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

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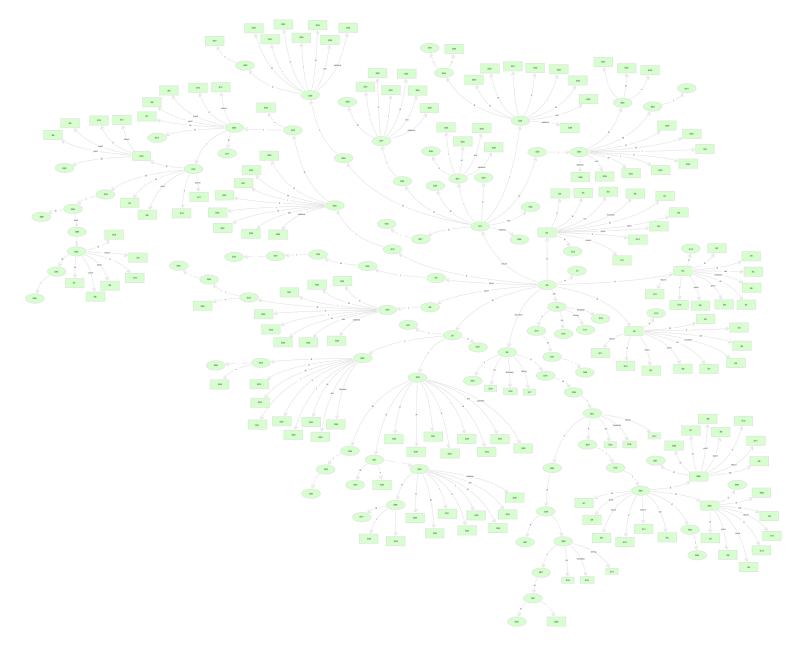
## 1 Diseño del Analizador Sintáctico

### 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,
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```
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{0.1cm} \hspace{0.1cm} \bullet \hspace{0.1cm} \bullet \hspace{0.1cm} \bullet \hspace{0.1cm} \bullet \hspace{0.1cm} \bullet \hspace{0.1c
                    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   65	64	_		_	_	_
S52   d66	_ _ _		949		_		 _	_	_	_	_ _ _	_		_	_	_	_
S53   d67	_ -		_ -  -	_ -	_ -	_	- - - -	-	- -		_ - _ -	_  _  _	_  _ -	- - - -	_ -	_ - _ -	_ -
S54		_		_	_ .		_  _	_		<u>-</u>	_ -  -				_		_  _
S55	d34   d35   d36		d31	_ -  -  -	_ -	- - - -	- - - -	-	- - - -		_ -  -  -	_ - _ -	_ - _ - _ -	_ -  	_ -	68   29   30	32
S26   d69	_ -	_ - _ - _ -	_ - _ - _ -	_ - _ -	_ -	- -	- - - -	- -	- - - -	= - - -					- - - -		_ -
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>
```

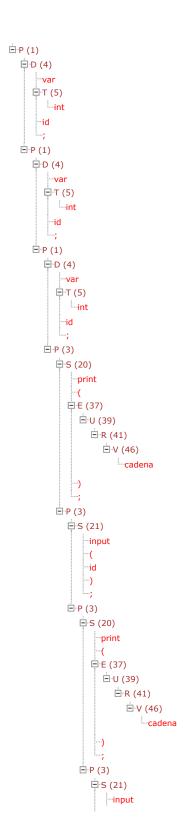
> Error Sintactico: Sentencia condicional compuesta incorrecta. Linea: 14

### 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)
      Ē ·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
     - P (49)
        lambda
```

## Prueba 2 Correcta:

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

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

function pideTexto ()

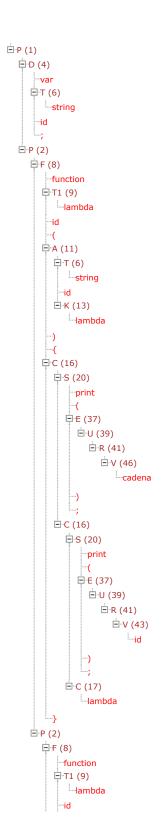
{
   print ('Introduce un texto');
   input (texto);

}

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)
             Ġ (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
                     Ė ·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)
        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
```