

First & Follow function - solved problems (set 1 & 2)

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FIRST() and FOLLOW() Functions - Solved Problems (Set 1)

FIRST() & FOLLOW() Functions
(Solved Problems) SET 1

What is FOLLOW(Q)?

$P \rightarrow xQRS$
 $Q \rightarrow yz \mid z$
 $R \rightarrow w \mid \epsilon$
 $S \rightarrow y$

(A) {R} (B) {w}
(C) {w, y} (D) {w, ϵ }

GATE 2017

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Q1: Consider the following grammar:

$P \rightarrow xQRS$
 $Q \rightarrow yz \mid z$
 $R \rightarrow w \mid \epsilon$
 $S \rightarrow y$

What is FOLLOW(Q)?

(A) {R}
(B) {w}
(C) {w, y}
(D) {w, ϵ }

$\text{Follow}(Q) = \text{FIRST}(R)$
 $= \{w, \epsilon\}$
 $= \{w\} \cup \text{FIRST}(S)$
 $= \{w, y\}$

Q2: Find the FIRST and FOLLOW of all the non-terminals:

	FIRST	FOLLOW
$S \rightarrow ABCDE$	{a, b, c}	{ \$ }
$A \rightarrow a \mid \epsilon$	{a, ϵ }	{b, c}
$B \rightarrow b \mid \epsilon$	{b, ϵ }	{c}
$C \rightarrow c$	{c}	{d, e, \$}
$D \rightarrow d \mid \epsilon$	{d, ϵ }	{e, \$}
$E \rightarrow e \mid \epsilon$	{e, ϵ }	{ \$ }

Q3: Find the FIRST and FOLLOW of all the non-terminals:

$S \rightarrow Bb \mid Cd$

$B \rightarrow aB \mid \epsilon$

$C \rightarrow cC \mid \epsilon$

	FIRST	FOLLOW
$S \rightarrow Bb \mid Cd$	$\{a, b, c, d\}$	$\{\$ \}$
$B \rightarrow aB \mid \epsilon$	$\{a, \epsilon\}$	$\{b\}$
$C \rightarrow cC \mid \epsilon$	$\{c, \epsilon\}$	$\{d\}$

$$\begin{aligned}
 \text{FIRST}(S) &= \{a, \epsilon\} \cup \{c, \epsilon\} \\
 &= \{a, b\} \cup \{c, d\} \\
 &= \{a, b, c, d\}
 \end{aligned}$$

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

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

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

$$\text{FOLLOW}(C) = \{d\}$$

[FIRST\(\) and FOLLOW\(\) Functions – Solved Problems \(Set 2\)](#)

FIRST() & FOLLOW() Functions (Solved Problems) SET 2

Find the FIRST and FOLLOW of all the non-terminals:

Que 2

$S \rightarrow ACB \mid CbB \mid B$

$A \rightarrow da \mid BC$

$B \rightarrow g \mid \epsilon$

$C \rightarrow h \mid \epsilon$

Que 1

$S \rightarrow aBDh$

$B \rightarrow cC$

$C \rightarrow bC \mid \epsilon$

$D \rightarrow EF$

$E \rightarrow g \mid \epsilon$

$F \rightarrow f \mid \epsilon$

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Q1: Find the FIRST and FOLLOW of all the non-terminals:

$S \rightarrow aBDh$

$B \rightarrow cC$

$C \rightarrow bC \mid \epsilon$

$D \rightarrow EF$

Q1: Find the FIRST and FOLLOW of all the non-terminals:

$S \rightarrow aBDh$

$B \rightarrow cC$

$C \rightarrow bC \mid \varepsilon$

$D \rightarrow EF$

$E \rightarrow g \mid \varepsilon$

$F \rightarrow f \mid \varepsilon$

	FIRST	FOLLOW
$S \rightarrow aBDh$	$\{a\}$	$\{\$ \}$
$B \rightarrow cC$	$\{c\}$	$\{g, f, h\}$
$C \rightarrow bC \mid \varepsilon$	$\{b, \varepsilon\}$	$\{a, g, h\}$
$D \rightarrow EF$	$\{g, f, \varepsilon\}$	$\{h\}$
$E \rightarrow g \mid \varepsilon$	$\{g, \varepsilon\}$	$\{f, h\}$
$F \rightarrow f \mid \varepsilon$	$\{f, \varepsilon\}$	$\{h\}$

$$\begin{aligned}
 \text{Follow}(B) &= \text{First}(D) \\
 &= \{g, f, \varepsilon\} \\
 &= \{g, f\} \cup \{h\}
 \end{aligned}$$

$$\text{Follow}(C) = \text{Follow}(B) \cup \text{Follow}(C)$$

$$\begin{aligned}
 \text{Follow}(E) &= \text{First}(F) \\
 &= \{f, \varepsilon\} \\
 &= \{f\} \cup \text{Follow}(D) \\
 &= \{f, h\}
 \end{aligned}$$

Q2: Find the FIRST and FOLLOW of all the non-terminals:

$S \rightarrow ACB \mid CbB \mid Ba$

$A \rightarrow da \mid BC$

$B \rightarrow g \mid \varepsilon$

$C \rightarrow h \mid \varepsilon$

	FIRST	FOLLOW
$S \rightarrow ACB \mid CbB \mid Ba$	$\varepsilon, d, g, h, b, a$	$\$$

$S \rightarrow ACB \mid CbB \mid Ba$	ϵ, d, g, h, b, a	$\$$
$A \rightarrow da \mid BC$	d, g, h, ϵ	$h, g, \$$
$B \rightarrow g \mid \epsilon$	g, ϵ	$\$, a, h, g$
$C \rightarrow h \mid \epsilon$	h, ϵ	$g, \$, b, h$

$$\begin{aligned}
 & \text{First}(ABC) \\
 &= \{d, g, \epsilon\} \\
 &= \{d, g\} \cup \text{First}(C) = \{d, g\} \cup \{h, \epsilon\} \\
 &= \{d, g, h\} \cup \text{First}(B) = \{d, g, h, \epsilon\}
 \end{aligned}$$

$$\text{First}(CbB) = \{h, b\}; \text{First}(Ba) = \{g, a\}$$

$$\begin{aligned}
 \text{Follow}(A) &= \text{First}(C) = \{h, \epsilon\} \\
 &= \{h\} \cup \text{First}(B) \\
 &= \{h, g, \epsilon\} = \{h, g\} \cup \text{Follow}(S) \\
 &= \{h, g, \$\}
 \end{aligned}$$

$$\begin{aligned}
 \text{Follow}(B) &= \{\$, a\} \cup \text{First}(C) \\
 &= \{\$, a, h\} \cup \text{Follow}(A)
 \end{aligned}$$

$$\text{Follow}(C) = \{g, \$\} \cup \text{Follow}(A) \cup \{b\}$$