**2a Guía Compiladores**

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A partir de hoc4 se usan dos etapas en hoc. ¿Cuáles son y que hacen ?

1. Generación de código: Genera el código a ser ejecutado.

2. Ejecución de código: Ejecuta el código generado.

Escriba 3 cosas importantes que se almacenan usualmente en un marco (o registro de activación) de función.

1. Variables .

2. Parámetros.

3. Nombre de la función.

**Falso o Verdadero (F/V)**

|  |  |
| --- | --- |
| 1.-En lenguaje C los **parámetros formales** no tienen nombre\_\_\_\_\_\_\_\_\_ | ( F ) |
| 2.-En lenguaje C las **variables locales** (no estáticas) se crean cuando se entra a una función y se destruyen cuando se sale de la función | ( V ) |
| 3.-En hoc los **parámetros formales** no tienen nombre\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | ( V ) |
| 4.-No es posible definir **funciones recursivas** en hoc6\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | ( F ) |
| 5.-En hoc no hay **variables locales**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | ( V ) |
| 6.-Es imposible que la pila de hoc se desborde (Stack Overflow | ( F ) |
| 7.-En hoc6 cuando una función termina su ejecución se saca su **marco** de la pila de llamadas | ( V ) |
| 8.-En hoc6 los **parámetros reales** son listas de **expresiones** \_\_\_\_\_\_\_\_\_\_\_ | ( V ) |
| 9.-En hoc6 el código que ejecuta la **máquina virtual de pila** está en prefijo (considere como se ejecuta una operación de suma) | ( F ) |
| 10.-Los valores de los **atributos sintetizados** se calculan a partir de los valores de atributos de su nodo padre o sus nodos hermanos. | ( F ) |
| 11.-En hoc4 la **variable pc** se usa en la etapa de **ejecución** | ( V ) |
| 12.-En hoc4 la **variable progp** se usa en la etapa de **generación** de código | ( V ) |
| 13.-La variable progp indica la posición de la RAM donde está la sig. instrucción a ejecutar | ( F ) |
| 14.-La variable pc indica cual es la sig. posición de la RAM donde se almacenara una instrucción | ( F ) |

1.-Un \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ es [A→ α . β , a] donde A→ αβ es una producción y a es un terminal o $.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a) mango | b) prefijo viable | c) elemento LR (1) | d) elemento LR (0) | ( C ) |

2.-Es una producción de G con un punto en cierta posición del lado derecho.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a) mango | b) prefijo viable | c) elemento LR (1) | d) elemento LR (0) | ( D ) |

3.-Son prefijos de las formas de frase derecha que pueden aparecer en la pila

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a) mango | b) elemento LR (0) | c) prefijo viable | d) elemento LR (1) | ( C ) |

4.-Un \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ de una forma de frase derecha g es una producción S →  y una posición de g donde la cadena  podría encontrarse y sustituirse por A para producir la forma de frase derecha previa en una derivación por la derecha de g.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a) prefijo viable | b) mango | c) elemento LR (0) | d) elemento LR(1) | ( B ) |

1-Ejecutar la funcion (poner el contador de programa igual a la direccion de su primera instrucción y ejecutar la instrucción a la que apunta el contador de programa) y meter el valor de retorno de la funcion en la pila.

2-Meter los parametros en la pila y meter el marco de la funcion en la pila de llamadas.

3-Poner el contador de programa igual a la direccion de retorno y ejecutar la instrucción a la que apunta el contador de programa.

4-Sacar parametros de la pila y sacar marco de la pila de llamadas.

5.-De acuerdo al **mecanismo de llamada a funcion** cual es el orden correcto?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a) 1, 2, 3 , 4 | b) 1, 3 , 4 ,2 | c) 2, 1 , 4, 3 | d) 4, 3 , 2 , 1 | ( C ) |

**Problema 1.-**Considere la siguiente gramática :

|  |  |  |  |
| --- | --- | --- | --- |
| 1) S → X | 2) X → **a** X **c** | 3) X → X X | 4) X → **b** |

**Calcule**

cerradura({X → X **.** X}), cerradura({X → X X **.** }) e ir\_a ( { X → **a** **.** X **c** } , X )

**-Para el Análisis LR las gramáticas se muestran con sus producciones numeradas**

**Para cada gramática:**

**-Calcule los conjuntos PRIMERO y SIGUIENTE**

**-Construya la tabla** **Análisis Sintáctico Predictivo no Recursivo ( LL(1) )**

**-Construya la colección de conjuntos de elementos LR (0)**

**-Construya la tabla SLR**

Primero (S) = {‘b’, ‘a’}

Siguiente (S) = {‘$’, ‘a’, ‘b’}

Primero (X) = {‘a’, ‘b’}

Siguiente (X) ={‘c’, ‘$’}

Cerradura ({X -> X . X})

X -> X . X

X->.aXc

X->.b

Cerradura ({X -> X X .})

X -> XX.

Ir\_a({X -> a . X c}, X)

X -> aX.c

**Problema 2**

|  |  |  |
| --- | --- | --- |
| 1) A → **x**A | 2) A → **y**A | 3) A → **y** |

-Explicar porque esta gramatica no es LL(1).

I1=ir\_a(I0, **x** ) , I2=ir\_a(I0, **y** ) , I3=ir\_a(I0, A ), I4=ir\_a(I1, A) , I5=ir\_a(I2, A )

No es gramática LL(1) debido a que en nuestra tabla LL(1), tenemos que:

|  |  |  |
| --- | --- | --- |
| $ | y | x |
| A | A → y A A → y | A → x A |

Tenemos un conflicto en la parte marcada de rojo

Primero (A) = {x, y}

Siguiente (A) = {$}

Elementos LR(0)

I0:

A’->.A

A->.xA

A->.yA

A->.y

I1:

A->.0.A

A->.xA

A->.yA

A->.y

I2:

A->.LA

A->.xA

A->.yA

A->.y

I3:

A’->A

I4:

A->.xA

A->.yA

I5:

A->bA.

**Problema 3**

|  |  |  |  |
| --- | --- | --- | --- |
| 1) S → **a** | 2) S → **(** S R | 3) R → **,** S R | 4) R → **)** |

I1=ir\_a(I0, **a** ) , I2=ir\_a(I0, **(** ) , I3=ir\_a(I0, S ), I4=ir\_a(I2, S ) , I5=ir\_a(I4 , **,** ) , I6=ir\_a(I4, **)** ),

I7=ir\_a(I4 , R ) , I8=ir\_a(I5, S ) , I9=ir\_a(I8, R )

Use ambos análisis para analizar las siguientes cadenas:

|  |  |  |  |
| --- | --- | --- | --- |
| **( a )** | **(a , a)** | **(a , a, a)** | **(a , a, a, a )** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | a | ( | , | ) | $ |
| S | S -> a | S -> (SR |  |  |  |
| R |  |  | R -> ,SR | R -> ) |  |

Primero (S) = {a, (}

Siguiente (S) = {$, c, )}

Primero (R) = {c, )}

Siguiente (R) = {c, )}

Elementos LR(0)

I0 = S´ -> .S I1 = R -> .,SR I2 = S´ -> S.

S -> .a R -> .)

S -> .(SR

I3 = S -> a. I4 = S -> (.SR I5 = R -> ,.SR

S -> .a S -> .a

S -> .(SR S -> .(SR

I6 = R -> ). I7 = S -> (S.R I8 = R -> ,S.R

R -> .,SR R -> .,SR

R -> .) R -> .)

I9 = S -> (SR. I10 = R -> ,SR.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Acción | | | | | ir\_a | |
| Estado | a | ( | , | ) | $ | S | R |
| 0 | d3 | d4 |  |  |  |  |  |
| 1 |  |  | d5 | d6 |  |  |  |
| 2 |  |  |  |  | ok |  |  |
| 3 |  |  | r1 | r1 | r1 |  |  |
| 4 | d3 | d4 |  |  |  | 7 |  |
| 5 | d3 | d4 |  |  |  | 8 |  |
| 6 | r4 |  |  |  | r4 |  |  |
| 7 |  |  | d5 | d6 |  |  | 9 |
| 8 |  |  | d5 | d6 |  |  | 10 |
| 9 |  |  | r2 | r2 | r2 |  |  |
| 10 | r3 |  |  |  | r3 |  |  |

**(a)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pila | Entrada | Salida | Pila | Entrada | Acción |
| $S | (a)$ | S -> (SR | 0 | (a)$ | d4 |
| $RS( | (a)$ |  | 0(4 | a)$ | d3 |
| $RS | a)$ | S -> a | 0(4a3 | )$ | r1 |
| $R( | a)$ |  | 0(457 | )$ | d6 |
| $R | )$ | R -> ) | 0(457)6 | $ | r4 |
| $) | )$ |  | 0(457R9 | $ | r2 |
| $ | $ |  | 0S2 | $ | ok |

**(a, a)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pila | Entrada | Salida | Pila | Entrada | Acción |
| $S | (a, a)$ | S -> (SR | 0 | (a, a)$ | d4 |
| $RS( | (a, a)$ |  | 0(4 | a, a)$ | d3 |
| $RS | a, a)$ | S -> a | 0(4a3 | , a)$ | r1 |
| $Ra | a, a)$ |  | 0(457 | , a)$ | d5 |
| $R | , a)$ | R -> ,SR | 0(457,5 | a)$ | d3 |
| $RS, | , a)$ |  | 0(457,5a3 | )$ | r1 |
| $RS | a)$ | S -> a | 0(457,558 | )$ | d6 |
| $Ra | a)$ |  | 0(457,558)6 | $ | r4 |
| $R | )$ | R -> ) | 0(457,55R10 | $ | r3 |
| $) | )$ |  | 0(457R9 | $ | r2 |
| $ | $ |  | 0S2 | $ | ok |

**(a, a, a)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pila | Entrada | Salida | Pila | Entrada | Acción |
| $S | (a, a, a)$ | S -> (SR | 0 | (a, a, a)$ | d4 |
| $RS( | (a, a, a)$ |  | 0(4 | a, a, a)$ | d3 |
| $RS | a, a, a)$ | S -> a | 0(4a3 | , a, a)$ | r1 |
| $Ra | a, a, a)$ |  | 0(457 | , a, a)$ | d5 |
| $R | , a, a)$ | R -> ,SR | 0(457,5 | a, a)$ | d3 |
| $RS, | , a, a)$ |  | 0(457,5a3 | , a)$ | r1 |
| $RS | a, a)$ | S -> a | 0(457,558 | , a)$ | d5 |
| $Ra | a, a)$ |  | 0(457,558,5 | a)$ | d3 |
| $R | , a)$ | R -> ,SR | 0(457,558,5a3 | )$ | r1 |
| $RS, | , a)$ |  | 0(457,558,558 | )$ | d6 |
| $RS | a)$ | S -> a | 0(457,558,558)6 | $ | r4 |
| $Ra | a)$ |  | 0(457,588,588R10 | $ | r3 |
| $R | )$ | R -> ) | 0(457,588,R10 | $ | r3 |
| $) | )$ |  | 0(457R9 | $ | r2 |
| $ | $ |  | 0S2 | $ | ok |

**(a, a, a, a)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pila | Entrada | Salida | Pila | Entrada | Acción |
| $S | (a, a, a, a)$ | S -> (SR | 0 | (a, a, a, a)$ | d4 |
| $RS( | (a, a, a, a)$ |  | 0(4 | a, a, a, a)$ | d3 |
| $RS | a, a, a, a)$ | S -> a | 0(4a3 | a, a, a, a)$ | r1 |
| $Ra | a, a, a, a)$ |  | 0(457 | , a, a, a)$ | d5 |
| $R | , a, a, a)$ | R -> ,SR | 0(457,5 | a, a, a)$ | d3 |
| $RS, | , a, a, a)$ |  | 0(457,5a3 | , a, a)$ | r1 |
| $RS | a, a, a)$ | S -> a | 0(457,558 | ,a , a)$ | d5 |
| $Ra | a, a, a)$ |  | 0(457,558,5 | a, a)$ | d3 |
| $R | , a, a)$ | R -> ,SR | 0(457,558,5a3 | , a)$ | r1 |
| $RS, | , a, a)$ |  | 0(457,558,558 | , a)$ | d5 |
| $RS | a, a)$ | S -> a | 0(457,558,558,5 | a)$ | d3 |
| $Ra | a, a)$ |  | 0(457,588,588,5a3 | )$ | r1 |
| $R | , a)$ | R -> ,SR | 0(457,588,588,588 | )$ | d6 |
| $RS, | , a)$ |  | 0(457,588,588,588)6 | $ | r4 |
| $RS | a)$ | S -> a | 0(457,588,588,588R10 | $ | r3 |
| $Ra | a)$ |  | 0(457,588,588R10 | $ | r3 |
| $R | )$ | R -> ) | 0(457,588R10 | $ | r3 |
| $) | )$ |  | 0(457R9 | $ | r2 |
| $ | $ |  | 0S2 | $ | ok |

**Análisis LR** Para cada gramática:

-Calcule los conjuntos PRIMERO y SIGUIENTE

-Construya la colección de conjuntos de elementos LR (0)

-Construya la tabla SLR

-Use la tabla de análisis SLR para analizar la(s) cadena(s) propuesta(s)

**Problema 4**

|  |  |  |
| --- | --- | --- |
| 1) S → A | 2) A → **ε** | 3) A → **bb**A |

I1=ir\_a(I0, **b** ) , I2=ir\_a(I0, S) , I3=ir\_a(I0, A), I4=ir\_a(I1, **b** ) , I5=ir\_a(I4, A )

Use ambos análisis para analizar la siguiente cadena : **bbbb**

Prim(A) = { ε }

Sig(A) = { $, b }

Prim(S) = { ε }

Sig(S) = { b }

Elementos LR(0)

I0

S’ → .S

S → .A

A → . ε

A → .Abb

I1

S’ → S.

I2

S’ → A.

I3

A → ε.

I4

A → A.bb

I5

A → Ab.b

I6

A → Abb.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Estado | Accion |  | Ir\_a | |
| b | $ | S | A |
| I0 |  |  | 1 | 2 |
| I1 |  | Aceptado |  |  |
| I2 | r1 | r1 |  |  |
| I3 | r2 | r2 |  |  |
| I4 | d5 |  |  |  |
| I5 | d6 |  |  |  |
| I6 | r3 | r3 |  |  |

**bbbb**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | bbbb$ | d5 |
| 0b5 | bbb$ | d6 |
| 0b5b6 | bb$ | r1 |
| 0d1A1 | bb$ | d6 |
| 0d1A1b6 | b$ | r2 |
| 0d1A1A2 | b$ | r2 |
| 0d1A1 | $ | r1 |
| 0d1A1 | $ | r1 |
| 0 | $ | aceptado |

**Problema 5**

|  |  |
| --- | --- |
| 1) A → A **c** | 2) A → **d** |

I1=ir\_a(I0, d) , I2=ir\_a(I0, A ) , I3=ir\_a(I2, a)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| cadenas | **d** | **dc** | **dcc** | **dccc** |

Prim(A) = { d }

Sig(A) = { $, c }

Elementos LR(0)

I0

A’ → .Ac

A → .d

I1

A → d.

I2

A’ → A.c

I3

A’ → Ac.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Estado | Accion | | | Ir\_a |
| c | d | $ | A |
| 0 |  | d1 |  | 2 |
| 1 | r2 |  |  |  |
| 2 | d3 |  | aceptado | 0 |
| 3 | r1 | r1 | r1 |  |

**d**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | d$ | d1 |
| 0d1 | $ | r1 |
| 0 |  | aceptado |

**dc**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | dc$ | d1 |
| 0d1 | c$ | r1 |
| 0d1c3 | $ | r1 |
| 0 | $ | aceptado |

**dcc**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | dcc$ | d1 |
| 0d1 | cc$ | d3 |
| 0d1c3 | c$ | r2 |
| 0d1A3 | c$ | r2 |
| 0d1 | $ | r1 |
| 0 | $ | aceptado |

**dccc**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | dccc$ | d1 |
| 0d1 | ccc$ | d3 |
| 0d1c3 | cc$ | r2 |
| 0d1A3 | cc$ | d3 |
| 0d1A3c3 | c$ | r2 |
| 0d1A3A3 | c$ | r2 |
| 0d1A3 | $ | r1 |
| 0d1A3 | $ | r1 |
| 0 | $ | aceptado |

**Problema 5.1**

|  |  |
| --- | --- |
| 1) S → S **a** | 2) S → **b** |

I1=ir\_a(I0, b) , I2=ir\_a(I0, S) , I3=ir\_a(I2, a)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| cadenas | **b** | **ba** | **baa** | **baaa** |

Prim(A) = { b }

Sig(A) = { $, a }

Elementos LR(0)

I0

A’ → .Aa

A → .b

I1

A → b.

I2

A’ → A.a

I3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Estado | Accion | | | Ir\_a |
| a | b | $ | A |
| 0 |  | d1 |  | 2 |
| 1 | r2 |  |  |  |
| 2 | d3 |  | aceptado | 0 |
| 3 | r1 | r1 | r1 |  |

A’ → A

**b**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | b$ | d1 |
| 0b1 | $ | r1 |
| 0 |  | aceptado |

**ba**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | ba$ | d1 |
| 0b1 | a$ | r1 |
| 0b1 | $ | r1 |
| 0 | $ | aceptado |

**baa**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | baa$ | d1 |
| 0b1 | aa$ | d3 |
| 0b1a3 | a$ | r2 |
| 0b1S3 | a$ | r2 |
| 0b1 | $ | r1 |
| 0 | $ | aceptado |

**baaa**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | baaa$ | d1 |
| 0b1 | aaa$ | d3 |
| 0b1c3 | aa$ | r2 |
| 0b1S3 | aa$ | d3 |
| 0b1S3a3 | a$ | r2 |
| 0b1S3S3 | a$ | r2 |
| 0b1S3 | $ | r1 |
| 0b1S3 | $ | r1 |
| 0 | $ | aceptado |

}

**Problema 6**

|  |  |  |
| --- | --- | --- |
| 1) S → AA | 2) A →**a** A | 3) A →**b** |

I1=ir\_a( I0, **a** ) , I2=ir\_a( I0, **b** ) , I3=ir\_a( I0, S ), I4=ir\_a( I0, A ) , I5=ir\_a( I1, A ) ,

I6=ir\_a( I4, A )

cadenas: **abab** y **baab**

Prim(S) = { a, b }

Sig(S) = { $ }

Prim(A) = { a, b }

Sig(A) = { a, b}

Elementos LR(0)

I1 = S´ -> S I2 = S -> A.A I3 = A -> a.A

S -> .Ca A -> .aA

S -> .b A -> .b

I4 = A -> b I5 = S -> AA. I6 = A -> aA.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Estado |  | Acción |  | ir\_a | |
|  | a | b | $ | A | S |
| 0 | d3 | d4 |  | 2 | 1 |
| 1 |  |  | ok |  |  |
| 2 | d3 | d4 |  | 5 |  |
| 3 | d3 | d4 |  | 6 |  |
| 4 |  | r3 | r3 |  |  |
| 5 |  |  | r1 |  |  |
| 6 |  |  | r2 |  |  |

**abab**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | abab$ | d3 |
| 0a1 | bab$ | r3 |
| 0a4b3 | ab$ | d3 |
| 0a4b3a3 | ab$ | d3 |
| 0a4b3a3 | b$ | r2 |
| 0a4 | $ | r1 |
| 0 | $ | ok |

**baab**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | baab$ | d4 |
| 0b1 | aab$ | r3 |
| 0b4a3 | ab$ | d3 |
| 0b4a3a3 | b$ | r2 |
| 0b4 | $ | r1 |
| 0 | $ | ok |

**Problema 7**

|  |  |  |
| --- | --- | --- |
| 1) S → BB | 2) B →**b** B | 3) B →**c** |

I1=ir\_a( I0, **b** ) , I2=ir\_a( I0, **c** ) , I3=ir\_a( I0, S ), I4=ir\_a( I0, B ) , I5=ir\_a( I1, B ) ,

I6=ir\_a( I4, B)

cadenas: **bcbc** y **cbbc**

Prim(S) = { b, c }

Sig(S) = { $ }

Prim(B) = { b, c }

Sig(B) = { b, c}

Elementos LR(0)

I1 = S´ -> S I2 = S -> B.B I3 = A -> b.B

S -> .Db A -> .bB

S -> .c A -> .c

I4 = A -> c I5 = S -> BB. I6 = A -> bB.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Estado |  | Acción |  | ir\_a | |
|  | b | c | $ | A | S |
| 0 | d3 | d4 |  | 2 | 1 |
| 1 |  |  | ok |  |  |
| 2 | d3 | d4 |  | 5 |  |
| 3 | d3 | d4 |  | 6 |  |
| 4 |  | r3 | r3 |  |  |
| 5 |  |  | r1 |  |  |
| 6 |  |  | r2 |  |  |

**bcbc**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | bcbc$ | d3 |
| 0b1 | cbc$ | r3 |
| 0b4c3 | bc$ | d3 |
| 0b4c3b3 | c$ | r2 |
| 0b4 | $ | r1 |
| 0 | $ | ok |

**cbbc**

|  |  |  |
| --- | --- | --- |
| Pila | Cadena | Acción |
| 0 | cbbc$ | d4 |
| 0c1 | bbc$ | r3 |
| 0c4b3 | bc$ | d3 |
| 0c4b3b3 | c$ | r2 |
| 0c4 | $ | r1 |
| 0 | $ | ok |

**Problema 8**

|  |  |
| --- | --- |
| 1) A → **(** A **)** | 2) A → **a** |

I1=ir\_a(I0, **(** ) , I2=ir\_a(I0, **a** ) , I3=ir\_a(I0, A ), I4=ir\_a(I1, A ) , I5=ir\_a(I4, **)** )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| cadenas | **( a )** | **( ( a ) )** | **( ( ( a ) ) )** | **( ( ( ( a ) ) ) )** |

a) PRIM (S) = { ( , e} SIG(E)={ ) , $ } I0

S → ( A )

S → ∙a

Elemento LR(0)

I1

A → ( ∙ A )

A → ∙ ( A )

A → ∙a

I2

A→ a∙ “reducir 2”

I3

A → A∙ “cadena aceptada”

I4

A→(A∙ )

I5

A→( A ) ∙ “reducir 1”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ( | ) | a | $ | S |
| 0 | D1 |  | D2 |  | 3 |
| 1 | D1 |  | D2 |  | 4 |
| 2 |  | R2 |  | R2 |  |
| 3 |  |  |  | Aceptar |  |
| 4 |  | D5 |  |  |  |
| 5 |  | R1 |  | R1 |  |

**(a)**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | (a)$ | D1 |
| 0(1 | e)$ | D2 |
| 0(1a2 | )$ | R2 |
| 0(1S4 | )$ | D5 |
| 0(1S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**((a))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | ((a))$ | D1 |
| 0(1 | (a))$ | D1 |
| 0(1(1 | a))$ | D2 |
| 0(1(1a2 | ))$ | R2 |
| 0(1(1S4 | ))$ | D5 |
| 0(1(1S4)5 | )$ | R1 |
| 0(1(1S4)a2 | )$ | R2 |
| 0(1(1S4)S4 | )$ | D5 |
| 0(1(1S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**(((aN)))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | (((a)))$ | D1 |
| 0(1 | ((a)))$ | D1 |
| 0(1(1 | (a)))$ | D1 |
| 0(1(1(1 | a)))$ | D2 |
| 0(1(1(1a2 | )))$ | R2 |
| 0(1(1(1S4 | )))$ | D5 |
| 0(1(1(1S4)5 | ))$ | R1 |
| 0(1(1(1S4)a2 | ))$ | R2 |
| 0(1(1(1S4)S4 | ))$ | D5 |
| 0(1(1(1S4)S4)5 | )$ | R1 |
| 0(1(1(1S4)S4)a2 | )$ | R2 |
| 0(1(1(1S4)S4)S4 | )$ | D5 |
| 0(1(1(1S4)S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**((((a))))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | ((((a))))$ | D1 |
| 0(1 | (((a))))$ | D1 |
| 0(1(1 | ((a))))$ | D1 |
| 0(1(1(1 | (a))))$ | D1 |
| 0(1(1(1(1 | a))))$ | D2 |
| 0(1(1(1(1a2 | ))))$ | R2 |
| 0(1(1(1(1S4 | ))))$ | D5 |
| 0(1(1(1(1S4)5 | )))$ | R1 |
| 0(1(1(1(1S4)a2 | )))$ | R2 |
| 0(1(1(1(1S4)S4 | )))$ | D5 |
| 0(1(1(1(1S4)S4)5 | ))$ | R1 |
| 0(1(1(1(1S4)S4)a2 | ))$ | R2 |
| 0(1(1(1(1S4)S4)S4 | ))$ | D5 |
| 0(1(1(1(1S4)S4)S4)5 | )$ | R1 |
| 0(1(1(1(1S4)S4)S4)a2 | )$ | R2 |
| 0(1(1(1(1S4)S4)S4)S4 | )$ | D5 |
| 0(1(1(1(1S4)S4)S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**Problema 9**

|  |  |
| --- | --- |
| 1) S → **(** S **)** | 2) S → **e** |

I1=ir\_a(I0, **(** ) , I2=ir\_a(I0, **e** ) , I3=ir\_a(I0, S ), I4=ir\_a(I1, S ) , I5=ir\_a(I4, **)** )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| cadenas | **( e )** | **( ( e ) )** | **( ( ( e ) ) )** | **( ( ( ( e ) ) ) )** |

a) PRIM (S) = { ( , e} SIG(E)={ ) , $ } I0

S → ( S )

S → ∙e

I1 ir\_a(I0, ( )

S→ ( ∙ S )

S→ ∙ ( S ) S → ∙e

I2 ir\_a(I0 , e)

S→ e∙ “reducir 2”

I3 ir\_a(I0, S)

S’ → S∙ “cadena aceptada”

I4 ir\_a(I1, S)

S→(S∙ )

I5 ir\_a(I4, ) )

S→( S ) ∙ “reducir 1”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ( | ) | e | $ | S |
| 0 | D1 |  | D2 |  | 3 |
| 1 | D1 |  | D2 |  | 4 |
| 2 |  | R2 |  | R2 |  |
| 3 |  |  |  | Aceptar |  |
| 4 |  | D5 |  |  |  |
| 5 |  | R1 |  | R1 |  |

**(e)**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | (e)$ | D1 |
| 0(1 | e)$ | D2 |
| 0(1e2 | )$ | R2 |
| 0(1S4 | )$ | D5 |
| 0(1S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**((e))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | ((e))$ | D1 |
| 0(1 | (e))$ | D1 |
| 0(1(1 | e))$ | D2 |
| 0(1(1e2 | ))$ | R2 |
| 0(1(1S4 | ))$ | D5 |
| 0(1(1S4)5 | )$ | R1 |
| 0(1(1S4)e2 | )$ | R2 |
| 0(1(1S4)S4 | )$ | D5 |
| 0(1(1S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**(((e)))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | (((e)))$ | D1 |
| 0(1 | ((e)))$ | D1 |
| 0(1(1 | (e)))$ | D1 |
| 0(1(1(1 | e)))$ | D2 |
| 0(1(1(1e2 | )))$ | R2 |
| 0(1(1(1S4 | )))$ | D5 |
| 0(1(1(1S4)5 | ))$ | R1 |
| 0(1(1(1S4)e2 | ))$ | R2 |
| 0(1(1(1S4)S4 | ))$ | D5 |
| 0(1(1(1S4)S4)5 | )$ | R1 |
| 0(1(1(1S4)S4)e2 | )$ | R2 |
| 0(1(1(1S4)S4)S4 | )$ | D5 |
| 0(1(1(1S4)S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**((((e))))**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | ((((e))))$ | D1 |
| 0(1 | (((e))))$ | D1 |
| 0(1(1 | ((e))))$ | D1 |
| 0(1(1(1 | (e))))$ | D1 |
| 0(1(1(1(1 | e))))$ | D2 |
| 0(1(1(1(1e2 | ))))$ | R2 |
| 0(1(1(1(1S4 | ))))$ | D5 |
| 0(1(1(1(1S4)5 | )))$ | R1 |
| 0(1(1(1(1S4)e2 | )))$ | R2 |
| 0(1(1(1(1S4)S4 | )))$ | D5 |
| 0(1(1(1(1S4)S4)5 | ))$ | R1 |
| 0(1(1(1(1S4)S4)e2 | ))$ | R2 |
| 0(1(1(1(1S4)S4)S4 | ))$ | D5 |
| 0(1(1(1(1S4)S4)S4)5 | )$ | R1 |
| 0(1(1(1(1S4)S4)S4)e2 | )$ | R2 |
| 0(1(1(1(1S4)S4)S4)S4 | )$ | D5 |
| 0(1(1(1(1S4)S4)S4)S4)5 | $ | R1 |
| 0S3 | $ | ACEPTAR |

**Problema 10**

|  |  |  |
| --- | --- | --- |
| 1) E → n | 2) E → **(** E **,** E **)** | Donde n es un entero |

I1=ir\_a(I0, **(** ) , I2=ir\_a(I0, **n** ) , I3=ir\_a(I0, E), I4=ir\_a(I1, E) , I5=ir\_a(I4, **,** ) ,

I6=ir\_a(I5, E), I7=ir\_a(I6, **)** )

cadena **( (21 , 18) , 17 )**

a) PRIM (E) = { n, (} SIG(E)={ $, ), ‘,’ }

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | N | ( | , | ) | $ |
| E | E → n | E→( E , E ) |  | A → d |  |

c)

Elementos LR(0)

I0

E → ∙ n

E → ∙ ( E , E )

I1 ir\_a(I0, ( )

E → ( E ∙ , E )

E → ∙ n

E → ∙ ( E, E)

I2 ir\_a(I0,n)

E → n ∙ “reducir 1”

I3 ir\_a(I0, E)

S’ → E∙ “cadena aceptada”

I4 ir\_a(I1, E)

E →(E∙ ,E)

I5 ir\_a(I4, , )

E → ( E , ∙ E)

E → ∙ n

E → ∙ ( E , E)

I6 ir\_a(I5, E)

E → ( E , E ∙ )

I7 ir\_a ( I6 , ) )

E → ( E , E ) ∙ “reducir 2”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ( | ) | $ | , | n | E |
| 0 | D1 |  |  |  | D2 | 3 |
| 1 | D1 |  |  |  | D2 | 4 |
| 2 |  | R1 | R1 | R1 |  |  |
| 3 |  |  | ACEPTAR |  |  |  |
| 4 |  |  |  | D5 |  |  |
| 5 | D1 |  |  |  | D2 | 6 |
| 6 |  | D7 |  |  |  |  |
| 7 |  | R2 | R2 | R2 |  |  |

**( (21 , 18) , 17 )**

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | ((21,18),17)$ | D1 |
| 0(1 | (21,18),17)$ | D1 |
| 0(1(1 | 21,18),17)$ | D2 |
| 0(1(1n2 | ,18),17)$ | R1 |
| 0(1(1E4 | ,18),17)$ | D3 |
| 0(1(1E4,5 | 18),17)$ | D2 |
| 0(1(1E4,5n2 | ),17)$ | R1 |
| 0(1(1E4,5E6 | ),17)$ | D7 |
| 0(1(1E4,5E6,7 | ,17)$ | R2 |
| 0(1(1E4 | ,17)$ | D3 |
| 0(1E4,5 | 17)$ | D2 |
| 0(1E4,5n2 | )$ | R1 |
| 0(1E4,4E6 | )$ | D7 |
| 0(1(E4(5E6)7 | $ | R2 |
| 0E3 | $ | ACEPTAR |

**Problema 11**

|  |  |  |  |
| --- | --- | --- | --- |
| 1) S→ **[** L **]** | 2) S → **a** | 3) L → L **,** S | 4) L → S |

I1=ir\_a(I0, **[** ) , I2=ir\_a(I0, **a** ) , I3=ir\_a(I0, S ), I4=ir\_a(I1, S ) , I5=ir\_a(I1, L ) , I6=ir\_a(I5, **]** ),

I7=ir\_a(I5 , **,** ) , I8=ir\_a(I7, S)

PRIM (S) = { [ , a } SIG(S) = { $, )]. ‘,’}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | [ | , | ] | A | $ |
| S | S → [ L ] |  |  | S → a |  |
| L | L → L, S  L → L, S |  |  | L → L, S  L → S |  |

Elementos LR(0)

I0

S → [ L ]

S → ∙ a

I1 ir\_a(I0,[)

S→ [∙L ]

L→ ∙ L ,S

L→ ∙ S

S → ∙ a

S→ ∙[ L ]

I2 ir\_a(I0,a)

S→ a∙ “reducir 2”

I3 ir\_a(I0, S)

S’ → S∙ “cadena aceptada”

I4 ir\_a(I1, S)

L→S∙ “reducir 4”

I5 ir\_a(I1, L )

S→ [ L ∙ ]

L→L ∙ , S

E → ∙ ( E , E)

I6 ir\_a(I5, ] )

S → [ L ] ∙ “reducir 1”

I7 ir\_a ( I5 , , )

L → L , ∙ S

S → ∙ a

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | [ | A | . | ] | $ | S | L |
| 0 | D1 | D2 |  |  |  | 3 |  |
| 1 | D1 | D2 |  |  |  | 4 | 5 |
| 2 |  |  | R2 | R2 | R2 |  |  |
| 3 |  |  |  |  | ACEPTAR |  |  |
| 4 |  |  |  | R4 | R4 |  |  |
| 5 |  |  | D7 | D6 |  |  |  |
| 6 |  |  | R1 | R1 | R1 |  |  |
| 7 | D1 | D2 |  |  |  | 8 |  |
| 8 |  |  | R3 | R3 |  |  |  |

**Problema 12**

|  |  |  |  |
| --- | --- | --- | --- |
| 1) S → **d c** **a** | 2) S →**d** A **b** | 3) S →A  **a** | 4) A → **c** |

I1=ir\_a(I0, **d** ) , I2=ir\_a(I0 , **c** ) , I3=ir\_a(I0, S ), I4=ir\_a(I0, A ) , I5=ir\_a(I1 , **c** ) ,

I6=ir\_a(I1, A), I7=ir\_a(I4, **a** ) , I8=ir\_a(I5, **a** ) , I9=ir\_a(I6, **b** )

PRIM (A)={ c } SIG(A)={ a , b }

PRIM (S)={ d , c } SIG(L)={ $ }

b)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | D | C | A | $ |
| S | S → dca  S → dAc | S → Aa |  |  |
| A |  |  |  |  |

c)

Elementos LR(0)

I0

S’ → ∙ S

S → dca

S → dAb

S → Aa

A → ∙c

I1 ir\_a(I0, d)

S → d ∙ ca

S → d∙Ab

A→ ∙ c

I2 ir\_a(I0,c)

S→ c∙ “reducir 4”

I3 ir\_a(I0, S)

S’ → S∙ “cadena aceptada”

I4 ir\_a(I1, A)

S → A ∙ a “reducir 4”

I5 ir\_a(I1, c )

S→ dc ∙ a

A→ c ∙ “reducir 4”

I6 ir\_a(I1, A )

S →dA ∙ b “reducir 1”

I7 ir\_a ( I4 , a )

S →Aa ∙ “reducir 3”

I8 ir\_a (I5 , a )

S →dca ∙ “reducir 1”

I9 ir\_a (I6 , b)

S →dAb ∙

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | d | a | b | c | $ | S | A |
| 0 | D1 |  |  | D2 |  | 3 | 4 |
| 1 |  |  |  | D5 |  |  | 6 |
| 2 |  | R4 | R4 |  |  |  |  |
| 3 |  |  |  |  | ACEPTAR |  |  |
| 4 |  | D7 |  | R4 | R4 |  |  |
| 5 |  | D8 / R4 | R4 |  |  |  |  |

**Problema 13**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1) S → A **a** | 2) S → **b** A **c** | 3) S → **d c** | 4) S → **b d a** | 5) A → **d** |

I1=ir\_a(I0, **b** ) , I2=ir\_a(I0, **d** ) , I3=ir\_a(I0, S), I4=ir\_a(I0, A ) , I5=ir\_a(I1, **d** ) , I6=ir\_a(I1, A ), I7=ir\_a(I2, **c** ) , I8=ir\_a(I4 , **a** ) , I9=ir\_a(I5, **a** ), I10=ir\_a(I6, **c** )

PRIM (S) = {b,d} SIG(S) = { }

PRIM(A) = {d} SIG(A) = { a,c }

Elementos LR(0)

I0

S’ → .S

S → .Aa

S → .b A c

S → .d c

S → .d b a

A → .d

I1

S → b.d a

S → b.A c

A → .d

I2

A → d.

S → d.c

I3

S’ → S.

I4

S → A.a

I5

A → d.

S → b d.a

I6

S → b A.c

I7

S → d c.

I8

S → A a.

I9

S → b d a.

I10

S → b A c.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| LR(0) | | | | | | | |
|  | **$** | **d** | **a** | **b** | **c** | **S** | **A** |
| **0** |  | s4 |  | s3 |  | s2 | s1 |
| **1** |  |  | s8 |  |  |  |  |
| **2** | acc | acc | acc | acc | acc |  |  |
| **3** |  | s7 |  |  |  |  | s6 |
| **4** | r(A → d) | r(A → d) | r(A → d) | r(A → d) | r(A → d)/s5 |  |  |
| **5** | r(S → d c) | r(S → d c) | r(S → d c) | r(S → d c) | r(S → d c) |  |  |
| **6** |  |  |  |  | s10 |  |  |
| **7** | r(A → d) | r(A → d) | r(A → d)/s9 | r(A → d) | r(A → d) |  |  |
| **8** | r(S → A a) | r(S → A a) | r(S → A a) | r(S → A a) | r(S → A a) |  |  |
| **9** | r(S → b d a) | r(S → b d a) | r(S → b d a) | r(S → b d a) | r(S → b d a) |  |  |
| **10** | r(S → b A c) | r(S → b A c) | r(S → b A c) | r(S → b A c) | r(S → b A c) |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SLR | | | | | | | |
|  | **$** | **d** | **a** | **b** | **c** | **S** | **A** |
| **0** |  | s4 |  | s3 |  | s2 | s1 |
| **1** |  |  | s8 |  |  |  |  |
| **2** | acc |  |  |  |  |  |  |
| **3** |  | s7 |  |  |  |  | s6 |
| **4** |  |  | r(A → d) |  | r(A → d)/s5 |  |  |
| **5** | r(S → d c) |  |  |  |  |  |  |
| **6** |  |  |  |  | s10 |  |  |
| **7** |  |  | r(A → d)/s9 |  | r(A → d) |  |  |
| **8** | r(S → A a) |  |  |  |  |  |  |
| **9** | r(S → b d a) |  |  |  |  |  |  |
| **10** | r(S → b A c) |  |  |  |  |  |  |

**Problema 14**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1) S → **c** S A **d** | 2) S → **d** | 3) A → **a** B | 4) A →**a** | 5) B → **a** | 6) B → **b** |

I1=ir\_a(I0 , **c** ) , I2=ir\_a(I0, **d** ) , I3=ir\_a(I0, S), I4=ir\_a(I1, S) , I5=ir\_a(I4, **a** ) ,

I6=ir\_a(I4, A), I7=ir\_a(I5, **a** ) , I8=ir\_a(I5, **b** ) , I9=ir\_a(I5, B), I10=ir\_a(I6, **d**)

cadena: **cdad**

PRIM (S) = {d,c} SIG(S) = {$ , a}

PRIM(A) = {a} SIG(A) = { d }

PRIM(B) = { a, b } SIG(B) = { d }

Elementos LR(0)

I0

S’ → ∙S

S’ → ∙cSAd

S →∙ d

I1 ir\_a(I0,c)

S’ → c∙SAd

S’ → ∙cSAd

S→ ∙ d

I2 ir\_a(I0,s)

S→ d ∙ “reducir 2”

I3 ir\_a(I0,d)

S’→ S∙ “cadena aceptada”

I4 ir\_a(I0,S)

S’ → cS∙Ad

A → aB

A → a

I5 ir\_a(I1,a)

A→a∙ B

A→a∙

B → ∙a

B →∙b

I6 ir\_a(I4,A)

S→ cSA ∙d

I7 ir\_a(I2,a)

B → a∙

I8 ir\_a(I5,6)

B→b∙ “reducir 6”

I9 ir\_a(I1,B)

A→aB∙ “reducir 3”

I10 ir\_a(I6,c)

S→ cSAd ∙ “reducir 1”

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | $ | S | A | B |
| 0 |  |  | D1 | D2 |  | 3 |  |  |
| 1 |  |  | D1 | D2 |  | 4 |  |  |
| 2 | R2 |  |  |  | R2 |  |  |  |
| 3 |  |  |  |  | ACEPTAR |  |  |  |
| 4 | D5 |  |  |  |  |  | 6 |  |
| 5 | D7 | D8 |  | R4 |  |  |  | 9 |
| 6 |  |  |  | D10 |  |  |  |  |
| 7 |  |  |  | R5 |  |  |  |  |
| 8 |  |  |  | R6 |  |  |  |  |
| 9 |  |  |  | R3 |  |  |  |  |
| 10 | R1 |  |  |  | R1 |  |  |  |

|  |  |  |
| --- | --- | --- |
| Pila | Entrada | Acción |
| 0 | cdad$ | D1 |
| 0c1 | dad$ | D2 |
| 0c1d2 | ad$ | R2 |
| 0c1S4 | ad$ | D5 |
| 0c1S4a5 | d$ | R4 |
| 0c1S4A6 | d$ | D10 |
| 0c1S4a5d10 | $ | R1 |
| 0S3 | $d | ACEPTAR |

**Problema 15**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1) R → R **|** R | 2) R → RR | 3) R ->R **\*** | 4) R →**(** R **)** | 5) R → **a** | 6) R → **b** |

I1=ir\_a(I0, **(** ) , I2=ir\_a(I0, **a** ) , I3=ir\_a(I0, **b** ), I4=ir\_a(I0, R ) , I5=ir\_a(I1, R ) , I6=ir\_a(I5, **|** ), I7=ir\_a(I5, **\*** ) , I8=ir\_a(I5, R ) , I9=ir\_a(I5, ) ), I10=ir\_a(I6, R )

cadena: **aa\*ba | b**

PRIM (R) = {\*, ( , ), a, b} SIG(S) = { }

PRIM(RR) = { } SIG(A) = { }

PRIM(R\*) = { } SIG(B) = { }

Elementos LR(0)

I0

R’ → .R | R

R → .RR

R → .\*

R → .(

R → .R

R → .)

R → .a

R → .b

I1

R → (.

I2

R → a.

I3

R → b.

I4

R → R.

I5

R’ → R.

I6

R → R.IR

I7

R → \*.

I8

R → .R

I9

R → ).

I10

R → RR.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LR(0) | | | | | | | | | |
|  | **$** | **b** | **a** | **)** | **(** | **\*** | **R** | **I** | **RR** |
| **0** |  | s7 | s6 | s5 | s4 | s3 | s2 |  | s1 |
| **1** | r(R → RR) | r(R → RR) | r(R → RR) | r(R → RR) | r(R → RR) | r(R → RR) |  |  |  |
| **2** | r(R → R)/acc | r(R → R)/acc | r(R → R)/acc | r(R → R)/acc | r(R → R)/acc | r(R → R)/acc |  | s8 |  |
|  |  |  |  |  |  |  |  |  |  |
| **3** | r(R → \*) | r(R → \*) | r(R → \*) | r(R → \*) | r(R → \*) | r(R → \*) |  |  |  |
| **4** | r(R → () | r(R → () | r(R → () | r(R → () | r(R → () | r(R → () |  |  |  |
| **5** | r(R → )) | r(R → )) | r(R → )) | r(R → )) | r(R → )) | r(R → )) |  |  |  |
| **6** | r(R → a) | r(R → a) | r(R → a) | r(R → a) | r(R → a) | r(R → a) |  |  |  |
| **7** | r(R → b) | r(R → b) | r(R → b) | r(R → b) | r(R → b) | r(R → b) |  |  |  |
| **8** |  | s7 | s6 | s5 | s4 | s3 | s9 |  | s1 |
| **9** | r(R → R)/r(R → R I R) | r(R → R)/r(R → R I R) | r(R → R)/r(R → R I R) | r(R → R)/r(R → R I R) | r(R → R)/r(R → R I R) | r(R → R)/r(R → R I R) |  | s8 |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SLR | | | | | | | | | |
|  | **$** | **b** | **a** | **)** | **(** | **\*** | **R** | **I** | **RR** |
| **0** |  | s7 | s6 | s5 | s4 | s3 | s2 |  | s1 |
| **1** | r(R → RR) |  |  |  |  |  |  |  |  |
| **2** | r(R → R)/acc |  |  |  |  |  |  | s8 |  |
| **3** | r(R → \*) |  |  |  |  |  |  |  |  |
| **4** | r(R → () |  |  |  |  |  |  |  |  |
| **5** | r(R → )) |  |  |  |  |  |  |  |  |
| **6** | r(R → a) |  |  |  |  |  |  |  |  |
| **7** | r(R → b) |  |  |  |  |  |  |  |  |
| **8** |  | s7 | s6 | s5 | s4 | s3 | s9 |  | s1 |
| **9** | r(R → R)/r(R → R I R) |  |  |  |  |  |  | s8 |  |

**Problema 16**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| (1) S → L **=** R | (2) S → R | (3) L → \* R | (4) L → **id** | (5) R → L |

I1=ir\_a(I0, **id** ) , I2=ir\_a(I0, \* ) , I3=ir\_a(I0, S), I4=ir\_a(I0, L ) , I5=ir\_a(I0, R ) , I6=ir\_a(I0, L ), I7=ir\_a(I2, R ) , I8=ir\_a(I4, **=** ) , I9=ir\_a(I8, R )

Prim(S) = { R }

Sig(S) = { $, = }

Prim(L) = { id }

Sig(L) = { $, \* }

Prim(R) = { L }

Sig(L) = { $ }

Elementos LR(0)

I0

S’ → .S

S → .L=R

S → .R

L → .\*R

L → .id

R → .L

I1

S’ → S.

I2

S → L. = R

R → L.

I3

S → R.

I4

L → \*.R

R → .L

L → .\*R

L → .id

I5

L → id.

I6

S → L = .R

R → .L

L → .\*R

L → .id

I7

L → \*R.

I8

R → L.

I9

S → L = R.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| LR(0) | | | | | | | |
|  | **$** | **id** | **\*** | **eq** | **S** | **R** | **L** |
| **0** |  | s6 | s5 | s4 | s3 | s2 | s1 |
| **1** | r(R → L)/r(S → L) | r(R → L)/r(S → L) | r(R → L)/r(S → L) | r(R → L)/r(S → L) |  |  |  |
| **2** | r(L → R)/r(S → R) | r(L → R)/r(S → R) | r(L → R)/r(S → R) | r(L → R)/r(S → R) |  |  |  |
| **3** | acc | acc | acc | acc |  |  |  |
| **4** | r(S → eq) | r(S → eq) | r(S → eq) | r(S → eq) |  |  |  |
| **5** | r(L → \*) | r(L → \*) | r(L → \*) | r(L → \*) |  |  |  |
| **6** | r(L → id) | r(L → id) | r(L → id) | r(L → id) |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SLR(1) Table | | | | | | | |
|  | **$** | **id** | **\*** | **eq** | **S** | **R** | **L** |
| **0** |  | s6 | s5 | s4 | s3 | s2 | s1 |
| **1** | r(R → L)/r(S → L) |  |  |  |  |  |  |
| **2** | r(L → R)/r(S → R) |  |  |  |  |  |  |
| **3** | acc |  |  |  |  |  |  |
| **4** | r(S → eq) |  |  |  |  |  |  |
| **5** | r(L → \*) |  |  |  |  |  |  |
| **6** | r(L → id) |  |  |  |  |  |  |

**Problema 17**

|  |  |  |
| --- | --- | --- |
| 1) S → A | 2) A → **ε** | 3) A → A**bb** |

I1=ir\_a(I0 , S ) , I2=ir\_a(I0, A ) , I3=ir\_a(I2,  **b** ), I4=ir\_a(I3, **b** )

Prim(A) = { ε }

Sig(A) = { $, b }

Prim(S) = { ε }

Sig(S) = { b }

Elementos LR(0)

I0

S’ → .S

S → .A

A → . ε

A → .Abb

I1

S’ → S.

I2

S’ → A.

I3

A → ε.

I4

A → A.bb

I5

A → Ab.b

I6

A → Abb.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Estado | Accion |  | Ir\_a | |
| b | $ | S | A |
| I0 |  |  | 1 | 2 |
| I1 |  | Aceptado |  |  |
| I2 | r1 | r1 |  |  |
| I3 | r2 | r2 |  |  |
| I4 | d5 |  |  |  |
| I5 | d6 |  |  |  |
| I6 | r3 | r3 |  |  |

**Problema 18.-**Considere la siguiente gramática:

|  |  |  |  |
| --- | --- | --- | --- |
| 1) S → A**a**A**b** | 2) S → B**b**B**a** | 3) A → **ε** | 4) B → **ε** |

I1=ir\_a(I0, S) , I2=ir\_a(I0, A ) , I3=ir\_a(I0, B ), I4=ir\_a(I2, **a** ) , I5=ir\_a(I3, **b** ) ,

I6=ir\_a(I4, A ), I7=ir\_a(I5, B ) , I8=ir\_a(I6, **b** ) , I9=ir\_a(I7, **a** )

cadenas: **ab** y **ba**

Prim(A) = { ε }

Sig(A) = { }

Prim(B) = { ε }

Sig(B) = { }

Elementos LR(0)

I0

S’ → .S

S → .AaAb

S → .BbBa

I1

S’ → S.

I2

S → AaAb.

I3

S → BbBa.

I4

S → A.aAb

I5

S → B.bBa

I6

S → Aa.Ab

I7

S → Bb.Ba

I8

S → AaA.b

I7

S → BbB.a

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| LR(0) | | | | | | | |
|  | **$** | **n** | **S** | **AaAb** | **BbBa** | **A** | **B** |
| **0** |  |  | s3 | s2 | s1 |  |  |
| **1** | r(S → BbBa) | r(S → BbBa) |  |  |  |  |  |
| **2** | r(S → AaAb) | r(S → AaAb) |  |  |  |  |  |
| **3** | acc | acc |  |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SLR | | | | | | | |
|  | **$** | **n** | **S** | **AaAb** | **BbBa** | **A** | **B** |
| **0** |  |  | s3 | s2 | s1 |  |  |
| **1** | r(S → BbBa) |  |  |  |  |  |  |
| **2** | r(S → AaAb) |  |  |  |  |  |  |
| **3** | acc |  |  |  |  |  |  |

**Problema 19.-**Considere la siguiente gramática:

|  |  |
| --- | --- |
| S → **a** S **b** S | S → **a** |

I1=ir\_a(I0, **a**) , I2=ir\_a(I0, S ) , I3=ir\_a(I1, S ), I4=ir\_a(I3, **b** ) , I5=ir\_a(I3, S ) ,

Prim(S) = { a }

Sig(S) = { b }

Elementos LR(0)

I0

S’ → .S

S → .aSbS

S → . a

I1

S’ → S.

I2

S’ → a.

S → a.SbS

I3

A → aS.bS

I4

A → aSb.S

I5

A → aSbS.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LR(0) | | | | |
|  | **$** | **a** | **b** | **S** |
| **0** |  | s2 |  | s1 |
| **1** | acc | acc | acc |  |
| **2** | r(S → a) | r(S → a)/s2 | r(S → a) | s3 |
| **3** |  |  | s4 |  |
| **4** |  | s2 |  | s5 |
| **5** | r(S → a S b S) | r(S → a S b S) | r(S → a S b S) |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SLR | | | | |
|  | **$** | **a** | **b** | **S** |
| **0** |  | s2 |  | s1 |
| **1** | acc |  |  |  |
| **2** | r(S → a) | s2 | r(S → a) | s3 |
| **3** |  |  | s4 |  |
| **4** |  | s2 |  | s5 |
| **5** | r(S → a S b S) |  | r(S → a S b S) |  |

**Problema 20.-**Considere la siguiente gramática:

|  |  |  |
| --- | --- | --- |
| 1) C → AB | 2) A → **a** | 3) B → **a** |

I1=ir\_a(I0, **a**) , I2=ir\_a(I0, C ) , I3=ir\_a(I0, A ), I4=ir\_a(I3, **a** ) , I5=ir\_a(I3, B ) .

Prim(A) = { a }

Sig(A) = { }

Prim(B) = { a }

Sig(B) = { }

Elementos LR(0)

I0

C’ → .C

C → .AB

I1

C’ → .C

C → .AB

C → A.a

I2

S’ → C.

I3

C’ → .C

C → .AB

I4

C’ → .C

C → .AB

C → .aB

I5

C’ → .C

C → A.B

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LR(0) | | | | | | |
|  | **$** | **a** | **C** | **AB** | **A** | **B** |
| **0** |  |  | s2 | s1 |  |  |
| **1** | r(C → AB) | r(C → AB) |  |  |  |  |
| **2** | acc | acc |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| SLR | | | | | | |
|  | **$** | **a** | **C** | **AB** | **A** | **B** |
| **0** |  |  | s2 | s1 |  |  |
| **1** | r(C → AB) |  |  |  |  |  |
| **2** | acc |  |  |  |  |  |