PES UNIVERSITY

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VI SEMESTER

B.TECH. (CSE)

Compiler Design

Week1-

Problem Statement:

Create a C minicompiler with lex and yacc

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Steps to execute the lex and yacc program:

1. yacc -dy pes2ug19cs198.y
2. lex pes2ug19cs198.l
3. gcc y.tab.c lex.yy.c
4. ./a.exe <filename.c>

Lex program:

```
pes2ug19cs198.l
1    %option noyywrap
2    %option yylineno
3    %{
4        #define YYSTYPE char*
5        #include "y.tab.h"
6        #include <stdio.h>
7        extern void yyerror(const char *msg);
8    %}
9    start \/\*
10   end  \*\/
11   digit [0-9]
12   letter [a-zA-Z]
13   id {letter}({letter}|{digit}|_)*
14   digits {digit}+
15   opFraction (\.{digits})?
16   opExponent ([Ee][+-]?{digits})?
17   number {digits}{opFraction}{opExponent}
18
19   %%
20
```

```
20
21
22    "/*"([^*]|\*+[^*/])*\*+"/"  ;
23    [\t\n] ;
24    "int" {return T_INT;}
25    "char" {return T_CHAR;}
26    "double" {return T_DOUBLE;}
27    "float" {return T_FLOAT;}
28    "while" {return T_WHILE;}
29    "for"    {return T_FOR;}
30    "if" {return T_IF;}
31    "else" {return T_ELSE;}
32    "do" {return T_DO;}
33    "include" {return T_INCLUDE;}
34    "main" {return T_MAIN;}
35    \".*\" {return T_STRLITERAL;}
36    "==" {return T_EQCOMP;}
37    "!=" {return T_NOTEQUAL;}
38    ">=" {return T_GREATEREQ;}
39    "<=" {return T_LESSEREQ;}
40    "(" {return *yytext;}
41    ")" {return *yytext;}
42    "." {return *yytext;}
43    "," {return *yytext;}
44    "{" {return *yytext;}
45    "}" {return *yytext;}
46    "*" {return *yytext;}
47    "+" {return *yytext;}
48    ";" {return *yytext;}
49    "-" {return *yytext;}
50    "/" {return *yytext;}
51    "=" {return *yytext;}
52    ">" {return *yytext;}
53    "<" {return *yytext;}
54    {number} {return T_NUM;}
55    {id}\.h {return T_HEADER;}
56    {id} {return T_ID;}
57    . {;}
58
```

Yacc Program:

```
pes2ug19cs198.y
1    %{
2        #include <stdio.h>
3        #include <stdlib.h>
4        #include <string.h>
5        extern FILE *yyin;
6        void yyerror(char* s);
7        int yylex();
8        extern int yylineno;
9    %}
10
11   %token T_CHAR T_DO T_DOUBLE T_ELSE T_EQCOMP T_FLOAT T_FOR
12   T_GREATEREQ T_HEADER T_ID T_IF T_INCLUDE T_INT T_LESSEREQ
13   T_MAIN T_NOTEQUAL T_NUM T_STRLITERAL T_WHILE
14   %start START
15   %nonassoc T_IFX
16   %nonassoc T_ELSE
17
```

```
%%
START : PROG {printf("Valid syntax\n"); YYACCEPT;}

PROG   : T_INCLUDE '<' T_HEADER '>' PROG
        |MAIN PROG
        |DECLR ';' PROG
        |ASSGN ';' PROG
        |
        ;

DECLR : TYPE LISTVAR
       ;

LISTVAR : LISTVAR ',' T_ID
        | T_ID
        ;

TYPE  : T_INT | T_FLOAT | T_DOUBLE | T_CHAR

ASSGN : T_ID '=' EXPR ;

EXPR  : EXPR REL_OP E | E ;

REL_OP : T_LESSEREQ | T_GREATEREQ | '<' | '>' | T_EQCOMP | T_NOTEQUAL ;

E: E '+' T | E '-' T | T ;

T: T '*' F | T '/' F | F ;

F: '(' EXPR ')' | T_ID | T_NUM ;

MAIN : TYPE T_MAIN '(' EMPTY_LISTVAR ')' '{' STMT '}';

EMPTY_LISTVAR : LISTVAR
              |
              ;

STMT : STMT_NO_BLOCK STMT
     | BLOCK STMT
     |
     ;
```

```
STMT_NO_BLOCK : DECLR ';'
              | ASSGN ';'
              | T_IF '(' COND ')' STMT %prec T_IFX
              | T_IF '(' COND ')' STMT T_ELSE STMT
              | WHILE
              ;

BLOCK : '{' STMT '}'

WHILE : T_WHILE '(' COND ')' WHILE|WHILE_2;

COND  : EXPR | ASSGN ;

WHILE_2 :'{' STMT '}'
        |
        ;

%%

void yyerror(char *s) {
    fprintf(stderr, "%s at line %d \n",s,yylineno);
}

int main(int argc, char** argv)
{
    yyin = fopen(argv[1],"r");
    yyparse();
    fclose(yyin);
    return 0;
}
```

Execution of the program:

```
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> yacc -dy parser.y
conflicts: 58 shift/reduce, 53 reduce/reduce
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> lex lexer.l
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> gcc y.tab.c lex.yy.c
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> ./a.exe lab-1_test-1_valid.c
Valid syntax
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> ./a.exe lab-1_test-1_invalid.c
syntax error at line 8
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> ./a.exe lab-1_test-2_valid.c
Valid syntax
PS C:\Users\Kuntal Gorai\OneDrive - PESUNIVERSITY\6th Semester\CompilerDesign\Lab_Project\week2> ./a.exe lab-1_test-2_invalid.c
syntax error at line 9
```