightarrow \text{or } DP^1 \mid E$$

$$D \rightarrow CD^1 \mid C$$

$$D^1 \rightarrow \text{and } CD^1 \mid E$$

$$C \rightarrow I \mid \text{not } (DP^1)$$

$$I \rightarrow O \text{ R } O \mid \text{true } \mid \text{false } \mid (f)$$

$$O \rightarrow id \mid n \mid \text{true } \mid \text{false}$$

$$R \rightarrow < \mid > \mid =$$

{}

Ejemplo Pg 303 (7)

Primeros	Siguiente
$S \mid id$	$\$$
$E \mid (, id, u$	$\$,)$
$E' \mid +, \epsilon$	$\$,)$
$T \mid (, id, u$	$+, \$,)$
$T' \mid *, \epsilon$	$+, \$,)$
$F \mid (, id, u$	$\times, +, \epsilon,)$

$P = R \cdot S \Rightarrow id = E$	1
$F \Rightarrow TE'$	2
$E' \Rightarrow +TE'$	3
$E' \Rightarrow \epsilon$	4
$T \Rightarrow FT'$	5
$T' \Rightarrow DFT'$	6
$T' \Rightarrow DE$	7
$F \Rightarrow (E)$	8
$F \Rightarrow id$	9
$F \Rightarrow n$	10

• Siguiente (E) \subseteq Siguiente (T)

Primeros (E) \subseteq $\{ \epsilon \} \subseteq$ Siguiente (T)

Siguiente (E) \subseteq Siguiente (T')

Siguiente (E') \subseteq Siguiente (T')

Siguiente (E) \subseteq Siguiente (E')

Primeros (T') - $\{ \epsilon \} \subseteq$ Siguiente (T')

Siguiente (T') \subseteq Siguiente (T)

Siguiente (T) \subseteq Siguiente (F)

Siguiente (T') \subseteq Siguiente (F')

Ejemplo Pg 310 (14)

Primeros	Siguiente
$S \mid \epsilon, int, float$	$\$$
$D \mid int, float$	$int, float, \$$
$T \mid int, float$	id
$L \mid id$	$;$
$L' \mid , \epsilon$	$;$

$P = 3 \cdot 1) S \Rightarrow DS$

2) $S \Rightarrow \epsilon$

3) $D \Rightarrow T L$

4) $T \Rightarrow int$

5) $T \Rightarrow float$

6) $L \Rightarrow id L$

7) $L \Rightarrow id, id L$

8) $L \Rightarrow \epsilon$

Primeros (S) - $\{ \epsilon \} \subseteq$ Siguiente (D) por 1

Siguiente (S) \subseteq Siguiente (D) por 1 y 2

• ϵ Siguiente (L) por 3

Primeros (L) - $\{ \epsilon \} \subseteq$ Siguiente (T) por 3

Siguiente (L') \subseteq Siguiente (L')

Ejercicio Pg 333 (CT4)

	Primer	Siguiente
S	a, e, b, c	\$
A	a, e	b, \$, c
B	b, e	c, A
C	c, e	\$

- P=3
- 1) S → ABC
 - 2) A → aA
 - 3) A → E
 - 4) B → bB
 - 5) B → E
 - 6) C → CC
 - 7) C → E
 - 8)

Primer (B) - 388 ⊆ Siguiente (A) por 1

Primer (C) - 388 ⊆ Siguiente (B) por 1

Siguiente (S) ⊆ Siguiente (C) por 1

Siguiente (S) ⊆ Siguiente (B) por 1, 7

Siguiente (S) ⊆ Siguiente (A) por 1, 5, 7

Ejercicio Pg 337 (CT4)

	id	=	+	*	()		n		\$
S	1									
E		2			2			2		
I			3			4			4	
T				5			5			
T'					7	6	7			
F							8	10		
									7	

	a	10	c	5
S	1	1	1	
A	2	3	3	3
B		4	5	5
C		1	6	7

Ejercicio Pg 350 (T4)

	;	int	float	id	,	\$
S		1	1		2	
D		3	3			
T		4	5			
L			6			
C	8			7	3	

Ejemplo Pg 352 (T4)

	id	()	:	int	float)	\$
S					1	1		2
D					3	3		
T					4	5		
P	7				6			
L					8			9

- P=3
 1) S → DS
 2) S → E
 3) D → T id(P);
 4) T → int
 5) T → float
 6) P → E
 7) P → id L
 8) L → E
 9) L → id L

	Primero	Siguiente
S	E, int, float	\$
D	int, float	int, float, \$
T	int, float	id
P	E, id)
L	E, ;)

Primero(S) - 3EP ⊆ Siguiente(D) por 1

Como $\epsilon \in \text{Primero}(S)$, Siguiente(S) ⊆ Siguiente(D)

id ∈ Siguiente(T) por 3

) ∈ Siguiente(P) por 3

Siguiente(P) ⊆ Siguiente(L)

int & (x)

$S \xrightarrow{1} DS \xrightarrow{3} T id(P); \xrightarrow{4} int id(P), \xrightarrow{5} int id(id L) \xrightarrow{6} int$

Ejercicio Pg 363 CT4

- P = 3
 1) $S \rightarrow \text{if } C \text{ then } S \text{ s}$
 2) $S \rightarrow \text{inst}$
 3) $S \rightarrow \text{else } S$
 4) $S \rightarrow E$
 5) $C \rightarrow \text{cond}$

Primero

$S \rightarrow \text{if, inst}$
 $S \rightarrow \text{else, E}$
 $C \rightarrow \text{cond}$

Siguiente

~~\$, else~~
~~\$, else~~
~~then~~

F

if then inst else cond \$

S	1	2		
S			3, 4	4
C				5

Ejercicio 1 Pg 551 (7a)

$$id = n^* (id + id) \$$$

Fila

\$ S

\$ E = id

\$ E =

\$ E

\$ E' T

\$ E' T' F

\$ E' T' n

\$ E' T'

\$ E' T' F*

\$ E' T' F

\$ E' T') E(

\$ E' T') E

\$ E' T') E' T

\$ E' T') E' T *

\$ E' T') E' T' id

\$ E' T') E' T') E

\$ E' T') E' T') E

\$ E' T') E' T') E T

\$ E' T') E' T') E T

\$ E' T') E' T') E T' F

Entrada

$id = n^* (id + id) \$$

$id = n^* (id + id) \$$

$= n^* (id + id) \$$

$n^* (id + id) \$$

$n^* (id + id) \$$

$n^* (id + id) \$$

$\times (id + id) \$$

$\times (id + id) \$$

$(id + id) \$$

Acción

1) $S \rightarrow id = E$

Emparejar

Emparejar

2) $E \rightarrow TE$

$E \rightarrow FT$

10) $F \rightarrow n$

Emparejar

6) $T \rightarrow \times FT$

Emparejar

8) $F \rightarrow (E)$

Emparejar

2) $E \rightarrow TE$

5) $T \rightarrow FT$

9) $F \rightarrow id$

Emp

7) $T \rightarrow \epsilon$

3) $E \rightarrow TE$

Imp

6) $T \rightarrow FT$

9) $F \rightarrow id$

!

2. 114

- 1) $S^1 \rightarrow S$
- $P = ?$ 2) $S \rightarrow SA$
- 3) $A \rightarrow id = L;$
- 4) $L \rightarrow n$
- 5) $L \rightarrow id = L$

$$\begin{aligned} I_0 &= \text{clausura } (\exists S^1 \rightarrow \bullet S \wedge) = \exists \cdot A(\bullet) = \\ &= \exists S^1 \rightarrow \bullet S, S \rightarrow \bullet SA, S \rightarrow \bullet A, A \rightarrow \bullet id = L; \end{aligned}$$

$$I_{r-a}(I_0, S) = \text{clausura } (\exists S^1 \rightarrow S \bullet \wedge) = \exists S^1 \rightarrow \bullet \wedge = I_1$$

$$I_{r-a}(I_0, A) = \text{clausura } (\exists S \rightarrow A \bullet \wedge) = \exists S \rightarrow A \bullet \wedge = I_2$$

$$I_{r-a}(I_0, id) = \text{clausura } (\exists A \rightarrow id \bullet \wedge) = \exists A \rightarrow id \bullet \wedge = L; \bullet = I_3$$

$$I_{r-a}(I_1, X) = \emptyset \quad \forall X \in V$$

$$I_{r-a}(I_2, X) = \emptyset \quad \forall X \in V$$

$$\begin{aligned} I_{r-a}(I_3, \wedge) &= \text{clausura } (\exists A \rightarrow id = \bullet L \bullet \wedge) = \\ &= \exists A \rightarrow id = \bullet L; L \rightarrow n, L \rightarrow \bullet id = L; \bullet = I_4 \end{aligned}$$

$$I_{r-a}(I_4, L) = \text{clausura } (\exists A \rightarrow id = L \bullet \wedge) = \exists A \rightarrow id = L \bullet \wedge = I_5$$

$$I_{r-a}(I_4, n) = \text{clausura } (\exists L \rightarrow n \bullet \wedge) = \exists L \rightarrow n \bullet \wedge = I_6$$

$$I_{r-a}(I_4, id) = \text{clausura } (\exists L \rightarrow id \bullet \wedge) = \exists L \rightarrow id \bullet \wedge = L; \bullet = I_7$$

$$I_{r-a}(I_5, ;) = \text{clausura } (\exists A \rightarrow id = L; \bullet \wedge) = \exists A \rightarrow id = L; \bullet \wedge = I_8$$

$$I_{r-a}(I_6, X) = \emptyset \quad \forall X \in V$$

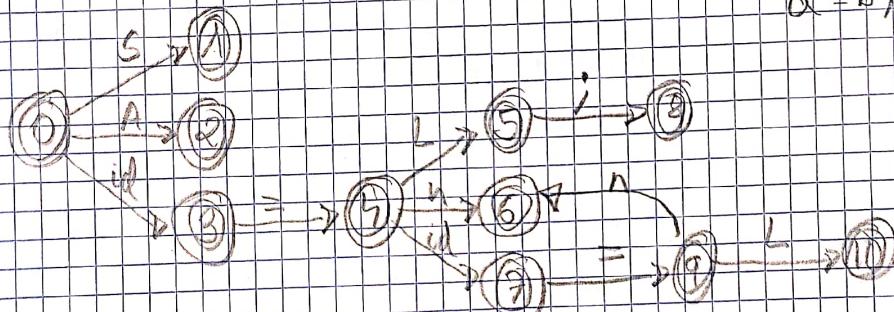
$$I_{r-a}(I_7, ;) = \text{clausura } (\exists L \rightarrow id = \bullet L \bullet \wedge) = \exists L \rightarrow id = \bullet L, L \rightarrow \bullet id = L; \bullet = I_9$$

$$I_{r-a}(I_8, X) = \emptyset \quad \forall X \in V$$

$$I_{r-a}(I_9, L) = \text{clausura } (\exists L \rightarrow id = L \bullet \wedge) = \exists L \rightarrow id = L \bullet \wedge = I_{10}$$

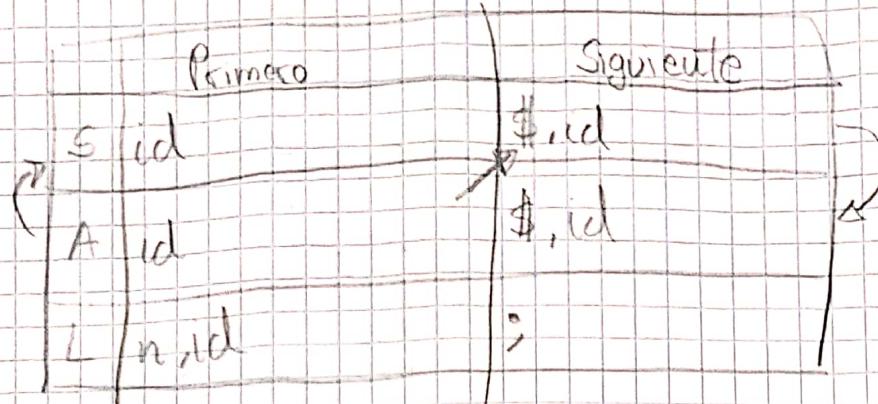
$$I_{r-a}(I_{10}, X) = \emptyset \quad \forall X \in V \quad I_{r-a}(I_9, n) = \text{clausura } (\exists L \rightarrow n \bullet \wedge) = \exists L \rightarrow n \bullet \wedge = I_6$$

b)



$$a = b;$$

c) d)



Siguiente (S) ⊆ Siguiendo (A) por 1

Primero (A) - REG ⊆ Siguiendo (S) por 1

; ∈ Siguiendo (L) por 3

	id	=	;	n \$	S A	L	
0	d3	E1	E2	E1	3	1	2
1	E2	E2	E2	E2	AC		
2	r2	r2*	r2*	r2+r2			
3	E2	d4	E2	E4	I3		
4	d7	E2	E5	A6	B		
5	E2	E2	d8	E2	I6		
6	r5*	r5*	r5	r5	r5*		
7	E2	d9	E2	E2	B		
8	r3	r3*	r3*	r3*	r3		
9	E2	E2	E2	d6	E3		
10	r5*	r5*	r5	r5	r5*		

E₁: S inesperado

Falta id

Insectas id u otra cosa

E₂: S inesperado

Se elimina de la pila

E₃: fin de entrada + neg.

Finaliza el análisis

E₄: simbolo inesperado

Falta F...

Insectas = entrada

E₅: simbolo inesperado

Falta id o u

Insectas id anterior

E₆: final inesperado

Falta ;

Insectas ; o otra cosa

Ejemplo 8 888(75)

$\rho = \lambda S \rightarrow S$

1) $S \rightarrow L = R$

2) $S \rightarrow R$

3) $L \rightarrow A = R$

4) $L \rightarrow id$

5) $R \rightarrow L$

$$I_0 = \text{clausura}(\exists [S \rightarrow S, \$]) =$$

$$= \exists [S \rightarrow S, \$], [S \rightarrow L = R, \$], [S \rightarrow R, \$], [L \rightarrow id, \$] \\ [L \rightarrow * R, \$], [R \rightarrow L, \$]$$

$$I_{c-a}(I_0, S) = \text{clausura}(\exists [S \rightarrow S, \$]) = \exists [S \rightarrow S, \$] = I_1$$

$$I_{c-a}(I_0, L) = \text{clausura}([S \rightarrow L = R, \$]) =$$

$$= \exists [S \rightarrow L = R, \$], [R \rightarrow L, \$] = I_2$$

$$I_{c-a}(I_0, R) = \text{clausura}(\exists [S \rightarrow R, \$]) = \exists [S \rightarrow R, \$] = I_3$$

$$I_{c-a}(I_0, *) = \text{clausura}(\exists [L \rightarrow * R, \$]) = \exists [L \rightarrow * R, \$] = I_4$$

$$I_{c-a}(I_0, id) = \text{clausura}(\exists [L \rightarrow id, \$]) = \exists [L \rightarrow id, \$] = I_5$$

$$I_{c-a}(I_0, *) = \text{clausura}(\exists [L \rightarrow id, \$]) = \exists [L \rightarrow id, \$] = I_6$$

$$I_{c-a}(I_1, X) = \emptyset \quad \forall X \in V$$

$$I_{c-a}(I_2, *) = \text{clausura}(\exists [S \rightarrow L = R, \$]) = \exists [S \rightarrow L = R, \$] = I_7$$

$$I_{c-a}(I_3, X) = \emptyset \quad \forall X \in V$$

$$I_{c-a}(I_4, R) = \text{clausura}(\exists [L \rightarrow * R, \$]) = \exists [L \rightarrow * R, \$] = I_8$$

$$I_{c-a}(I_5, L) = \text{clausura}(\exists [R \rightarrow L, \$]) = \exists [R \rightarrow L, \$] = I_9$$

$$I_{c-a}(I_6, *) = \text{clausura}(\exists [L \rightarrow * R, \$]) =$$

$$= \exists [L \rightarrow * R, \$], [R \rightarrow L, \$] = I_{10}$$

$$I_{c-a}(I_7, id) = \text{clausura}(\exists [L \rightarrow id, \$]) = \exists [L \rightarrow id, \$] = I_{11}$$

$$I_{c-a}(I_8, X) = \emptyset \quad \forall X \in V$$

$$I_{c-a}(I_9, R) = \text{clausura}(\exists [S \rightarrow L = R, \$]) = \exists [S \rightarrow L = R, \$] = I_{12}$$

$$I_{c-a}(I_{10}, L) = \text{clausura}(\exists [R \rightarrow L, \$]) = \exists [R \rightarrow L, \$] = I_{13}$$

$$I_{c-a}(I_{11}, *) = \text{clausura}(\exists [L \rightarrow * R, \$]) =$$

$$= \exists [L \rightarrow * R, \$], [R \rightarrow L, \$], [L \rightarrow * R, \$], [L \rightarrow id, \$] = I_{14}$$

$$I_{c-a}(I_{12}, id) = \text{clausura}(\exists [L \rightarrow id, \$]) = \exists [L \rightarrow id, \$] = I_{15}$$

$$I_{c-a}(I_{13}, X) = \emptyset \quad \forall X \in V$$

$$I_{c-a}(I_{14}, R) = \emptyset \quad \forall X \in V$$

$$I_{c-a}(I_{15}, X) = \emptyset \quad \forall X \in V$$

$$Tr-a(T_{11}, \$) = clausura(\{L \rightarrow \star^* R, \$\}^*) = T_{14} \rightarrow \star^* R, \$ \}^* \boxed{\{L\}}$$

$$Tr-a(T_{11}, L) = clausura(\{R \rightarrow L^*, \$\}^*) = T_{10}$$

$$Tr-a(T_{11}, *) = clausura(\{A \rightarrow \star^* R, \$\}^*) = T_1$$

$$Tr-a(T_{11}, id) = clausura(\{L \rightarrow id, \$\}^*) = T_{12}$$

$$Tr-a(T_{12}, x) = \emptyset \nmid x \in V$$

$$Tr-a(T_{13}, x) = \emptyset \nmid x \in V$$

	=	#	id	\$	1	S	L	R
0		d4	d5			1	2	3
1								
2	d6			r5				
3				r2				
4		d4 d5						
5	r4			r4				
6		d11 d12						
7	r3			r3				
8	r5			r5				
9				r4				
10				r5				
11		d11 d12						
12				r4				
13				r3				
						10	13	

2-H4

e)

Pila

0
0
0 id 3
0 id 3 = 4
0 id 3 = 4 a 7
0 id 3 = 4 a 7 = 9
0 id 3 = 4 a 7 = 9 b
0 id 3 = 4 a 7 = 9 L 10
0 id 3 = 4 L 5
0 id 3 = 4 L 5 ; 8
0 A L
0 S A

Entrada

= a == b 1 ; \$
id = a == b 1 ; \$
= a == b 1 ; \$
a == b 1 ; \$
= = b 1 ; \$
= b 1 ; \$
b 1 ; \$
; \$
; \$
; \$
; \$
; \$
; \$
; \$
; \$

Acción

E1: Insertar id
d3
d4
d7
d9
E2: Eliminar =
E2: Eliminar id
d6
r4: L → n
r5: L → id = L
d8
r3: A → id = L ;
r2: S → A
Acepta

3-H4

1) $S^1 \rightarrow S$
 $P = \{1\} S \rightarrow SD$

2) $S \rightarrow D$
 3) $D \rightarrow e \cdot id \{L\}$
 4) $L \rightarrow id$
 5) $L \rightarrow L, id$
 6) $S \rightarrow S D^0 \epsilon = \boxed{I_1}$

$I_{r-a}(I_0, S) = \text{clausura}(\{S^1 \rightarrow S^0, S \rightarrow S^0 D^0\}) =$
 $\{S^1 \rightarrow S^0, S \rightarrow S^0 D^0, D \rightarrow e \cdot id \{L\}; \epsilon = \boxed{I_1}\}$

$I_{r-a}(I_1, D) = \text{clausura}(\{S \rightarrow SD^0 \epsilon\}) = \{S \rightarrow SD^0 \epsilon\} = \boxed{I_2}$

$I_{r-a}(I_1, e) = \text{clausura}(\{D \rightarrow e \cdot id \{L\}; \epsilon = \{D \rightarrow e \cdot id \{L\}; \epsilon = \boxed{I_3}\})$

$I_{r-a}(I_2, X) = \emptyset \quad \forall X \in V$

$I_{r-a}(I_3, id) = \text{clausura}(\{e \cdot id \cdot \{L\}; \epsilon = \{e \cdot id \cdot \{L\}; \epsilon = \boxed{I_4}\})$

$I_{r-a}(I_4, L) = \text{clausura}(\{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\}) =$
 $\{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\} = \boxed{I_5}$

$I_{r-a}(I_5, L) = \text{clausura}(\{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\}) =$
 $\{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\} = \boxed{I_6}$

$I_{r-a}(I_6, id) = \text{clausura}(\{L \rightarrow id \epsilon\}) = \{L \rightarrow id \epsilon\} = \boxed{I_7}$

$I_{r-a}(I_6, L) = \text{clausura}(\{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\}) = \{D \rightarrow e \cdot id \{L\}; L \rightarrow L^0, id \epsilon\} = \boxed{I_8}$

$I_{r-a}(I_8, L) = \text{clausura}(\{L \rightarrow L^0, id \epsilon\}) = \{L \rightarrow L^0, id \epsilon\} = \boxed{I_9}$

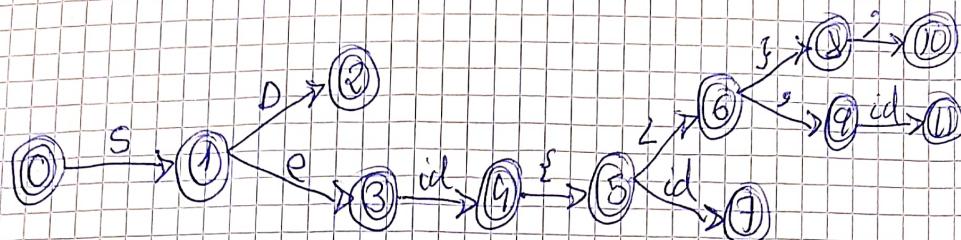
$$\text{Ir-a}(I_7, X) = \emptyset \quad \forall X \in V$$

$$\begin{aligned} \text{Ir-a}(I_8, ";\") &= \text{clausura}(\{\}) \Rightarrow e \in \text{id}\{\}_{\mathcal{L}} ; ; \circ \emptyset = \\ &= \emptyset \Rightarrow D \Rightarrow e \in \text{id}\{\}_{\mathcal{L}} ; ; \circ \emptyset = I_{10} \end{aligned}$$

$$\text{Ir-a}(I_9, id) = \text{clausura}(\{\} \rightarrow L \rightarrow L, \text{id} \circ \emptyset) = \emptyset \rightarrow L \rightarrow L, \text{id} \circ \emptyset = I_{11}$$

$$\text{Ir-a}(I_{10}, X) = \emptyset \quad \forall X \in V$$

$$\text{Ir-a}(I_{11}, X) = \emptyset \quad \forall X \in V$$



	Primero	Siguiente
S^*	e	\$
S	e	\$, e
D	e	\$, e
L	id	{, "}"

Siguiente(S') ⊆ Siguiente(S) por 1.

Siguiente(S) ⊆ Siguiente(D) por 2

Primer(D) - {e} ⊆ Siguiente(S) por 2.

g ∈ Siguiente(L) por 3

g ∈ Siguiente(L) por 5.

	e	id	{	}	;	\$		S	D	L
0	r2	r2	r2	r2	r2	r2	r2	1		
1	d3	E1	E2	E2	E2	E2	Ac		2	
2	r1	r1	r1	r1	r1	r1	r1			
3	E2	d4	E3	E2	E2	E2	E4			
4	E2	E5	d5	E2	E2	E2	E4			
5	E2	d7	E2	E3	E2	E3	E4		6	
6	E2	E6	E2	d8	E7	d9	E4			E1: Síntesis inesperada. Falta "e"
7	r4	r4	r4	r4	r4	r4	r4			E2: Síntesis inesperada. Se inserta "e"
8	E8	E2	E2	E2	d10	E2	E8			E3: Síntesis inesperada. Falta id. Se inserta id.
9	E2	d11	E2	E3	E2	E2	E4			E4: Final inesperado. Fin del análisis.
10	r3	r3	r3	r3	r3	r3	r3			E5: Síntesis inesperada. Falta [
11	r5	r5	r5	r5	r5	r5	r5			E6: Síntesis inesperada. Falta], "Anular"; E7: Anular ? E8: Anular ;

Pila	Entrada	Acción
0	id ; \$	R2: S → E
0 S 1	id id ; \$	E1: Se inserta "e"
0 S 1	e id id ; \$	d3
0 S 1 e 3	id id id ; \$	d4
0 S 1 e 3 id h	id id id ; \$	d5
0 S 1 e 3 id h f 5	id id ; \$	d7
0 S 1 e 3 id h f 5 id 7	id ; \$	r4: L → id
0 S 1 e 3 id h f 5 L 6	id ; \$	E6: Anadir "
0 S 1 e 3 id h f 5 L 6	id ; \$	d9
0 S 1 e 3 id h f 5 L 6 , 9	id ; \$	d11
0 S 1 e 3 id h f 5 L 6 , 9 id 11	id ; \$	r5: L → L, id
0 S 1 e 3 id h f 5 L 6	id ; \$	E7: Anadir ?
0 S 1 e 3 id h f 5 L 6	id ; \$	d8
0 S 1 e 3 id h f 5 L 6 , 8	id ; \$	d10
0 S 1 e 3 id h f 5 L 6 , 8 ; 10	id ; \$	r3: D → e id ? L 4;
0 S 1 D 2	id ; \$	r1: S → SD
0 S 1	id ; \$	Aceptar

4.- Ay

a) LR(1)

$$\begin{aligned}
 I_0 &= \text{clausura } (R[S^* \rightarrow S, \$])^G = \\
 &= \{ [S^* \rightarrow S, \$], [S \rightarrow L \cdot pL, \$], [S \rightarrow L, \$], \\
 &\quad [L \rightarrow L \cdot d, d, \$], [L \rightarrow d, d, \$] \}^G
 \end{aligned}$$

$$P = \{ 1) S \rightarrow L \cdot pL \\ 2) S \rightarrow L \\ 3) L \rightarrow L \cdot d \\ 4) L \rightarrow d \}$$

$$\begin{aligned}
 Ir-a(I_0, S) &= \text{clausura } (R[S^* \rightarrow S, \$])^G = \{ [S \rightarrow S \cdot, \$] \}^G = I_1 \\
 Ir-a(I_0, L) &= \text{clausura } (R[S \rightarrow L \cdot pL, \$])^G = \{ [S \rightarrow L \cdot, \$], [L \rightarrow L \cdot d, d, \$] \}^G = I_2 \\
 Ir-a(I_0, d) &= \text{clausura } (R[L \rightarrow d \cdot, d, \$])^G = \{ [L \rightarrow d \cdot, d, \$] \}^G = I_3
 \end{aligned}$$

$$Ir-a(I_1, X) = \emptyset \quad \forall X \in V$$

$$\begin{aligned}
 Ir-a(I_2, p) &= \text{clausura } (R[S \rightarrow L \cdot p \cdot L, \$])^G = \{ [S \rightarrow L \cdot p \cdot L, \$] \}^G = I_4 \\
 &= \{ [L \rightarrow L \cdot d, \$], [L \rightarrow d, \$] \}^G = I_4
 \end{aligned}$$

$$Ir-a(I_2, d) = \text{clausura } (R[\$ \rightarrow L \cdot d \cdot, d, \$])^G = \{ [\$ \rightarrow L \cdot d \cdot, d, \$] \}^G = I_5$$

$$Ir-a(I_3, X) = \emptyset \quad \forall X \in V$$

$$Fr-a(I_4, L) = \text{clausura}(\{S \rightarrow LpL^0, \$\})^*, [L \rightarrow L^0 d, \$]^\infty =$$

$$= \{S \rightarrow LpL^0, \$\}, [L \rightarrow L^0 d, \$]^\infty \equiv I_6$$

$$Fr-a(I_4, d) = \text{clausura}(\{[L \rightarrow Ld^0, \$]\}^*) = \{[L \rightarrow Ld^0, \$]\}^* = I_3$$

$$Fr-a(I_5, X) = \emptyset \forall X \in V$$

$$Fr-a(I_6, d) = \text{clausura}(\{[L \rightarrow Ld^0, \$]\}^*) = \{[L \rightarrow Ld^0, \$]\}^* = I_3$$

$$Fr-a(I_7, X) = \emptyset \forall X \in V$$

$$Fr-a(I_8, X) = \emptyset \forall X \in V$$

	p	d	\$	S	L
0	E1	d3	E2	1	2
1	E3	E3	Acepta		
2	d4	d5	r2		
3	r4	r4	r4		
4	E1	d3	E2	5	
5	r3	r3	r3		
6	r1	d8	r1		
7	r0	d3	r3		
8	r1	r3	r3		

E1: Punto inesperado.
Falta digito.
Insertar d.

E2: final de entrada inesp.
Fin del análisis.

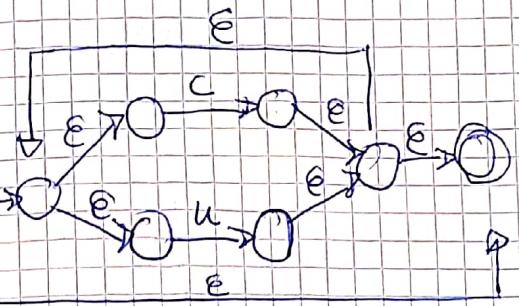
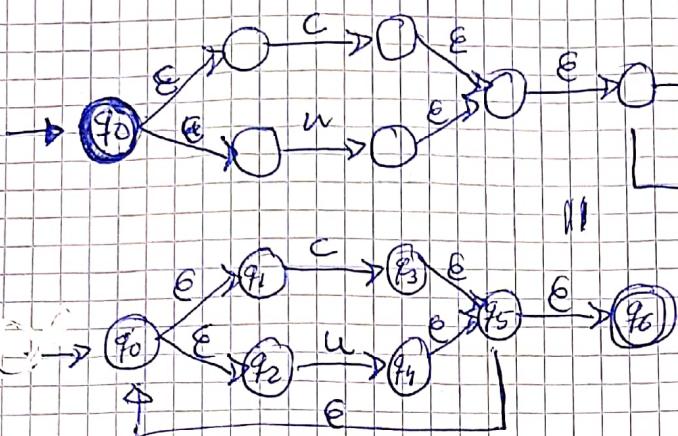
E3: símbolo inesperado.
Eliminar de la entrada

d)	pila	Entrada	Acción
	0	dppddpdplp	d3
	0d3	ppdddpdp	r4: L \rightarrow d
	0L2	ppdddpdp	d4
	0LRph4	pddpdplp	E1: Insertar d
	0LRph4	d pdplp	d3
	0LRph4d3	d pdplp	r4: L \rightarrow d
	0L2ph1L6	d pdplp	d8
	0L2ph1L6d7	d pdplp	r3: L \rightarrow Ld
	0L2ph1L6	pddpdplp	d1: S \rightarrow Lpl
	0S1	pddpdplp	r3: Eliminar
	0S1	#	Acepta

Examen Junio 2016

4.-

$$c + n(c+n)^*$$



$$p_0 = \text{clausura-}e(q_0) = \{q_0, q_1, q_2\}$$

$$\begin{aligned} \delta_D(p_0, c) &= \text{clausura-}e(\delta_N(p_0, c)) = \text{clausura-}e(\bigcup_{q \in p_0} \delta_N(q, c)) = \\ &= \text{clausura-}e(\delta_N(q_0, c) \cup \delta_N(q_1, c) \cup \delta_N(q_2, c)) = \\ &= \text{clausura-}e(\emptyset \cup \{q_3\} \cup \emptyset) = \{q_3, q_5, q_6, q_0, q_1, q_2\} = [p_1] \end{aligned}$$

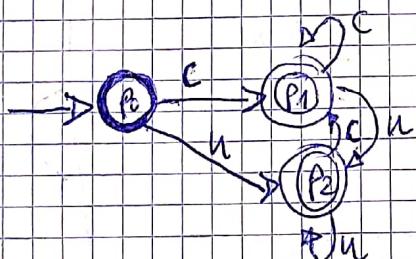
$$\begin{aligned} \delta_D(p_0, n) &= \text{clausura-}e(\delta_N(p_0, n)) = \text{clausura-}e(\{q_4\}) = \\ &= \{q_4, q_5, q_6, q_0, q_1, q_2\} = [p_2] \end{aligned}$$

$$\delta_D(p_1, c) = \text{clausura-}e(\delta_N(p_1, c)) = \text{clausura-}e(\{q_3\}) = p_1$$

$$\delta_D(p_1, n) = \text{clausura-}e(\delta_N(p_1, n)) = \text{clausura-}e(\emptyset) = p_2$$

$$\delta_D(p_2, c) = \text{clausura-}e(\delta_N(p_2, c)) = \text{clausura-}e(\{q_4\}) = p_1$$

$$\begin{aligned} \delta_D(p_2, n) &= \text{clausura-}e(\delta_N(p_2, n)) = \\ &= \text{clausura-}e(\{q_4\}) = p_2 \end{aligned}$$



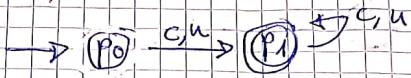
Kimilitar: Llamamos q_i a los p_i

$$p_0 \Rightarrow q_0 \epsilon$$

$$p_1 = q_1, q_2 \epsilon$$

p_0	c	u
q_0	p_1	p_1

p_1	c	u
q_1	p_1	p_1
q_2	p_1	p_1



$$(uucc, p_0) \leftarrow (ucc, p_1) \leftarrow (cc, p_1) \leftarrow (c, p_1) \leftarrow (\epsilon, p_1)$$

5-

a) Rec. y fact.

$q(S, D, L^i, T, A) \epsilon$

$$\begin{cases} S \rightarrow SD | D \\ \hookrightarrow \} S \rightarrow DS^i \\ \hookrightarrow \} S^i \rightarrow DS^i | \epsilon \end{cases}$$

$$\begin{array}{c} A \rightarrow A, T \text{id} | T \text{id} \\ \hookrightarrow A \rightarrow A, \text{ent id } \alpha_1 | N_A, \text{real id } \alpha_2 | \text{ent id } \beta_1 | \text{real id } \beta_2 \\ \downarrow \\ A^i \rightarrow T \text{id } A^i \\ \downarrow \\ A^i \rightarrow T \text{id } A^i | \epsilon \end{array}$$

- $P = \{ 1) S \rightarrow SD$
2) $S \rightarrow D$
3) $D \rightarrow T \text{id } (4)$,
4) $T \rightarrow \text{ent id}$
5) $T \rightarrow \text{real id}$
6) $L \rightarrow \epsilon$
7) $L \rightarrow A$
8) $A \rightarrow A, T \text{id }$
9) $A \rightarrow T \text{id } A^i$
10) $A^i \rightarrow T \text{id } A^i$
11) $A^i \rightarrow \epsilon$

Primero		Siguiente	
S	ent, real	\$	
S^i	$\epsilon, \text{ent, real}$	\$	
D	ent, real	ent, real	
T	ent, real	id	
$E, \text{ent, real}$)		
A	ent, real		
A^i, ϵ			

- $P' = \{ 1) S \rightarrow DS^i$
2) $S^i \rightarrow DS^i$
3) $S^i \rightarrow \epsilon$
4) $D \rightarrow T \text{id } (L)$,
5) $T \rightarrow \text{ent id}$
6) $T \rightarrow \text{real id}$
7) $L \rightarrow \epsilon$
8) $L \rightarrow A$
9) $A \rightarrow T \text{id } A^i$
10) $A^i \rightarrow T \text{id } A^i$
11) $A^i \rightarrow \epsilon$

	id	()	;	ent	real	,	\$	
S	E1	E2	E2	E2	1	1	E2	E3	E1: Símbolo inesperado Falta tipo. Insertar ent.
S'	3*	3*	3*	3*	2	2	3*	3	E2: Símbolo inesperado Eliminar de entrada.
D	E1	E2	E2	E2	4	4	E2	E3	E3: Final de entrada inesp. Fin del análisis.
T	E1	E2	E2	E2	5	6	E2	E3	E4: Símbolo inesp. Falta id. Insertar id.
L	7*	7*	7	7	8	8	7*	7*	E5: Símbolo inesp. Falta C. Insertar C
A	E1	E2	E2	E2	9	9	E2	E3	E6: Final inesperado. Falta ; Insertar ;
A'	11*	11*	11	11*	11*	11*	10	11*	E7: Símbolo inesp. Falta) Insertar)
id	Fmp	E4	E4	E2	E2	E2	E2	E3	
(E2	Fmp	E5	E2	E5	E5	E2	E3	
)	E2	E2	Fmp	E2	E2	E2	E2	E3	
;	E2	E2	E2	Fmp	E2	E2	E2	E6	
ent					Fmp				
real						Fmp			
,							Emp.		
\$	E2	E2	E2	E2	E2	E2	E2	Aceptar	

real (entero entero a, entero b ;)

Pila

\$
\$S
\$S;D
\$S;T
\$S;L(id real)
\$S;L(id
\$S;L(id
\$S;L(id
\$S;L(
\$S;L(
\$S;L(
\$S;L(
\$S;L(
\$S;A' id T
\$S;A' id ent
\$S;A' id
\$S;A'
\$S;)

Entrada

real (ent ent a, ent b ;)
real (ent a, ent b ; \$)
real (ent a, ent b ; \$)
real (ent a, ent b ; \$)
(ent a, ent b ; \$)
ent a, ent b ; \$
a, ent b ; \$
ent b ; \$
ent b ; \$
(ent b ; \$)
ent b ; \$
ent b ; \$
ent b ; \$
b ; \$
; \$

Acción

- 1) S \rightarrow DS'
- 4) D \rightarrow T id (1);
- 6) T \rightarrow real
- E2: Eliminar (
- E2: Eliminar ent
- E2: Eliminar)
- E5: Insertar (
- E5: Insertar)
- 8) L \rightarrow A, 9) A \rightarrow T id A
- 5) T \rightarrow ent
- Emp.
- 11) A' \rightarrow ;
- E7: Insertar)

$\$ \ S^1 ;)$	$) ; \$$	Emp
$\$ \ S^1 ;$	$; \$$	Emp
$\$ \ S^1$	$\$$	$S^1 \rightarrow \emptyset$
$\$$		Acceptar

6.-

a) $L(R(0))$

$$\boxed{I_0} = \text{clausura } (\exists S^1 \rightarrow S \circ) = \\ = \exists S^1 \rightarrow S, S \rightarrow S \circ D, S \rightarrow \circ D, D \rightarrow \circ \text{Var } L : T ; \emptyset$$

$$Ir-a(I_0, S) = \text{clausura } (\exists S^1 \rightarrow S \circ, S \rightarrow S \circ D) = \\ = \exists S^1 \rightarrow S \circ, S \rightarrow S \circ D, D \rightarrow \circ \text{Var } L : T ; \emptyset = \boxed{I_1}$$

$$Ir-a(I_0, D) = \text{clausura } (\exists S^1 \rightarrow S \circ \text{Var } L : T ; \emptyset) =$$

$$= \exists D \rightarrow \text{Var } L : T, \forall L \rightarrow \circ L, id, L \rightarrow \circ id \emptyset = \boxed{I_2}$$

$$Ir-a(I_0, Var) = \text{clausura } (\exists D \rightarrow \text{Var } \circ L : T ; \emptyset) =$$

$$= \exists D \rightarrow \text{Var } \circ L : T, L \rightarrow \circ L, id, L \rightarrow \circ id \emptyset = \boxed{I_3}$$

$$Ir-a(I_0, D) = \text{clausura } (\exists S^1 \rightarrow S \circ \emptyset) = \exists S \rightarrow S \circ \emptyset = \boxed{I_4}$$

$$Ir-a(I_1, D) = \text{clausura } (\exists S^1 \rightarrow S \circ D \circ \emptyset) = \exists S \rightarrow S \circ D \circ \emptyset = \boxed{I_5}$$

$$Ir-a(I_1, Var) = \text{clausura } (\exists D \rightarrow \text{Var } \circ L : T ; \emptyset) = \boxed{I_3}$$

$$Ir-a(I_2, X) = \emptyset \forall X \in V$$

$$Ir-a(I_2, L) = \text{clausura } (\exists D \rightarrow \text{Var } L : T, L \rightarrow L \circ, id \emptyset) = \\ = \exists D \rightarrow \text{Var } L \circ : T, L \rightarrow L \circ, id \emptyset = \boxed{I_5}$$

$$Ir-a(I_3, id) = \text{clausura } (\exists L \rightarrow id \circ \emptyset) = \exists L \rightarrow id \circ \emptyset = \boxed{I_6}$$

$$Ir-a(I_5, ";") = \text{clausura } (\exists D \rightarrow \text{Var } L : T ; \emptyset) =$$

$$= \exists D \rightarrow \text{Var } L : T, T \rightarrow \circ \text{int}, T \rightarrow \circ \text{real} \emptyset = \boxed{I_7}$$

$$Ir-a(I_5, ",") = \text{clausura } (\exists L \rightarrow L, id \emptyset) = \exists L \rightarrow L, id \emptyset = \boxed{I_8}$$

$$Ir-a(I_6, X) = \emptyset \forall X \in V$$

$$Ir-a(I_7, T) = \text{clausura } (\exists D \rightarrow \text{Var } L : T \circ ; \emptyset) = \exists D \rightarrow \text{Var } L : T \circ ; \emptyset = \boxed{I_9}$$

$$Ir-a(I_7, cut) = \exists T \rightarrow \text{int} \circ \emptyset = \boxed{I_{10}}$$

$$Ir-a(I_7, real) = \exists T \rightarrow \text{real} \circ \emptyset = \boxed{I_{11}}$$

$$Ir-a(I_8, id) = \exists L \rightarrow L, id \circ \emptyset = \boxed{I_{12}}$$

$$Ir-a(I_9, ";") = \exists D \rightarrow \text{Var } L : T ; \circ \emptyset = \boxed{I_{13}}$$

$$i) S \rightarrow S$$

$$p = q) 1) S \rightarrow SD$$

$$2) S \rightarrow D$$

$$3) D \rightarrow \text{Var } L : T,$$

$$4) L \rightarrow L, id$$

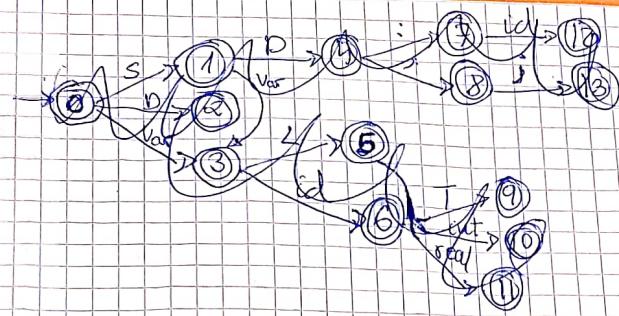
$$5) L \rightarrow id$$

$$6) T \rightarrow \text{int}$$

$$7) T \rightarrow \text{real}$$

$$\emptyset$$

d)



$P = 3$

- 1) $S \rightarrow S$
- 2) $S \rightarrow D$
- 3) $D \rightarrow \text{Var}$
- 4) $L \rightarrow ;$
- 5) $L \rightarrow \text{id}$
- 6) $T \rightarrow \text{int}$
- 7) $T \rightarrow \text{real}$

?

c)

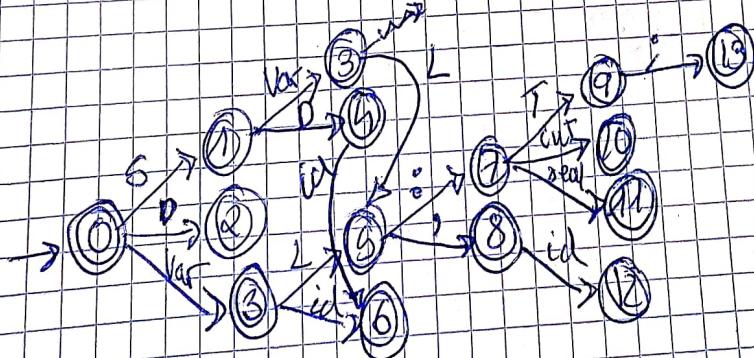
	Primer	Siguien
S^1	Var	;
S	Var	;, Var
D	Var	;, " "
L	id	;
T	int, real	;

d)

	Var	:	;	,	id	int	real	\$	S	D	L	T
0	d3	E1	E1	E1	E2	E1	E1	E3	1	2		
1	d3	E1	E1	E1	E2	E1	E1	Aceptar		4		
2	r2	r2	r2	r2	r2	r2	r2	r2				
3	E1	E4	E1	E4	d6	E1	E1	E3		5		
4	r1	r1	r1	r1	r1	r1	r1	r1				
5	E1	d7	E1	d8	E5	E6	E6	E3				
6	r5	r5	r5	r5	r5	r5	r5	r5				
7	E1	E1	E7	E1	E1	d10	d11	E3				
8	E1	E4	E1	E4	d12	E1	E1	E3				
9	E1	E1	d13	E1	E1	E1	E1	E3				
10	r6	r6	r6	r6	r6	r6	r6	r6				
11	r7	r7	r7	r7	r7	r7	r7	r7				
12	r4	r4	r4	r4	r4	r4	r4	r4				
13	r3	r3	r3	r3	r3	r3	r3	r3				

E1: Elimina
 E2: Ins. Var
 E3: Terminar
 E4: Ins. id
 E5: Ins. ;
 E6: Ins. :
 E7: Ins. int
 E8: Ins. ;

e)



g) a, b : Integer Integer ;

Pila

0
0
0 Var 3
0 Var 3 id 6
0 Var 3 L 5
0 Var 3 L 5 , 8
0 Var 3 L 5 , 8 id 12
0 Var 3 L 5
0 Var 3 L 5 : 7
0 Var 3 L 5 : 7 int 10
0 Var 3 L 5 : 7 T 9
0 Var 3 L 5 : 7 T 9 ; 13
0 D 2
0 S 1

Entrada

id, id : int int ; \$
Var id, id : int int ; \$
id, id : int int ; \$
id : int int ; \$
, id : int int ; \$
id : int int ; \$
id : int int ; \$
: int int ; \$
: int int ; \$
int int ; \$
int ; \$
int ; \$
; \$
\$
\$

Acció

E2 : Ins. Var
d3
d6
r5 : L → id
d8
d12
r4 : L → L, id
d7
d10
r6 : T → int
E1 : Borras int
d13
r3 : D → Var L : ;
r2 : S → D
Acceptar

7.-

$P = \emptyset$ 1) $S \rightarrow SD$

2) $S \rightarrow D$

3) $D \rightarrow \text{Type id} = \text{Record } L \text{ End} ;$

4) $L \rightarrow LA$

5) $L \rightarrow A$

6) $A \rightarrow I : B ;$

7) $I \rightarrow id, I$

8) $I \rightarrow id$

9) $B \rightarrow \text{array}[n..n] \text{ of } T$

10) $B \rightarrow T$

11) $T \rightarrow \text{string}$

12) $T \rightarrow \text{Integer}$