

First and Follow

always find for L.H.S

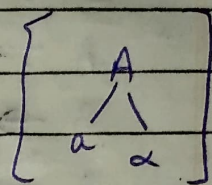
always find for R.H.S

Rules

① $A \rightarrow a\alpha$, α can be T/NT

$A \rightarrow a$

$\text{first}(A) = \{a\}$



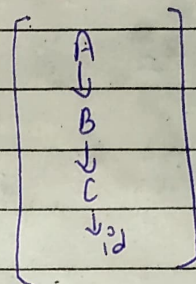
② $A \rightarrow \epsilon$

$\text{first}(A) = \{\epsilon\}$

③ $A \rightarrow B$

$B \rightarrow C$

$C \rightarrow id$



$\text{first}(A) = \{id\}$

④ $A \rightarrow BC$

case i if $\text{first}(B) \neq \epsilon$

then $\text{first}(A) = \text{first}(B)$

case ii if $\text{first}(B) = \epsilon$

then $\text{first}(A) = \text{first}(B) \cup \text{first}(C)$

Qol

$A \rightarrow a$

$B \rightarrow () \mid id$

$C \rightarrow * \mid \epsilon$

Solve

$\text{first}(A) \Rightarrow \{a\}$

$\text{first}(B) \Rightarrow \{(), id\}$

$\text{first}(C) = \{*, \epsilon\}$

Qo2

$$S \rightarrow ABC \mid ghi \mid jkl$$

$$A \rightarrow a \mid b \mid c$$

$$B \rightarrow b$$

$$D \rightarrow a$$

Solve

$$\text{first}(S) = \{a, b, c, g, h, j\}$$

$$\text{first}(A) = \{a, b, c\}$$

$$\text{first}(B) = \{b\}$$

$$\text{first}(D) = \{a\}$$

Qo3

$$S \rightarrow ABC$$

$$A \rightarrow a \mid b \mid \epsilon$$

$$B \rightarrow c \mid d \mid \epsilon$$

$$C \rightarrow e \mid f \mid \epsilon$$

Solve

$$\text{first}(C) = \{e, f, \epsilon\}$$

$$\text{first}(B) = \{c, d, \epsilon\}$$

$$\text{first}(A) = \{a, b, \epsilon\}$$

$$\text{first}(S) = \{a, b, c, d, e, f, \epsilon\}$$

Rules

① if 's' is start symbol then
 $\text{follow}(s)$ will contain $\{\$, '\}$

② $A \rightarrow \alpha B \beta$
 $B \rightarrow a$

case i $\text{follow}(B) = \text{first}(\beta)$ (iff $\text{first}(\beta) \neq \epsilon$)

case ii $\text{follow}(B) = \text{follow}(A)$ (iff $\text{first}(\beta) = \epsilon$)

if 'A' is a start symbol
 $\text{follow}(B) = \text{follow}(A) = \{\$, '\}$

③ $A \rightarrow \alpha B$
 $\text{follow}(B) = \text{follow}(A)$

Q.1
 $E \rightarrow TE'$
 $E' \rightarrow +TE' \mid \epsilon$
 $T \rightarrow FT'$
 $T' \rightarrow *FT' \mid \epsilon$
 $F \rightarrow (\epsilon) \mid \text{id}$

<u>Solve</u>	$\text{first}(E) = \{ '(', \text{id} \}$	$\text{follow}(E) = \{ \$, ' ' \}$
	$\text{first}(E') = \{ +, \epsilon \}$	$\text{follow}(E')$ $= \{ \$, ' ' \}$
	$\text{first}(F) = \{ '(', \text{id} \}$	$\text{follow}(T)$ $= \{ +, \$, ' ' \}$
	$\text{first}(T') = \{ *, \epsilon \}$	$\text{follow}(T')$ $= \{ +, \$, ' ' \}$
	$\text{first}(T) = \{ '(', \text{id} \}$	
	$\text{follow}(F) = \{ *, +, \$, ' ' \}$	

Qo3 $S \rightarrow B \cdot b \mid \epsilon d$

$B \rightarrow a B \mid \epsilon$

$C \rightarrow C C \mid \epsilon$

Solve $\text{first}(S) = \{a, \epsilon, c, \epsilon, b, d\}$ (rule 3, 4)

$\text{first}(B) = \{a, \epsilon\}$

$\text{first}(C) = \{c, \epsilon\}$

$\text{follow}(S) = \{ \$ \}$

$\text{follow}(B) = \{b, \}$

$\text{follow}(C) = \{d, \}$

Qo $S \rightarrow ABCDE$

$A \rightarrow a \mid \epsilon$

$B \rightarrow b \mid \epsilon$

$C \rightarrow c$

$D \rightarrow d \mid \epsilon$

$E \rightarrow e \mid \epsilon$

Solve $\text{first}(A) = \{a, \epsilon\}$

" $\text{first}(B) = \{b, \epsilon\}$

" $\text{first}(C) = \{c\}$

" $\text{first}(D) = \{d, \epsilon\}$

" $\text{first}(E) = \{e, \epsilon\}$

" $\text{first}(S) = \{a, b, c\}$

$\text{follow}(S) = \{ \$ \}$

" $\text{follow}(A) = \{b, c\}$

" $\text{follow}(B) = \{c\}$

" $\text{follow}(C) = \{d, e, \$\}$

" $\text{follow}(D) = \{e, \$\}$

" $\text{follow}(E) = \{ \$ \}$