

**AI665: Natural Language Processing**

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**Assignment 3 - SLR(1)**

**Q1: Please construct canonical Collection and parsing table of SLR(1) the following Grammer**

**S → A**

**S → xb**

**A → aAb**

**A → B**

**B → x**

Step1: Add augment as first rule (S’ → S$)

(1) S’ → S$

(2) S → A

(3) S → xb

(4) A → aAb

(5) A → B

(6) B → x

Step2: Context-free grammar

I9

I8

I7

I6

I5

I4

I3

I2

I1

I0

Step3: Parsing table

1. Find follow for each Non Terminal

* Follow(S) = {$}
* Follow(A) = {$,b}
* Follow(B) = {$,b}

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Status # | Activation Table | | | | GO\_TO | | |
| a | b | x | $ | S | A | B |
| 0 | S4 |  | S3 |  | 1 | 2 | 5 |
| 1 |  |  |  | Accept |  |  |  |
| 2 |  |  |  | r2 |  |  |  |
| 3 |  | S6/r6 |  | r6 |  |  |  |
| 4 | S4 |  | S8 |  |  | 7 | 5 |
| 5 |  | r5 |  | r5 |  |  |  |
| 6 |  |  |  | r3 |  |  |  |
| 7 |  | S9 |  |  |  |  |  |
| 8 |  | r6 |  | r6 |  |  |  |
| 9 |  | r4 |  | r4 |  |  |  |

Step4: Parse input (aaxbxb)

|  |  |  |
| --- | --- | --- |
| Stack | input | Action |
| 0 | aaxbxb $ | - |
| 0a | axbxb $ | S4 |
| 0a4a4 | xbxb $ | S4 |
| 0a4a4x8 | bxb $ | S8 |
| 0a4a4 | bxb $ | (r6) Reduce by B → x (\*2) |
| 0a4a4B5 | bxb $ | Add B (NT) and (5) |
| 0a4a4 | bxb $ | (r5) Reduce by A → B (\*2) |
| 0a4a4A7 | bxb $ | Add A (NT) and (7) |
| 0a4a4A7b9 | xb $ | S9 |
| 0a4a4A7b9 | xb $ | No action (ERROR) |

**Q2: Please construct canonical Collection and parsing table of SLR(1) the following Grammer**

S → AB

A → a

A → aa

C → A

C → c

B → aCb

Step1: Add augment as first rule (S’ → S$)

(1) S’ → S$

(2) S → AB

(3) A → a

(4) A → aa

(5) C → A

(6) C → c

(7) B → aCb

Step2: Context-free grammar

I3

I8

I5

I1

I2

I10

I9

I7

I6

I4

I0

Step3: Parsing table

1. Find follow for each Non Terminal

* Follow(S) = {$}
* Follow(A) = {a, b}
* Follow(B) = {$}
* Follow(C) = {b}

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Status # | Activation Table | | | | GO\_TO | | |  |
| a | c | b | $ | S | A | B | C |
| 0 | S3 |  |  |  | 1 | 2 |  |  |
| 1 |  |  |  | Accept |  |  |  |  |
| 2 | S5 |  |  |  |  |  | 4 |  |
| 3 | S6/r3 |  | r3 |  |  |  |  |  |
| 4 |  |  |  | r2 |  |  |  |  |
| 5 | S3 | S9 |  |  |  | 8 |  | 7 |
| 6 | r4 |  | r4 |  |  |  |  |  |
| 7 |  |  | S10 |  |  |  |  |  |
| 8 |  |  | r5 |  |  |  |  |  |
| 9 |  |  | r6 |  |  |  |  |  |
| 10 |  |  |  | r7 |  |  |  |  |

Step4: Parse input (aaacb)

1. Stack and action

|  |  |  |
| --- | --- | --- |
| Stack | input | Action |
| 0 | aaacb $ | - |
| 0a3 | aacb $ | S3 |
| 0a3a6 | acb $ | S6 |
| 0 | acb $ | (r4) Reduce by A → aa (\*4) |
| 0A2 | acb $ | Add A (NT) and (2) |
| 0A2a5 | cb $ | S5 |
| 0A2a5c9 | b $ | S9 |
| 0A2a5 | b $ | (r6) Reduce by C → c (\*2) |
| 0A2a5C7 | b $ | Add C (NT) and (7) |
| 0A2a5C7b10 | $ | S10 |
| 0A2 | $ | (r7) Reduce by B → aCb (\*6) |
| 0A2B4 | $ | Add B (NT) and (4) |
| 0 | $ | (r2) Reduce by S → AB (\*4) |
| 0S1 | $ | Add S (NT) and (1) |
| 0S1$ |  | Accept |

1. Input Tree: