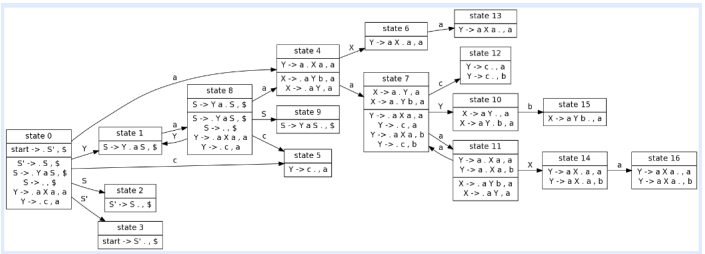
Hoja 4: Análisis sintáctico ascendente LALR(1) y LR(1)

Ejercicio 1 Comprueba si la siguiente gramática es LALR(1) o LR(1):
S'→ S
S → YaS | ε
X → aYb | aY
Y → aXa | c



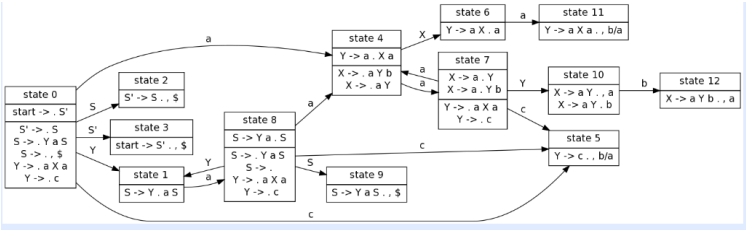
Grammar

```
S' → S .
S → Y a S
  | .
X → a Y b
  | a Y .
Y → a X a
  | c .
```

LR(1) Table

	$	c	a	b	S'	S	Y	X
0	r(S → &epsilon)	s5	s4		s3	s2	s1	
1			s8					
2	r(S' → S)							
3	acc							
4			s7					s6
5			r(Y → c)					
6			s13					
7		s12	s11				s10	
8	r(S → &epsilon)	s5	s4			s9	s1	
9	r(S → Y a S)							
10			r(X → a Y)	s15				
11			s7					s14
12			r(Y → c)	r(Y → c)				
13			r(Y → a X a)					
14			s16					
15			r(X → a Y b)					
16			r(Y → a X a)	r(Y → a X a)				

It is LR(1).



Grammar

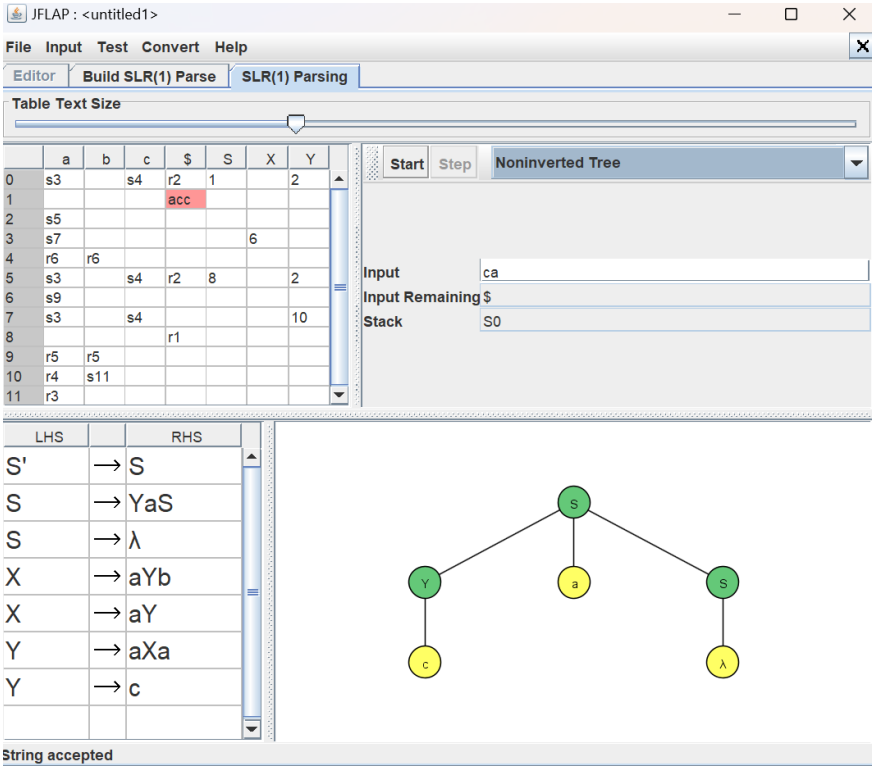
```
S' → S .
S → Y a S
  | .
X → a Y b
  | a Y .
Y → a X a
  | c .
```

LALR(1) Table

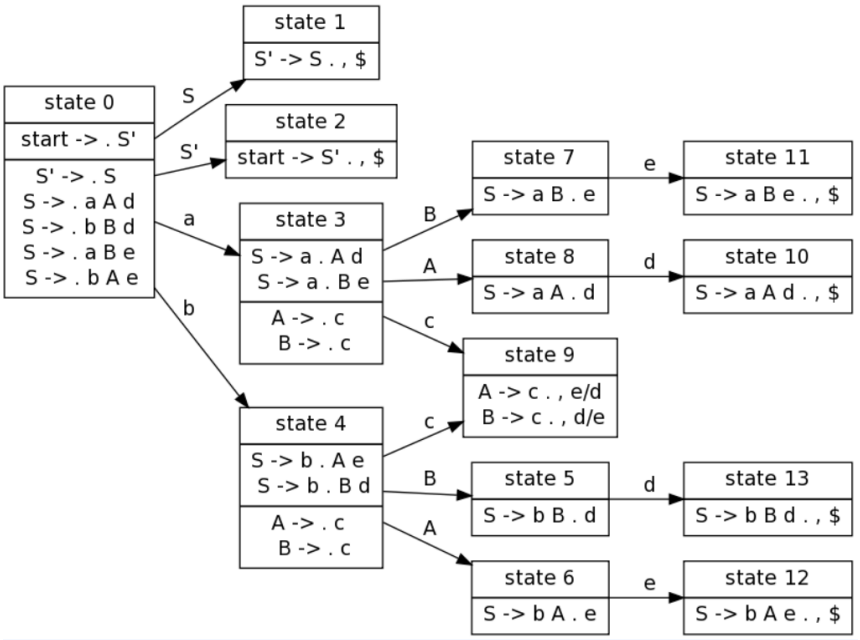
	$	c	a	b	S'	S	Y	X
0	r(S → &epsilon)	s5	s4		s3	s2	s1	
1			s8					
2	r(S' → S)							
3	acc							
4			s7					s6
5			r(Y → c)	r(Y → c)				
6			s11					
7		s5	s4				s10	
8		s5	s4			s9	s1	
9	r(S → Y a S)							
10			r(X → a Y)	s12				
11			r(Y → a X a)	r(Y → a X a)				
12			r(X → a Y b)					

It is LALR(1).

En caso de serlo, utiliza el analizador más sencillo para analizar la palabra *ca*.



Ejercicio 2 Comprueba si la siguiente gramática es LALR(1) o LR(1):
S'→ S
S → aAd | bBd | aBe | bAe
A → c
B → c



Grammar

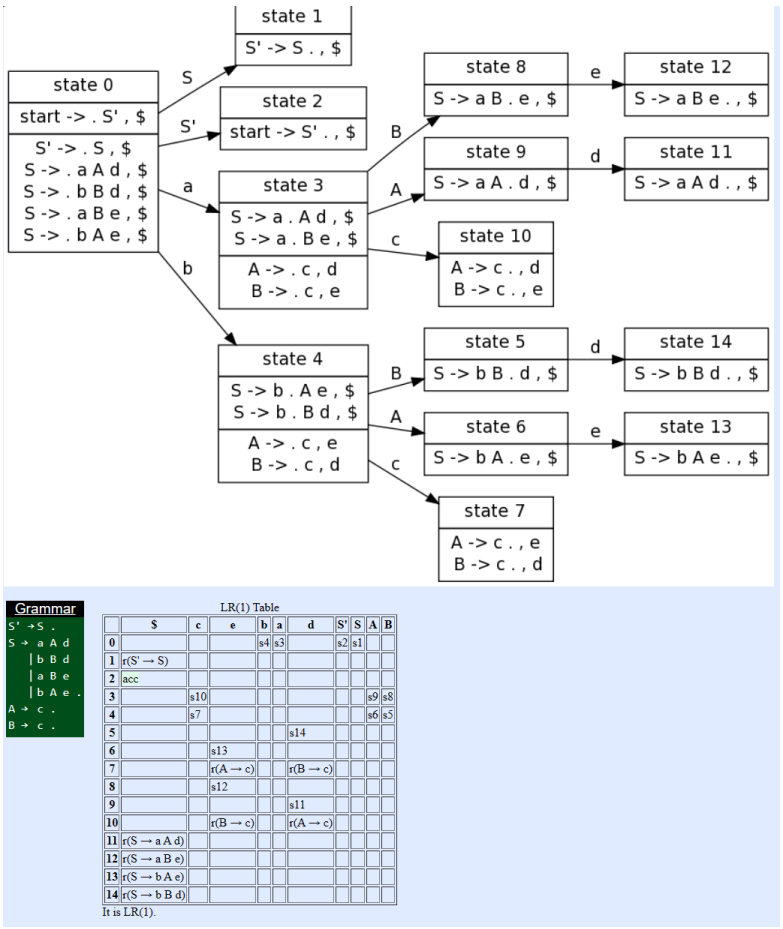
```
S' →S .
S → a A d
  | b B d
  | a B e
  | b A e .
A → c .
B → c .
```

LALR(1) Table

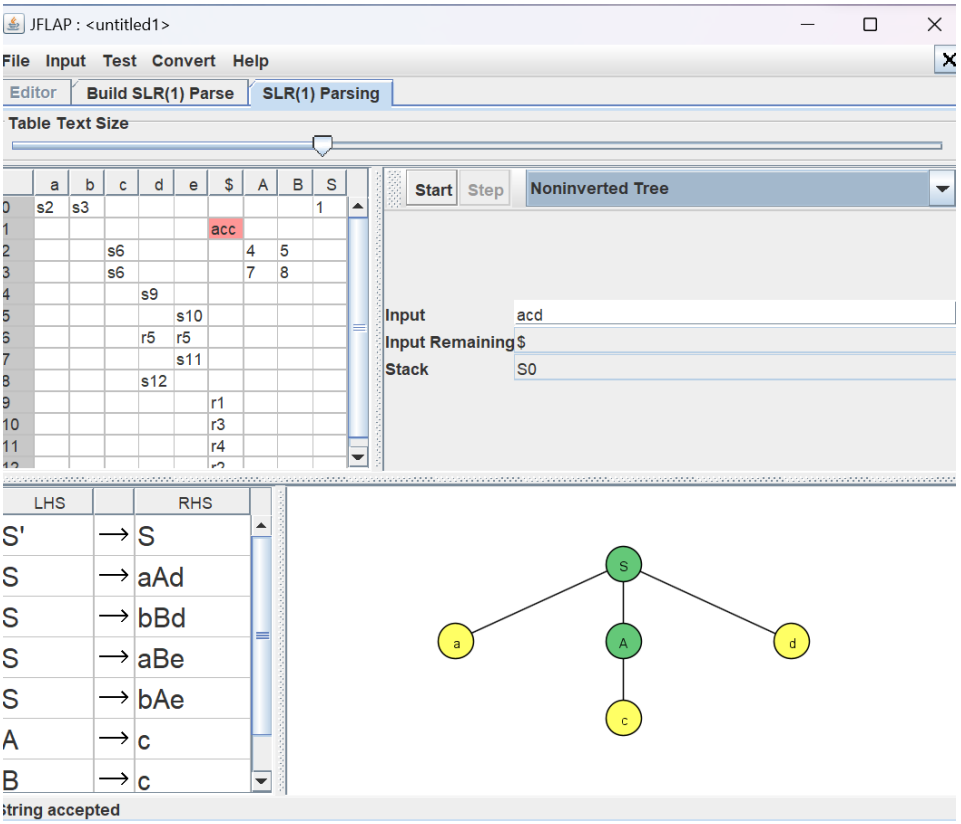
	$	c	e	b	a	d	S'	S	A	B
0				s4	s3		s2	s1		
1	r(S' → S)									
2	acc									
3		s9							s8	s7
4		s9							s6	s5
5						s13				
6			s12							
7			s11							
8						s10				
9			r(A → c)/r(B → c)			r(A → c)/r(B → c)				
10	r(S → a A d)									
11	r(S → a B e)									
12	r(S → b A e)									
13	r(S → b B d)									

It is not LALR(1) because:

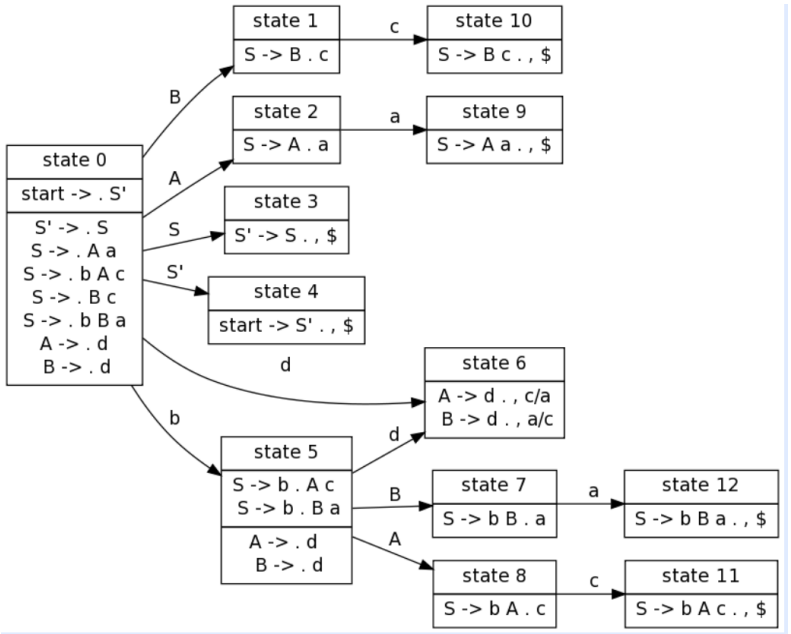
- reduce/reduce conflict in state 9.



En caso de serlo, utiliza el analizador más sencillo para analizar la palabra ***acd***.



Ejercicio 3 Comprueba que la siguiente gramática es LR(1) pero no LALR(1):
S’ → S
S → Aa | bAc | Bc | bBa
A → d
B → d



Grammar

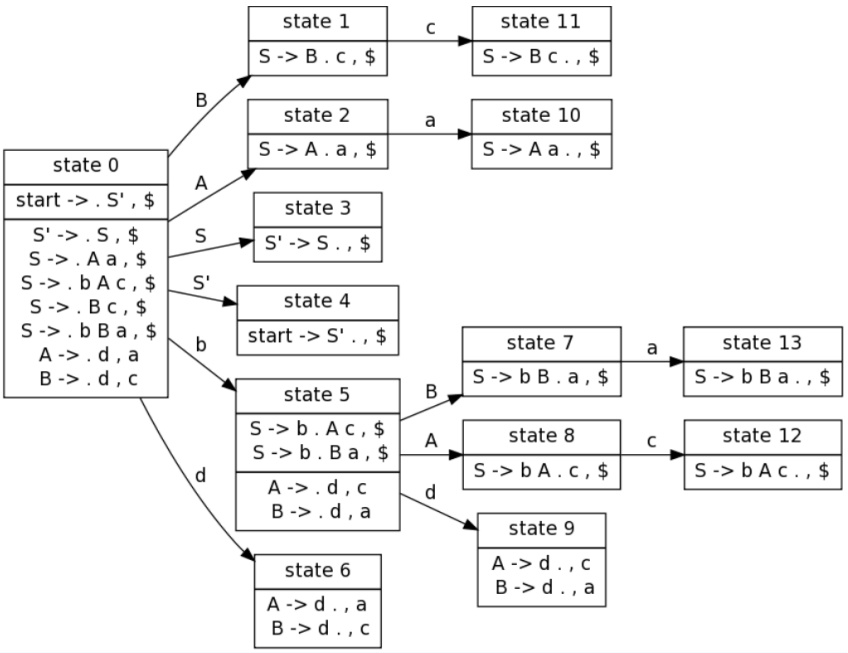
```
S' →S .
S → A a
  | b A c
  | B c
  | b B a .
A → d .
B → d .
```

LALR(1) Table

	$	d	a	b	c	S'	S	A	B
0		s6		s5		s4	s3	s2	s1
1					s10				
2			s9						
3	r(S' → S)								
4	acc								
5		s6						s8	s7
6		r(A → d)/r(B → d)			r(A → d)/r(B → d)				
7			s12						
8					s11				
9	r(S → A a)								
10	r(S → B c)								
11	r(S → b A c)								
12	r(S → b B a)								

It is not LALR(1) because:

- reduce/reduce conflict in state 6.



Grammar

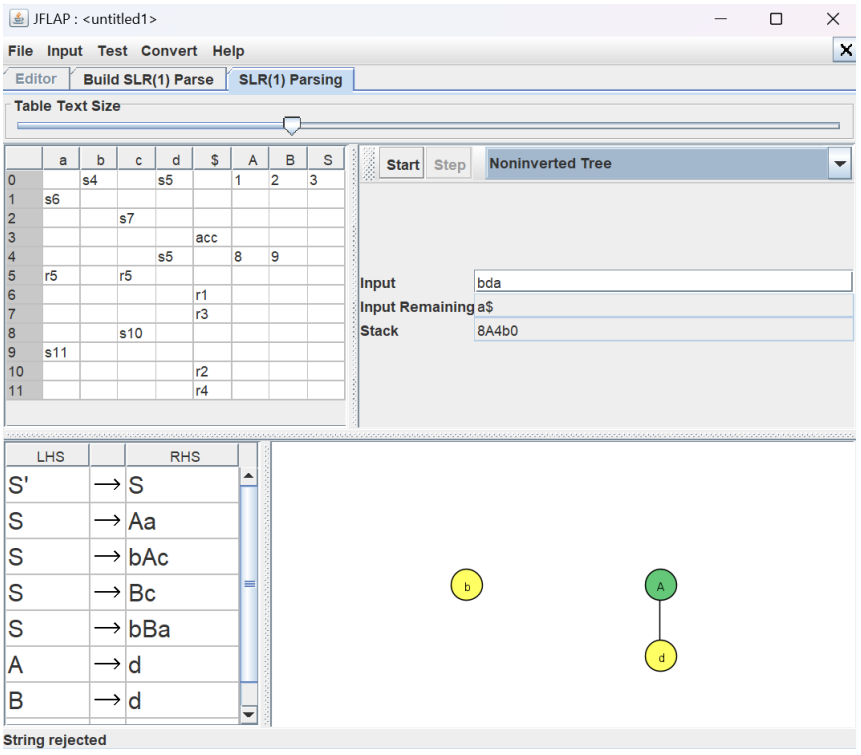
S' → S .
S → A a
| b A c
| B c
| b B a .
A → d .
B → d .

LR(1) Table

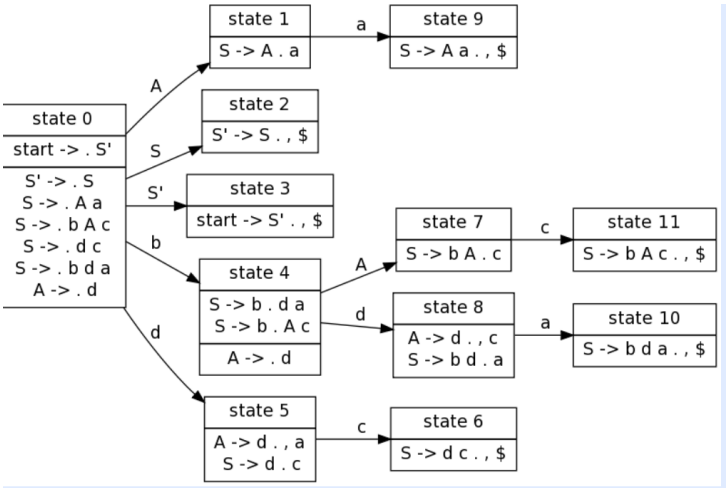
	$	d	a	b	c	S'	S	A	B
0		s6		s5		s4	s3	s2	s1
1					s11				
2			s10						
3	r(S' → S)								
4	acc								
5		s9						s8	s7
6			r(A → d)		r(B → d)				
7			s13						
8					s12				
9			r(B → d)		r(A → d)				
10	r(S → A a)								
11	r(S → B c)								
12	r(S → b A c)								
13	r(S → b B a)								

It is LR(1).

Utiliza el analizador LR(1) para construir el árbol sintáctico de *bda*.



Ejercicio 4 Comprueba que la siguiente gramática es LALR(1) pero no SLR:
S'→ S
S → Aa | bAc | dc | bda
A → d



Grammar

```
S' → S .
S → A a
  | b A c
  | d c
  | b d a .
A → d .
```

LALR(1) Table

	$	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1			s9					
2	r(S' → S)							
3	acc							
4		s8						s7
5			r(A → d)		s6			
6	r(S → d c)							
7					s11			
8			s10		r(A → d)			
9	r(S → A a)							
10	r(S → b d a)							
11	r(S → b A c)							

It is LALR(1).

Grammar

```
S' → S .
S → A a
  | b A c
  | d c
  | b d a .
A → d .
```

LR(0) Table

	$	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1			s9					
2	r(S' → S)	r(S' → S)	r(S' → S)	r(S' → S)	r(S' → S)			
3	acc	acc	acc	acc	acc			
4		s8						s7
5	r(A → d)	r(A → d)	r(A → d)	r(A → d)	r(A → d)/s6			
6	r(S → d c)	r(S → d c)	r(S → d c)	r(S → d c)	r(S → d c)			
7					s11			
8	r(A → d)	r(A → d)	r(A → d)/s10	r(A → d)	r(A → d)			
9	r(S → A a)	r(S → A a)	r(S → A a)	r(S → A a)	r(S → A a)			
10	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)			
11	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(1) Table

	$	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1			s9					
2	r(S' → S)							
3	acc							
4		s8						s7
5			r(A → d)		r(A → d)/s6			
6	r(S → d c)							
7					s11			
8			r(A → d)/s10		r(A → d)			
9	r(S → A a)							
10	r(S → b d a)							
11	r(S → b A c)							

The grammar is not LR(0) because:

- shift/reduce conflict in state 5.
- shift/reduce conflict in state 8.

Neither is it SLR(1) because:

- shift/reduce conflict in state 5.
- shift/reduce conflict in state 8.

Utiliza el analizador LALR(1) para construir el árbol sintáctico de ***bd***