

CSC-135-HW-1

Grammer

program \rightarrow S {statemt}
statemt \rightarrow assnmt | ifstmt | do | inout | progcall
assnmt \rightarrow ident ~ exprsn ;
ifstmt \rightarrow I comprsn @ {statemt} [% {statemt }] &
do \rightarrow D { statemt } U comprsn E
inout \rightarrow iosym ident { , ident } ;
iosym \rightarrow R | O
progcall \rightarrow C program G
comprsn \rightarrow (oprnd opratr oprnd)
exprsn \rightarrow factor { + factor }
factor \rightarrow oprnd { * oprnd }
oprnd \rightarrow int | ident | bool | (exprsn)
opratr \rightarrow < | = | > | ! | ^
ident \rightarrow letter {char}
char \rightarrow letter | digit
int \rightarrow digit {digit}
letter \rightarrow W | X | Y | Z
digit \rightarrow 0 | 1
bool \rightarrow T | F

Terminal	First	Follow
program	{S}	{\$,G}
statemt	{W,X,Y,Z,I,D,R,O,W,X,Y,Z,C}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
assnmt	{W,X,Y,Z}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
ifstmt	{I}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
do	{D}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
inout	{R,O,W,X,Y,Z}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
iosym	{R,O}	{W,X,Y,Z}
progcall	{C}	{%,&,W,X,Y,Z,I,D,R,O,C,U}
comprsn	{(}	{@,E}
exprsn	{0,1,W,X,Y,Z,T,F,(}	{;,)} {+,,)} {+,,)}
factor	{0,1,W,X,Y,Z,T,F,(}	{+,,)}

Terminal	First	Follow
oprnd	{0,1,W,X,Y,Z,T,F,{}	{<,,>,,!,^,,),*,+,;}
opratr	{<,,>,,!,^}	{0,1,W,X,Y,Z,T,F,{}
ident	{W,X,Y,Z}	{~, , ,,,<,,>,,!,^,,),*,+,}
char	{W,X,Y,Z,0,1}	{~, , ,,,<,,>,,!,^,,),*,+,W,X,Y,Z,0,1}
int	{0,1}	{<,,>,,!,^,,),*,+,;}
letter	{W,X,Y,Z}	{~, , ,,,<,,>,,!,^,,),*,+,W,X,Y,Z}
digit	{0,1}	{~, , ,,,<,,>,,!,^,,),*,+,W,X,Y,Z,0,1}
bool	{T,F}	{<,,>,,!,^,,),*,+,;}

Grammer	Proof
program $\rightarrow S\{\text{statemt}\}$	$\text{FOLLOW}(\text{program}) \cap \text{FIRST}(\text{statemt}) = \{\$, G\}$ $\cap \{W,X,Y,Z,I,D,R,O,W,X,Y,Z,C\} = \emptyset$
statemt $\rightarrow \text{assnmt} \mid \text{ifstmt} \mid \text{do} \mid \text{inout} \mid \text{progcalls}$	$\text{FIRST}(\text{assnmt}) \cap \text{FIRST}(\text{ifstmt}) = \{W,X,Y,Z\} \cap \{I\} = \emptyset$ $\text{FIRST}(\text{assnmt}) \cap \text{FIRST}(\text{do}) = \{W,X,Y,Z\} \cap \{D\} = \emptyset$ $\text{FIRST}(\text{assnmt}) \cap \text{FIRST}(\text{inout}) = \{W,X,Y,Z\} \cap \{R,O\} = \emptyset$ $\text{FIRST}(\text{assnmt}) \cap \text{FIRST}(\text{progcalls}) = \{W,X,Y,Z\} \cap \{C\} = \emptyset$ $\text{FIRST}(\text{ifstmt}) \cap \text{FIRST}(\text{do}) = \{I\} \cap \{D\} = \emptyset$ $\text{FIRST}(\text{ifstmt}) \cap \text{FIRST}(\text{inout}) = \{I\} \cap \{R,O,W,X,Y,Z\} = \emptyset$ $\text{FIRST}(\text{ifstmt}) \cap \text{FIRST}(\text{progcalls}) = \{I\} \cap \{C\} = \emptyset$ $\text{FIRST}(\text{do}) \cap \text{FIRST}(\text{inout}) = \{D\} \cap \{R,O,W,X,Y,Z\} = \emptyset$ $\text{FIRST}(\text{do}) \cap \text{FIRST}(\text{progcalls}) = \{D\} \cap \{C\} = \emptyset$ $\text{FIRST}(\text{inout}) \cap \text{FIRST}(\text{progcalls}) = \{R,O,W,X,Y,Z\} \cap \{C\} = \emptyset$ Proven that all pairwise disjoint.
assnmt $\rightarrow \text{ident} \sim \text{exprsn} ;$	No issues because there are only one production.
ifstmt $\rightarrow I \text{ comprsn } @ \{ \text{statemt} \} [\% \{ \text{statemt} \}] \&$	$\text{FIRST}(\text{statemt}) \cap \{ \% \} = \{W,X,Y,Z,I,D,R,O,W,X,Y,Z,C\} \cap \{ \% \} = \emptyset$ $\text{FIRST}(\text{statemt}) \cap \{ \& \} = \{W,X,Y,Z,I,D,R,O,W,X,Y,Z,C\} \cap \{ \& \} = \emptyset$ $\{ \% \} \cap \{ \& \} = \emptyset$
do $\rightarrow D \{ \text{statemt} \} U \text{ comprsn } E$	$\text{FIRST}(\text{statemt}) \cap \{ U \} = \{W,X,Y,Z,I,D,R,O,W,X,Y,Z,C\} \cap \{ U \} = \emptyset$
inout $\rightarrow \text{iosym ident } \{ , \text{ident} \} ;$	$\{ , \} \cap \{ ; \} = \emptyset$
iosym $\rightarrow R \mid O$	No issues because there are only one production.
progcalls $\rightarrow C \text{ program } G$	No issues because there are only one production.

Grammer	Proof
$\text{comprsn} \rightarrow (\text{oprnd} \text{opratr} \text{oprnd})$	No issues because there are only one production.
$\text{exprsn} \rightarrow \text{factor} \{ + \text{factor} \}$	$\text{FOLLOW}(\text{exprsn}) \cap \{ + \} = \{ ; , \} \cap \{ + \} = \emptyset$
$\text{factor} \rightarrow \text{oprnd} \{ * \text{oprnd} \}$	$\text{FOLLOW}(\text{factor}) \cap \{ * \} = \{ + , ; , \} \cap \{ * \} = \emptyset$
$\text{oprnd} \rightarrow \text{int} \mid \text{ident} \mid \text{bool} \mid (\text{exprsn})$	$\text{FIRST}(\text{int}) \cap \text{FIRST}() = \{ 0, 1 \} \cap \{ \} = \emptyset$ $\text{FIRST}(\text{int}) \cap \text{FIRST}() = \{ 0, 1 \} \cap \{ \} = \emptyset$ $\text{FIRST}(\text{int}) \cap \text{FIRST}() = \{ 0, 1 \} \cap \{ \} = \emptyset$ $\text{FIRST}(\text{ident}) \cap \text{FIRST}(\text{bool}) = \{ W, X, Y, Z \} \cap \{ T, F \} = \emptyset$ $\text{FIRST}(\text{ident}) \cap \{ (\} = \{ W, X, Y, Z \} \cap \{ (\} = \emptyset$ $\text{FIRST}(\text{bool}) \cap \{ (\} = \{ T, F \} \cap \{ (\} = \emptyset$
$\text{opratr} \rightarrow < \mid = \mid > \mid ! \mid ^$	No issues because there are only one production.
$\text{ident} \rightarrow \text{letter} \{ \text{char} \}$	$\text{FOLLOW}(\text{ident}) \cap \text{FIRST}(\text{char}) = \{ \sim , , , ; , < , = , > , ! , ^ ,) , * , + \} \cap \{ W, X, Y, Z, 0, 1 \} = \emptyset$
$\text{char} \rightarrow \text{letter} \mid \text{digit}$	$\text{FOLLOW}(\text{letter}) \cap \text{FIRST}(\text{digit}) = \{ \sim , , , ; , < , = , > , ! , ^ ,) , * , + , W, X, Y, Z \} \cap \{ 0, 1 \} = \emptyset$
$\text{int} \rightarrow \text{digit} \{ \text{digit} \}$	$\text{FOLLOW}(\text{int}) \cap \text{FIRST}(\text{digit}) = \{ < , = , > , ! , ^ ,) , * , + , ; \} \cap \{ 0, 1 \} = \emptyset$
$\text{letter} \rightarrow W \mid X \mid Y \mid Z$	No issues because there are only one production.
$\text{digit} \rightarrow 0 \mid 1$	No issues because there are only one production.
$\text{bool} \rightarrow T \mid F$	No issues because there are only one production.

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