CD Assignment 1

Name - RIthvik Rajesh Matta
SRN - PES2UG23CS485
Class - 6H

CD > assignments > lexer.l

```
%{
#include "y.tab.h"
#include <stdio.h>
#include <stdlib.h>

int line_no = 1;
%}

%%

int             { return INT; }
float           { return FLOAT; }
char            { return CHAR; }
double          { return DOUBLE; }

if              { return IF; }
else            { return ELSE; }
do              { return DO; }
while           { return WHILE; }
for             { return FOR; }
switch          { return SWITCH; }
case            { return CASE; }
default         { return DEFAULT; }
break           { return BREAK; }

"=="            { return EQ; }
"!="            { return NE; }
">="            { return GE; }
"<="            { return LE; }
">"             { return GT; }
"<"             { return LT; }
"&&"            { return AND; }
"++"            { return INC; }

"+"             { return '+'; }
"-"             { return '-'; }
"*"             { return '*'; }
"/"             { return '/'; }
"="             { return '='; }

";"             { return ';'; }
","             { return ','; }
":"             { return ':'; }
"("             { return '('; }
")"             { return ')'; }
"{"             { return '{'; }
"}"             { return '}'; }
"["             { return '['; }
"]"             { return ']'; }

[0-9]+                  { return NUM; }
[a-zA-Z_][a-zA-Z0-9_]*  { return ID; }

[ \t\r]+        ;
\n              { line_no++; }

.               { return yytext[0]; }

%%

int yywrap(void)
{
    return 1;
}
```

Lexer.l

Parser.y

CD > assignments > parser.y

```
%{
#include <stdio.h>
#include <stdlib.h>

extern int yylex();
extern int line_no;
extern char *yytext;

void yyerror(const char *s);
%}

/* Tokens */
%token INT FLOAT CHAR DOUBLE
%token IF ELSE DO WHILE FOR
%token SWITCH CASE DEFAULT BREAK
%token ID NUM
%token EQ NE GE LE GT LT
%token AND INC

/* Operator precedence */
%left AND
%left GT LT GE LE EQ NE
%left '+' '-'
%left '*' '/'
%right '='
%right INC

/* Fix dangling else */
%nonassoc LOWER_THAN_ELSE
%nonassoc ELSE

%%

program:
      program statement
    | /* empty */
    ;

statement:
      declaration
    | expression_stmt
    | selection_stmt
    | iteration_stmt
    | compound_stmt
    | BREAK ';'
    ;

/* --------------- DECLARATIONS --------------- */

declaration:
    type declarator_list ';'
    ;

type:
      INT
    | FLOAT
    | CHAR
    | DOUBLE
    ;

declarator_list:
      declarator
    | declarator_list ',' declarator
    ;

declarator:
      ID
    | ID '=' expression
    | ID array_dims
    | ID array_dims '=' expression
    ;

array_dims:
      '[' NUM ']'
    | array_dims '[' NUM ']'
    ;

/* --------------- EXPRESSIONS --------------- */

expression_stmt:
    expression ';'
    ;

expression_list:
      expression
    | expression_list ',' expression
    ;

/* Array access for expressions */
array_access:
      ID '[' expression ']'
    | array_access '[' expression ']'
    ;

expression:
      ID '=' expression
    | array_access '=' expression
    | expression '+' expression
    | expression '-' expression
    | expression '*' expression
    | expression '/' expression
    | expression GT expression
```

CD > assignments > $ parsecy

```
array_dims:
        '[' NUM ']'
      | array_dims '[' NUM ']'
      ;

/* ---------------- EXPRESSIONS ---------------- */

expression_stmt:
      expression ';'
      ;

expression_list:
        expression
      | expression_list ',' expression
      ;

/* Array access for expressions */
array_access:
        ID '[' expression ']'
      | array_access '[' expression ']'
      ;

expression:
        ID '=' expression
      | array_access '=' expression
      | expression '+' expression
      | expression '-' expression
      | expression '*' expression
      | expression '/' expression
      | expression GT expression
      | expression LT expression
      | expression GE expression
      | expression LE expression
      | expression EQ expression
      | expression NE expression
      | expression AND expression
      | ID INC
      | array_access
      | '(' expression ')'
      | ID
      | NUM
      ;

/* ---------------- IF / SWITCH ---------------- */

selection_stmt:
        IF '(' expression ')' statement %prec LOWER_THAN_ELSE
      | IF '(' expression ')' statement ELSE statement
      | SWITCH '(' expression ')' '{' case_list '}'
      ;

case_list:
        case_list case_stmt
      | case_stmt
      ;

case_stmt:
        CASE NUM ':' program BREAK ';'
      | DEFAULT ':' program
      ;

/* ---------------- LOOPS ---------------- */

iteration_stmt:
        DO statement WHILE '(' expression ')' ';'
      | WHILE '(' expression ')' statement
      | FOR '(' for_init ';' expression ';' for_update ')' statement
      ;

for_init:
        expression_list
      | /* empty */
      ;

for_update:
        expression_list
      | /* empty */
      ;

/* ---------------- BLOCK ---------------- */

compound_stmt:
      '{' program '}'
      ;

%%

void yyerror(const char *s)
{
    printf("Syntax error at line %d, token '%s': %s\n", line_no, yytext, s);
}

int main()
{
    if (yyparse() == 0)
        printf("Syntax valid.\n");
    return 0;
}
```

Variable declaration

```
CD > assignments > C test1.c
  1   int a=5, b, c=10;
  2   float x;
  3   char ch;
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Array

```
CD > assignments > C test1.c
  1   int a[10];
  2   int b[5][5];
  3   int c[1][2][3][4];
  4   int d[4][4], e[5];
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

For loop

CD > assignments > C test1.c

```c
int i;
for(i=0; i<10; i++)
    i = i + 1;
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Complex for loop

CD > assignments > C test1.c

```c
int i,j,p,q;

for(i=0,j=0; i<p && j<q; i++,j++)
{
    i = i + 1;
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

While

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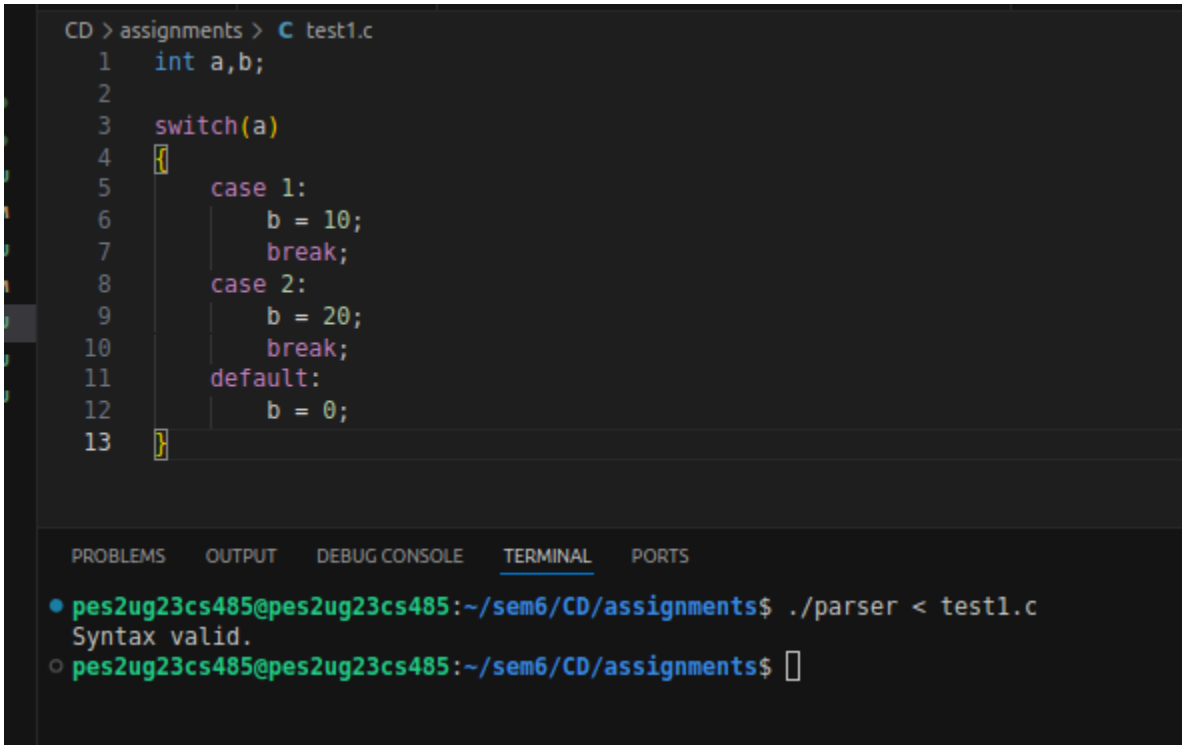
```c
int a=0;

while(a<10)
{
    a++;
}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Switch



Combined

CD > assignments > C test1.c

```c
int a=5, b[10], c[5][5];

for(a=0; a<10; a++)
{
    switch(a)
    {
        case 1:
            b[a] = 10;
            break;
        default:
            b[a] = 0;
    }
}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax valid.
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Invalid

Var

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```
1   int a=5
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 1, token '': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Wrong syntax

CD > assignments > C test1.c

```
1   int a[];
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 1, token ']': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Incorrect for loop

CD > assignments > C test1.c

```
1   for(i=0 i<10; i++)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 1, token 'i': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Missing break

CD > assignments > C test1.c

```
1   switch(a)
2   {
3       case 1:
4           b = 10;
5           break
6   }
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 6, token '}': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Invalid initialization

CD > assignments > C test1.c

```
1   int a = ;
```

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```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 1, token ';': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```

Invalid while

CD > assignments > C test1.c

```
1   while a<10)
2       a++;
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$ ./parser < test1.c
Syntax error at line 1, token 'a': syntax error
pes2ug23cs485@pes2ug23cs485:~/sem6/CD/assignments$
```