GRAMMAR SPECIFICATIONS

OF

ERPLAG

GROUP NO. 15

Mithil Shah 2020A7PS0980P

Tanveer Singh 2020A7PS0084P

Kshitij Garg 2020A7PS0120P

Shivam Pande 2020A7PS0124P

Utkarsh Darolia 2020A7PS0981P

Grammar for ERPLAG

1. <program> → <moduleDeclarations> <otherModules> <DriverModule> <otherModules>

2. <moduleDeclarations> → <moduleDeclaration> <moduleDeclarations> | ∈

3. <moduleDeclaration> → DECLARE MODULE ID SEMICOL

4. <otherModules> → <module><otherModules> | ∈

5. <driverModule> → DRIVERDEF DRIVER PROGRAM DRIVERENDDEF <moduleDef>

6. <module> → DEF MODULE ID ENDDEF TAKES INPUT SQBO <input-plist> SQBC SEMICOL <ret> <moduleDef>

7. <ret> → RETURNS SQBO <output-plist> SQBC SEMICOL | ∈

8. <input-plist> → ID COLON <datatype> <A1>

9. <A1> → COMMA ID COLON <datatype> <A1> | ∈

10. <output-plist> → ID COLON <type> <A2>

11. <A2> → COMMA ID COLON <type> <A2> | ∈

12. <datatype> → INTEGER | REAL | BOOLEAN | ARRAY SQBO <A3> SQBC of <type>

13. <A3> → <index> RANGEOP <index>

14. <type> → INTEGER | REAL | BOOLEAN

15. <moduleDef> → START <statements> END

16. <statements> → <statement> <statements> | ∈

17. <statement> → <iostmt> | <simplestmt> | <declarestmt> | <conditionalstmt> | <iterativestmt>.

18. <iostmt> → GET_VALUE BO ID BC SEMICOL | PRINT BO <var> BC SEMICOL

19. <var> → <A4> | <A5> | PLUS <A6> | MINUS <A6>

20. <A4> → ID <whichID> | <A6>

21. <A5> → TRUE | FALSE

22. <A6> → NUM | RNUM

23. <whichID> → SQBO <A12> SQBC | ∈

24. <simplestmt> → <assignmentstmt> | <moduleReusestmt>

25. <assignmentstmt> → ID <whichstmt>

26. <whichstmt> → <lvalueIDstmt> | <lvalueARRstmt>

27. <lvalueIDstmt> → ASSIGNOP <expression> SEMICOL

28. <lvalueARRstmt> → SQBO <A12> SQBC ASSIGNOP <expression> SEMICOL

29. <index> → <A8> | PLUS <A8> | MINUS <A8>

30. <A8> → ID | NUM

31. <moduleReusestmt> → <optional> USE MODULE ID WITH PARAMETERS <idList> SEMICOL

32. <optional> → SQBO <idList> SQBC ASSIGNOP | ∈

33. <idList> → ID <A9>

34. <A9> → COMMA ID <A9> | ϵ

35. <expression> → <A10> <A11>

36. <A11> → <logicalOp> <A10> <A11> | ϵ

37. <A10> → <A12> <A13> | TRUE <A13> | FALSE <A13>

38. <A13> → <RelationalOp> <A12> <A13> | ϵ

39. <A12> → <A14> | <ArithmeticExpr>

40. <A14> → PLUS <A15> | MINUS <A15>

41. <A15> → BO <ArithmeticExpr> BC | <A4>

42. <ArithmeticExpr> → <Term> <A16>

43. <A16> → <A17> <term> <A16> | ϵ

44. <A17> → PLUS | MINUS

45. <Term> → <factor> <A18>

46. <A18> → <A19> <factor> <A18> | ϵ

47. <A19> → MUL | DIV

48. <factor> → <A4> | BO <expression> BC

49. <logicalop> → AND | OR

50. <RelationalOp> → LT | LE | GT | GE | EQ | NE

51. <declarestmt> → DECLARE <idList> COLON <datatype> SEMICOL

52. <conditionalstmt> → SWITCH BO ID BC START <casestmt>
<default> END

53. <casestmt> → CASE <value> COLON <statements> BREAK
SEMICOL <A20>

54. <A20> → CASE <value> COLON <statements> BREAK SEMICOL
<A20> | ϵ

55. <value> → NUM | PLUS NUM | MINUS NUM | TRUE | FALSE

56. <default> → DEFAULT COLON <statements> BREAK SEMICOL | ϵ

57. <iterativestmt> → FOR BO ID IN <range> BC START <statements> END |
WHILE BO <expression> BC START <statements> END

58. <range> → <A21> RANGEOP <A21>

59. <A21> → NUM | PLUS NUM | MINUS NUM.

FIRST-set and FOLLOW-set of Non-Terminals from Grammar

Non-Terminals (λ)	FIRST(λ)	FOLLOW(λ)
<program>	DECLARE, DEF, DRIVERDEF	$
<moduleDeclarations>	DECLARE | ∈	DEF | DRIVERDEF
<moduleDeclaration>	DECLARE	DECLARE | DEF | DRIVERDEF
<otherModules>	DEF | ∈	DRIVERDEF | $
<driverModule>	DRIVERDEF	DEF | $
<module>	DEF	DEF | DRIVERDEF | $
<ret>	RETURNS | ∈	START
<input-plist>	ID	SQBC
<A1>	COMMA | ∈	SQBC
<output-plist>	ID	SQBC
<A2>	COMMA | ∈	SQBC
<datatype>	INTEGER | REAL | BOOLEAN | ARRAY	COMMA | SQBC | SEMICOL
<A3>	PLUS | MINUS | ID | NUM	SQBC
<type>	INTEGER | REAL | BOOLEAN	COMMA | SQBC | SEMICOL
<moduleDef>	START	DEF | DRIVERDEF | $
<statements>	GET-VALUE | ID | SQBO | USE | DECLARE SWITCH | FOR | WHILE | ∈	BREAK | END

λ (Non-terminals)	FIRST(λ)	FOLLOW(λ)
<statement>	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<iostmt>	GET_VALUE	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<var>	ID | NUM | TRUE | FALSE | RNUM | PLUS | MINUS	BC
<A4>	PLUS | MINUS | ID | NUM | RNUM	BC | MUL | DIV | PLUS | MINUS | LT | LE | GT | GE | EQ | NE | SQBC AND | OR | SEMICOL
<A5>	TRUE | FALSE	BC
<A6>	NUM | RNUM	BC
<whichID>	SQBO | ϵ	BC | MUL | DIV | PLUS | MINUS | LT | LE | GT | GE | EQ | NE | SQBC AND | OR | SEMICOL
<simplestmt>	ID | SQBO | USE	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE BREAK | END
<assignmentstmt>	ID	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<whichstmt>	ASSIGNOP | SQBO	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END

Non-terminals	FIRST(λ)	FOLLOW(λ)
<lvalueIDstmt>	ASSIGNOP	GET-VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<lvalueARRstmt>	SQBO	GET-VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<index>	PLUS | MINUS | ID | NUM	SQBC | RANGEOP
<A8>	ID | NUM	SQBC
<moduleReuseStmt>	SQBO | USE	GET-VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<optional>	SQBO | ϵ	USE
<idList>	ID	SEMICOL | SQBC | COLON
<A9>	COMMA | ϵ	SEMICOL | SQBC | COLON
<expression>	PLUS | MINUS | ID | NUM | RNUM | BO	SEMICOL | BC
<A11>	AND | OR | ϵ	SEMICOL | BC
<A10>	PLUS | MINUS | ID | NUM | RNUM | BO	SEMICOL | BC | AND | OR
<A13>	LT | LE | GT | GE | EQ | NE | ϵ	SEMICOL | BC | AND | OR
<A12>	PLUS | MINUS | ID | NUM | RNUM | BO	LT | LE | GT | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL
<A14>	PLUS | MINUS	LT | LE | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL
<A15>	ID | NUM | RNUM | BO	LT | LE | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL

λ (Non-terminals)	FIRST (λ)	FOLLOW (λ)
<ArithmeticExp>	ID | BO | NUM | RNUM	LT | LE | GT | GE | EQ | NE | SQBC | BC AND | OR | SEMICOL
<A16>	PLUS | MINUS | ϵ	LT | LE | GT | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL
<A17>	PLUS | MINUS	ID | BO | NUM | RNUM
<term>	ID | BO | NUM | RNUM	LT | LE | GT | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL | PLUS | MINUS
<A18>	MUL | DIV | ϵ	LT | LE | GT | GE | EQ | NE | SQBC | BC | AND | OR | SEMICOL | PLUS | MINUS
<A19>	MUL | DIV	ID | BO | NUM | RNUM
<factor>	ID | BO | NUM | RNUM	LT | LE | GT | GE | EQ | NE | SQBC | BC | AND | OR SEMICOL | PLUS | MINUS | MUL | DIV
<logicalop>	AND | OR	PLUS | MINUS | ID | BO | NUM | RNUM
<relationalop>	LT | LE | GT | GE | EQ | NE	PLUS | MINUS | ID | BO | NUM | RNUM
<declarestmt>	DECLARE	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<conditionalstmt>	SWITCH	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<casestmt>	CASE	DEFAULT | END
<A20>	CASE | ϵ	DEFAULT | END
<value>	NUM | PLUS | MINUS | TRUE | FALSE	COLON
<default>	DEFAULT | ϵ	END
<iterativestmt>	FOR | WHILE	GET_VALUE | ID | SQBO | USE | DECLARE | SWITCH | FOR | WHILE | BREAK | END
<range>	NUM | PLUS | MINUS	BC
<A21>	NUM | PLUS | MINUS	BC | RANGEOP