

Compiler Theory Project (Milestone 2)

Team 21

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Context-Free Grammar for Tiny Programming Language

1. Terminals

DIGIT	→ 0 1 2 3 4 5 6 7 8 9
LETTER	→ a b c ... z A B C ... Z
CHAR	→ LETTER DIGIT special characters
ARITH_OP	→ + - * /
COND_OP	→ < > = <>
BOOL_OP	→ &&
ASSIGN_OP	→ :=
COMMA	→ ,
SEMICOLON	→ ;
LEFT_PAREN	→ (
RIGHT_PAREN	→)
LEFT_BRACE	→ {
RIGHT_BRACE	→ }
QUOTE	→ "
DOT	→ .
COMMENT_START	→ /*
COMMENT_END	→ */

2. Production Rules

1) Number

Number → DIGIT Number_Tail

Number_Tail → DIGIT Number_Tail | DOT DIGIT Number_Tail | ε

2) String

String \rightarrow QUOTE Char_Sequence QUOTE
Char_Sequence \rightarrow CHAR Char_Sequence | ϵ

3) Reserved Keywords

Reserved_Keywords \rightarrow int | float | string | read | write | repeat |
until | if | elseif | else | then | return | endl

4) Comment Statement

Comment_Statement \rightarrow COMMENT_START Char_Sequence COMMENT_END

5) Identifiers

Identifier \rightarrow LETTER Identifier_Tail
Identifier_Tail \rightarrow LETTER Identifier_Tail | DIGIT Identifier_Tail | ϵ

6) Function Call

Function_Call \rightarrow Identifier LEFT_PAREN Argument_List RIGHT_PAREN
Argument_List \rightarrow Expression Argument_Tail | ϵ
Argument_Tail \rightarrow COMMA Expression Argument_Tail | ϵ

7) Term

Term \rightarrow Number | Identifier | Function_Call

8) Arithmetic Operator

Arithmetic_Operator \rightarrow + | - | * | /

9)Equation

Equation \rightarrow Term Equation_Tail | LEFT_PAREN Equation RIGHT_PAREN
Equation_Tail
Equation_Tail \rightarrow Arithmetic_Operator Term Equation_Tail
 | Arithmetic_Operator LEFT_PAREN Equation RIGHT_PAREN
Equation_Tail
 | ϵ

10) Expression

Expression \rightarrow String | Term | Equation

11) Assignment Statement

Assignment_Statement \rightarrow Identifier ASSIGN_OP Expression

12) Datatype

Datatype \rightarrow int | float | string

13) Declaration Statement

Declaration_Statement \rightarrow Datatype Identifier_List SEMICOLON
Identifier_List \rightarrow Identifier_Item Identifier_List_Tail
Identifier_List_Tail \rightarrow COMMA Identifier_Item Identifier_List_Tail | ϵ
Identifier_Item \rightarrow Identifier Assignment_Opt
Assignment_Opt \rightarrow ASSIGN_OP Expression | ϵ

14) Write Statement

Write_Statement \rightarrow write Write_Content SEMICOLON
Write_Content \rightarrow Expression | endl

15) Read Statement

Read_Statement \rightarrow read Identifier SEMICOLON

2.16 Return Statement

Return_Statement \rightarrow return Expression SEMICOLON

17) Condition Operator

Condition_Operator \rightarrow < | > | = | <>

18) Condition

Condition \rightarrow Identifier Condition_Operator Term

19) Boolean Operator

Boolean_Operator \rightarrow && | ||

20) Condition Statement

Condition_Statement \rightarrow Condition Condition_Tail

Condition_Tail \rightarrow Boolean_Operator Condition Condition_Tail | ϵ

21) If Statement

If_Statement \rightarrow if Condition_Statement then Statements If_Tail end

If_Tail \rightarrow Else_If_Statement | Else_Statement | ϵ

22) Else If Statement

Else_If_Statement \rightarrow elseif Condition_Statement then Statements If_Tail

23) Else Statement

Else_Statement \rightarrow else Statements

2.24 Repeat Statement

Repeat_Statement \rightarrow repeat Statements until Condition_Statement

25) Function Name

FunctionName \rightarrow Identifier

26) Parameter

Parameter \rightarrow Datatype Identifier

27) Function Declaration

Function_Declaration \rightarrow Datatype FunctionName LEFT_PAREN Parameter_List RIGHT_PAREN

Parameter_List \rightarrow Parameter Parameter_Tail | ϵ

Parameter_Tail \rightarrow COMMA Parameter Parameter_Tail | ϵ

28) Function Body

Function_Body \rightarrow LEFT_BRACE Statements Return_Opt RIGHT_BRACE

Return_Opt \rightarrow Return_Statement | ϵ

29) Function Statement

Function_Statement \rightarrow Function_Declaration Function_Body

30) Main Function

Main_Function \rightarrow Datatype main LEFT_PAREN RIGHT_PAREN Function_Body

31) Program

Program \rightarrow Function_List Main_Function

Function_List \rightarrow Function_Statement Function_List | ϵ