GROUP - 8 : ADITYA THAKUR, AMAL SAYEED, OHIDUZ ZAMAN, PRIYANSH PATEL, RACHOITA DAS, SUBHRAMIT BASU BHOWMICK

ORIGINAL GRAMMAR

1. <program> ===> <otherFunctions> <mainFunction>
2. <mainFunction>===> TK_MAIN <stmts> TK_END
3. <otherFunctions>===> <function><otherFunctions> | ∈
4. <function>===>TK_FUNID <input_par> <output_par> TK_SEM <stmts> TK_END
5. <input_par>===>TK_INPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR
6. <output_par>===>TK_OUTPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR | ∈
7. <parameter_list>===><dataType> TK_ID <remaining_list>
8. <dataType>===> <primitiveDatatype> |<constructedDatatype>
9. <primitiveDatatype>===> TK_INT | TK_REAL
10. <constructedDatatype>===>TK_RECORD TK_RUID | TK_UNION TK_RUID
11. <remaining_list>===>TK_COMMA <parameter_list> | ∈
12. <stmts>===><typeDefinitions> <declarations> <otherStmts><returnStmt>
13. <typeDefinitions>===><typeDefinition><typeDefinitions> |∈
14. <typeDefinition>===>TK_RECORD TK_RUID <fieldDefinitions> TK_ENDRECORD
15. <typeDefinition>===>TK_UNION TK_RUID <fieldDefinitions> TK_ENDUNION
16. <fieldDefinitions>===> <fieldDefinition><fieldDefinition><moreFields>
17. <fieldDefinition>===> TK_TYPE <primitiveDatatype> TK_COLON TK_FIELDID TK_SEM
18. <moreFields>===><fieldDefinition><moreFields> | ∈
19. <declarations> ===> <declaration><declarations>|∈
20. <declaration>===> TK_TYPE <dataType> TK_COLON TK_ID TK_COLON <global_or_not> TK_SEM
21. <global_or_not>===>TK_GLOBAL| ∈
22. <otherStmts>===> <stmt><otherStmts> | ∈
23. <stmt>===> <assignmentStmt> | <iterativeStmt> | <conditionalStmt> | <ioStmt> | <funCallStmt>
24. <assignmentStmt>===><SingleOrRecId> TK_ASSIGNOP <arithmeticExpression> TK_SEM

25. <singleOrRecId>===>TK_ID | TK_ID TK_DOT TK_FIELDID
26. <funCallStmt>===><outputParameters> TK_CALL TK_FUNID TK_WITH TK_PARAMETERS <inputParameters>
27. <outputParameters> ==> TK_SQL <idList> TK_SQR TK_ASSIGNOP | ∈
28. <inputParameters>===> TK_SQL <idList> TK_SQR
29. <iterativeStmt>===> TK_WHILE TK_OP <booleanExpression> TK_CL <stmt> <otherStmts> TK_ENDWHILE
30. <conditionalStmt>===> TK_IF <booleanExpression> TK_THEN <stmt><otherStmts> TK_ELSE <otherStmts> TK_ENDIF
31. <conditionalStmt>===> TK_IF <booleanExpression> TK_THEN <stmt> <otherStmts> TK_ENDIF
32. <ioStmt>===>TK_READ TK_OP <var> TK_CL TK_SEM | TK_WRITE TK_OP <var> TK_CL TK_SEM
33. <arithmeticExpression>===><arithmeticExpression> <operator> <arithmeticExpression>
34. <arithmeticExpression> ====>TK_OP <arithmeticExpression> TK_CL | <var>
35. <operator> ===> TK_PLUS | TK_MUL |TK_MINUS|TK_DIV
36. <booleanExpression>===>TK_OP <booleanExpression> TK_CL <logicalOp> TK_OP <booleanExpression> TK_CL
37. <booleanExpression>===> <var> <relationalOp> <var>
38. <booleanExpression>===> TK_NOT <booleanExpression>
39. <var>===> TK_ID | TK_NUM | TK_RNUM
40. <logicalOp>===>TK_AND | TK_OR
41. <relationalOp>===> TK_LT | TK_LE | TK_EQ |TK_GT | TK_GE | TK_NE
42. <returnStmt>===>TK_RETURN <optionalReturn> TK_SEM
43. <optionalReturn>===>TK_SQL <idList> TK_SQR | ∈
44. <idList>===> TK_ID <more_ids>
45. <more_ids>===> TK_COMMA <idList> | eps
46. <definetypestmt>===>TK_DEFINETYPE <A> TK_RUID TK_AS TK_RUID
47. <A>==>TK_RECORD | TK_UNION

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CORRECTION:

10. <constructedDatatype>===> <A> TK_RUID | TK_RUID

13. <typeDefinitions>===> <deftypes> <typeDefinition> <typeDefinitions> |∈

13.2 <deftypes> ===> <definetypestmt><deftypes> | epsilon

16. <fieldDefinitions>===> <nested_rec><fieldDefinition><fieldDefinition><moreFields>

16.2 <nested_rec> ===> <typeDefinitions>

17. <fieldDefinition>===> TK_TYPE <DataType> TK_COLON TK_FIELDID TK_SEM

20. <declaration>===> TK_TYPE <dataType> TK_COLON TK_ID <global_or_not> TK_SEM (TK_COLON REMOVED)

21. <global_or_not>===> TK_COLON TK_GLOBAL| ∈

25. <singleOrRecId>===>TK_ID <SinOrRec>

25.2 <SinOrRec> ===> TK_DOT TK_FIELDID <SinOrRec> | epsilon

26. <funCallStmt>===><outputParameters> TK_CALL TK_FUNID TK_WITH TK_PARAMETERS <inputParameters> TK_SEM

30/31:

<conditionalStmt>===> TK_IF <booleanExpression> TK_THEN <stmt><otherStmts> <CONDT_STMT>

<CONDT_STMT> ===> TK_ELSE <stmt> <otherStmts> TK_ENDIF | TK_ENDIF

33/34/35:

34. <arithmeticExpression> ===> <term> <Arth_Expr>

35. <Arth_Expr> ===> <addSubOp> <term> <Arth_Expr> | Epsilon

36. <term> ===> <factor> <__Term>

37. <__Term> ===> <mulDivOp> <factor> <__Term> | Epsilon

38. <factor> ===> TK_OP <arithmeticExpression> TK_CL | <var>

39. <addSubOp> ===> TK_ADD | TK_MINUS

40. <mulDivOp> ===> TK_MUL | TK_DIV

38. <booleanExpression> ===> TK_NOT TK_OP <booleanExpression> TK_CL
39. <var>===> <singleorRecId>| TK_NUM | TK_RNUM

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LL1 Grammar

1. <program> ===> <otherFunctions> <mainFunction>
2. <mainFunction>===> TK_MAIN <stmts> TK_END
3. <otherFunctions>===> <function><otherFunctions> | ∈
4. <function>===>TK_FUNID <input_par> <output_par> TK_SEM <stmts> TK_END
5. <input_par>===>TK_INPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR
6. <output_par>===>TK_OUTPUT TK_PARAMETER TK_LIST TK_SQL <parameter_list> TK_SQR | ∈
7. <parameter_list>===><dataType> TK_ID <remaining_list>
8. <dataType>===> <primitiveDatatype> |<constructedDatatype>
9. <primitiveDatatype>===> TK_INT | TK_REAL
10. <constructedDatatype>===> <A> TK_RUID | TK_RUID
11. <remaining_list>===>TK_COMMA <parameter_list> | ∈
12. <stmts>===><typeDefinitions> <declarations> <otherStmts><returnStmt>
13. <typeDefinitions>===> <deftypes> <typeDefinition> <typeDefinitions> |∈

13.2 <deftypes> ===> <definetypestmt><deftypes> | ∈

14. <typeDefinition>===>TK_RECORD TK_RUID <fieldDefinitions> TK_ENDRECORD
15. <typeDefinition>===>TK_UNION TK_RUID <fieldDefinitions> TK_ENDUNION
16. <fieldDefinitions>===> <nested_rec><fieldDefinition><fieldDefinition><moreFields>

16.2 <nested_rec> ===> <typeDefinitions>

17. <fieldDefinition>===> TK_TYPE <dataType> TK_COLON TK_FIELDID TK_SEM
18. <moreFields>===><fieldDefinition><moreFields> | ∈
19. <declarations> ===> <declaration><declarations>|∈
20. <declaration>===> TK_TYPE <dataType> TK_COLON TK_ID <global_or_not> TK_SEM (TK_COLON REMOVED)
21. <global_or_not>===> TK_COLON TK_GLOBAL| ∈
22. <otherStmts>===> <stmt><otherStmts> | ∈
23. <stmt>===> <assignmentStmt> | <iterativeStmt> | <conditionalStmt> | <ioStmt> | <funCallStmt>

24. <assignmentStmt>===><SingleOrRecId> TK_ASSIGNOP <arithmeticExpression> TK_SEM

25. <SingleOrRecId>===>TK_ID <SinOrRec>

25.2 <SinOrRec> ===> TK_DOT TK_FIELDID <SinOrRec> | ∈

26. <funCallStmt>===><outputParameters> TK_CALL TK_FUNID TK_WITH TK_PARAMETERS <inputParameters> TK_SEM

27. <outputParameters> ==> TK_SQL <idList> TK_SQR TK_ASSIGNOP | ∈

28. <inputParameters>===> TK_SQL <idList> TK_SQR

29. <iterativeStmt>===> TK_WHILE TK_OP <booleanExpression> TK_CL <stmt> <otherStmts> TK_ENDWHILE

30/31:

<conditionalStmt>===> TK_IF <booleanExpression> TK_THEN <stmt><otherStmts> <CondStmt>

<CondStmt> ===> TK_ELSE <stmt> <otherStmts> TK_ENDIF | TK_ENDIF

32. <ioStmt>===>TK_READ TK_OP <var> TK_CL TK_SEM | TK_WRITE TK_OP <var> TK_CL TK_SEM

33/34/35:

34. <arithmeticExpression> ===> <term> <Arth_Expr>

35. <Arth_Expr> ===> <addSubOp> <term> <Arth_Expr> | ∈

36. <term> ===> <factor> <__Term>

37. <__Term> ===> <mulDivOp> <factor> <__Term> | ∈

38. <factor> ===> TK_OP <arithmeticExpression> TK_CL | <var>

39. <addSubOp> ===> TK_ADD | TK_MINUS

40. <mulDivOp> ===> TK_MUL | TK_DIV

36. <booleanExpression>===>TK_OP <booleanExpression> TK_CL <logicalOp> TK_OP <booleanExpression> TK_CL

37. <booleanExpression>===> <var> <relationalOp> <var>

38. <booleanExpression> ===> TK_NOT TK_OP <booleanExpression> TK_CL

39. <var>===> <SingleorRecId>| TK_NUM | TK_RNUM

40. <logicalOp>===>TK_AND | TK_OR

41. <relationalOp>===> TK_LT | TK_LE | TK_EQ |TK_GT | TK_GE | TK_NE

42. <returnStmt>===>TK_RETURN <optionalReturn> TK_SEM
43. <optionalReturn>===>TK_SQL <idList> TK_SQR | ∈
44. <idList>===> TK_ID <more_ids>
45. <more_ids>===> TK_COMMA <idList> | ∈
46. <definetypestmt>===>TK_DEFINETYPE <A> TK_RUID TK_AS TK_RUID
47. <A>==>TK_RECORD | TK_UNION

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First and Follow Sets:

	First	Follow
<program>	{TK_FUNID, TK_MAIN}	{$}
<otherFunctions>	{TK_FUNID, ∈}	{TK_MAIN}
<mainFunction>	{TK_MAIN}	{$}
<stmts>	{TK_DEFINETYPE, TK_RECORD, TK_UNION, TK_TYPE, TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN}	{TK_END}
<stmt>	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<function>	{TK_FUNID}	{TK_FUNID, TK_MAIN}
<input_par>	{TK_INPUT}	{TK_OUTPUT, TK_SEM}
<output_par>	{TK_OUTPUT, ∈}	{TK_SEM}
<parameter_list>	{TK_INT, TK_REAL, TK_RECORD, TK_UNION, TK_RUID}	{TK_SQR}
<dataType>	{TK_INT, TK_REAL, TK_RECORD, TK_UNION, TK_RUID}	{TK_ID, TK_COLON}
<remaining_list>	{TK_COMMA, ∈}	{TK_SQR}
<primitiveDatatype>	{TK_INT, TK_REAL}	{TK_ID, TK_COLON}

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<constructedDatatype>	{TK_RECORD, TK_UNION, TK_RUID}	{TK_ID, TK_COLON}
<typeDefinitions>	{TK_DEFINETYPE, TK_RECORD, TK_UNION, ∈}	{TK_TYPE, TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN}
<typeDefinition>	{TK_RECORD, TK_UNION}	{TK_DEFINETYPE, TK_RECORD, TK_UNION, TK_TYPE, TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN}
<declarations>	{TK_TYPE, ∈}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN}
<declaration>	{TK_TYPE}	{TK_TYPE, TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN}
<otherStmts>	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, ∈}	{TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<returnStmt>	{TK_RETURN}	{TK_END}
<definetypestmt>	{TK_DEFINETYPE}	{TK_DEFINETYPE, TK_RECORD, TK_UNION}
<deftypes>	{TK_DEFINETYPE, ∈}	{TK_RECORD, TK_UNION}
<nested_rec>	{TK_DEFINETYPE, TK_RECORD, TK_UNION, ∈}	{TK_TYPE}
<fieldDefinition>	{TK_TYPE}	{TK_TYPE, TK_ENDRECORD, TK_ENDUNION}

<fieldDefinitions>	{TK_DEFINETYPE, TK_RECORD, TK_UNION, TK_TYPE}	{TK_ENDRECORD, TK_ENDUNION}
<moreFields>	{TK_TYPE, ∈}	{TK_ENDRECORD, TK_ENDUNION}
<global_or_not>	{TK_COLON}	{TK_SEM}
<assignmentStmt>	{TK_ID}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<iterativeStmt>	{TK_WHILE}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<conditionalStmt>	{TK_IF}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<ioStmt>	{TK_READ, TK_WRITE}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<funCallStmt>	{TK_SQL, TK_CALL}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<SingleOrRecId>	{TK_ID}	{TK_ASSIGNOP, TK_CL, TK_MUL, TK_DIV, TK_ADD, TK_MINUS, TK_SEM,

		TK_LT, TK_LE, TK_EQ, TK_GT, TK_GE, TK_NE, TK_THEN}
<SinOrRec>	{TK_DOT, ∈}	{TK_ASSIGNOP, TK_CL, TK_MUL, TK_DIV, TK_ADD, TK_MINUS, TK_SEM, TK_LT, TK_LE, TK_EQ, TK_GT, TK_GE, TK_NE, TK_THEN}
<arithmeticExpression>	{TK_OP, TK_ID, TK_NUM, TK_RNUM}	{TK_SEM, TK_CL}
<outputParameters>	{TK_SQL, ∈}	{TK_CALL}
<inputParameters>	{TK_SQL}	{TK_SEM}
<idList>	{TK_ID}	{TK_SQR}
<booleanExpression>	{TK_OP, TK_NOT, TK_ID, TK_NUM, TK_RNUM}	{TK_CL, TK_THEN}
<CondStmt>	{TK_ELSE, TK_ENDIF}	{TK_ID, TK_WHILE, TK_IF, TK_READ, TK_WRITE, TK_SQL, TK_CALL, TK_RETURN, TK_ENDWHILE, TK_ELSE, TK_ENDIF}
<var>	{TK_ID, TK_NUM, TK_RNUM}	{TK_CL, TK_MUL, TK_DIV, TK_ADD, TK_MINUS, TK_SEM, TK_LT, TK_LE, TK_EQ, TK_GT, TK_GE, TK_NE, TK_THEN}
<term>	{TK_OP, TK_ID, TK_NUM, TK_RNUM}	{TK_ADD, TK_MINUS, TK_SEM, TK_CL}
<Arth_Expr>	{TK_ADD, TK_MINUS, ∈}	{TK_SEM, TK_CL}
<addSubOp>	{TK_ADD, TK_MINUS}	{TK_OP, TK_ID, TK_NUM, TK_RNUM}
<__Term>	{TK_MUL, TK_DIV, ∈}	{TK_ADD, TK_MINUS, TK_SEM, TK_CL}

<factor>	{TK_OP, TK_ID, TK_NUM, TK_RNUM}	{TK_MUL, TK_DIV, TK_ADD, TK_MINUS, TK_SEM, TK_CL}
<mulDivOp>	{TK_MUL, TK_DIV}	{TK_OP, TK_ID, TK_NUM, TK_RNUM}
<logicalOp>	{TK_AND, TK_OR}	{TK_OP}
<relationalOp>	{TK_LT, TK_LE, TK_EQ, TK_GT, TK_GE, TK_NE}	{TK_ID, TK_NUM, TK_RNUM}
<optionalReturn>	{TK_SQL, ∈}	{TK_SEM}
<more_ids>	{TK_COMMA, ∈}	{TK_SQR}
<A>	{TK_RECORD, TK_UNION}	{TK_RUID}