Parul® University
VADODARA, GUJARAT

NAAC A++
ACCREDITED UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

BACHELOR OF TECHNOLOGY

Compiler Design Laboratory
(303105350)

SEMESTER VI
Computer Science & Engineering Department

Laboratory Manual

CERTIFICATE

This is to certify that

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Date of Submission …..…… **Staff In charge …..……**

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8	To Study about Lexical Analyzer Generator (LEX) and Flex (Fast Lexical Analyzer)				
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10	Implement following programs using Lex. **a.** Write a Lex program to print out all numbers from the given file. **b.** Write a Lex program to printout all HTML tags in file. **c.** Write a Lex program which adds line numbers to the given file and display the same onto the standard output.				

Experiment No: 1

Aim: Program to implement Lexical Analyzer.

Program :

```
#include<stdio.h>
#include<ctype.h>
#include<string.h>
#include<stdlib.h>
void keyw(char *p);
int i=0,id=0,kw=0,num=0,op=0,sp=0,ar=0,count=0,new_line=0;
char keys[32][10]={"auto","break","case","char","const","continue","default",
                                        "do","double","else","enum","extern","float","for","goto",
                                        "if","int","long","register","return","short","signed",
                                        "sizeof","static","struct","switch","typedef","union",
                                        "unsigned","void","volatile","while"};
main()
{
   char ch,str[25],seps[20]=" \t\n,;(){}[]#\"<>",oper[]="!%^&*-+=~|.<>/?";
   int j;
   char fname[50];
   FILE *f1;
   f1 = fopen("Laxcode.txt","r");
   if(f1==NULL)
   {
      printf("file not found");
      exit(0);
   }

   while((ch=fgetc(f1))!=EOF)
   {
         for(j=0;j<=14;j++)
      {
         if(ch==oper[j])
         {
                                    printf("%c is an operator\n",ch);
            op++;
            count++;
            str[i]='\0';
            keyw(str);
         }
      }
      if(ch=='\n'){
         new_line++;
                  }
```

```
for(j=0;j<=14;j++)
{
   if(i==-1)
            break;
   if(ch==seps[j])
   {
      if(ch=='#')
      {
         while(ch!='>')
         {
            printf("%c",ch);
            ch=fgetc(f1);
         }
         printf("%c is a header file\n",ch);
         i=-1;
         break;
      }
      if(ch=="")
      {
         do
         {
            ch=fgetc(f1);
            printf("%c",ch);
         }while(ch!="");
         printf("\b is an argument\n");
         i=-1;
         ar++;
         count++;
         break;
      }
      if(ch==',' || ch==';' || ch=='(' || ch==')' || ch=='{' || ch=='}' || ch=='[' || ch==']'){
            printf("%c is a Sepretor\n",ch);

            sp++;
            count++;
                              }
      str[i]='\0';
      keyw(str);
   }
}
if(i!=-1)
{
   str[i]=ch;
   i++;
}
else
   i=0;
```

```
    }
    printf("\nKeywords:        %d\nIdentifiers:        %d\nOperators:        %d\nNumbers:
%d\nSepretor:%d\nArgument:%d",kw,id,op,num,sp,ar);
            printf("\nTotal number of Token:%d",count);
            printf("\n Number Of lines:%d",new_line);
}
void keyw(char *p)
{
    int k,flag=0;
    for(k=0;k<=31;k++)
    {
        if(strcmp(keys[k],p)==0)
        {
            printf("%s is a keyword\n",p);
            kw++;
            count++;
            flag=1;
            break;
        }
    }
    if(flag==0)
    {
        if(isdigit(p[0]))
        {
            printf("%s is a number\n",p);
            num++;
            count++;
        }
        else
                    {
            if(p[0]!='\0')
            {
                printf("%s is an identifier\n",p);
                id++;
                count++;
            }
        }
    }
    i=-1;
}
```

Output :

```
int is a keyword
( is a Sepretor
main is an identifier
) is a Sepretor
{ is a Sepretor
int is a keyword
= is an operator
a is an identifier
, is a Sepretor
10 is a number
= is an operator
b is an identifier
; is a Sepretor
20 is a number
( is a Sepretor
if is a keyword
> is an operator
a is an identifier
) is a Sepretor
b is an identifier
return is a keyword
; is a Sepretor
a is an identifier
else is a keyword
return is a keyword
; is a Sepretor
b is an identifier
} is a Sepretor

Keywords: 6
Identifiers: 7
Operators: 3
Numbers: 2
Sepretor:10
Argument:0
Total number of Token:28
 Number Of lines:7
--------------------------------
Process exited after 0.6474 seconds with return value 0
Press any key to continue . . .
```

Experiment No: 2

Aim : Program to count digits, vowels and symbols in C.

Program :

```
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int main(){

        char str[100];
        int i=0;
        int vowels=0,consonant=0,digit=0,symbols=0,spaces=0;
        FILE *fp;
        char ch;
        fp = fopen("input.txt", "r");
  if (fp == NULL)
  {

    printf("File not opened ");
    exit(1);
  }
  ch = fgetc(fp);
  printf("Your string is :\n");
  while (!feof(fp))
  {
    str[i++]=ch;
    ch = fgetc(fp);
```

```
    }
    str[i]='\0';
    printf("%s",str);
    fclose(fp);



        for(i=0;str[i]!='\0';i++)
        {
                if(str[i]=='a' || str[i]=='A' || str[i]=='e' || str[i]=='E' || str[i]=='i' || str[i]=='I' || str[i]=='o' ||
str[i]=='O' || str[i]=='u' || str[i]=='U'){
                        vowels++;
                }
                else if((str[i]>='a' && str[i]<='z')||(str[i]>='A' && str[i]<='Z'))
                {
                        consonant++;
                }
                else if(str[i]>='0' && str[i]<='9'){
                        digit++;
                }
                else if (str[i]==' ')
                {
                        spaces++;
                }
                else{
                        symbols++;
                }
        }
```

```
        printf("\nVowels : %d",vowels);
        printf("\nConsonant : %d",consonant);
        printf("\nDigit : %d",digit);
        printf("\nSpecialSymbols : %d",symbols);
        printf("\nWhite spaces: %d", spaces);



        return 0;
}
```

Output :

```
Your string is :
Programmer Jd @123
Vowels : 3
Consonant : 9
Digit : 3
SpecialSymbols : 1
White spaces: 2
--------------------------------
Process exited after 3.416 seconds with return value 0
Press any key to continue . . .
```

Experiment No: 3

Aim: Program to check validation of User Name and Password in C.

Program:

```
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int main(){

        char str[25],pwd[20];
        int a,i=0,j=0,h=0,m=0;
        FILE *fp,*fp1;
        char ch,ch1;
        fp = fopen("user.txt", "r");
  if (fp == NULL)
  {

     printf("File not opened ");
     exit(1);
  }
  ch = fgetc(fp);
  printf("Your Username is :\n");
  while (!feof(fp))
  {
     str[i++]=ch;
     ch = fgetc(fp);
```

```
    }
    str[i]='\0';
    printf("%s",str);
    fclose(fp);

        if(strcmp(str,"JayDepani")==0 || strcmp(str,"DepaniJay")==0 || strcmp(str,"JayPatel")==0 ||
strcmp(str,"PatelJay")==0){
                printf("\n This Username is Already there,please try to other Username.");
                return 0;
        }

        if(str[0]<'A' || str[0]>'Z'){
                 printf("\n First character of the Username should be Capital.");
        }

        for(i=0;str[i]!='\0';i++){
                if(str[i]>='0' && str[i]<='9'){
                        m=1;
                        break;
                }
                m=0;
        }

        if(m==1){
                printf("\n Digit is not Allow in the Username.");
        }
```

```
        for(i=0;str[i]!='\0';i++){
                if(str[i]=='~' || str[i]=='!' || str[i]=='@' || str[i]=='#' || str[i]=='$' || str[i]=='%' || str[i]=='^'
|| str[i]=='&' || str[i]=='*'){
                        m=1;
                        break;
                }
                m=0;
        }

        if(m==1){
                printf("\n Spacial Symbols are not Allow in Username.");
                return 0;
        }

        fp1 = fopen("pass.txt", "r");
    if (fp1 == NULL)
    {

       printf("File not opened ");
       exit(1);
    }
    ch1 = fgetc(fp1);
    printf("\nYour Password is :\n");
    while (!feof(fp1))
    {
       pwd[j++]=ch1;
```

```
    ch1 = fgetc(fp1);
}
pwd[j]='\0';
printf("%s",pwd);
fclose(fp1);

    a=strlen(pwd);

    if(a<8 || a>15){
        printf("\n Password length should be 8 to 15 characters.");
    }

    for(i=0;pwd[i]!='\0';i++){
        if(pwd[i]>='0' && pwd[i]<='9'){
            h=0;
            break;
        }
        h=1;
    }

    if(h==1){
        printf("\n Minimum one digit is complasary to use in password like 1,2,3...");
    }

    for(i=0;pwd[i]!='\0';i++){
        if(pwd[i]=='~' || pwd[i]=='!' || pwd[i]=='@' || pwd[i]=='#' || pwd[i]=='$' || pwd[i]=='%'
|| pwd[i]=='^' || pwd[i]=='&' || pwd[i]=='*'){
```

```
                h=0;
                break;
        }
        h=1;
}

if(h==1){
        printf("\n Must be use one Spacial Symbols in Password like ~,!,@,#,$,%,^,&,*.");
        return 0;
}

for(i=0;pwd[i]!='\0';i++){
        if(pwd[i]==' '){
                h=1;
                break;
        }
        h=0;
}
if(h==1){
        printf("\n Password should not contain any space.");
        return 0;
}

printf("\n Now Your Username is Created.\n Your Username is:%s",str);
printf("\n Now your Password is Created.\n your Password is :%s",pwd);
return 0;
```

}

Output :

```
Your Username is :
ProgrammerJd
Your Password is :
Programmer@123
 Now Your Username is Created.
 Your Username is:ProgrammerJd
 Now your Password is Created.
 your Password is :Programmer@123
--------------------------------
Process exited after 4.673 seconds with return value 0
Press any key to continue . . .
```

```
Your Username is :
ProgrammerJd
Your Password is :
programmerdepanijay
 Password length should be 8 to 15 characters.
 Minimum one digit is complasary to use in password like 1,2,3...
 Must be use one Spacial Symbols in Password like ~,!,@,#,$,,^,&,*.
--------------------------------
Process exited after 0.9037 seconds with return value 0
Press any key to continue . . .
```

Experiment No: 4

Aim : Program to implement Predictive Parsing LL(1) in C.

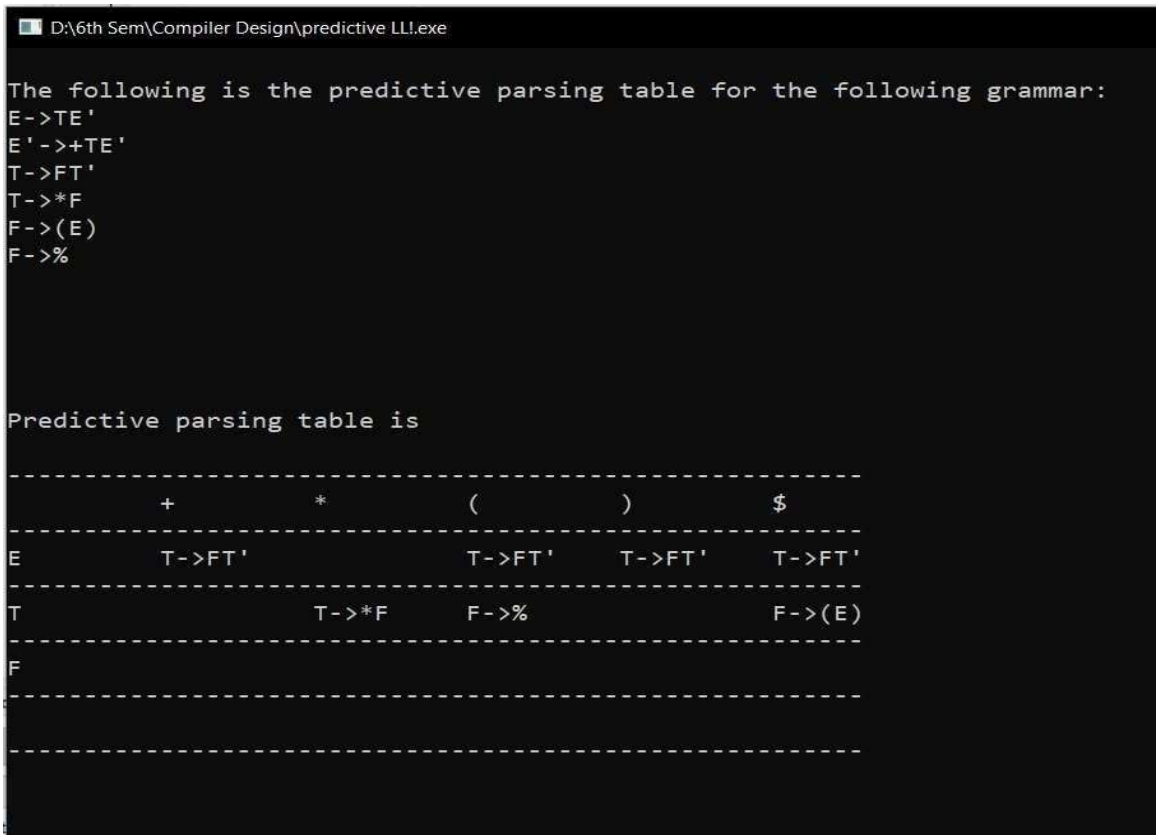
Program :

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
char prol[10][10]={"E","E'","E'","T","T'","T'","F","F"};
char pror[10][10]={"TE'","+TE'","@","FT'","*FT'","@","(E)","%"};
char prod[10][10]={"E->TE'","E'->+TE'","T->FT'","T->*F","F->(E)","F->%"};
char first[10][10]={"(%","+@","(%","*@","(%"};
char follow[10][10]={"$)","$)","+$)","+$)","*+$)"};
char table[5][6][10];
numr(char c)
 {
        switch(c)
 {
 case 'E': return 0;
 case 'T': return 1;
 case 'F': return 2;
 case '+': return 0;
 case '*': return 1;
 case '(': return 2;
 case ')': return 3;
 case '%': return 4;
 case '$': return 5;
}
```

```
return(2);
 }
void main()
 { int i,j,k;
// clrscr();
 for(i=0;i<5;i++)
 for(j=0;j<6;j++)
 strcpy(table[i][j]," ");
 printf("\nThe following is the predictive parsing table for the following grammar:\n");
 for(i=0;i<10;i++)
 printf("%s\n",prod[i]);
 printf("\nPredictive parsing table is\n");
 fflush(stdin);
 for(i=0;i<10;i++)
 {
k=strlen(first[i]);
for(j=0;j<10;j++)
if(first[i][j]!='@')
strcpy(table[numr(prol[i][0])+1][numr(first[i][j])+1],prod[i]);
 }
 for(i=0;i<10;i++)
{
if(strlen(pror[i])==1)
 {
 if(pror[i][0]=='@')
 {
```

```
 k=strlen(follow[i]);
 for(j=0;j<k;j++)
 strcpy(table[numr(prol[i][0])+1][numr(follow[i][j])+1],prod[i]);
} } }
strcpy(table[0][0]," ");
strcpy(table[0][1],"+");
strcpy(table[0][2],"*");
strcpy(table[0][3],"(");
strcpy(table[0][4],")");
strcpy(table[0][5],"%");
strcpy(table[0][5],"$");
strcpy(table[1][0],"E");
strcpy(table[2][0],"T");
strcpy(table[3][0],"F");
printf("\n----------\n");
for(i=0;i<5;i++)
for(j=0;j<6;j++)
 {
 printf("%-10s",table[i][j]);  if(j==5)  printf("\n ----------\n");
 }
getch();
 }
```

Output :


D:\6th Sem\Compiler Design\predictive LL!.exe
The following is the predictive parsing table for the following grammar:
E->TE'
E'->+TE'
T->FT'
T->*F
F->(E)
F->%
Predictive parsing table is
+ * ( ) $
E T->FT' T->FT' T->FT' T->FT'
T T->*F F->% F->(E)
F

Experiment No. : 5

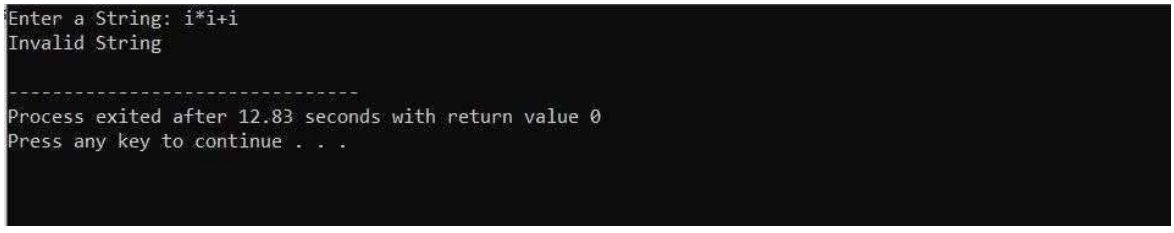
Aim : Program to implement Recursive Descent Parsing in C.

Program :

```
#include<stdio.h>
static char c[10];
char input;
void E(),EPRIME();
int main()
{
   printf("Enter a String: ");
   scanf("%s",c);

   E();
   if(c[input]=='$')
      printf("Valid String\n");
   else
      printf("Invalid String\n");
   return 0;
}
void E()
{
   if (c[input] == 'i')
      input++;
   EPRIME();
}
void EPRIME()
```

```
{
   if (c[input]== '+') {
      input++;
      if(c[input]=='i')
         input++;
      EPRIME();
   }
   else
      return;
}
```

Output :



Experiment No: 6

Aim: Program to implement Operator Precedence Parsing in C.

Program :

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
int main()
{
char stack[20],ip[20],opt[10][10][1],ter[10];
int i,j,k,n,top=0,row,col;
int len;
for(i=0;i<10;i++)
{
stack[i]=NULL;
ip[i]=NULL;
for(j=0;j<10;j++)
{
opt[i][j][1]=NULL;
}
}
printf("Enter the no.of terminals:");
scanf("%d",&n);
printf("\nEnter the terminals:");
scanf("%s",ter);
printf("\nEnter the table values:\n");
for(i=0;i<n;i++)
```

```
{
for(j=0;j<n;j++)
{
printf("Enter the value for %c %c:",ter[i],ter[j]);
scanf("%s",opt[i][j]);
}
}
printf("\nOPERATOR PRECEDENCE TABLE:\n");
for(i=0;i<n;i++)
{
printf("\t%c",ter[i]);
}
printf("\n_____");
printf("\n");
for(i=0;i<n;i++)
{
printf("\n%c |",ter[i]);
for(j=0;j<n;j++)
{
printf("\t%c",opt[i][j][0]);
}
}
stack[top]='$';
printf("\n\nEnter the input string(append with $):");
scanf("%s",ip);
i=0;
```

```
printf("\nSTACK\t\t\tINPUT STRING\t\t\tACTION\n");
printf("\n%s\t\t\t%s\t\t\t",stack,ip);

len=strlen(ip);
while(i<=len)
{
for(k=0;k<n;k++)
{
if(stack[top]==ter[k])
row=k;
if(ip[i]==ter[k])
col=k;
}
if((stack[top]=='$')&&(ip[i]=='$'))
{
printf("String is ACCEPTED");
break;
}
else if((opt[row][col][0]=='<') ||(opt[row][col][0]=='='))
{
stack[++top]=opt[row][col][0];
stack[++top]=ip[i];
ip[i]=' ';
printf("Shift %c",ip[i]);
i++;
}
```

```
else
{
if(opt[row][col][0]=='>')
{
while(stack[top]!='<')
{
--top;
}
top=top-1;
printf("Reduce");
}
else
{
printf("\nString is not accepted");
break;
}
}
printf("\n");
printf("%s\t\t\t%s\t\t\t",stack,ip);
}
getch();
}
```

Output :

```
D:\6th Sem\Compiler Design\All Programs\1\operrator.exe
Enter the no.of terminals:4

Enter the terminals:+*$i

Enter the table values:
Enter the value for + +:>
Enter the value for + *:<
Enter the value for + $:>
Enter the value for + i:<
Enter the value for * +:>
Enter the value for * *:>
Enter the value for * $:>
Enter the value for * i:<
Enter the value for $ +:<
Enter the value for $ *:<
Enter the value for $ $:>
Enter the value for $ i:<
Enter the value for i +:>
Enter the value for i *:>
Enter the value for i $:>
Enter the value for i i:>
```

```
OPERATOR PRECEDENCE TABLE:
        +       *       $       i
_____________________________________

+ |     >       <       >       <
* |     >       >       >       <
$ |     <       <       >       <
i |     >       >       >       >

Enter the input string(append with $):i+i*i$

STACK                   INPUT STRING                    ACTION

$                       i+i*i$                  Shift
$<i                      +i*i$                  Reduce
$<i                      +i*i$                  Shift
$<+                       i*i$                  Shift
$<+<i                      *i$                  Reduce
$<+<i                      *i$                  Shift
$<+<*                       i$                  Shift
$<+<*<i                      $                  Reduce
$<+<*<i                      $                  Reduce
$<+<*<i                      $                  Reduce
$<+<*<i                      $                  String is ACCEPTED
```

Experiment No: 7

Aim : Program to implement LALR Parsing in C.

Program :

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<string.h>
void push(char *,int *,char);
char stacktop(char *);
void isproduct(char,char);
int ister(char);
int   isnter(char);
int  isstate(char);
void error();
void isreduce(char,char);
char pop(char *,int *);
void printt(char *,int *,char [],int);
void rep(char [],int);
struct action
{
char row[6][5];
};
const struct action A[12]={
{"sf","emp","emp","se","emp","emp"},
{"emp","sg","emp","emp","emp","acc"},
{"emp","rc","sh","emp","rc","rc"},
```

```
{"emp","re","re","emp","re","re"},
{"sf","emp","emp","se","emp","emp"},
{"emp","rg","rg","emp","rg","rg"},
{"sf","emp","emp","se","emp","emp"},
{"sf","emp","emp","se","emp","emp"},
{"emp","sg","emp","emp","sl","emp"},
{"emp","rb","sh","emp","rb","rb"},
{"emp","rb","rd","emp","rd","rd"},
{"emp","rf","rf","emp","rf","rf"}
};
struct gotol
{
char r[3][4];
};
const struct gotol G[12]={
{"b","c","d"},
{"emp","emp","emp"},
{"emp","emp","emp"},
{"emp","emp","emp"},
{"i","c","d"},
{"emp","emp","emp"},
{"emp","j","d"},
{"emp","emp","k"},
{"emp","emp","emp"},
{"emp","emp","emp"},
};
```

```
char ter[6]={'i','+','*',')','(','$'};
char nter[3]={'E','T','F'};
char states[12]={'a','b','c','d','e','f','g','h','m','j','k','l'};
char stack[100];
int  top=-1;
char temp[10];
struct grammar
{
char left;
char right[5];
};
const struct grammar rl[6]={
{'E',"e+T"},
{'E',"T"},
{'T',"T*F"},
{'T',"F"},
{'F',"(E)"},
{'F',"i"},
};
int main()
{
char inp[80],x,p,dl[80],y,bl='a';
int i=0,j,k,l,n,m,c,len;
printf(" Enter the input :");
scanf("%s",inp);
len=strlen(inp);
```

```
inp[len]='$';
inp[len+1]='\0';
push(stack,&top,bl);
printf("\n stack \t\t\t input");
printt(stack,&top,inp,i);
do
{
x=inp[i];
p=stacktop(stack);
isproduct(x,p);
if(strcmp(temp,"emp")==0)
error();
if(strcmp(temp,"acc")==0)
break;
else
{
if(temp[0]=='s')
{
push(stack,&top,inp[i]);
push(stack,&top,temp[1]);
i++;
}
else
{
if(temp[0]=='r')
{
```

```
j=isstate(temp[1]);
strcpy(temp,rl[j-2].right);
dl[0]=rl[j-2].left;
dl[1]='\0';
n=strlen(temp);
for(k=0;k<2*n;k++)
pop(stack,&top);
for(m=0;dl[m]!='\0';m++)
push(stack,&top,dl[m]);
l=top;
y=stack[l-1];
isreduce(y,dl[0]);
for(m=0;temp[m]!='\0';m++)
push(stack,&top,temp[m]);
}
}
}
printt(stack,&top,inp,i);
}while(inp[i]!='\0');
if(strcmp(temp,"acc")==0)
printf(" \n accept the input ");
else
printf(" \n do not accept the input ");
getch();
}
void push(char *s,int *sp,char item)
```

```
{
if(*sp==100)
printf(" stack is full ");
else
{
*sp=*sp+1;
s[*sp]=item;
}
}
char stacktop(char *s)
{
char i;
i=s[top];
return i;
}
void isproduct(char x,char p)
{
int k,l;
k=ister(x);
l=isstate(p);
strcpy(temp,A[l-1].row[k-1]);
}
int ister(char x)
{
int i;
for(i=0;i<6;i++)
```

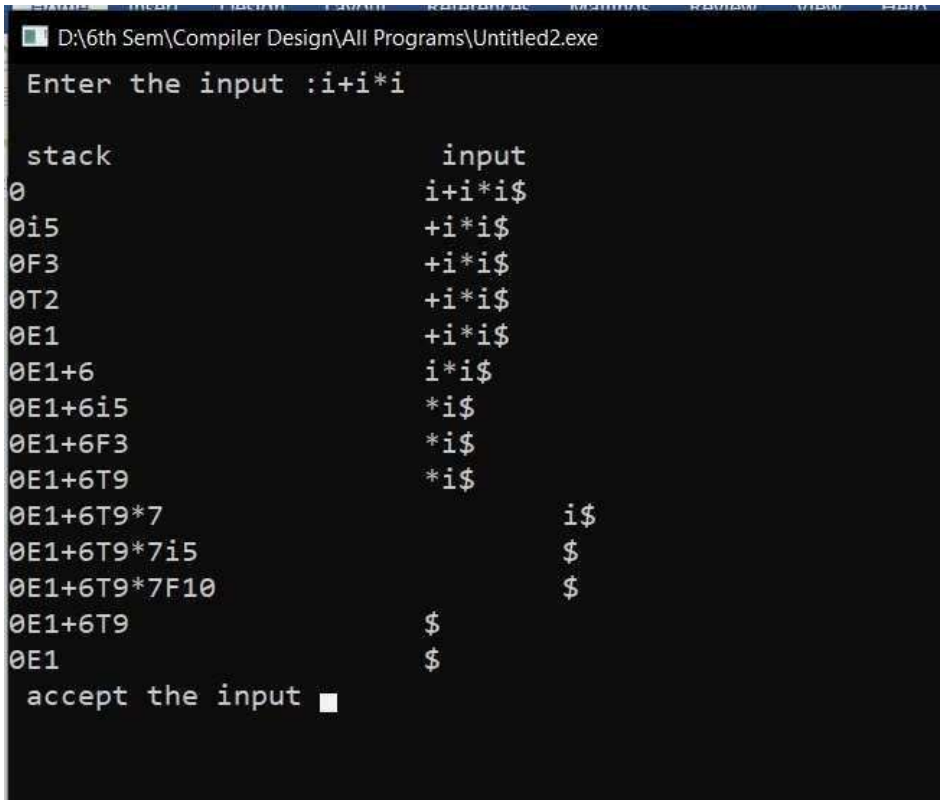
```
if(x==ter[i])
return i+1;
return 0;
}
int isnter(char x)
{
int i;
for(i=0;i<3;i++)
if(x==nter[i])
return i+1;
return 0;
}

int isstate(char p)
{
int i;
for(i=0;i<12;i++)
if(p==states[i])
return i+1;
return 0;
}
void error()
{
printf(" error in the input ");
exit(0);
}
```

```
void isreduce(char x,char p)
{
int k,l;
k=isstate(x);
l=isnter(p);
strcpy(temp,G[k-1].r[l-1]);
}
char pop(char *s,int *sp)
{
char item;
if(*sp==-1)
printf(" stack is empty ");
else
{
item=s[*sp];
*sp=*sp-1;
}
return item;
}
void printt(char *t,int *p,char inp[],int i)
{
int r;
printf("\n");
for(r=0;r<=*p;r++)
rep(t,r);
printf("\t\t\t");
```

```
for(r=i;inp[r]!='\0';r++)
printf("%c",inp[r]);
}
void rep(char t[],int r)
{
char c;
c=t[r];
switch(c)
{
case 'a': printf("0");
break;
case 'b': printf("1");
break;
case 'c': printf("2");
break;
case 'd': printf("3");
break;
case 'e': printf("4");
break;
case 'f': printf("5");
break;
case 'g': printf("6");
break;
case 'h': printf("7");
break;
case 'm': printf("8");
```

```
break;
case 'j': printf("9");
break;
case 'k': printf("10");
break;
case 'l': printf("11");
break;
default :printf("%c",t[r]);
break;
}
}
```

Output :



Experiment No: 8

Aim : To Study about Lexical Analyzer Generator (LEX) and Flex (Fast Lexical Analyzer)

Lex - A Lexical Analyzer Generator:-

Lex is a program generator designed for lexical processing of character input streams. It accepts a high-level, problem oriented specification for character string matching, and produces a program in a general purpose language which recognizes regular expressions. The regular expressions are specified by the user in the source specifications given to Lex. The Lex written code recognizes these expressions in an input stream and partitions the input stream into strings matching the expressions.

The grammar in the above diagram is a text file you create with a text edtior. Yacc will read your grammar and generate C code for a syntax analyzer or parser. The syntax analyzer uses grammar rules that allow it to analyze tokens from the lexical analyzer and create a syntax tree. The syntax tree imposes a hierarchical structure the tokens. For example, operator precedence and associativity are apparent in the syntax tree. The next step, code generation, does a depth-first Lexical Analyzer Syntax Analyzer a = b + c * d id1 = id2 + id3 * id4 = + * id1 source code tokens syntax tree id2 id3 id4 load id3 mul id4 add id2 store id1 Code Generator generated code Lex Yacc patterns grammar 5 walk of the syntax tree to generate code. Some compilers produce machine code, while others, as shown above, output assembly language.

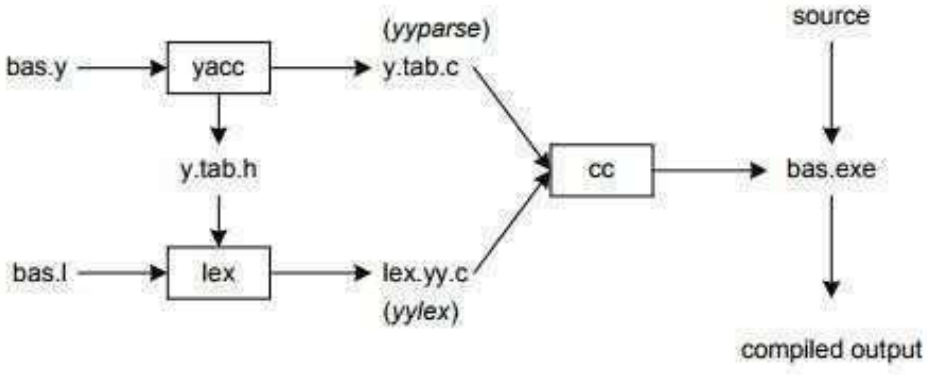


Figure 2: Building a Compiler with Lex/Yacc

What is Flex?

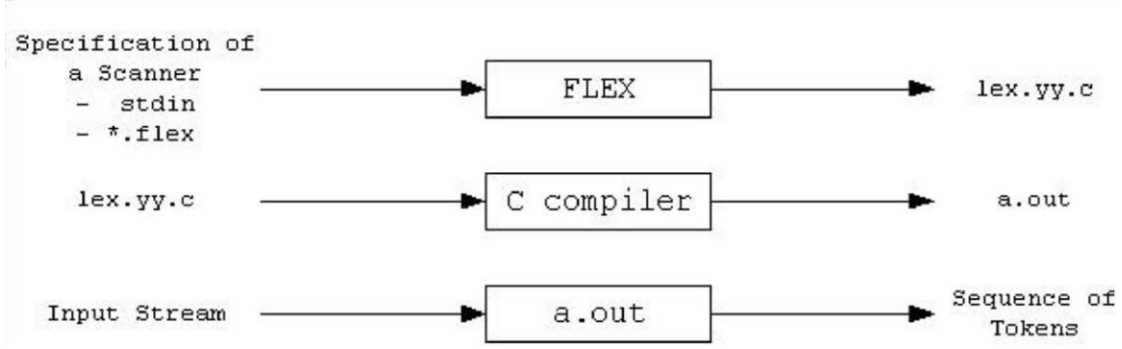
- Flex is a powerful, open source application framework which allows to build traditional applications for browser, mobile and desktop using the same programming model, tool, and codebase.

- Flex provides FLEX SDK consisting of the Flex class library (ActionScript classes), the Flex compilers, the debugger, the MXML and ActionScript programming languages, and other utilities to build expressive and interactive rich internet applications (RIA)

- Flex takes care of the user interface (UI) or the client-side functionality of a web application. Server-side functionality dependent on server-side components written in a traditional scripting language

How to use FLEX?

FLEX (Fast LEXical analyzer generator) is a tool for generating scanners. In stead of writing a scanner from scratch, you only need to identify the *vocabulary* of a certain language (e.g. Simple), write a specification of patterns using regular expressions (e.g. DIGIT [0-9]), and FLEX will construct a scanner for you. FLEX is generally used in the manner depicted here:



First, FLEX reads a specification of a scanner either from an input file *.lex, or from standard input, and it generates as output a C source file *lex.yy.c*. Then, *lex.yy.c* is compiled and linked with the "-lfl" library to produce an executable *a.out*. Finally, *a.out* analyzes its input stream and transforms it into a sequence of tokens.

***.lex** is in the form of pairs of regular expressions and C code. (sample1.lex, sample2.lex) **lex.yy.c** defines a routine *yylex()* that uses the specification to recognize tokens. **a.out** is actually the scanner!

How to Compile & Run LEX / YACC Programs on Windows ?

If you are installing Ubuntu (or any Linux based OS) on your system either through Virtual Box or by making your system Multi-Bootable, just to execute your Lex & Yacc programs; then you might be wasting your HDD space & your valuable time. You can easily skip this annoying process and run your programs in Windows OS without any hassles.

Here's how you can do it:

Installing Softwares:

1. Download **Flex 2.5.4a**
2. Download **Bison 2.4.1**
3. Download **DevC++**
4. **Install** Flex **at** "C:\GnuWin32"
5. **Install** Bison **at** "C:\GnuWin32"
6. **Install** DevC++ **at** "C:\Dev-Cpp"
7. Open Environment Variables.
8. Add "**C:\GnuWin32\bin;C:\Dev-Cpp\bin;**" to path.

Compilation & Execution of your Program:

1. Open Command prompt and switch to your working directory where you have stored your lex file (".l") and yacc file (".y")
2. Let your lex and yacc files be "hello.l" and "hello.y". Now, follow the preceding steps to compile and run your program.
    1. For Compiling **Lex** file only:
        1. flex hello.l
        2. gcc lex.yy.c
    2. For Compiling **Lex & Yacc** file both:
        1. flex hello.l
        2. bison -dy hello.y
        3. gcc lex.yy.c y.tab.c
3. For **Executing** the Program
        1. a.exe

EXAMPLE:- **HELLO.L FILE**

```
%{

#include "y.tab.h"

int yyerror(char *errormsg);

%}

%%

("hi"|"oi")"\n"        { return HI;  }
```

```
("tchau"|"bye")"\n"   { return BYE; }
.                     { yyerror("Unknown char");  }
%%
int main(void)
{
  yyparse();
  return 0;
}
int yywrap(void)
{
  return 0;
}

int yyerror(char *errormsg)
{
   fprintf(stderr, "%s\n", errormsg);
   exit(1);
}
```

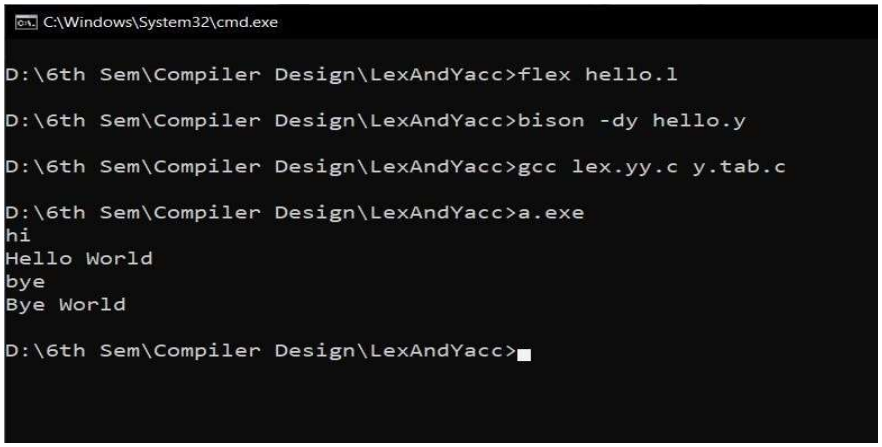
HELLO.Y FILE

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

%}

%token HI BYE

%%
```

program:

```
    hi bye
    ;

hi:
    HI    { printf("Hello World\n");  }
    ;
bye:
    BYE    { printf("Bye World\n"); exit(0); }
    ;
```

Output :



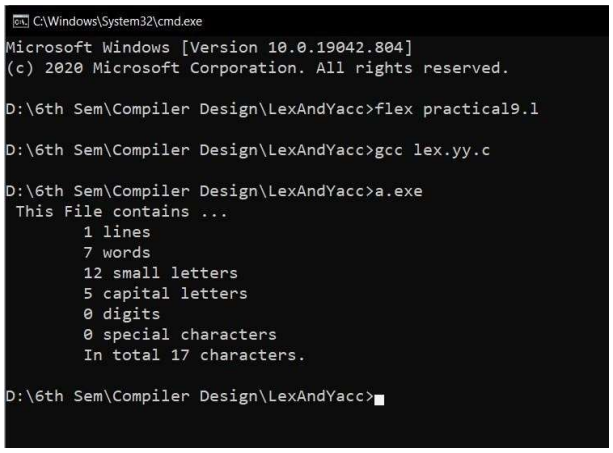
Experiment No: 9

Aim : A). Create a Lexer to take input from text file and count no of characters, no. of lines & no. of words.

Program :

```
%{
#include<stdio.h>
 int lines=0, words=0,s_letters=0,c_letters=0, num=0, spl_char=0,total=0;
%}
%%
\n { lines++; words++;}
[\t ' '] words++;
[A-Z] c_letters++;
[a-z] s_letters++;
[0-9] num++;
. spl_char++;
%%
main(void)
{
yyin= fopen("practical9.txt","r");
yylex();
total=s_letters+c_letters+num+spl_char;
printf(" This File contains ...");
printf("\n\t%d lines", lines);
printf("\n\t%d words",words);
printf("\n\t%d small letters", s_letters);
printf("\n\t%d capital letters",c_letters);
printf("\n\t%d digits", num);
printf("\n\t%d special characters",spl_char);
 printf("\n\tIn total %d characters.\n",total);
}
int yywrap()
{
return(1);
}
```

Output :

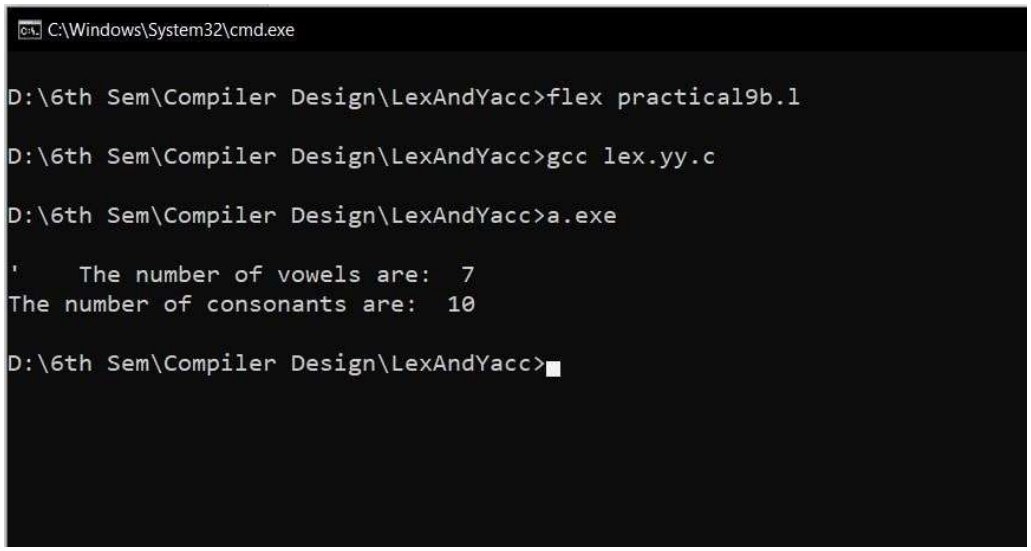


B). Write a Lex program to count number of vowels and consonants in a given input string.

Program :

```
%{
 int vow_count=0;
int const_count =0;
%}
%%
[aeiouAEIOU] {vow_count++;}
[a-zA-Z] {const_count++;}
%%
main()
{
yyin= fopen("practical8.txt","r");
yylex();
 printf("The number of vowels are: %d\n",vow_count);
printf("The number of consonants are: %d\n",const_count);
return 0;
}
yywrap()
{
return 1;
 }
```

Output :


C:\Windows\System32\cmd.exe
D:\6th Sem\Compiler Design\LexAndYacc>flex practical9b.l
D:\6th Sem\Compiler Design\LexAndYacc>gcc lex.yy.c
D:\6th Sem\Compiler Design\LexAndYacc>a.exe
'   The number of vowels are: 7
The number of consonants are: 10
D:\6th Sem\Compiler Design\LexAndYacc>

Experiment No: 10

Aim : A). Write a Lex program to print out all numbers from the given file.

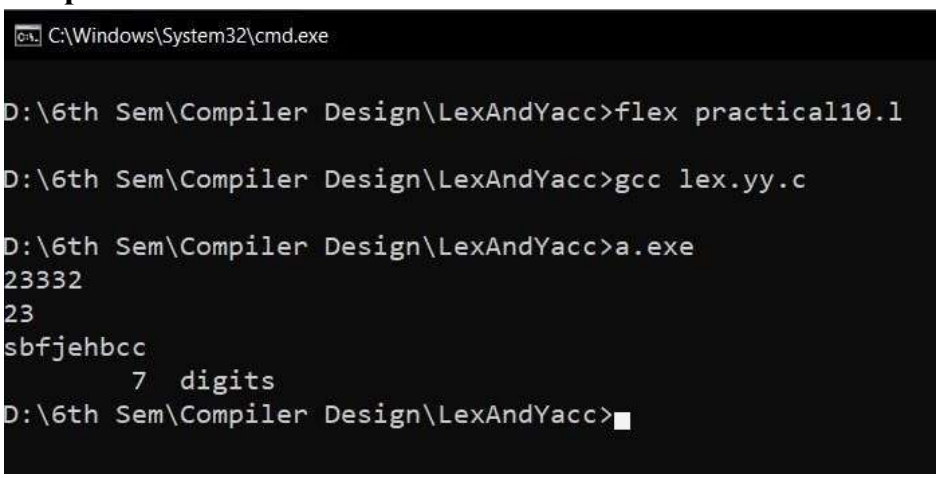
Program :

```
%{
#include<stdio.h>
int num=0;
%}
%%
[0-9] num++; ECHO;
%%
main(void)
{
yyin= fopen("practical10.txt","r");
yylex();
printf("\n\t%d  digits",  num);
}
int yywrap()
{
return(1);
}
```

Practical10.txt FILE

```
23332
23
Sbfjehbcc
```

Output :



B). Write a Lex program to printout all HTML tags in file.

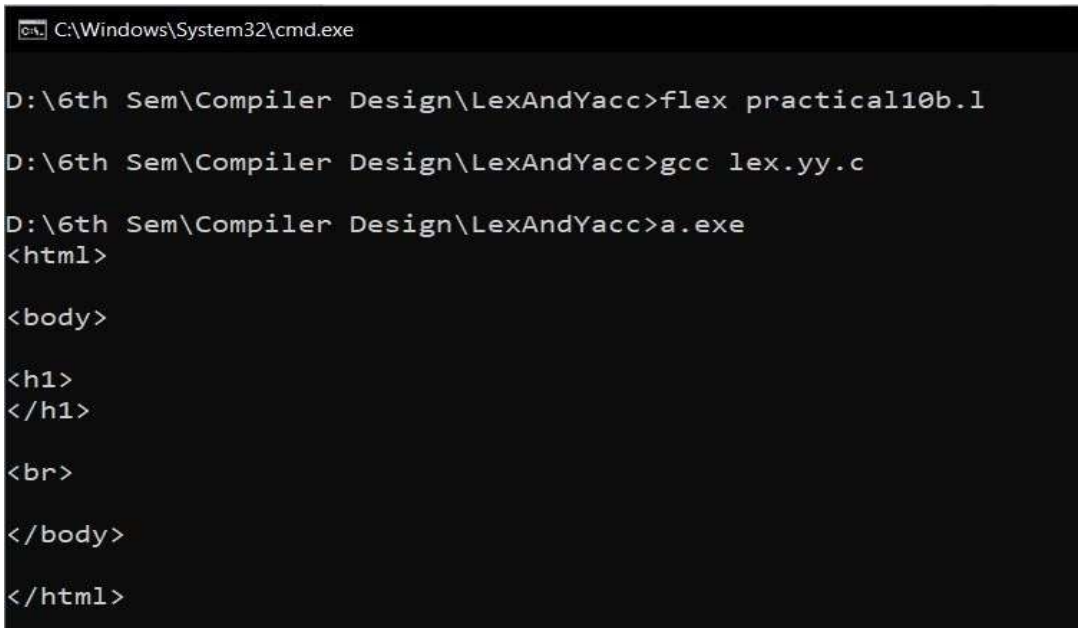
Program :

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

%%
\<[^>]*\> printf("%s\n",yytext);
.|\n;
%%

int yywrap()
{
return 1;
}

int main()
{
yyin=fopen("practical10b.txt","r");
yylex();
return 0;
}
```

Practical10b.txt FILE

```
<html>
<body>
<h1> Hello</h1>
<br>
</body>
</html>
```

Output :



C). Write a Lex program which adds line numbers to the given file and display the same onto the standard output.

Program :

```
%{
        #include<stdio.h>
        int line_number = 1;
%}
line .*\n
%%
{line} { printf("%d %s", line_number++, yytext); }
%%
int yywrap(){}
int main()
{
        extern FILE *yyin;
        yyin=fopen("add.txt","r");
        if(yyin==NULL){
                printf("File Not Found");
        }
        yylex();
        return 0;
}
```

Add.txt FILE

```
#include<stdio.h>
int main()
{
int a=10,b=20;
int c=a+b;
printf("Addition of a and b is:%d",c);
return 0;
}
```

Output :