



PES University, Bengaluru

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UE22CS341B: COMPILER DESIGN

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LAB - 1

lex.l:

```
%{  
  
    #define YYSTYPE char*  
  
    #include "y.tab.h"  
  
    #include <stdio.h>  
  
    extern void yyerror(const char*); // declare the error handling function  
  
    int yylineno;  
  
}%  
  
  
/* Regular definitions */  
  
digit    [0-9]  
  
letter   [a-zA-Z]  
  
id        ({letter}|_){letter}{digit}|_*  
  
digits   {digit}+  
  
opFraction  (\\.{digits})?
```

opExponent ([Ee][+-]?{digits})?

number {digits}{opFraction}{opExponent}

%%

\\(.*) ; // ignore comments

[\\f\\r\\t] ; // ignore whitespaces

\\n {++yylineno;}

"int" {return T_INT;}

"char" {return T_CHAR;}

"double" {return T_DOUBLE;}

"float" {return T_FLOAT;}

"while" {return T_WHILE;}

"if" {return T_IF;}

"else" {return T_ELSE;}

"for" {return T_FOR;} /* added to support for */

"do" {return T_DO;}

"#include" {return T_INCLUDE;}

"main" {return T_MAIN;}

\\".*\\" {return T_STRLITERAL; }

"++" {return T_INC;} /* added to support unary increment op */

"--" {return T_DEC;} /* added to support unary decrement op */

"==" {return T_EQCOMP;}

"!=" {return T_NOTEQUAL;}

">=" {return T_GREATEREQ;}

"<=" {return T_LESSEREQ;}

| | |
|----------|--|
| " " | {return T_OROR;} |
| "&&" | {return T_ANDAND;} |
| "(" | {return *yytext;} |
| ")" | {return *yytext;} |
| "." | {return *yytext;} |
| "," | {return *yytext;} |
| "{" | {return *yytext;} |
| "}" | {return *yytext;} |
| "[" | {return *yytext;} /* added to support arrays */ |
| "]" | {return *yytext;} /* added to support arrays */ |
| "*" | {return *yytext;} |
| "+" | {return *yytext;} |
| "," | {return *yytext;} |
| "_" | {return *yytext;} |
| "/" | {return *yytext;} |
| "=" | {return *yytext;} |
| ">" | {return *yytext;} |
| "<" | {return *yytext;} |
| "!" | {return *yytext;} |
| {number} | {return T_NUM;} |
| {id}\\.h | {return T_HEADER;} // ending in .h => header file name |
| {id} | {return T_ID;} |
| . | {yyerror("Unrecognized token");} |
| %% | |

parser.y

```
%{

    #include <stdio.h>

    #include <stdlib.h>

    #include <string.h>


    void yyerror(const char*); // error handling function

    int yylex(); // declare the function performing lexical analysis

    extern int yylineno; // track the line number

    extern char* yytext;

    int err = 0;


%}

/* declare tokens */

%token T_INT T_CHAR T_DOUBLE T_WHILE T_INC T_DEC T_OROR T_ANDAND
T_EQCOMP T_NOTEQUAL T_GREATEREQ T_LESSEREQ T_LEFTSHIFT T_RIGHTSHIFT
T_NUM T_ID T_PRINTLN T_STRING T_FLOAT T_BOOLEAN T_IF T_ELSE
T_STRLITERAL T_DO T_INCLUDE T_HEADER T_MAIN T_FOR


/* specify start symbol */

%start START


%%

START : PROG { if(err==0) {printf("Valid syntax\n"); YYACCEPT;} } /* If program fits the
grammar, syntax is valid */
```

;
corresponding to the

/* Anything within {} is C code, it is the action
production rule */

```
PROG : T_INCLUDE '<' T_HEADER '>' PROG    /* include header */  
      |MAIN PROG                          /* main function */  
      |DECLR ';' PROG                     /* declarations */  
      |ASSGN ';' PROG                     /* assignments */  
      |error ';' PROG                     /* synchronizing token */  
      |                                  /* end of program */  
      ;
```

/* Grammar for variable declaration */

DECLR : TYPE LISTVAR

; /* always terminate with a ; */

LISTVAR : LISTVAR ',' T_ID

| T_ID

;

TYPE : T_INT

| T_FLOAT

| T_DOUBLE

| T_CHAR

;

/* Grammar for assignment */

ASSGN : T_ID '=' EXPR

;

EXPR : EXPR REL_OP E

| E

;

/* Expression Grammar */

E : E '+' T

| E '-' T

| T

;

T : T '*' F

| T '/' F

| F

;

F : '(' EXPR ')'

```
| T_ID  
| T_NUM  
;  
;
```

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

```
/* Grammar for main function */
```

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

```
/* argument list can be empty, or have a list of variables */
```

```
EMPTY_LISTVAR : LISTVAR  
               |      /* similar to lambda */  
               ;
```

```
/* statements can be standalone, or parts of blocks */
```

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

```
|  
;
```

```
STMT_NO_BLOCK : DECLR ';
```

```
| ASSGN ';
```

```
| error ';' /* synchronizing token */
```

```
;
```

```
BLOCK : '{' STMT '}';
```

```
%%
```

```
/* error handling function */
```

```
void yyerror(const char* s)
```

```
{
```

```
    printf("Error: %s,line number: %d,token: %s\n",s,yylineno,yytext);
```

```
    err = 1; // An error has occurred
```

```
}
```

```
int yywrap()
```

```
{
```

```
    return(1);
```



```
}
```

```
int main(int argc, char* argv[])
```

```
{
```

```
    yyparse();
```

```
    return 0;
```

```
}
```

Valid syntax test codes:

lab-1_test-1_valid.c:

```
D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>a.exe < "D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819\Test Files\valid\lab-1_test-1_valid.c"
Error: syntax error,line number: 0,token: /
Error: Unrecognized token,line number: 16,token: '
Error: Unrecognized token,line number: 16,token: '
Error: syntax error,line number: 20,token: if
Error: syntax error,line number: 34,token: }
Error: syntax error,line number: 45,token: }

D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>|
```

lab-1_test-2_valid.c:

```
D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>a.exe < "D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819\Test Files\valid\lab-1_test-2_valid.c"
Valid syntax

D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>|
```

Invalid syntax test codes:

lab-1_test-1_invalid.c:

Output Screenshot:

```
D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>a.exe < "D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819\Test Files\invalid\lab-1_test-1_invalid.c"
Error: syntax error,line number: 9,token: if
Error: syntax error,line number: 14,token: else
Error: syntax error,line number: 18,token: }
Error: syntax error,line number: 23,token: }
Error: Unrecognized token,line number: 30,token: :
Error: syntax error,line number: 37,token: }

D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>|
```

lab-1_test-2_invalid.c:

Output Screenshot:

```
D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>a.exe < "D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819\Test Files\invalid\lab-1_test-2_invalid.c"
Error: syntax error,line number: 2,token: /
Error: Unrecognized token,line number: 13,token: :
Error: syntax error,line number: 13,token: c
Error: Unrecognized token,line number: 14,token: :
Error: syntax error,line number: 27,token: *
Error: syntax error,line number: 40,token: }

D:\SEM-6 NOTES\Compiler Design\CD-2024\LAB\PES2UG23CS819>|
```