

c) left factorization :-

if we have a non terminal with productions of the form

$$A \rightarrow \alpha\beta \mid \alpha\gamma \text{ where}$$

$\alpha$ ,  $\beta$  and  $\gamma$  are combinations of terminals and non terminals then we can do left factoring as

follows,

$$A \rightarrow \alpha \beta / \alpha \gamma \quad (\text{BNF})$$

$$A \rightarrow \alpha (\beta / \gamma) \quad (\text{EBNF})$$

$$\left[ \begin{array}{l} A \rightarrow \alpha A' \\ A' \rightarrow \beta / \gamma \end{array} \right] \text{ left factorization}$$

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$$S \rightarrow \cancel{ab} abC / a \underline{c} D$$

$$S \rightarrow a S'$$

$$S' \rightarrow bC / cD$$

if applying it on CFG of if statement,

$$\text{if-stmt} \rightarrow \text{if}(\text{exp}) \text{ statement } |$$

$$\text{if}(\text{exp}) \text{ statement else statement}$$

$$\text{if-stmt} \rightarrow \text{if}(\text{exp}) \text{ statement 'if-stmt'}$$

$$\text{if-stmt}' \rightarrow \epsilon \mid \text{else statement}$$



imp

$$E \rightarrow E + T \mid E - T \mid T$$

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$\rightarrow E \rightarrow E S'$  left factorization

$S' \rightarrow +T \mid -T \mid T$

left recursion

### METHOD 4

$$E \rightarrow E + T \mid E - T \mid T$$

$$E \rightarrow E E' \mid T \quad (A \propto 1P)$$

$$(E' \rightarrow +T \mid -T \text{ (factorization)})$$

$\rightarrow$  left recursion

$$E \rightarrow TE''$$

$$E'' \rightarrow E' E'' \mid \epsilon$$

## METHOD # 2

$$\begin{array}{ccccc} E \rightarrow E + T & | E - T & | T \\ A & A \times & A \div & B \end{array}$$

$$E \rightarrow T E'$$

$$E' \rightarrow + T E' \mid - T E' \mid \epsilon$$

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$$S \rightarrow a S a \mid b S b \mid a \mid b \quad \text{imp}$$

var-decl imp

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Q. LL(1) Parsing Algo steps explanation