Exercises

Exercise 1. Let G be the grammar whose productions are:

S:= Bc | b | A
A::= aBb
B::= ε

(**a1**) Is G∈LL(1) ? (**a2**) Why ?
(**b1**) Is G∈SLR(1) ? (**b2**) Why ?
(**c1**) Is G∈LR(1) ? (**c2**) Why ?
(**d1**) Give the LR(1) parsing table;
(**d2**) Using table in (d1), show tha states of the pushdown automaton, during the anlysis of strin: abc.
(**e1**) Is G∈LALR(1) ? (**e2**) Why ?
(**f**) Compare LR(1) and LALR(1) parsing tables.

Exercise 2. Let G be the grammar whose productions are:

S:= Au | av
A::= a | Av

(**a1**) Is G∈LL(1) ? (**a2**) Why ?
(**b1**) Is G∈SLR(1) ? (**b2**) Why ?
(**c1**) Is G∈LR(1) ? (**c2**) Why ?
(**d1**) Is G∈LALR(1) ? (**d2**) Why ?
(**e1**) Is L(G)∈SLR(1) ? (**e2**) Why ?
(**f1**) Show a set expression for L(G); **(f2)** and, a LL(1) grammar, if any, for it;
(f3) and, in the case, the analysis table of the given grammar

Exercise 3. Answer all the questions of exercise 1, in case of a grammar with the following productions:

S:= Au | av
A::= a | bAv

Exercise 4. Let G be the grammar whose productions are: S::=aSS|b
(a) Compute the n-th approximation of the Traski's sequence;
(b) Prove the correctness of the answer above given

Exercise 1

a1) Yes, G is LL(1) because LL(1) properties hold as (a2) shows

a2) S ::= B c   S ::= b
- FS(Bc) = {c}   FS(b) = {b} => Property 1 is sat. since {b} ∩ {c} = {}
- S ::= B c   S ::= A

  FS(A) = {a} => Property 1 is sat. since {a} ∩ {c} = {}

  S ::= b   S = A => Property 1 is sat. since {b} ∩ {a} = {}, R ∈ {Bc, b, A}

  About property 2: It is satisfied because no right part of production for S has ε ∈ FS(R)

b1) We need to compute Coll(0), below

$I0 = \{S' \to .S, S \to .Bc, S \to .b, S \to .A, B \to ., A \to .aBb\}$: FW(B) = {b, c} => S/R conflict since {S → .b, B → .}

NO: G ∉ SLR(1)

b2) because of the S/R conflict in state 0.

c1) Yes, G is LR(1) because of the inclusion below

c1) $G \in LL(1) \subset LR(1)$

d1) We need to compute collection Coll(1), below:

$I0 = \{S' \to .S/\$, S \to .Bc/\$, S \to .b/\$, S \to .A/\$, B \to ./c, A \to .aBb/\$\}$

No conflict between $S \to .b/\$$ and $B \to ./c$

goto(0, S) = {S' → S. / $} NC since only 1 item
= I1

goto(0, B) = {S → B . c / $} NC since 1 only item
= I2

goto(0, b) = {S → b. / $} NC since 1 item
= I3

goto(0, A) = {S → A. / $} NC since 1 item
= I4

goto(0, a) = {A → a.Bb/$, B → ./b} NC since
= I5 we only 1 reduce and no shift item

goto(2, c) = {S → Bc./$} NC since only 1 item
= I6

goto(5, B) = {A → aB.b/$} NC since 1 item
= I7

goto(7, b) = {A → aBb./$} NC since 1 item
= I8

	a	b	c	$	S	A	B
0	S/5	S/3	R/4		1	4	2
1				Acc			
2			S/6				
3				R/1			
4				R/2			
5		R/4					7
6				R/0			
7		S/8					
8				R/3			

a b c $

| 0 | $ |

=>

b c $

| 5 | a | 0 | $ |

b c $

| 7 | B | 5 | a | 0 | $ |

c $

| 8 | b | 7 | B | 5 | a | 0 | $ |

FAILURE

Exercise 5

Consider the grammar below which is a variant of the grammar of exercise 4.

$$S ::= SA \mid b$$
$$A ::= Sa$$

a) Define the parsing table of an LR(1) analyser for the grammar.

<u>Solution</u>

- We start computing the Core [0]

$I0 = \{S' \to .S,\ S \to .SA,\ S \to .b\}$ NC since no reduce items

$GOTO(0,S) = \{S' \to S.,\ S \to S.A,\ A \to .Sa,\ S \to .SA,\ S \to .b\}$ NC since no reduce items.

$GOTO(0,b) =$

To be completed as homework for the next lesson.