

Q. Draw LR(1) parsing table of following grammar

$$S \rightarrow AA$$

$$S \rightarrow aA$$

$$A \rightarrow b$$

so/

The augmented grammar of above grammar is,

$$0. S' \rightarrow S$$

$$1. S \rightarrow AA$$

$$2. A \rightarrow aA$$

$$3. A \rightarrow b$$

Step 1: At first find the canonical collection of LR(1) items of the given augmented grammar is,

$$I_0 = \text{closure}(S' \rightarrow \cdot S)$$

$$= \{ (S' \rightarrow \cdot S, \$), (S \rightarrow \cdot AA, \$), (A \rightarrow \cdot aA, a/b), (A \rightarrow \cdot b, a/b) \}$$

$$I_1 = \text{goto}(I_0, S) = \text{closure}(S' \rightarrow S \cdot) = \{ (S' \rightarrow S \cdot, \$) \}$$

$$I_2 = \text{goto}(I_0, A) = \text{closure}(S \rightarrow A \cdot A, S \rightarrow A \cdot A, \$) \\ = \{ (S \rightarrow A \cdot A, \$), (A \rightarrow \cdot aA, \$), (A \rightarrow \cdot b, \$) \}$$

$$I_3 = \text{goto}(I_0, a) = \text{closure}(A \rightarrow a \cdot A, a/b) \\ = \{ (A \rightarrow a \cdot A, a/b), (A \rightarrow \cdot aA, a/b), (A \rightarrow \cdot b, a/b) \}$$

$$I_4 = \text{goto}(I_0, b) = \text{closure}(A \rightarrow b \cdot, a/b) = \{A \rightarrow b \cdot, a/b\}$$

$$I_5 = \text{goto}(I_2, A) = \text{closure}(S \rightarrow AA \cdot, \$) = \{S \rightarrow AA \cdot, \$\}$$

$$\begin{aligned} I_6 = \text{goto}(I_2, a) &= \text{closure}(A \rightarrow a \cdot A, \$) \\ &= \{ (A \rightarrow a \cdot A, \$), (A \rightarrow \cdot aA, \$) \\ &\quad (A \rightarrow \cdot b, \$) \} \end{aligned}$$

$$I_7 = \text{goto}(I_2, b) = \text{closure}(A \rightarrow b \cdot, \$) = \{A \rightarrow b \cdot, \$\}$$

$$\text{goto}(I_3, a) = \text{closure}(A \rightarrow a \cdot A, a/b) = \text{same as } I_3$$

$$\text{goto}(I_3, b) = \text{closure}(A \rightarrow b \cdot, a/b) = \text{same as } I_4$$

$$\begin{aligned} I_8 = \text{goto}(I_3, A) &= \text{closure}(A \rightarrow aA \cdot, a/b) \\ &= \{A \rightarrow aA \cdot, a/b\} \end{aligned}$$

$$\text{goto}(I_6, a) = \text{closure}(A \rightarrow a \cdot A, \$) = \text{same as } I_6$$

$$\text{goto}(I_6, b) = \text{closure}(A \rightarrow b \cdot, \$) = \text{same as } I_7$$

$$I_9 = \text{goto}(I_6, A) = \text{closure}(A \rightarrow aA \cdot, \$) = \{A \rightarrow aA \cdot, \$\}$$

Step 2:- Combine LR(1) sets with sets of items that share the same first part. Combine LR(1) sets with sets of items that share the same first part i.e. core part.

Combine state 3 and 6 as,

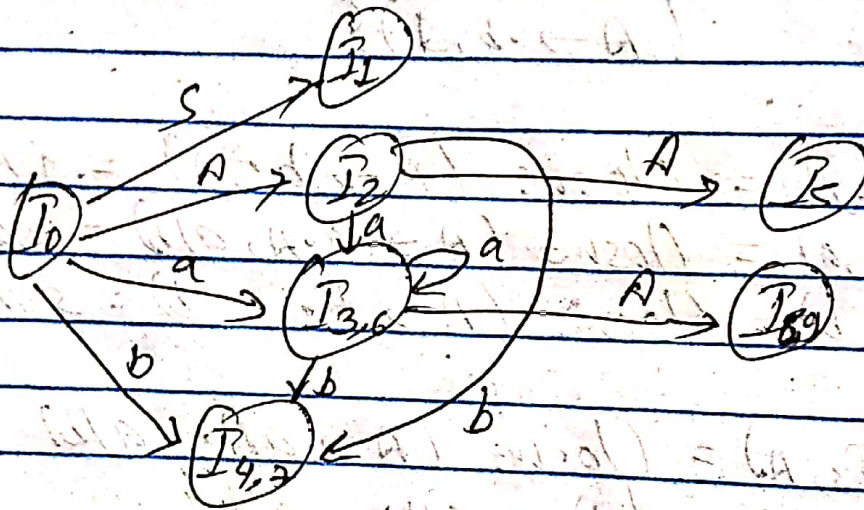
$$I_{3,6} = \{ (A \rightarrow a \cdot A, a/b/\$), (A \rightarrow \cdot aA, a/b/\$), (A \rightarrow \cdot b, a/b/\$) \}$$

Combine state 4 and 7 as

$$I_{4,7} = \{ A \rightarrow b \cdot, a/b/\$ \}$$

Combine state 8 and 9 as
 $I_{8,9} = \{A \rightarrow aA \cdot, a/b/\$ \}$

Step 3:- The DFA of LR parsing is



Step 4:- The LR parsing table is

States	Action table			Goto Table	
	a	b	\$	S	R
I_0	$S_{3,6}$	$S_{4,7}$			
I_1			Accept	1	2
I_2	$S_{3,6}$	$S_{4,7}$			
$I_{3,6}$	$S_{3,6}$	$S_{4,7}$			5
$I_{4,7}$	R_3	R_3	R_3		8,9
I_5			R_1		
$I_{8,9}$	R_2	R_2	R_2		