Group No. 46

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CS F363 Compiler Design
Course Assignment Stage #2

Semantic Rules for AST generation

Assumptions: A line for each symbol on RHS. ‘do nothing’ for an epsilon transition. ‘pull up’ for non terminal. ‘’

```
<program> ===> <otherFunctions> <mainFunction>
#no change
#retain

<mainFunction> ===> TK_MAIN <stmts> TK_END
#pull up TK_MAIN
#TK_MAIN -> <stmts>
#remove TK_END

<otherFunctions> ===> <function> <otherFunctions>
#no change
#retain

<otherFunctions> ===> eps
#do nothing

<function> ===> TK_FUNID <input_par> <output_par> TK_SEM <stmts> TK_END
#pull up TK_FUNID
#TK_FUNID -> <input_par> <output_par> <stmts>

<input_par> ===> TK_INPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR
#pull up TK_INPUT -> <parameter_list>
#remove remaining

<output_par> ===> TK_OUTPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR
#pull up TK_OUTPUT
#TK_OUTPUT -> <parameter_list>
#remove remaining

<output_par> ===> eps
#do nothing

<parameter_list> ===> <dataType> TK_ID <remaining_list>
#pull up TK_ID
#TK_ID -> <dataType> <remaining_list>

<dataType> ===> <primitiveDatatype>
#pull up <primitiveDatatype>

<dataType> ===> <constructedDatatype>
#pull up <constructedDatatype>

<primitiveDatatype> ===> TK_INT
#pull up TK_INT

<primitiveDatatype> ===> TK_REAL
#pull up TK_REAL

<constructedDatatype> ===> TK_RECORD TK_RECORDID
#pull up TK_RECORD
#TK_RECORD -> TK_RECORDID

<remaining_list> ===> TK_COMMA <parameter_list>
#pull up <parameter_list>
#remove TK_COMMA
```

```
<remaining_list> ===> eps
#do nothing

<stmts> ===> <typeDefinitions> <declarations> <otherStmts> <returnStmt>
#no change
#retain

<typeDefinitions> ===> <typeDefinition> <typeDefinitions>
#pull up <typeDefinitions>
#<typeDefinition> -> <typeDefinitions>
#only right child mentioned here

<typeDefinitions> ===> eps
#do nothing

<typeDefinition> ===> TK_RECORD TK_RECORDID <fieldDefinitions> TK_ENDRECORD TK_SEM
#pull up TK_RECORDID
#TK_RECORDID -> <fieldDefinitions>
#only left child mentioned here

<fieldDefinitions> ===> <fieldDefinition> <fieldDefinition> <moreFields>
#pull up <fieldDefintion>
#<fieldDefinition> -> <fieldDefinition> -> <moreFields>
#only right children mentioned here

<fieldDefinition> ===> TK_TYPE <primitiveDatatype> TK_COLON TK_FIELDID TK_SEM
#pull up TK_FIELDID
#TK_FIELDID -> <primitiveDatatype>
#only left child mentioned here

<moreFields> ===> <fieldDefinition> <moreFields>
#pull up <fieldDefinition>
#<fieldDefinition> -> <moreFields>

<moreFields> ===> eps
#do nothing

<declarations> ===> <declaration> <declarations>
#pull up <declaration>
#<declaration> -> <declarations>
#only rightost child mentioned here

<declarations> ===> eps
#do nothing

<declaration> ===> TK_TYPE <dataType> TK_COLON TK_ID <global_or_not> TK_SEM
#pull up TK_ID
#TK_ID -> <dataType> <global_or_not>

<global_or_not> ===> TK_COLON TK_GLOBAL
#pull up TK_GLOBAL

<global_or_not> ===> eps
#do nothing

<otherStmts> ===> <stmt> <otherStmts>
#no change
#retain

<otherStmts> ===> eps
#do nothing

<stmt> ===> <assignmentStmt>
#pull up <assignmentStmt>
```

```
<stmt> ===> <iterativeStmt>
#pull up <iterativeStmt>

<stmt> ===> <conditionalStmt>
#pull up <conditionalStmt>

<stmt> ===> <ioStmt>
#pull up <conditionalStmt>

<stmt> ===> <funCallStmt>
#pull up <funCallStmt>

<assignmentStmt> ===> <singleOrRecId> TK_ASSIGNOP <arithmeticExpression> TK_SEM
#pull up TK_ASSIGNOP
#TK_ASSIGNOP -> <singleOrRecId> <arithmeticExpression>

<singleOrRecId> ===> TK_ID <new_24>
#pull up TK_ID
#TK_ID -> <new_24>

<new_24> ===> eps
#do nothing

<new_24> ===> TK_DOT TK_FIELDID
#pull up TK_DOT
#TK_DOT -> TK_FIELDID

<funCallStmt> ===> <outputParameters> TK_CALL TK_FUNID TK_WITH TK_PARAMETERS
<inputParameters> TK_SEM
#pull up TK_FUNID
TK_FUNID -> <outputParameters> <inputParameters>

<outputParameters> ===> TK_SQL <idList> TK_SQR TK_ASSIGNOP
#pull up <idList>

<outputParameters> ===> eps
#do nothing

<inputParameters> ===> TK_SQL <idList> TK_SQR
#pull up <idList>

<iterativeStmt> ===> TK_WHILE TK_OP <booleanExpression> TK_CL <stmt> <otherStmts>
TK_ENDWHILE
#pull up TK_WHILE
#TK_WHILE -> <booleanExpression> <stmt> <otherStmts>

<conditionalStmt> ===> TK_IF TK_OP <booleanExpression> TK_CL TK_THEN <stmt>
<otherStmts> <elsePart>
#pull up TK_IF
#TK_IF -> <booleanExpression> TK_THEN <elsePart>
#TK_THEN -> <stmt> <otherStmts>

<elsePart> ===> TK_ELSE <stmt> <otherStmts> TK_ENDIF
#pull up TK_ELSE
#TK_ELSE -> <stmt> <otherStmts>

<elsePart> ===> TK_ENDIF
#do nothing

<ioStmt> ===> TK_READ TK_OP <singleOrRecId> TK_CL TK_SEM
#pull up TK_READ
#TK_READ -> <singleOrRecId>
```

```
<ioStmt> ===> TK_WRITE TK_OP <allVar> TK_CL TK_SEM
#pull up TK_WRITE
#TK_WRITE -> <allVar>

<allVar> ===> TK_NUM
#pull up TK_NUM

<allVar> ===> TK_RNUM
#pull up TK_RNUM

<allVar> ===> TK_ID <temp>
#pull up TK_ID
#TK_ID -> TEMP

<arithmeticExpression> ===> <term> <expPrime>
#no change
#retain

<expPrime> ===> <lowPrecedenceOperators> <term> <expPrime>
#pull up <lowPrecedenceOperators>
<lowPrecedenceOperators> -> <term> <expPrime>

<expPrime> ===> eps
#do nothing

<term> ===> <factor> <termPrime>
#no change
#retain

<termPrime> ===> <highPrecedenceOperators> <factor> <termPrime>
#pull up <highPrecedenceOperators> <factor> <termPrime>

<termPrime> ===> eps
#do nothing

<factor> ===> TK_OP <arithmeticExpression> TK_CL
#pull up <arithmeticExpression>

<factor> ===> <allVar>
#pull up <allVar>

<highPrecedenceOperators> ===> TK_MUL
#pull up TK_MUL

<highPrecedenceOperators> ===> TK_DIV
#pull up TK_DIV

<lowPrecedenceOperators> ===> TK_PLUS
#pull up TK_PLUS

<lowPrecedenceOperators> ===> TK_MINUS
#pull up TK_MINUS

<temp> ===> eps
#do nothing

<temp> ===> TK_DOT TK_FIELDID
#pull up TK_DOT
#TK_DOT -> TK_FIELDID

<booleanExpression> ===> TK_OP <booleanExpression> TK_CL <logicalOp> TK_OP
<booleanExpression> TK_CL
#pull up <logicalOp>
#<logicalOp> -> <booleanExpression> <booleanExpression>
```

```
<booleanExpression> ===> <var> <relationalOp> <var>
#pull up <relationOp>
#<relationOp> -> <var> <var>

<booleanExpression> ===> TK_NOT TK_OP <booleanExpression> TK_CL
#pull up TK_NOT
TK_NOT -> <booleanExpression>

<var> ===> TK_ID
#pull up TK_ID

<var> ===> TK_NUM
#pull up TK_NUM

<var> ===> TK_RNUM
#pull up TK_RNUM

<logicalOp> ===> TK_AND
#pull up TK_AND

<logicalOp> ===> TK_OR
#pull up TK_OR

<relationalOp> ===> TK_LT
#pull up TK_LT

<relationalOp> ===> TK_LE
#pull up TK_LE

<relationalOp> ===> TK_EQ
#pull up TK_EQ

<relationalOp> ===> TK_GT
#pull up TK_GT

<relationalOp> ===> TK_GE
#pull up TK_GE

<relationalOp> ===> TK_NE
#pull up TK_NE

<returnStmt> ===> TK_RETURN <optionalReturn> TK_SEM
#pull up <optionalReturn>

<optionalReturn> ===> TK_SQL <idList> TK_SQR
#pull up <idList>

<optionalReturn> ===> eps
#do nothing

<idList> ===> TK_ID <more_ids>
#pull up TK_ID
#TK_ID -> <more_ids>

<more_ids> ===> TK_COMMA <idList>
#pull up <idList>

<more_ids> ===> eps
#do nothing
```