# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

## LAB REPORT

**on**

## COMPILER DESIGN

*Submitted by*

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***Under the Guidance of***

**Prof. Dr. Pallavi G B**
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*in partial fulfilment for the award of the degree of*

**BACHELOR OF ENGINEERING**

in

**COMPUTER SCIENCE AND ENGINEERING**


**B.M.S. COLLEGE OF ENGINEERING**

**(Autonomous Institution under VTU)**

**BENGALURU-560019**

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**B. M. S. College of Engineering,**

**Bull Temple Road, Bangalore 560019**

**(Affiliated To Visvesvaraya Technological University, Belgaum)**

**Department of Computer Science and Engineering**

## CERTIFICATE

This is to certify that the Lab work entitled "**Compiler Design**" carried out by **Samrith Sanjoo.S(1BM21CS185)** , who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023-24.

The Lab report has been approved as it satisfies the academic requirements in respect of **Compiler Design- (22CS5PCCPD)** work prescribed for the said degree.

| | |
|---|---|
| Prof.Dr Pallavi G B | Dr. Jyothi Nayak |
| Assistant professor | Professor and Head |
| Department of CSE | Department of CSE |
| BMSCE, Bengaluru | BMSCE, Bengaluru |

# B. M. S. COLLEGE OF ENGINEERING

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING


## *DECLARATION*

I, Samrith Sanjoo.S (1BM21CS185), student of 5th Semester, B.E, Department of Computer Science and Engineering, B. M. S. College of Engineering, Bangalore, here by declare that, this lab report entitled " **Compiler Design**" has been carried out by me under the guidance of Prof. Dr.Pallavi G B, Assistant Professor, Department of CSE, B. M. S. College of Engineering, Bangalore during the academic semester November-2023-February-2024.

I also declare that to the best of my knowledge and belief, the development reported here is not from part of any other report by any other students.

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|---|---|---|
| | {0,1,..,9} | |

# Lab 1

## 1.1 Write a program in LEX to recognize different tokens: Keywords, Identifiers, Constants, Operators and Punctuation symbols.

**Code:**

```
%{
#include<stdio.h>
%}
%%
printf|for|void|main|while|do|switch|case|int|char|float|double|if|else
{printf("%s-keyword\n",yytext);
, {printf("%s-separator\n",yytext);}
; {printf("%s-delimiter\n",yytext);}
[a-zA-Z_][a-zA-Z0-9_]*
{printf("%s-Identifier\n",yytext);}
">"|"<"|">="|"<="|"==" {printf("%s- Relational
operator\n",yytext);} "=" {printf("%s-assignment
operator\n",yytext);}
[0-9]+ {printf("%s-digit\n",yytext);}
%%
void main()
{
printf("Give an
input:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

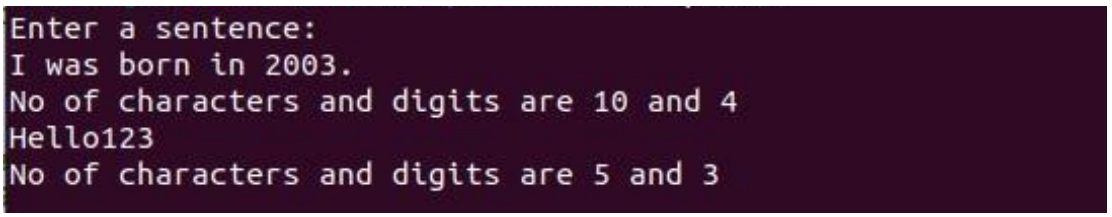
**Output**

```
C:\Users\samri\Desktop\cd_lab>flex tocken2.l

C:\Users\samri\Desktop\cd_lab>gcc lex.yy.c

C:\Users\samri\Desktop\cd_lab>a.exe
Enter an input:
int x=2;
int : keyword
 x : identifier
= : relation operator
2 : digits
; : punctuation
```

## 1.2 Write a program in LEX to count the number of characters and digits in a string. Code

```
%{
#include<stdio
.h> int
d=0,c=0;
%}
%%
[a-zA-Z] {c++;}
[0-9] {d++;}
. ;
\n {printf("No of characters and digits are %d and %d\n",c,d),c=0,d=0;}
%%
void main()
{
printf("Enter a
sentence:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

**Output**



## 1.3 Write a program in LEX to count the number of vowels and consonants in a string. Code

```
%{
#include<stdio
.h> int
v=0,c=0;
%}

%%


[AEIOUaeiou]
{v++;} [A-Za-z]
{c++;}
\n {printf("No of vowels and consonants are %d and %d\n",v,c),v=0,c=0;}
%%
void main()
{
printf("Enter a
sentence:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

**Output**

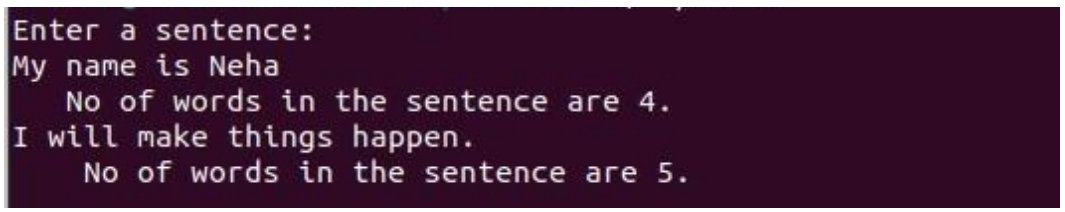
```
Enter a sentence:
Compiler design
 No of vowels and consonants are 5 and 9
This is a book
   No of vowels and consonants are 5 and 6
^C
```

# Lab 2

## 2.1 Write a program in lex to count the number of words in a sentence. Code

```
%{
#include<stdio
.h> int words;
%}
%%
[^\t\n ]+ {words++;}
\n {printf("No of words in the sentence are %d.\n",words),words=0;}
%%
void main()
{
printf("Enter a
sentence:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

**Output**



## 2.2 Write a program in lex to demonstrate regular definition.

**Code**

```
%{
#include<stdio.h>
%}
alpha [a-zA-Z0-9]
%%
[a-zA-Z]+ {printf("Characters\n");}
[0-9]+ {printf("Digits");}
{alpha}+ {printf("Invalid input!\n");}
%%
void main()
{
printf("Enter a
string:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

**Output**

**2.3 Write a program in lex to identify tokens in a program by taking input from a file and printing the output on the terminal.**

**Code**

```
%{
#include<stdio.h>
%}
%%
char|int|float {printf("%s is a keyword.\n",yytext);}
[a-zA-Z][a-zA-Z0-9]* {printf("%s is an identifier.\n",yytext);}
, {printf("%s is a separator.\n",yytext);}
; {printf("%s is a delimiter.\n",yytext);}
"=" {printf("%s is an assignment
operator.\n",yytext);} "+"|"-"|"*"|"/" {printf("%s
is a binary operator.\n",yytext);}
[0-9]+ {printf("%s is/are digit(s).\n",yytext);}
\n ;
%%
void main()
{
yyin=fopen("input.txt"
,"r"); yylex();
fclose(yyin);
}
int yywrap()
{
return 1;
}
```

**Output**

```
1 int sum,x=2,y=3;
2 sum=x+y;
```

```
int is a keyword.
 sum is an identifier.
, is a separator.
x is an identifier.
= is an assignment operator.
2 is/are digit(s).
, is a separator.
y is an identifier.
= is an assignment operator.
3 is/are digit(s).
; is a delimiter.
sum is an identifier.
= is an assignment operator.
x is an identifier.
+ is a binary operator.
y is an identifier.
; is a delimiter.
```

**2.4 Write a program in lex to identify tokens in a program by taking input from a file and printing the output in another file.**

**Code**

```
%{
#include<stdio.h>
%}
%%
char|int|float {fprintf(yyout,"%s is a keyword.\n",yytext);}
[a-zA-Z][a-zA-Z0-9]* {fprintf(yyout,"%s is an identifier.\n",yytext);}
, {fprintf(yyout,"%s is a separator.\n",yytext);}
; {fprintf(yyout,"%s is a delimiter.\n",yytext);}
"=" {fprintf(yyout,"%s is an assignment
operator.\n",yytext);} "+"|"-"|"*"|"/" {fprintf(yyout,"%s
is a binary operator.\n",yytext);} [0-9]+
{fprintf(yyout,"%s is/are digit(s).\n",yytext);}
\n ;
%%
void main()
{
yyin=fopen("input.txt","r
");
yyout=fopen("output.txt",
"w"); yylex();
printf("Printed in
output.txt\n");
fclose(yyin);
fclose(yyout);
}
int yywrap()
{
return 1;
```

}

**Output**

```
1 int sum,x=2,y=3;
2 sum=x+y;
```

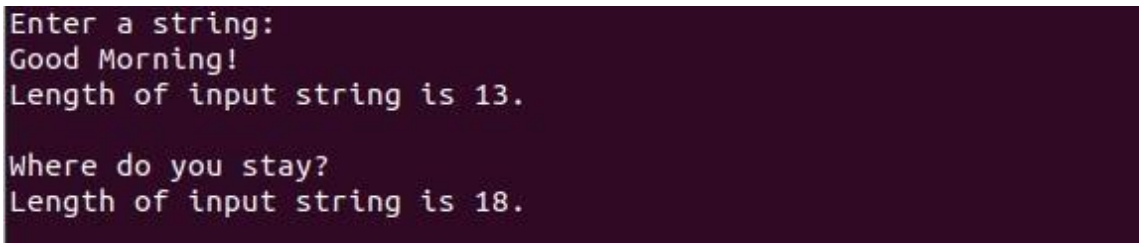
```
Printed in output.txt
```

```
 1 int is a keyword.
 2  sum is an identifier.
 3 , is a separator.
 4 x is an identifier.
 5 = is an assignment operator.
 6 2 is/are digit(s).
 7 , is a separator.
 8 y is an identifier.
 9 = is an assignment operator.
10 3 is/are digit(s).
11 ; is a delimiter.
12 sum is an identifier.
13 = is an assignment operator.
14 x is an identifier.
15 + is a binary operator.
16 y is an identifier.
17 ; is a delimiter.
```

## 2.5 Write a program in lex to find the length of the input string. Code

```
%{
#include<stdio.h>
%}
%%
[a-zA-Z0-9.,!? \t]+ {printf("Length of input string is %d.\n",yyleng);}
%%
void main()
{
printf("Enter a
string:\n"); yylex();
}
int yywrap()
{
return 1;
}
```

**Output**

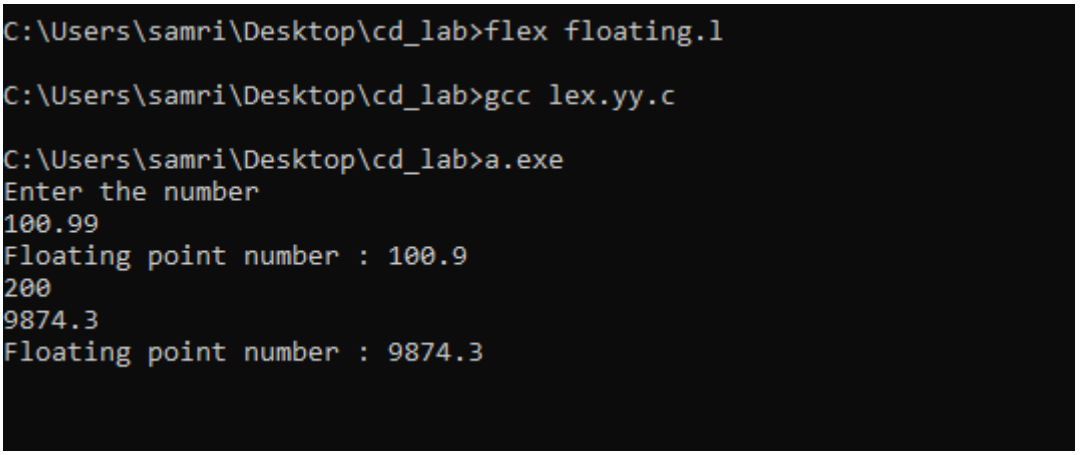


# Lab 3

## 3.1 Write a program in LEX to recognize Floating Point Numbers. Code

```
%{
#include<stdio.h>
%}
%%
[+-]?[0-9]*[.][0-9][0-9]* {printf("Floating point number!\n");};
[+-]?[0-9][0-9]* {printf("Not a floating point number!\n");};
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a
number:\n"); yylex();
}
```

**Output**



**3.2 Read and input sentence, and check if it is compound or simple. If a sentence has the word- and , or ,but ,because ,if ,then ,nevertheless then it is compound else it is simple.**

**Code**

```
%{
#include<stdio
.h> int flag=0;
%}
%%
if|then|but|because|nevertheless|and|or {flag=1;}
. ;
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a
sentence:\n"); yylex();
if(flag==1)
printf("Compound
sentence!\n"); else
printf("Simple sentence!\n");
}
```

**Output**

### 3.3 Write a program to check if the input sentence ends with any of the following punctuation marks ( ? , fullstop , ! )

**Code**

```
%{
#include<stdio
.h> int flag=0;
%}
%%
.*[?|!|.]$ {flag=1;}
.* {flag=0;}
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a
sentence:\n"); yylex();
if(flag==1)
printf("Ends with a
punctuation!\n"); else
printf("Does not end with punctuation!\n");
}
```

**Output**

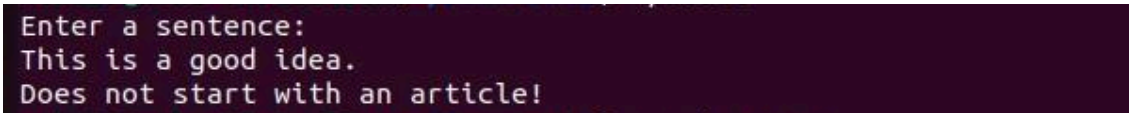
```
Enter a sentence:
Is this yours?
Ends with a punctuation!
```

**3.4 Write a program to read an input sentence and to check if the sentence begins with English articles (A, a,AN,An,THE and The).**

**Code**

```
%{
#include<stdio
.h> int flag=0;
%}
%%
^(an|An|The|the|A|a)[" "].* {flag=1;}
.* {flag=0;}
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a
sentence:\n"); yylex();
if(flag==1)
printf("Starts with an
article!\n"); else
printf("Does not start with an article!\n");
}
```

**Output**

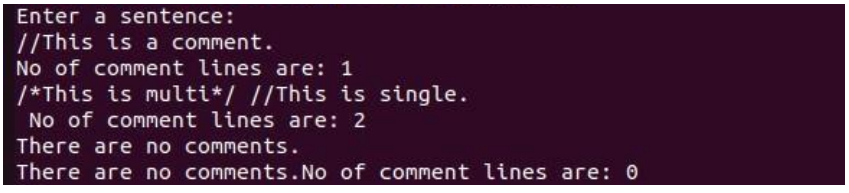

Enter a sentence:
This is a good idea.
Does not start with an article!

**3.5 Lex program to count the number of comment lines (multi line comments or single line) in a program. Read the input from a file called input.txt and print the count in a file called output.txt.**

**Code**

```
%{
#include<stdio
.h> int c=0;
%}
%%
"\/\*"[^*]*\*+([^/*][^*]*\*+)*\/
{c++;} "//".* {c++;}
. ECHO;
%%
int yywrap()
{
return 1;
}
void main()
{
yyin=fopen("input.txt","r
");
yyout=fopen("output.txt",
"w"); yylex();
printf("The number of comments
are:%d\n",c); fclose(yyin);
fclose(yyout);
}
```

**Output**



**3.6 Write a program to read and check if the user entered number is signed or unsigned using appropriate meta character.**

**Code**

```
%{
#include<stdio.h>
%}
%%
[+|-][0-9]+ {printf("Signed number!\n");}
[0-9]+ {printf("Unsigned number!\n");}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a
number:\n"); yylex();
}
```

**Output**

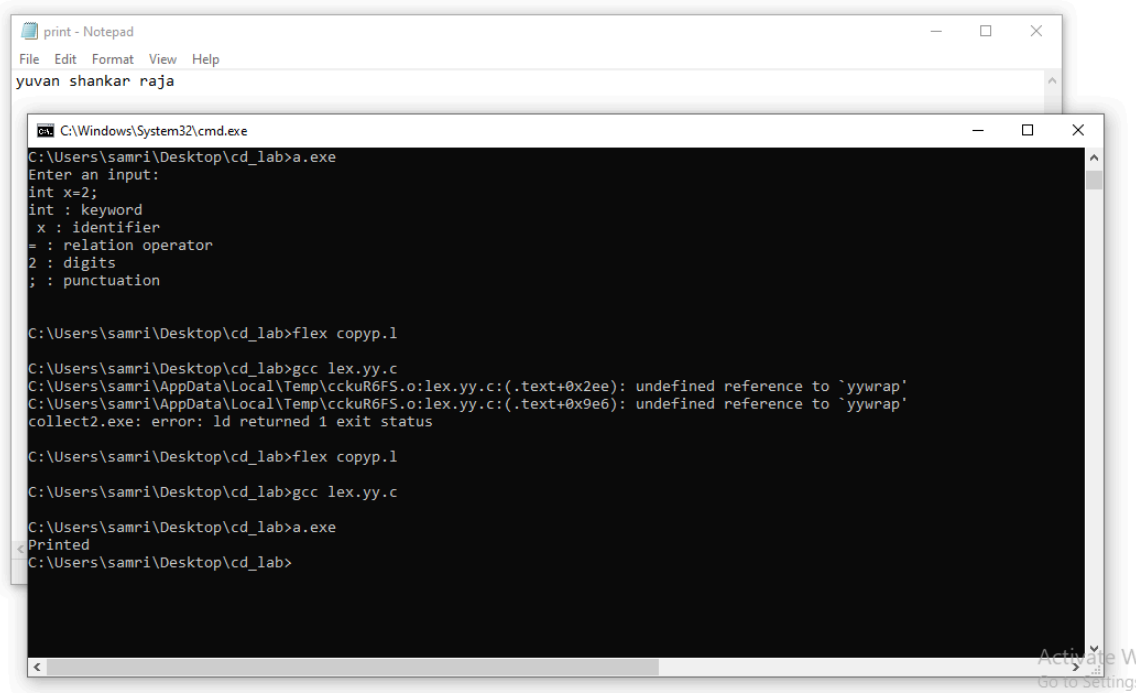
# Lab 4

## 4.1 Write a LEX program that copies a file, replacing each nonempty sequence of white spaces by a single blank.

**Code**

```
%{
#include<stdio.h>
%}
%%
[ \t]+ {fprintf(yyout," ");}
.|\n {fprintf(yyout,"%s",yytext);}
%%
void main()
{
yyin=fopen("text.txt","r");
yyout=fopen("print.txt",
"w"); yylex();
fclose(yyin);
fclose(yyout);
printf("Printed!\
n");
}
int yywrap()
{
return 1;
}
```

## Output


print - Notepad
File Edit Format View Help
yuvan shankar raja
C:\Windows\System32\cmd.exe
C:\Users\samri\Desktop\cd_lab>a.exe
Enter an input:
int x=2;
int : keyword
x : identifier
= : relation operator
2 : digits
; : punctuation
C:\Users\samri\Desktop\cd_lab>flex copyp.l
C:\Users\samri\Desktop\cd_lab>gcc lex.yy.c
C:\Users\samri\AppData\Local\Temp\cckuR6FS.o:lex.yy.c:(.text+0x2ee): undefined reference to `yywrap'
C:\Users\samri\AppData\Local\Temp\cckuR6FS.o:lex.yy.c:(.text+0x9e6): undefined reference to `yywrap'
collect2.exe: error: ld returned 1 exit status
C:\Users\samri\Desktop\cd_lab>flex copyp.l
C:\Users\samri\Desktop\cd_lab>gcc lex.yy.c
C:\Users\samri\Desktop\cd_lab>a.exe
Printed
C:\Users\samri\Desktop\cd_lab>
Activate Windows
Go to Settings to activa

## 4.2 Write a LEX program to recognize the following tokens over the alphabets {0,1,..,9}

### 4.2.1 The set of all string ending in

**00. Code**

```
%{
#include<stdio
.h> int flag=0;
%}
%%
[0-9]+[00] {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a
string:\n"); yylex();
if(flag==1)
printf("Ends with
0.\n"); else
printf("Does not end with 0.\n");
}
int yywrap()
{
return 1;
}
```

**Output**

### 4.2.2 The set of all strings with three consecutive 222's. Code

```
%{
#include<stdio
.h> int flag=0;
%}
%%
[0-9]*[2][2][2][0-9]* {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a
string:\n"); yylex();
if(flag==1)
printf("Has 3 consecutive
2's.\n"); else
printf("Does not have 3 consecutive 2's.\n");
}
int yywrap()
{
return 1;
}
```

**Output**

### 4.2.3 The set of all string such that every block of five consecutive symbols contains at least two 5's.

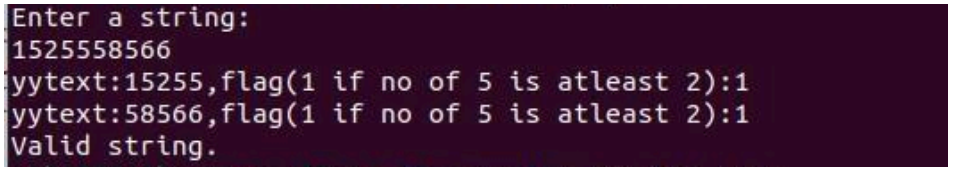
**Code**

```
%{
#include<stdio
.h> int
i,count=0,flag;
%}
%%
.{1,5} {flag=0;
for(i=0;i<5;i++)
      {
       int
       c=yytext[i]-'0';
       if(c==5)
       {
       count++;
       if(count==
       2)
       {
        flag=
        1;
        break
        ;
       }
       }
       }
       count=0;
       printf("yytext:%s,flag(1 if no of 5 is atleast
       2):%d\n",yytext,flag); if(flag!=1)
```

```
        {
         printf("Not a valid
        string!\n"); return 0;
       }
       }


 \n {return
     0;}
%%
void main()
```

```
{
printf("Enter a
string:\n"); yylex();
if(flag==1)
printf("Valid
string.\n");
}
int yywrap()
{
return 1;
}
```

**Output**



### 4.2.4 The set of all strings beginning with a 1 which, interpreted as the binary representation of an integer, is congruent to zero modulo 5.

**Code**

```
%{
#include<stdio.h>
int c,i,flag=1,sum=0,power=1;
%}
%%
^1[01]* {for(i=yyleng-1;i>=0;i--)
        {
         c=yytext[i]-'
         0';
         sum+=c*pow
         er;
         power*=2;
        }
        printf("Decimal
        representation:%d\n",sum);
        if(sum%5!=0)
        {
        printf("Not congruent to modulo
        5.\n"); sum=0;
        power=1;
        }
        else
        {
        printf("Congruent to modulo
        5.\n"); sum=0;
        power=1;
        }
        }
```

```
.* {printf("Not a binary number.\n");}
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
```

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

**Output**

### 4.2.5 The set of all strings such that the 10th symbol from the right end is

**1. Code**

```
%{
#include<stdio
.h> int flag=0;
%}
%%
[0-9]*1[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9] {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a
string:\n"); yylex();
if(flag==1)
printf("10th symbol from right is
1.\n"); else
printf("10th symbol from right is not 1.\n");
}
int yywrap()
{
return 1;
}
```

**Output**

### 4.2.6 The set of all four digits numbers whose sum is

**9. Code**

```
%{
#include<stdio.
h> int
sum=0,i,flag=0
;
%}
%%
[0-9][0-9][0-9][0-9] {for(i=0;i<yyleng;i++)
                {
                                                 sum+=yytext[i]-'0';
                                                }
                                                if(sum==9)
                                                {
                                                f
                                                l
                                                a
                                                g
                                                =
                                                1
                                                ;
                                                s
                                                u
                                                m
\n {return 0;}                                  =
%%                                              0
void main()                                     ;
{                                               }
                                                else
```

{

f

l

a

g

=

0

;

s

u

m

=

0

;

}

}

printf("Enter a

string:\n"); yylex();

if(flag==1)

printf("The sum of digits is

9.\n"); else

printf("The sum of digits is not 9.\n");

}

int yywrap()

{

return 1;

}

**Output**

### 4.2.7 The set of all four digital numbers, whose individual digits are in ascending order from left to right.

**Code**

```
%{
#include<stdio
.h> int
c,i,flag=1;
%}
%%
[0-9][0-9][0-9][0-9] {for(i=0;i<yyleng-1;i++)
                {
                 if(yytext[i]>=yytext[i+1])
                 {
                                                  f
                                                  l
                                                  a
                                                  g
                                                  =
                                                  0
\n {return 0;}                                    ;
%%                                                b
void main()                                       r
{                                                 e
                                                  a
                                                  k
                                                  ;
                                                 }
                                                }
                                               }
printf("Enter a
string:\n"); yylex();
```

```
if(flag==1)
printf("The digits are in ascending
order.\n"); else
printf("The digits are not in ascending order.\n");
}
int yywrap()
{
return 1;
}
```

**Output**

# Lab 5

**Write a C program to design lexical analysis to recognize any five keywords, identifiers, numbers, operators and punctuations.**

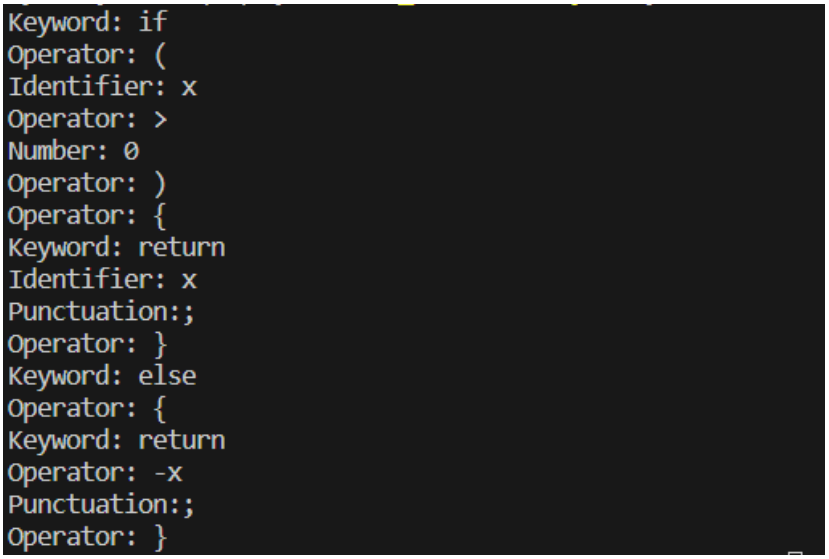
**Code**

```
#include
<stdio.h>
#include
<string.h>
#include
<ctype.h>

void lexicalAnalyzer(char input_code[]) {
  char *keywords[] = {"if", "else", "while", "for", "return"};
  char *operators[] = {"+", "-", "*", "/", "=", "==", "<", ">", "<=", ">="};
  char *punctuations[] = {",", ";", "(", ")", "{", "}"};

  char *token = strtok(input_code, " \t\n");

  while (token !=
    NULL) { if
    (isdigit(token[0]))
    {
      printf("Number: %s\n", token);
    } else if (isalpha(token[0]) || token[0]
      == '_') { int isKeyword = 0;
      for (int i = 0; i < sizeof(keywords) /
        sizeof(keywords[0]); i++) { if (strcmp(token,
        keywords[i]) == 0) {
          printf("Keyword: %s\n",
          token); isKeyword = 1;
```

```
            break;
        }
    }
    if (!isKeyword) {
        printf("Identifier: %s\n",
        token);
    }
} else if (strchr("+-*/=<>(){}[]", token[0]) !=
    NULL) { printf("Operator: %s\n", token);
}
else if(strchr(",;", token[0]) != NULL)
```

```
        {
            printf("Punctuation:%s\n",token);
        }

        token = strtok(NULL, " \t\n");
    }
}

int main() {
    char input_code[] = "if ( x > 0 ) { return x ; } else {
    return -x ; }"; lexicalAnalyzer(input_code);
    return 0;
}
```

**Output**



# Lab 6

**Write a program to perform recursive descent parsing on the following grammar:**

**S->cAd**

**A->ab | a**

**Code**

```
#include
<stdio.h>
#include<stdlib
.h> char
input[100]; int
ind = 0;
void match(char expected)
{
  if (input[ind] == expected)
  {
    ind++;
  }
}
void
A();
void
S()
{
  match('c
  '); A();
  match('d');
}
void A()
{
  if (input[ind] == 'a')
```

```
{
   printf("Hello\
   n");
   match('a');
   match('b');
} /*else if (input[ind] == 'a')
{
   printf("Hi!\n");
```

```
    match('a');
  }*/
  els
  e
  {
    printf("Parsing failed.\n",
    ind); exit(1);
  }
}
int main() {
  printf("Enter the input
  string:\n"); scanf("%s",
  input);

  S();

  if (input[ind] == '$') {
    printf("Parsing
    successful.\n");
  } else {
    printf("Parsing failed. Extra characters found.\n");
  }

  return 0;
}
```

**Output**

# Lab 7

## 7.1 Write a program in YACC to design a suitable grammar for evaluation of arithmetic expression having +, -, * and /.

**Code**

LEX

```
%{
#include<stdio.
h>
#include<stdlib
.h> #include
"y.tab.h" extern
int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return
num;} [\t ] ;
\n {return 0;}
. {return yytext[0];}
%%
int yywrap()
{
}
```

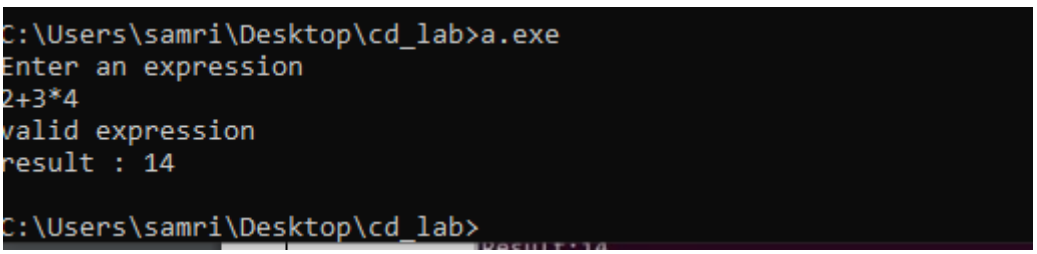
YACC

```
%{
#include<stdio.
h>
#include<stdlib
.h>
int yyerror(const char
```

```
*s); int yylex(void);
%}
%token num;
%left '+' '-'
%left '*' '/'
%left ')'
%left '('
```

```
%%
s:e {printf("Valid
    expression!\n");
    printf("Result:%d\n",$$);
    exit(0);
   }
;
e:e'+'e {$$=$1+$3;}
|e'-'e {$$=$1-$3;}
|e'*'e {$$=$1*$3;}
|e'/'e {$$=$1/$3;}
|'('e')' {$$=$2;}
|num {$$=$1;}
;
%%
void main()
{
printf("Enter an arithmetic
expression:\n"); yyparse();
}
int yyerror(const char *s)
{
printf("Invalid
expression!\n"); return 0;
}
```

**Output**



**7.2 Write a program in YACC to recognize strings of the form {(a^n)b , n>=5}. Code**

LEX

```
%{
#include<stdio.
h>
#include<stdlib
.h> #include
"y.tab.h" extern
int yylval;
%}
%%
[aA]
{yylval=yytext[0];return
A;} [bB]
{yylval=yytext[0];return
B;}
\n {return NL;}
. {return yytext[0];}
%%
int yywrap()
{
return 1;
}
```

YACC

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

```
yyerror(char *s);
int yylex(void);
%}
%token A
%token B
%token NL
%%
smtr:A A A A A S B NL {printf("Parsed using the rule (a^n)b, n>=5.\nValid String!\n");}
;
S:S A
|
```

```
;
%%
void main()
{
printf("Enter a
string!\n"); yyparse();
}
int yyerror(char *s)
{
printf("Invalid
String!\n"); return 0;
}
```

**Output**

**7.3 Write a program in YACC to generate syntax tree for a given arithmetic expression. Code**

LEX

```
%{
#include<stdio.
h>
#include<stdlib
.h> #include
"y.tab.h" extern
int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return
digit;} [\t] ;
[\n] return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

YACC

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

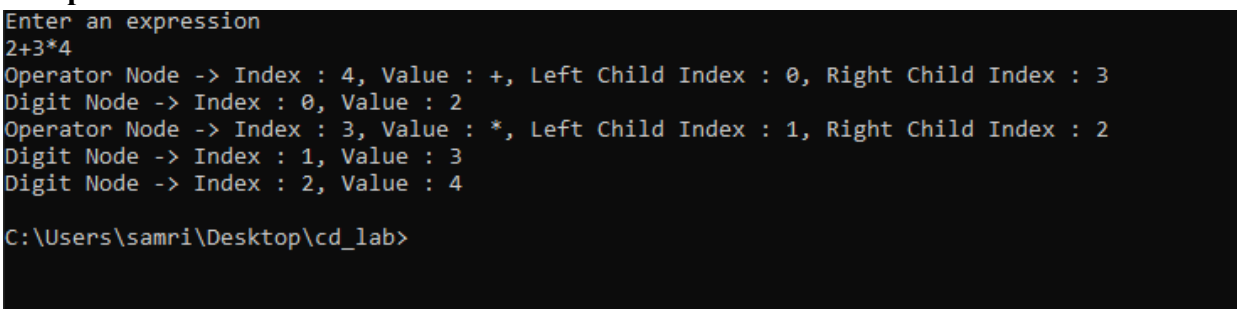
```
h>
#include<string.
h> int
yyerror(char *s);
int yylex(void);
struct tree_node
{
char
val[10];
int lc;
int rc;
};
```

```
int ind;
struct tree_node
syn_tree[100]; void
my_print_tree(int cur_ind);
int mknode(int lc,int rc,char
*val);
%}
%token digit
%%
S:E {my_print_tree($1);}
;
E:E'+'T {$$=mknode($1,$3,"+");}
|T {$$=$1;}
;
T:T'*'F {$$= mknode($1,$3,"*");}
|F {$$=$1;}
;
F:'('E')' {$$=$2;}
|digit {char buf[10];sprintf(buf,"%d", yylval);$$ = mknode(-1,-1,buf);}
;
%%
int main()
{
ind=0;
printf("Enter an
expression:\n"); yyparse();
return 0;
}
int yyerror(char *s)
{
printf("NITW
```

```
Error\n"); return 0;
}
int mknode(int lc,int rc,char val[10])
{
strcpy(syn_tree[ind].val,val);
```

```
syn_tree[ind].lc
=                   lc;
syn_tree[ind].rc
= rc; ind++;
return ind-1;
}
/*my_print_tree function to print the syntax tree in
DLR fashion*/ void my_print_tree(int cur_ind)
{
if(cur_ind==-1) return;
if(syn_tree[cur_ind].lc==-1&&syn_tree[cur_ind].rc==-1)
printf("Digit Node -> Index : %d, Value :
%s\n",cur_ind,syn_tree[cur_ind].val); else
printf("Operator Node -> Index : %d, Value : %s, Left Child Index : %d,Right Child Index :
%d\n",cur_ind,syn_tree[cur_ind].val, syn_tree[cur_ind].lc,syn_tree[cur_ind].rc);
my_print_tree(syn_tree[cur_ind].lc);
my_print_tree(syn_tree[cur_ind].rc);
}
```

**Output**



# Lab 8

## 8.1 Write a program in YACC to convert infix to postfix expression.

**Code**

LEX

```
%{
#include<stdio.
h>
#include<stdlib
.h> #include
"y.tab.h" extern
int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return
num;} [\t ] ;
\n {return 0;}
. {return yytext[0];}
%%
int yywrap()
{
}
```

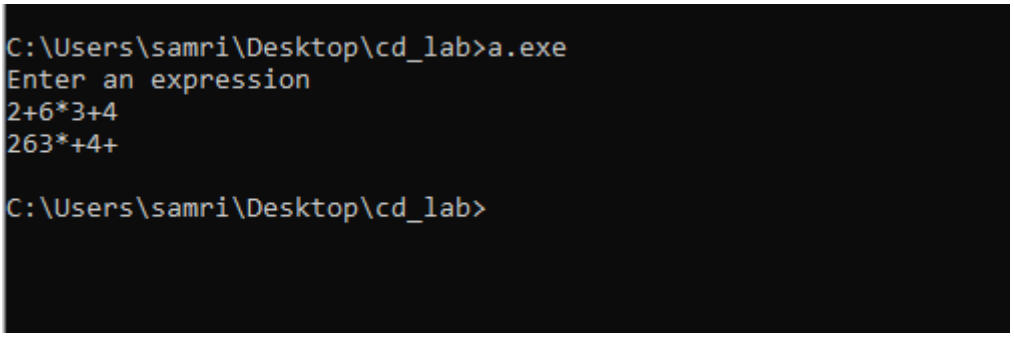
YACC

```
%{
#include<stdio.
h>
#include<stdlib
.h>
int yyerror(const char
*s); int yylex(void);
%}
```

```
%token num
%left '+' '-'
%left '*' '/'
%left ')'
%left '('
%right '^'
%%
```

```
s:e {printf("\n");}
;
e:e'+'t {printf("+");}
|e'-'t {printf("-");}
|t
;
t:t'*'h {printf("*");}
|t'/'h {printf("/");}
|h
;
h:f'^'h {printf("^");}
|f
;
f:'('e'
)'
|num {printf("%d",$1);}
;
%%
void main()
{
printf("Enter an infix
expression:\n"); yyparse();
}
int yyerror(const char *s)
{
printf("Invalid infix
expression!\n"); return 0;
}
```

**Output**


C:\Users\samri\Desktop\cd_lab>a.exe
Enter an expression
2+6*3+4
263*+4+
C:\Users\samri\Desktop\cd_lab>

# Lab 9

## 9.1Write a program in YACC to generate three address code for a given expression.

**Code**

LEX

```
%{
#include<stdio.h>
#include<stdlib.h
>
#include"y.tab.h"
extern int yylval;
extern char
iden[20];
%}
d [0-9]+
a [a-zA-Z]+
%%
{d} { yylval=atoi(yytext); return digit; }
{a} { strcpy(iden,yytext); yylval=1;
return id;} [ \t] {;}
\n return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

YACC

```
%{
#include
<math.h>
```

```
#include<ctype.
h>
#include<stdio.h
> int
yyerror(char *s);
int yylex(void);
int
var_cnt=0;
char
iden[20];
```

```
%}
%token id
%token digit
%%
S:id '=' E {printf("%s=t%d\n",iden,var_cnt-1);}
E:E '+' T {$$=var_cnt; var_cnt++; printf("t%d = t%d + t%d;\n", $$, $1, $3 );}
|E '-' T { $$=var_cnt; var_cnt++; printf("t%d = t%d - t%d;\n", $$, $1, $3 );}
|T {$$=$1;}
;
T:T '*' F {$$=var_cnt; var_cnt++; printf("t%d = t%d * t%d;\n", $$, $1, $3 );}
|T '/' F {$$=var_cnt; var_cnt++; printf("t%d = t%d / t%d;\n", $$, $1, $3 );}
|F {$$=$1;}
;
F:P '^' F {$$=var_cnt; var_cnt++; printf("t%d = t%d ^ t%d;\n", $$, $1, $3 );}
|P {$$ = $1;}
;
P: '(' E ')' {$$=$2;}
|digit {$$=var_cnt; var_cnt++; printf("t%d = %d;\n",$$,$1);}
;
%%
int main()
{
var_cnt=0;
printf("Enter an
expression:\n"); yyparse();
return 0;
}
int yyerror(char *s)
{
printf("Invalid
expression!"); return 0;
```

}

**Output**

```
C:\Users\samri\Desktop\cd_lab>flex pract.l

C:\Users\samri\Desktop\cd_lab>bison -dy pract.y

C:\Users\samri\Desktop\cd_lab>gcc lex.yy.c y.tab.c

C:\Users\samri\Desktop\cd_lab>a.exe
Enter an expression
a=2*3/6-4
t0 =2
t1 =3
t2 = t0 * t1
t3 =6
t4 = t2 / t3
t5 =4
t6 = t4 +-t5
a=t6
```