# Memoria de la Práctica de Procesadores de Lenguajes: Analizador Sintáctico

Diego José Abengózar Vilar, Alejandro García Castellanos, Ignacio Javier Encinas Ramos

# ${\rm Grupo}~82$

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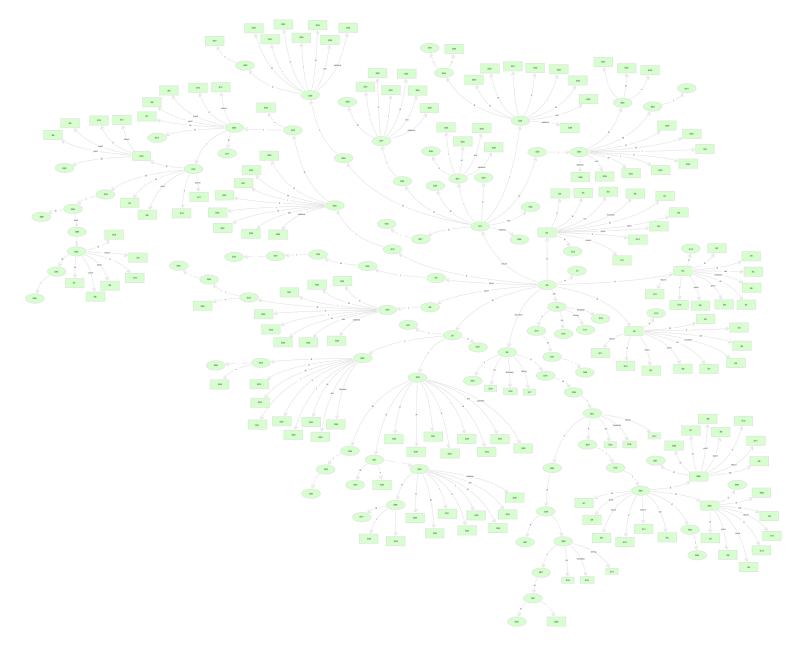
## 1 Diseño del Analizador Sintáctico

### 1.1 Gramática

```
Terminales = \{ ; \{ \} id ent cadena ( ) + < ! = | = var int \}
boolean \ string \ print \ input \ , \ return \ function \ if \ else \ \}
NoTerminales = \{ PDTFT1AKCSLMQS1GXEURVS2 \}
Axioma = P
Producciones = \{
P \rightarrow D P
P \rightarrow F P
P \rightarrow S P
D \rightarrow var T id ;
T \rightarrow int
T \rightarrow string
T \rightarrow boolean
F \rightarrow function T1 id (A) \{C\}
T1 \rightarrow lambda
T1 \rightarrow T
A \rightarrow T id K
A \rightarrow lambda
K \rightarrow lambda
K \rightarrow T id K
C \rightarrow D C
C \rightarrow S C
C \rightarrow lambda
S \rightarrow id L E;
S \rightarrow id \ (M);
S \rightarrow print (E);
S \rightarrow input \ (id);
S \rightarrow if (E) S1
S \rightarrow return X;
L \rightarrow |=
L \rightarrow =
M \rightarrow E Q
M \rightarrow lambda
Q \rightarrow lambda
Q \rightarrow E Q
S1 \rightarrow \{S2\}G
S1 \rightarrow S
G \rightarrow else \{ S2 \}
G \ \to \ lambda
X \rightarrow E
X \rightarrow lambda
E \rightarrow E < U
E \rightarrow U
U \rightarrow U + R
U \rightarrow R
R \rightarrow ! V
R \rightarrow V
V \rightarrow (E)
```

```
egin{array}{ll} V & 
ightarrow & id \ V & 
ightarrow & id \ (M) \ V & 
ightarrow & ent \ V & 
ightarrow & cadena \ S2 & 
ightarrow & S2 \ S2 & 
ightarrow & S2 \ P & 
ightarrow & lambda \ \ \end{array}
```

# 1.2 Autómata Reconocedor de Prefijos Viables<sup>1</sup>



<sup>&</sup>lt;sup>1</sup>Los estados con forma de rectángulo redondeado son aquellos con bucles a si mismos. La etiqueta de dicha arista es la misma que la arista que conecta dicho estado y su antecedente

#### 1.2.1 Estados del autómata

```
S_0=\{P1 \rightarrow \bullet P, P \rightarrow \bullet DP, P \rightarrow \bullet SP, P \rightarrow \bullet, D \rightarrow \bullet var T id;,
         F \rightarrow \bullet \text{ function } T1 \text{ id}(A)\{C\}, S \rightarrow \bullet \text{ id } L E;, S \rightarrow \bullet \text{ id}(M);
         S \rightarrow \bullet \text{ print}(E); , S \rightarrow \bullet \text{ input}(id); , S \rightarrow \bullet \text{ if}(E) S1,
         S \rightarrow \bullet return X;
S_1 = \{P1 \rightarrow P \bullet \}
S_2 = \{P \rightarrow D \bullet P, P \rightarrow \bullet DP, P \rightarrow \bullet SP, P \rightarrow \bullet , D \rightarrow \bullet var T id;,
         F \rightarrow \bullet function T1 id(A){C}, S \rightarrow \bullet id L E;, S \rightarrow \bullet id(M);
         S \rightarrow \bullet print(E); S \rightarrow \bullet input(id); S \rightarrow \bullet if(E) S1,
         S \rightarrow \bullet return X;
S_3=\{P \rightarrow F \bullet P, P \rightarrow \bullet DP, P \rightarrow \bullet FP, P \rightarrow \bullet SP, P \rightarrow \bullet,
         D \rightarrow \bullet \text{ var } T \text{ id}; F \rightarrow \bullet \text{ function } T1 \text{ id}(A) \{C\},
         S \rightarrow \bullet \text{ id } L E;, S \rightarrow \bullet \text{ id}(M);, S \rightarrow \bullet \text{ print}(E);
         S \rightarrow \bullet \text{ input (id)}; S \rightarrow \bullet \text{ if (E)} S1, S \rightarrow \bullet \text{ return } X;
S_4=\{P \rightarrow S \bullet P, P \rightarrow \bullet DP, P \rightarrow \bullet FP, P \rightarrow \bullet SP, P \rightarrow \bullet,
         D \rightarrow \bullet \text{ var } T \text{ id};, F \rightarrow \bullet \text{ function } T1 \text{ id}(A)\{C\},
         S \rightarrow \bullet id L E;, S \rightarrow \bullet id (M);, S \rightarrow \bullet print (E);,
         S \ \rightarrow \ \bullet \ input(id); \, , \ S \ \rightarrow \ \bullet \ if(E) \ S1 \, , \ S \ \rightarrow \ \bullet \ return \ X; \}
S_5 = \{D \rightarrow var \bullet T id;, T \rightarrow \bullet int, T \rightarrow \bullet string, T \rightarrow \bullet boolean\}
S_6=\{F \rightarrow function \bullet T1 \ id(A)\{C\}, \ T1 \rightarrow \bullet, \ T1 \rightarrow \bullet T,
        T \rightarrow \bullet \text{ int}, T \rightarrow \bullet \text{ string}, T \rightarrow \bullet \text{ boolean}
S_7 = \{S \rightarrow id \bullet L E; , S \rightarrow id \bullet (M); , L \rightarrow |=, L \rightarrow \bullet =\}
S_8 = \{S \rightarrow print \bullet (E); \}
S_9 = \{S \rightarrow input \bullet (id); \}
S_{10} = \{S \rightarrow if \bullet (E) S1\}
S_{11}\!\!=\!\!\{S \ \rightarrow\! \texttt{return} \ \bullet X; \,, \ X \ \rightarrow \ \bullet, \ X \ \rightarrow \ \bullet \ E, \ E \ \rightarrow \ \bullet \ E < U, \ E \ \rightarrow \ \bullet \ U,
         U \rightarrow \bullet U + R, U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E),
         V \rightarrow \bullet \text{ id}, V \rightarrow \bullet \text{ id}(M), V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{12} = \{P \rightarrow DP \bullet\}
S_{13} = \{P \rightarrow FP \bullet\}
S_{14} = \{P \rightarrow SP \bullet \}
S_{15}=\{D \rightarrow var \ T \bullet id;\}
S_{16} = \{T \rightarrow int \bullet \}
S_{17} = \{T \rightarrow string \bullet \}
S_{18} = \{T \rightarrow boolean \bullet \}
S_{19} = \{F \rightarrow function \ T1 \bullet id(A)\{C\}\}\
S_{20} {=} \{T1 \ \rightarrow T \ \bullet\}
S_{21} = \{L \rightarrow = \bullet\}
S_{22} = \{S \rightarrow id \ (\bullet M); , M \rightarrow \bullet E Q, M \rightarrow \bullet, E \rightarrow \bullet E < U, E \rightarrow \bullet U,
         U \rightarrow \bullet U + R, U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E),
         V \rightarrow \bullet \text{ id}, V \rightarrow \bullet \text{ id}(M), V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{23} = \{L \rightarrow |= \bullet\}
S_{24} = \{S \rightarrow print \ (\bullet E); , E \rightarrow \bullet E < U, E \rightarrow \bullet U, U \rightarrow \bullet U + R,
         U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E), V \rightarrow \bullet id,
         V \rightarrow \bullet id(M), V \rightarrow \bullet ent, V \rightarrow \bullet cadena
S_{25} = \{S \rightarrow input \ ( \bullet id ) \}
S_{26} = \{S \rightarrow if \ (\bullet E) \ S1, \ E \rightarrow \bullet E < U, \ E \rightarrow \bullet U, \ U \rightarrow \bullet U + R,
         U \ \rightarrow \ \bullet \ R, \ R \ \rightarrow \ \bullet \ ! \ V, \ R \ \rightarrow \ \bullet \ V, \ V \ \rightarrow \ \bullet \ (E) \,, \ V \ \rightarrow \ \bullet \ id \,,
         V \rightarrow \bullet id(M), V \rightarrow \bullet ent, V \rightarrow \bullet cadena)
S_{27} = \{S \rightarrow return \ X \bullet ; \}
S_{28} = \{X \rightarrow E \bullet, E \rightarrow E \bullet < U\}
S_{29} = \{E \rightarrow U \bullet, U \rightarrow U \bullet + R\}
S_{30} = \{U \rightarrow R \bullet \}
S_{31} = \{R \rightarrow ! \bullet V, V \rightarrow \bullet (E), V \rightarrow \bullet id, V \rightarrow \bullet id(M),
        V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{32} = \{R \rightarrow V \bullet \}
S_{33}=\{V \rightarrow (\bullet E), E \rightarrow \bullet E < U, E \rightarrow \bullet U, U \rightarrow \bullet U + R,
```

```
U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E), V \rightarrow \bullet id,
         V \rightarrow \bullet id(M), V \rightarrow \bullet ent, V \rightarrow \bullet cadena
S_{34} = \{V \rightarrow id \bullet, V \rightarrow id \bullet (M)\}
S_{35} = \{V \rightarrow ent \bullet \}
S_{36} = \{V \rightarrow cadena \bullet \}
S_{37} = \{D \rightarrow var \ T \ id \bullet; \}
S_{38} = \{F \rightarrow function T1 id \bullet (A)\{C\}\}\
S_{39}=\{S \rightarrow id L \bullet E, E \rightarrow \bullet E < U, E \rightarrow \bullet U, U \rightarrow \bullet U + R,
         U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E), V \rightarrow \bullet id,
         V \rightarrow \bullet id(M), V \rightarrow \bullet ent, V \rightarrow \bullet cadena
S_{40} = \{S \rightarrow id (M \bullet); \}
S_{41}=\{M \rightarrow E \bullet Q, E \rightarrow E \bullet < U, Q \rightarrow \bullet, Q \rightarrow \bullet, EQ\}
S_{42} = \{S \rightarrow print(E \bullet);, E \rightarrow E \bullet < U\}
S_{43} = \{S \rightarrow input(id \bullet);\}
S_{44} = \{S \rightarrow if(E \bullet) S1, E \rightarrow E \bullet < U\}
S_{45} = \{S \rightarrow return X; \bullet \}
S_{46}=\{E \rightarrow E < \bullet U, U \rightarrow \bullet R, U \rightarrow \bullet U + R, R \rightarrow \bullet ! V, R \rightarrow \bullet V\}
         V \rightarrow \bullet (E), V \rightarrow \bullet id, V \rightarrow \bullet id (M), V \rightarrow \bullet ent, V \rightarrow \bullet cadena}
S_{47}=\{U \rightarrow U + \bullet R, R \rightarrow \bullet ! V, V \rightarrow \bullet (E), V \rightarrow \bullet id(M),
         V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{48} = \{R \rightarrow ! V \bullet \}
S_{49} = \{V \rightarrow (E \bullet), E \rightarrow E \bullet < U\}
S_{50} = \{ V \rightarrow id \ ( \bullet \ M ) \ , \ M \rightarrow \bullet \ E \ Q, \ M \rightarrow \bullet \ , \ E \rightarrow \bullet \ E < U, \ E \rightarrow \bullet \ U,
         U \rightarrow \bullet U + R, U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E),
         V \rightarrow \bullet \text{ id}, V \rightarrow \bullet \text{ id}(M), V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{51}=\{F \rightarrow function \ T1 \ id (\bullet \ A)\{C\}, \ A \rightarrow \bullet \ T \ id \ K, \ A \rightarrow \bullet, \ T \rightarrow \bullet \ int,
         T \rightarrow \bullet \text{ string}, T \rightarrow \bullet \text{ boolean}
S_{52} = \{S \rightarrow id \ L \ E \bullet ; , E \rightarrow E \bullet < U\}
S_{53} = \{S \rightarrow id(M) \bullet ; \}
S_{54}=\{M \rightarrow E Q \bullet \}
S_{55}=\{Q \rightarrow , \bullet E Q, E \rightarrow \bullet E < U, E \rightarrow \bullet U, 
         U \rightarrow \bullet U + R, U \rightarrow \bullet R, R \rightarrow \bullet ! V, R \rightarrow \bullet V, V \rightarrow \bullet (E),
         V \rightarrow \bullet \text{ id}, V \rightarrow \bullet \text{ id}(M), V \rightarrow \bullet \text{ ent}, V \rightarrow \bullet \text{ cadena}
S_{56} = \{S \rightarrow print(E) \bullet ;\}
S_{57} = \{S \rightarrow input(id) \bullet ;\}
S_{58} \hspace{-0.05cm} = \hspace{-0.05cm} \{S \rightarrow i\, f\, (E) \mid \bullet \ S1 \,, \ S1 \rightarrow \bullet \ \{S2\}G, \ S1 \rightarrow \bullet \ S, \ S \rightarrow \bullet \ i\, d \ L \ E; \,,
         S \rightarrow \bullet id(M);, S \rightarrow \bullet print(E);, S \rightarrow \bullet input(id);,
         S \ \rightarrow \ \bullet \ if (E) S1 \, , \ S \ \rightarrow \ \bullet \ return \ X \ ; \}
S_{59} = \{E \rightarrow E < U \bullet, U \rightarrow U \bullet + R\}
S_{60} = \{U \rightarrow U + R \bullet \}
S_{61} {=} \{ V \rightarrow (E) \quad \bullet \, \}
S_{62} = \{V \rightarrow id (M \bullet)\}
S_{63}=\{M \rightarrow E \bullet Q, E \rightarrow E \bullet < U, Q \rightarrow \bullet, Q \rightarrow \bullet, EQ\}
S_{64} = \{F \rightarrow function T1 id(A \bullet)\{C\}\}
S_{65}=\{A \rightarrow T \bullet id K\}
S_{66} = \{S \rightarrow id L E ; \bullet \}
S_{67} = \{S \rightarrow id (M); \bullet \}
S_{68}=\{Q \rightarrow E \bullet Q, E \rightarrow E \bullet C, Q \rightarrow \bullet, Q \rightarrow \bullet, EQ\}
S_{69} = \{S \rightarrow print(E); \bullet \}
S_{70} = \{S \rightarrow input(id); \bullet\}
S_{71}=\{S \rightarrow if(E) S1 \bullet \}
S_{72} = \{S1 \rightarrow \{\bullet \ S2\}G, \ S2 \rightarrow \bullet \ S \ S2, \ S2 \rightarrow \bullet \ S, \ S \rightarrow \bullet \ id \ L \ E;, \}
         S \rightarrow \bullet id(M);, S \rightarrow \bullet print(E);, S \rightarrow \bullet input(id);,
         S \rightarrow \bullet \text{ if } (E)S1, S \rightarrow \bullet \text{ return } X ; 
S_{73} = \{S1 \rightarrow S \bullet \}
S_{74} = \{V \rightarrow id(M) \bullet \}
S_{75}=\{F \rightarrow function T1 id (K) \bullet \{C\}\}
S_{76}=\{A \rightarrow T \text{ id } \bullet K , K \rightarrow \bullet, K \rightarrow \bullet , T \text{ id } K\}
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S_{77} = \{Q \rightarrow , E Q \bullet \}
S_{78} = \{S1 \rightarrow \{S2 \bullet \} G\}
S_{79}=\{S2 \rightarrow S \bullet S2, S2 \rightarrow S \bullet, S2 \rightarrow \bullet S S2, S \rightarrow \bullet id L E;
                    S_{80}\!\!=\!\!\left\{F \ \to function \ T1 \ id \ (K) \ \left\{ \ \bullet \ C\right\}, \ C \ \to \ \bullet \ D \ C \ , \ C \ \to \ \bullet \ , \right.
                    D \ \rightarrow \ \bullet \ var \ T \ id \ ; \, , \ S \ \rightarrow \ \bullet \ id \ L \ E \ , \ S \ \rightarrow \ \bullet \ id \ (M) \, ; \, ,
                    S \rightarrow \bullet \text{ print } (E);, S \rightarrow \bullet \text{ input (id)};, S \rightarrow \bullet \text{ if } (E) S1,
                    S \rightarrow \bullet return X ; 
S_{81} = \{A \rightarrow T \text{ id } K \bullet \}
S_{82} = \{K \rightarrow, \bullet T \text{ id } K, T \rightarrow \bullet \text{ int }, T \rightarrow \bullet \text{ string }, T \rightarrow \bullet \text{ boolean}\}
S_{83} = \{S1 \rightarrow \{S2\} \bullet G , G \rightarrow \bullet \text{ else } \{S2\} , G \rightarrow \bullet \}
S_{84} = \{F \rightarrow function T1 id (K) \{C \bullet \}\}
S_{85} \!\!=\!\! \{C \rightarrow\! D \bullet C,\ C \rightarrow \bullet \ D \ C,\ C \rightarrow \bullet \ S \ C,\ C \rightarrow \bullet,\ D \rightarrow \bullet \ var \ T \ id \ ;,
                    \dot{S} \rightarrow \bullet \text{ id } L E ;, S \rightarrow \bullet \text{ id } (M) ;, S \rightarrow \bullet \text{ print } (E) ;,
                    S \rightarrow \bullet \text{ input (id)};, S \rightarrow \bullet \text{ if (E)} S1, S \rightarrow \bullet \text{ return } X;
S_{86} = \{C \rightarrow S \bullet C, C \rightarrow \bullet D C, C \rightarrow \bullet S C, C \rightarrow \bullet, D \rightarrow \bullet \text{ var T id };
                    S \rightarrow • id L E ;, S \rightarrow • id ( M ) ;, S \rightarrow • print ( E ) ;,
                    S \rightarrow \bullet \text{ input (id)};, S \rightarrow \bullet \text{ if (E)} S1, S \rightarrow \bullet \text{ return } X;
S_{87} \hspace{-0.1cm}=\hspace{-0.1cm} \{K \ \rightarrow \ , \ T \ \bullet \ id \ K\}
S_{88} = \{S1 \rightarrow \{S2\} G \bullet \}
S_{89} = \{G \rightarrow else \bullet \{S2\}\}\
S_{90} = \{F \rightarrow function T1 id (K) \{C\} \bullet \}
S_{91}=\{K \rightarrow , T \text{ id } \bullet K, K \rightarrow \bullet, K \rightarrow \bullet, T \text{ id } K\}
S_{92} \hspace{-0.05cm}=\hspace{-0.05cm} \{G \hspace{0.1cm} \rightarrow \hspace{0.1cm} \texttt{else} \hspace{0.1cm} \{ \hspace{0.1cm} \bullet \hspace{0.1cm} S2 \} \hspace{0.1cm}, \hspace{0.1cm} S2 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} S \hspace{0.1cm} S2 \hspace{0.1cm}, \hspace{0.1cm} S2 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm}, \hspace{0.1cm} S3 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \texttt{id} \hspace{0.1cm} L \hspace{0.1cm} E \hspace{0.1cm} ; \hspace{0.1cm} , \hspace{0.1cm} S4 \hspace{0.1cm} \rightarrow \hspace{0.1cm} \bullet \hspace{0.1cm} \hspace{0.1cm} \bullet \hspace{0.1cm} \hspace{0.1cm} \bullet \hspace{0.
                    S \ \rightarrow \ \bullet \ id \ (M \ ) \ ; \ , \ S \ \rightarrow \ \bullet \ print \ (E \ ) \ ; , \ S \ \rightarrow \ \bullet \ input(id); ,
                    S \rightarrow \bullet \text{ if } (E) S1, S \rightarrow \bullet \text{ return } X;
S_{93} = \{K \rightarrow , T \text{ id } K \bullet \}
S_{94} = \{G \rightarrow else \{ S2 \bullet \} \}
S_{95} = \{G \rightarrow else \{ S2 \} \bullet \}
S_{96} = \{C \rightarrow D C \bullet \}
S_{97} = \{C \rightarrow S C \bullet \}
S_{98}=\{D \rightarrow var \ T \ id \ ; \bullet\}
S_{99} = \{S2 \rightarrow S \ S2 \bullet \}
```

#### 1.3 Conflictos

Como podemos observar en la tabla de decisión no hay ningún conflicto. Los posibles conflictos son:

#### Reducción-Reducción

Podríamos ver como en los posibles estados con este conflicto, en nuestro caso ninguno, se verifica que

 $\forall \{A \to \alpha \bullet, B \to \beta \bullet\} \subset S_x \Rightarrow \text{Follow}(A) \cap \text{Follow}(B) = \emptyset \text{ (Esto lo podemos observar al no tener dos entradas de reducción en la misma celda de cada fila de <math>S_x$ )

#### Reducción-Desplazamiento

Podemos ver como en los posibles estados con este conflicto,  $S_0$ ,  $S_2$ ,  $S_3$ ,  $S_4$ ,  $S_6$ ,  $S_{11}$ ,  $S_{22}$ ,  $S_{28}$ ,  $S_{29}$ ,  $S_{34}$ ,  $S_{41}$ ,  $S_{50}$ ,  $S_{51}$ ,  $S_{59}$ ,  $S_{63}$ ,  $S_{68}$ ,  $S_{76}$ ,  $S_{79}$ ,  $S_{80}$ ,  $S_{83}$ ,  $S_{85}$ ,  $S_{86}$ ,  $S_{91}$ , se verifica  $\forall \{A \rightarrow \alpha \bullet b \gamma, C \rightarrow \beta \bullet\} \subset S_x \Rightarrow b \notin Follow(C)$  (Esto lo podemos observar al no tener una entrada de desplazamiento y otra de reducción en la misma celda de cada fila de  $S_x$ )

Por ejemplo, para los estados  $S_0$ ,  $S_2$ ,  $S_3$ ,  $S_4$ : {var, function, id, print, input, if, return}  $\notin$  Follow(P) = { \$ }

En el estado  $S_6$ : {int, string, boolean}  $\notin$  Follow(T1) = { id }

Y así sucesivamente con el resto de estados.

## 1.4 Errores

En las celdas vacías de cada fila se lanzan los siguientes errores:

S<sub>0</sub>, S<sub>4</sub>, S<sub>7</sub>, S<sub>14</sub>, S<sub>85</sub>, S<sub>86</sub>, S<sub>96</sub>, S<sub>97</sub>: Error 1: "Sentencia no válida"

S<sub>1</sub>: Error -1 : "No se pudo derivar la raíz"

S<sub>2</sub>, S<sub>5</sub>, S<sub>12</sub>, S<sub>15</sub>, S<sub>37</sub>, S<sub>98</sub>: Error 2: "Declaración incorrecta de variable"

 $S_3$ ,  $S_6$ ,  $S_{13}$ ,  $S_{19}$ ,  $S_{38}$ ,  $S_{51}$ ,  $S_{64}$ ,  $S_{65}$ ,  $S_{75}$ ,  $S_{76}$ ,  $S_{80}$ ,  $S_{81}$ ,  $S_{82}$ ,  $S_{84}$ ,  $S_{87}$ ,  $S_{90}$ ,  $S_{91}$ ,  $S_{93}$ : Error 3: "Declaración incorrecta de función"

S<sub>8</sub>, S<sub>24</sub>, S<sub>42</sub>, S<sub>56</sub>, S<sub>69</sub>: Error 4: "Sentencia print incorrecta"

S<sub>9</sub>, S<sub>25</sub>, S<sub>43</sub>, S<sub>57</sub>, S<sub>70</sub>: Error 5: "Sentencia input incorrecta"

 $S_{10},\,S_{26},\,S_{44},\,S_{58},\,{}_{S71},\,{}_{S73}$ : Error 6: "Sentencia condicional simple incorrecta"

 $S_{11},\,S_{27},\,S_{28},\,S_{45}$ : Error 7: "Sentencia return incorrecta"

 $S_{16}, S_{17}, S_{18}, S_{20}$ : Error 8: "Tipo incorrecto"

S<sub>21</sub>, S<sub>23</sub>, S<sub>39</sub>, S<sub>52</sub>, S<sub>66</sub>: Error 9: "Asignación incorrecta"

 $S_{22}$ ,  $S_{40}$ ,  $S_{41}$ ,  $S_{53}$ ,  $S_{54}$ ,  $S_{55}$ ,  $S_{63}$ ,  $S_{67}$ ,  $S_{68}$ ,  $S_{77}$ : Error 10: "Llamada a función incorrecta"

 $S_{29}$ ,  $S_{30}$ ,  $S_{31}$ ,  $S_{32}$ ,  $S_{33}$ ,  $S_{34}$ ,  $S_{35}$ ,  $S_{36}$ ,  $S_{46}$ ,  $S_{47}$ ,  $S_{48}$ ,  $S_{49}$ ,  $S_{50}$ ,  $S_{59}$ ,  $S_{60}$ ,  $S_{61}$ ,  $S_{62}$ ,  $S_{74}$ : Error 11: "Expresión incorrecta"

 $S_{72}$ ,  $S_{78}$ ,  $S_{79}$ ,  $S_{83}$ ,  $S_{88}$ ,  $S_{89}$ ,  $S_{92}$ ,  $S_{94}$ ,  $S_{95}$ ,  $S_{99}$ : Error 12 "Sentencia condicional compuesta incorrecta"

### 1.5 Tabla de Decisión

	}   id   entero	entero   cadena   (   )   +   <       =	var   int   boolean   string	ring   print   input   .	return   function   if   else   \$    P   D   T   F   T   A   K   C   S   L   M   O   S   G   X   E   U   R   V   S
08	-1		q2	- Sp	d6   d10   r49   1   2   3       4
S1				-	8
S2	d7		d5	dp   dp	9p
83	d7		d5	-	9p
84	d7			6p   8p	d11   d6   d10   r49   14   2     3         4
S5	_		d18	d17	
98	l r9			d17	
S7		_	d21   d23	_	
88	_	d24	_ _ _ _	_	
88	_				
S10	_ _	d26	_ _ _ _	_ _ _	
S11   r35	d34   d35	d36   d33       d31	_	_	
S12				_	
S13					
S14	_	_ _ _ _	_ _ _	_	
S15	d37		  	_ _ _	
816	r5		  	_ _ _	
817	r6			_ _	
S18	r7		_ _ _	_ _	
819	829		_ _ _ _	_ _ _	
S20			_ _ _ _	_ _ _	
S21	r25   r25	r25	_ _ _ _	_	
S22	d34   d35	d36   d33   r27	_ _ _ _	_	
S23		r24   r24	_ _ _ _	_ _ _	
S24	d34   d35	d36   d33       d31	_  _  _	_ _ _	
S25	—I.				_
S26	d34   d35	d36   d33       d31			
S27 d45	_ -  -		-	-	
S28   r34	_ -  -  -		-  -  -		
S29   r37	_ -	r37   d47   r37	-	r37	
S30 r39		_ :	-	r39	
831	d34   d35	d36   d33			87
S32 r41		r41 r41 r41		r41	
S33	d34   d35	929			49 29 30 32
S34 r43		d50   r43   r43		r43	13
S35 r45		r45   r45   r45	-	r45	12
S36 r46	_ - _ -	r46   r46	-	r46	90
S37   d98	_ - _ -		_ - _ - _ -	- - - -	
238		d51	_ ·	_ -	
S39	d34   d35	d36   d33			52 29 30 32
840		d53	_  _  _	_	
S41	_		_ _ _ _ _		55
S42	_	d56     d46	_ _ _ _	_ _ _	
S43	_		_ _ _ _	_	
S44		d58     d46	_ _ _ _	_	
S45	- 1	_	r23	r23   r23	r23   r23   r23   r23     r23
846		d36   d33	_  _  _	_ _ _	
S47	d34   d35	d36   d33			00 32
S48 r40		r40		- r40	01
S49		d61   d46			

-	id   entero   cadena	a ( ) +	 	=    =   var   int	int   boolean   string   print   input	print   inp	_	return   function	tion   if   else	ee ==	P D T F	F   T'   A	K C S	S   L   M   Q	S. G X	X   E   U   R   V   S"	N 3
-		d33   r27	d31				_	_		-	-	1-	-	62		63 29 30 32	32
S21		r12	_ _		71b   d18   d17	_	-  -	_	_	_	9   92	64	_		_	_	_
S52   d66	_ _ _		949		_		 _	_	_	_	_ _ _	_		_	_	_	_
S53   d67	_ -		_ -  -	_ -	_ -	_ -	- - - -	-	- -		_ - _ -	_  _  _	_  _ -	- - - -	_ -	_ - _ -	_ -
S54		_		_	_ .		_  _	_		<u>-</u>	_				_		_  _
S55	d34   d35   d36	d33	d31	_ -  -  -	_ -	- - - -	- - - -	-	- - - -		_ -  -  -	_ - _ -	_ - _ - _ -	_  _  _ -	_ -	68   29   30	32
S26   d69	_ -	_ - _ - _ -	_ - _ - _ -	_ - _ -	_ -		- - - -	- -	- - - -	<u>-</u>  -					- - - -		_ -
d70		_ -	_  _  _		_ .	-	_  _	-		<u>- </u>					_		_  _
S58   d72	72   d7	_ _ _	_ _ _	_ _ _		6p   8p	_ _	d11	d10	<u>-</u>	_ _ _	_ _ _	73		71	_	_
S59   r36	_	r36   d47   r36	7   r36	_		_	r36	_	_	<u>-</u>	_ _ _		_ _ _	_ _ _	_	_	_
S60   r38		r38   r38   r38	8   r38	_		_	r38	_	_	_	_ _ _	_ _ _	_	_	_	_	_
S61   r42		r42   r42   r42	2   r42	_	_	_	r42	_	_	<del></del>	   	-  -  -	_	-  -  -	_	_ 	 
S62		d74			_	_	_	_	_	_	_	_	-  -	-  -	_	_	_
863		r28		_			d55	_		_		_		54	_	_	-  -
864		d75	_	_	_	_	-	_	-	-	-	-  -	-  -	-  -	-	_	-
S65			-			_	-	_	-	<del>-</del>	-  -  -	-		-  -  -	-	_	-
998	r18   r18	- - - -		118		r18   r18		r18   r18	8 r18	r18		-			_		_
298	r19   r19		_	r19	_	r19   r19	_	r19   r19	9   r19	r19		_				_	-  -
898		r28		_	_	_	d55	_	_	_	_	_	-  -	12	_	_	-  -
698	r20   r20	 	-	r20		r20   r20	_	r20   r20	0   r20	r20		_			_		-
870	r21   r21		_	r21		-	_	_	1-	r21		_			_	_	-
S71	r22   r22	_	-	r22		-	_	-	-	r22	_	-  -	-	_	_	_	_
S72	4b	- 	-	- - - -		-	-	-	1-	<del>-</del>	-  -  -	-	62	-  -  -	-	-  -	- 82
S73	r31   r31	 	-	r31		-	_	r31 r31		r31		_			_		-
S74   r44		r44 r44	4 r44			_	r44	_	1	<del>-</del>	_	_			_	_	-  -
S75   d80	0:		_ _	_	_	_	_	_	_	_	_	_ _	_	_ _	_	_	
876	_ _ _		-  -  -	_  	_	_	482	_	_	_	-  -  -	-  -  -	81	-  -  -	_ _	-  -  -	-  -
S77	_ _ _ _	r29	_ _ _	_ _ _	_		_	-	_ _	<u>-</u>	_	_	_	_ _ _	_	_	_
878	d83	_ _ _	_ _ _	_ _ _	_	_	_	_	_ _	<u>-</u>	_ _ _	_	_ _ _	_ _ _	_	_	_ _
879	r48   d7	_	_ _ _			-	_	d11	q10	<u>=</u>	_ _ _		62	_	_		66
880	r17   d7	_ _ _	_ _ _	d5	_	6p   8p	_ _	d11	q10	<u>-</u>	82	_	84   86	_	_	_	
881	_ _ _ _	r11	_ _ _	_ _ _	_	_	_	_	_	<u>-</u>	_	_	_	_ _ _	_	_	_
882		_	_	d16	d18   d17	_	_	_	_	_	87				_		_
883	r33   r33	_	_	r33	_	r33 r33	_	r33 r33	3   r33   d89	189   r33	_	_	_	_		_	
884		_ _ _	_ _ _	_	_	-	_	-	_	_	_	_		_ _ _	_	_	_
882	r17   d7	_ _ _	_ _ _	d5	_	6p   8p	_	d11	d10	<del>-</del>	 	_		_ _ _	_	_	_ _
886	r17   d7	_ _ _	_ _ _	d2		gp   gp	_	d11	d10	<u> </u>	82	_ _ _	98   26	_ _ _	_	_	_
887		_ _ _	_  _  _	_ _ _	_	-	-  -	-	-	<u>-</u>	_  _  _		_ _ _	_ _ _	_ _	_	_
	r30   r30	_ _ _	_  _	r30	_	r30   r30	_ _	r30   r30	0   r30	r30	_  _  _	_	_ _ _	_ _ _	_	_	_
S89   d92	12	_ _ _	_  _  _	_ _ _	_	_	_	_	_ _	<u>-</u>	  	_ _ _	_ _ _	 	_	_	_
068	r8	_ _ _	_  _			r8   r8	_	r8   r8			_ _ _				_		_
891	_ _ _	r13	_ _ _	_ _ _	_	-	482	-	_	<u>-</u>	_ _ _	<u>-</u>	93	_	_	_	
892	d7	_ _ _	_ _ _	_	_	6p   8p	_	d11	d10	<u>-</u>	_ _ _	_ _ _	62	_ _ _	_	_	94
893	_ _ _	r14	_ _ _	_ _ _	_	_	_	_	_ _	<u>-</u>	_	_	_	_ _ _	_	_	_
S94	d95	_ 		_		_	_ _	_	_	_	_				_	_	_
895	r32   r32	_ _ _	_ _ _	r32	_	r32   r32	_	r32   r32	2   r32	r32	_ _ _	_	_	_ _ _	_	_	
968	115	_ _ _	_ _ _	_	_	_	_ _	_	_	_	_	_	_	_ _ _	_	_	_
897						-	_	_	-	<u>-</u>	_  _  _	_  _  _	_  _  _	_  _  _	_	_	_  _
86S	r4   r4	_ -	_ - _ -	- r4	_	r4 r4	= - = -	r4   r4	1 r4	r4	_ - _ -				_ - - -		_ ·
668	r47	_	_		_		- -	-	_ _	<u>-</u>	_ _ _ _			_ _ _	_		

## 2 Anexo de Pruebas

### Error 1:

```
1 var int a;
2 var b;
3 a = 3;
4 b = a;
5 if (a < b) b = 1;
6 if (b < a) b = 8;
7 a = a + b;
8 print (a);
9 print (b);</pre>
```

> Error Sintactico: Declaracion incorrecta de variable. Linea: 2

#### Error 2:

```
var string texto;
function pideTexto ()
{
  print ('Introduce un texto');
  input (texto);
}
function imprime (string msg,)
{
  print (msg);
}
pideTexto();
var string textoAux;
textoAux = texto;
imprime (textoAux);
```

> Error Sintactico: Declaracion incorrecta de funcion. Linea: 7

### Error 3:

```
var int a;
var int b;
a = 3;
b = a;
var boolean c;
c = a < b;
if (c) {
b = 1;
} else {
c = b < a;
if (c) b = 4;
print (a);
print (b);</pre>
```

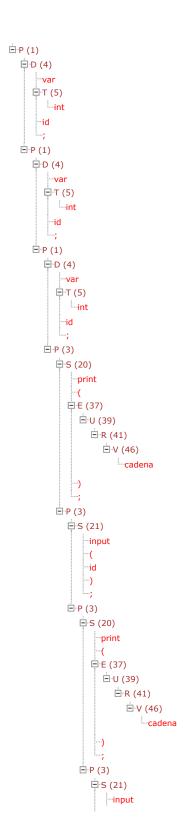
> Error Sintactico: Sentencia condicional compuesta incorrecta. Linea: 14

### Prueba 1 Correcta:

```
1 var int a;
2 var int b;
3 var int c;
   print ('Introduce el primer operando');
5 input (a);
6 print ('Introduce el segundo operando');
7 input (b);
8 function int suma (int num1, int num2)
9 {
10
    var int res;
11
    res = num1 + num2;
12
     return res;
13 }
14 c = suma (a, b);
15 print (c);
```

## Parse a Derechas:

## Árbol sintáctico:



```
···(
···id
  ···)
<u></u>-F (8)
   function
    T1 (10)
     ⊟ T (5)
       int
     ∵id
     ...(
    A (11)
      □-T (5)
—int
—id
□-K (14)
       □ T (5)
int
        Ē K (13)
         lambda
      ····)
    C (15)
      □ D (4)
        var
□ T (5)
□ int
□ id
□ ';
       E C (16)
         - S (18)
          Ė U (38)
                .
□ U (39)
                 Ē-R (41)
                   _ v (43),
—id
—+
                Ē-R (41)
                  ÷...∨ (43)
                    id
         Ė C (16)
            Ē S (23)
            return
             □·X (34)
□·E (37)
```

```
.
⊡. U (39)
                    Ē ·R (41)
                       ...V (43)
                          id
          Ē C (17)
             lambda
Ē ··P (3)
  Ė S (18)
    Ė (37)
       Ū U (39)
          .
∃∵R (41)
            ÷...∨ (44)
                ···id
               —(
□-M (26)
                 Ē (37)
                   Ė U (39)
                     .
∃ ··R (41)
                       Ē·V (43)
                            i...id
                  Ē-Q (29)
                    ----,
----E (37)
                      .
∃.·U (39)
                         Ė ·R (41)
                            ÷ ∨ (43)
                               i...id
                    Q (28)
                       lambda
  Ē-P (3)
     Ė S (20)
       print
(
= E (37)
        <u>-</u>U (39)
           .
∃∵R (41)
               ÷ ∨ (43)
                  i...id
     Ė P (49)
        lambda
```

## Prueba 2 Correcta:

```
var string texto;
function imprime (string msg)

{
   print ('Mensage introducido:');
   print (msg);
}

function pideTexto ()

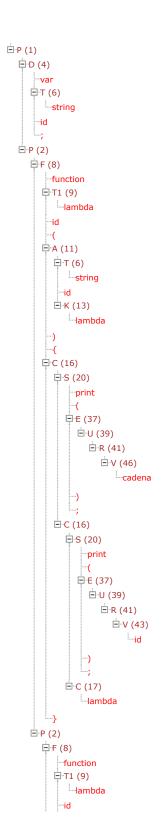
{
   print ('Introduce un texto');
   input (texto);

}

pideTexto();
imprime (texto);
```

#### Parse a Derechas:

## Árbol sintáctico:



```
....(
□··A (12)
  lambda
 Ē-S (20)
    Ė-U (39)
        Ė ·R (41)
          Ė ∨ (46)
             cadena
      ···)
;
    Ē ·C (16)
     Ġ S (21)
      --input
---(
---id
     lambda
Ē ··P (3)
  Ė ·S (19)
  id (
   ĒM (27)
    lambda
    ···)
;
  Ē-P (3)
    Ë S (19)
     id ....(
-...(
-...(26)
        Ė-U (39)
          Ė R (41)
          ⊟ V (43)
       Ē Q (28)
        lambda
    Ē P (49)
      lambda
```

## Prueba 3 Correcta:

```
1 function string cadena (boolean log)
2 {
3
   if (!log)
4
    {
5
      imprime (s, 'hola', 33);
      if (uno < UNO) return s;</pre>
6
7
     }
8
     else
9
    {
10
     return 'Fin';
11
12 }
13 s = 'El factorial ';
14
15 if (num < 0) print ('No existe el factorial de un negativo.');
16 imprime (cadena (booleano), 'recursivo es: ', Factorial (num));
```

#### Parse a Derechas:

A 6 10 7 13 11 43 40 39 37 43 41 39 37 46 41 39 37 45 41 39 37 28 29 29 26 19 43 41 39 37 43 41 39 36 43 41 39 37 34 23 31 22 48 47 46 41 39 37 34 23 48 32 30 22 17 16 8 25 46 41 39 37 18 43 41 39 37 45 41 39 36 46 41 39 37 20 31 22 43 41 39 37 28 26 44 41 39 37 46 41 39 37 43 41 39 37 28 26 44 41 39 37 28 29 29 26 19 49 3 3 3 2

## Árbol sintáctico:

```
.
∃ P (2)
  ÷ (8)
     function
    □ T1 (10)
     Ė ⊤ (6)
       string
     ···id
    --(
---A (11)
      ⊟∙Т (7)
      ---boolean
---id
      ⊟ K (13)
       lambda
    -{
□ C (16)
       Ē S (22)
         if
--(
--E (37)
          Ė U (39)
            Ė R (40)
               ---!
               Ē V (43)
                ---id
         □ S1 (30)
           --{
= S2 (47)
             Ē S (19)
               id
(
= M (26)
                 Ē-E (37)
                   Ů-U (39)
                      .
∃ R (41)
                         ÷...∨ (43)
                            i...id
                   Ė · Q (29)
                     ....,
□ E (37)
                       .
∃.·U (39)
                        Ė R (41)
                          Ů·V (46)
                             cadena
                     Ē ·Q (29)
                        ---,
---E (37)
                         Ė U (39)
                           .
∃ R (41)
```

```
ent
                    Ē ·Q (28)
                       lambda
           Ē-S2 (48)
             ÷ S (22)
               ···if
                E (36)
                  Ė (37)
                    .
∃ U (39)
                     .
∃ ·R (41)
                       id
                  -U (39)
                    Ė R (41)
                     Ė ··V (43)
                      __ • (+3)
                Ē-S1 (31)
                  ÷ S (23)
                    return X (34)
                      .
∃. E (37)
                        <u>÷</u>...U (39)
                           .
∃ ··R (41)
                             ÷ ∨ (43)
                               id
          --}
         Ġ (32)
            else
            ---{
           □ S2 (48)
            Ē-S (23)
               return
EX (34)
                 Ė (37)
                    .
∃.·U (39)
                      .
∃ R (41)
                        cadena
   .
⊡...C (17)
    lambda
= P (3)
```

```
.

S (18)
 id
= L (25)
  i i..._ '
 Ē E (37)
  Ė ·U (39)
    .
∃ R (41)
      cadena
Ē S (22)
   ...if
....(
....(
....E (36)
     Ė (37)
       Ė-U (39)
         Ė R (41)
           Ė ··V (43)
              id
      -
-U (39)
       .
-R (41)
        .
∃.·V (45)
          ent
     ···)
    Ē-S1 (31)
     Ė ·S (20)
       print
(
□ E (37)
          Ė-U (39)
           .
∃ R (41)
              cadena
  Ē-P (3)
    .
□ S (19)
      id
--(
--M (26)
        Ē-E (37)
          Ė-U (39)
            .
∃ ··R (41)
                ÷...∨ (44)
                   ···id
                   ...(
                  <sup>‡</sup> ⋅ M (26)
                   ⊟-E (37)
⊟-U (39)
                       Ė R (41)
```

```
...V (43)
                       id
               Ē-Q (28)
                 lambda
    Ē ·Q (29)
      ...,
E-E (37)
        Ė U (39)
         .
∃..R (41)
           cadena
      Ē-Q (29)
        → E (37)
          .
∃.·U (39)
            .
∃ ··R (41)
              id
--(
--M (26)
                   Ė (37)
                    Ė U (39)
                      .
∃∵R (41)
                        ÷ ∨ (43)
                          id
                   Ē ·Q (28)
                      lambda
        Ū Q (28)
           lambda
Ė P (49)
  lambda
```