PRACTICAL: 1

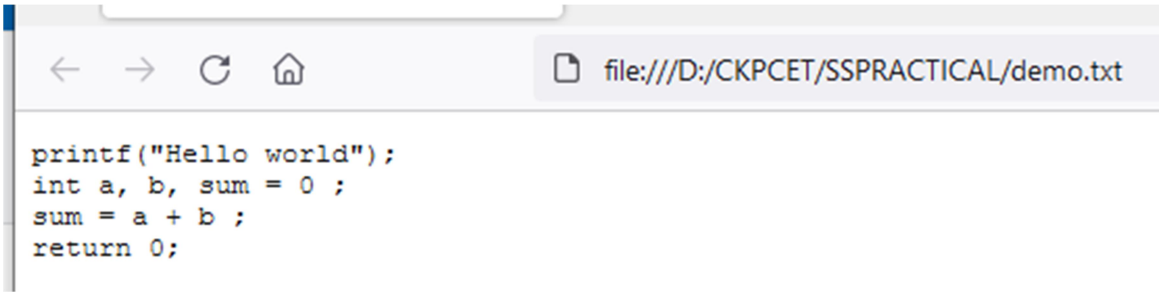
Write a program to implement a lexical analyzer for the 'C' language.

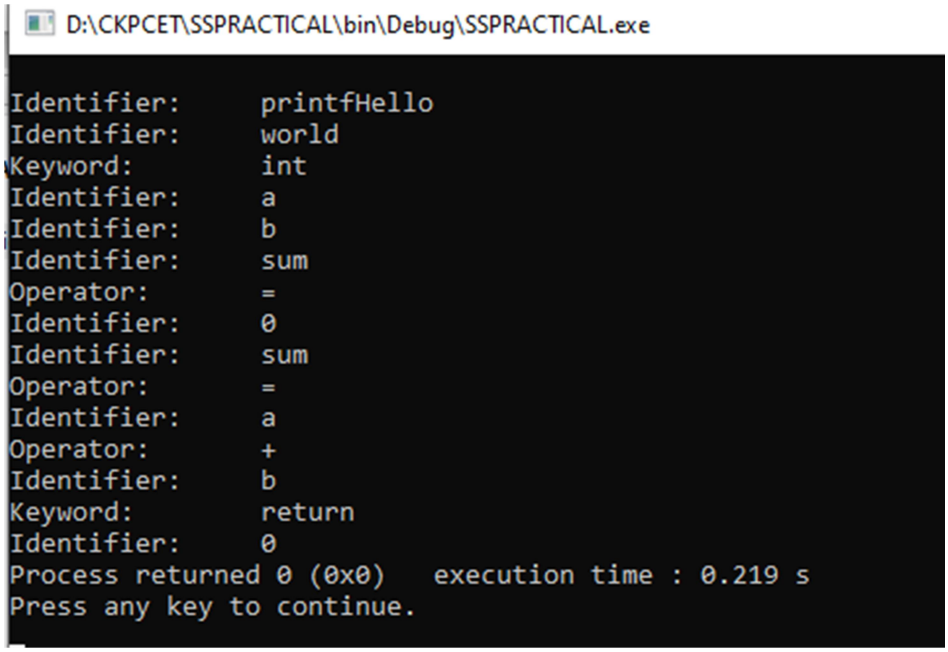
CODE:

```
#include <stdio.h>
#include <conio.h>
#include <ctype.h>
#include <string.h>
#include <stdlib.h>
int keyword_library(char temp[]);
int main()
{
   char ch, temp[40], operators[] = "=+%*/-";
   FILE *fp;
   int count, x = 0;
   fp= fopen("D:/CKPCET/SSPRACTICAL/demo.txt", "r");
   if (fp == NULL)
   {
      printf("The file could not be opened.\n");
      exit(0);
   }
   while ((ch = fgetc(fp)) != EOF)
   {
      count = 0;
      while (count <= 5)
      {
         if (ch == operators[count])
         {
            printf("\nOperator:\t%c", ch);
         }
         count = count + 1;
      }
      if (isalnum(ch))
      {
         temp[x++] = ch;
      }
      else if ((ch == '\n' || ch == ' ') && (x != 0))
      {
         temp[x] = '\0';
         x = 0;
         if (keyword_library(temp) == 1)
         {
```

```
            printf("\nKeyword:\t%s", temp);
         }
         else
         {
            printf("\nIdentifier:\t%s", temp);
         }
      }
   }
   fclose(fp);
   return 0;
}
int keyword_library(char temp[])
{
   int count = 0, flag = 0;
   char keywords[14][10] = {"return", "continue","switch", "char", "else",  "if", "while",
"float", "double", "for",
                  "break", "void", "int", "do"};
   while (count <= 13)
   {
      if (strcmp(keywords[count], temp) == 0)
      {
         flag = 1;
         break;
      }
      count = count + 1;
}
return (flag);
}
```

OUTPUT:




D:\CKPCET\SSPRACTICAL\bin\Debug\SSPRACTICAL.exe
Identifier: printfHello
Identifier: world
Keyword: int
Identifier: a
Identifier: b
Identifier: sum
Operator: =
Identifier: 0
Identifier: sum
Operator: =
Identifier: a
Operator: +
Identifier: b
Keyword: return
Identifier: 0
Process returned 0 (0x0) execution time : 0.219 s
Press any key to continue.

PRACTICAL : 2

Write a program to check the validity of the input string for a fixed Finite Automata.

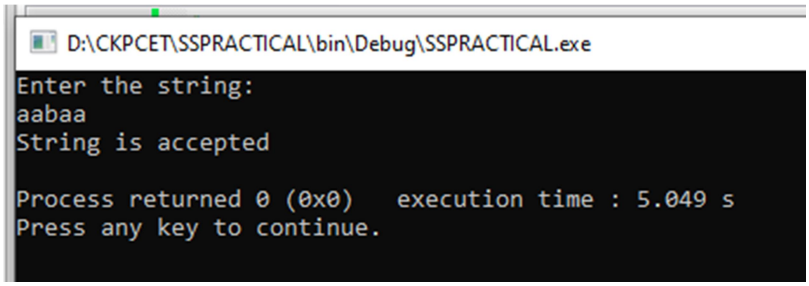
CODE:

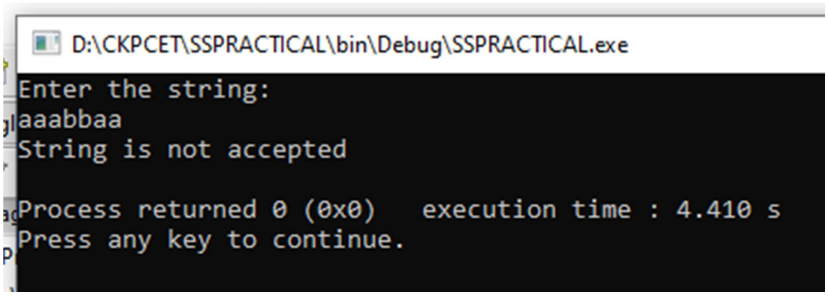
```
//DFA for regular expression (a+aab*)*
#include<stdio.h>
#include<string.h>
int main()
{
   char input[100];
   int len,i,status_a=0,status_b=0;
   printf("Enter the string: \n");
   scanf("%s",input);
   len=strlen(input);
   for(i=0;i<len;i++)
   {
      if(input[i]!='a'&&input[i]!='b')
      {
         printf("you enter wrong input\n");
         break;
      }
      else
      {
         if(input[i]=='a')
         {
            status_a=1;
            status_b=0;
         }
         else
         {
            if(status_b==1 || status_a==0)
            {
               printf("String is not accepted\n");
               break;
            }
            else
            {
               status_b=1;
               status_a=0;
            }
         }
      }
```

```
    if(i==len-1)
    {
       printf("String is accepted\n");
    }
    }
    return 0;
}
```

OUTPUT:

//DFA for regular expression (a+aab*)*





PRACTICAL : 3

Write a program to find FIRST and FOLLOW from the given set of production rules.

CODE:

```
#include<stdio.h> #include<ctype.h> #include<string.h>
// Functions to calculate Follow
void followfirst(char, int, int); void follow(char c);
// Function to calculate First
void findfirst(char, int, int); int count, n = 0;
// Stores the final result of the First Sets
char calc_first[10][100];
// Stores the final result of the Follow Sets
char calc_follow[10][100];
int m = 0;
// Stores the production rules char production[10][10];
char f[10], first[10]; int k;
char ck; int e;
int main(int argc, char **argv)
{
int jm = 0; int km = 0; int i, choice; char c, ch; count = 8;
// The Input grammar
strcpy(production[0], "E=TR");
strcpy(production[1], "R=+TR");
strcpy(production[2], "R=#");
strcpy(production[3], "T=FY");
strcpy(production[4], "Y=*FY");
strcpy(production[5], "Y=#");
strcpy(production[6], "F=(E)");
strcpy(production[7], "F=i");
int kay;
char done[count];
int ptr = -1;
 // Initializing the calc_first array
 for(k = 0; k < count; k++) {
 for(kay = 0; kay < 100; kay++) {
 calc_first[k][kay] = '!';
 }
 }
 int point1 = 0, point2, xxx;
 for(k = 0; k < count; k++)
 {
 c = production[k][0];
```

```
point2 = 0;
xxx = 0;
// Checking if First of c has already been calculated
for(kay = 0; kay <= ptr; kay++)
if(c == done[kay])
xxx = 1;
if (xxx == 1)
continue;
// Function call
findfirst(c, 0, 0);
ptr += 1;
// Adding c to the calculated list
done[ptr] = c;
printf("First(%c) = { ", c);
calc_first[point1][point2++] = c;
// Printing the First Sets of the grammar
for(i = 0 + jm; i < n; i++) {
int lark = 0, chk = 0;
for(lark = 0; lark < point2; lark++)
if (first[i] == calc_first[point1][lark])
{
chk = 1;
break;
}
}
if(chk == 0)
{
printf("%c, ", first[i]);
calc_first[point1][point2++] = first[i];
}
}
printf("}\n");
jm = n;
point1++;
}
printf("\n");
printf("----------------------------------------------\n\n");
char donee[count];
ptr = -1;
// Initializing the calc_follow array
for(k = 0; k < count; k++) {
for(kay = 0; kay < 100; kay++) {
calc_follow[k][kay] = '!';
}
```

```
}
point1 = 0;
int land = 0;
for(e = 0; e < count; e++)
{
ck = production[e][0];
point2 = 0;
xxx = 0;
// Checking if Follow of ck has alredy been calculated
for(kay = 0; kay <= ptr; kay++)
if(ck == donee[kay])
xxx = 1;
if (xxx == 1)
continue;
land += 1;
// Function call
follow(ck);
ptr += 1;
// Adding ck to the calculated list
donee[ptr] = ck;
printf("Follow(%c) = { ", ck);
calc_follow[point1][point2++] = ck;
// Printing the Follow Sets of the grammar
for(i = 0 + km; i < m; i++) {
int lark = 0, chk = 0;
for(lark = 0; lark < point2; lark++)
{
if (f[i] == calc_follow[point1][lark])
{
chk = 1;
break;
}
}
if(chk == 0)
{
printf("%c, ", f[i]);
calc_follow[point1][point2++] = f[i];
}
}
printf(" }\n");
km = m;
point1++;
}
}
```

```
void follow(char c)
{
 int i, j;
 // Adding "$" to the follow set of the start symbol
 if(production[0][0] == c) {
 f[m++] = '$';
 }
 for(i = 0; i < 10; i++)
 {
 for(j = 2;j < 10; j++)
 {
 if(production[i][j] == c)
 {
 if(production[i][j+1] != '\0')
 {
 // Calculate the first of the next Non-Terminal in the production
 followfirst(production[i][j+1], i, (j+2));
 }
 if(production[i][j+1]=='\0' && c!=production[i][0])
 {
 // Calculate the follow of the Non-Terminal in the L.H.S. of the production
 follow(production[i][0]);
 }
 }
 }
 }
}

void findfirst(char c, int q1, int q2)
{
 int j;
 // The case where we encounter a Terminal
 if(!(isupper(c))) {
   first[n++] = c;
 }
 for(j = 0; j < count; j++)
   {
    if(production[j][0] == c)
    {
      if(production[j][2] == '#')
      {
        if(production[q1][q2] == '\0')
          first[n++] = '#';
        else if(production[q1][q2] != '\0' && (q1 != 0 || q2 != 0))
```

```
        {
          // Recursion to calculate First of New Non-Terminal we encounter after epsilon
          findfirst(production[q1][q2], q1, (q2+1));
        }
        else
          first[n++] = '#';
      }
      else if(!isupper(production[j][2]))
      {
        first[n++] = production[j][2];
      }
      else
      {
        // Recursion to calculate First of New Non-Terminal we encounter at the beginning
        findfirst(production[j][2], j, 3);
      }
    }
  }
}
void followfirst(char c, int c1, int c2)
{
 int k;
 // The case where we encounter a Terminal
 if(!(isupper(c)))
   f[m++] = c;
 else
  {
    int i = 0, j = 1;
    for(i = 0; i < count; i++)
    {
      if(calc_first[i][0] == c)
      break;
    }
    //Including the First set of the Non-Terminal in the Follow of the original query
    while(calc_first[i][j] != '!')
    {
      if(calc_first[i][j] != '#')
      {
        f[m++] = calc_first[i][j];
      }
    else
    {
      if(production[c1][c2] == '\0')
      {
```

```
        // Case where we reach the end of a production
        follow(production[c1][0]);
      }
      else
      {
        // Recursion to the next symbol in case we encounter a "#"
        followfirst(production[c1][c2], c1, c2+1);
      }
    }
    j++;
   }
  }
}
```

INPUT:

E=TR
R=+TR
R=#
T=FY
Y=*FY
Y=#
F=(E)
F=i

OUTPUT:

```
First(E) = { (, i, }
First(R) = { +, #, }
First(T) = { (, i, }
First(Y) = { *, #, }
First(F) = { (, i, }

------------------------------------------------

Follow(E) = { $, ),  }
Follow(R) = { $, ),  }
Follow(T) = { +, $, ),  }
Follow(Y) = { +, $, ),  }
Follow(F) = { *, +, $, ),  }
```

PRACTICAL : 4

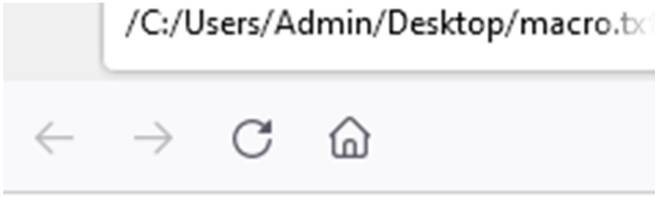
Write a SAL (Simple Assembly Language) program in a text file and generate SYMTAB and LITTAB

CODE:

```
#include<stdio.h>
#include<stdlib.h>
struct sys{
  char n[20];
  int ad;
};
int main()
{
  char ch[50],c;int adr=0,f=0,fl=0,sp=0,lp=0;struct sys stb[20],lt[20];
  FILE *fr1; fr1=fopen("macro.txt","r");
  printf("The ap is \n");
  while((c=fgetc(fr1))!=EOF)
  {
    printf("%c",c);
  }
  FILE *fr;
  fr=fopen("ap.txt","r");
  c=fgetc(fr);
  printf("\n\nThe sys and lt is \n\n");
  while((c)!=EOF)
  {
    if(c=='\t'&&f==0)
          {
            f =1;
          }
   else if(c!='\t'&&f==0&&fl==0)
    {
      int j=0;
      while(c!='\t'&&(c)!=EOF){
```

```
        stb[sp].n[j++]=c;
        c=fgetc(fr);
       }
      stb[sp].n[j]='\0';
      stb[sp++].ad=adr;
      fl=1;
    }
   else if(c=='=')
    {
      int j=0;
      while(c!='\n'&&(c)!=EOF){
      lt[lp].n[j++]=c;
      c=fgetc(fr);
    }
   lt[lp].n[j-1]='\0';
   lt[lp++].ad=adr;
   f=1;
  }
 else if(c=='\n')
  {
    adr++; f=0;fl=0;
  }
  c=fgetc(fr);
 }
printf("\n"); fclose(fr);
int i;
for(i=0;i<sp;i++)
  printf("%s %d\n",stb[i].n,stb[i].ad);
  printf("\nlt table\n");
for(i=0;i<lp;i++)
  printf("%s %d\n",lt[i].n,lt[i].ad);return 0;
}
```

OUTPUT:




```
        MOVER ARG,BRG
ARG SET ='1'
BRG SET ='2'
        SET ='5'
```

PRACTICAL : 5

Practice macro features of the ‘C’ language().

CODE:

```
#include<stdio.h>
#define RECTANGLE(l,b)l*b
int main()
{
  int length = 3, breadth = 4;
  int area = RECTANGLE(length,breadth);

  printf("The area is: %d\n\n", area);
  printf("The current date is: %s\n",          DATE__ );
  printf("The current time is: %s\n",   TIME__ );
  printf("The total lines in the code is: %d\n",          LINE   );
  printf("The file name is: %s\n",       FILE    );
return 0;
}
```

OUTPUT:

```
The area is: 12

The current date is: Apr  7 2021
The current time is: 15:56:56
The total lines in the code is: 11
The file name is: macro.c
```

PRACTICAL : 6

Write a program that generates a Quadruple Table for the given postfix String.

CODE:

```
#include<stdio.h>
#include<string.h>
void main()
{
 char line[20];
 int s[20];
 int t=1;
 int i=0;
 printf("Enter string : ");
 gets(line);
 for(i=0;i<20;i++)s[i]=0;
  printf("op\ta1\ta2\tres\n");
 for(i=2;line[i]!='\0';i++)
 {
  if(line[i]=='/' || line[i]=='*')
  {
    printf("\n");
    if(s[i]==0)
    {
      if(s[i+1]==0)
      {
        printf(":=\t%c\t\t t%d\n",line[i+1],t);
        s[i+1]=t++;
      }
     printf("%c\t",line[i]);
     (s[i-1]==0)?printf("%c\t",line[i-1]):printf("t%d\t",s[i-1]);
     printf("t%d \t t%d",s[i+1],t);
     s[i-1]=s[i+1]=t++;
     s[i]=1;
```

```
    }
   }
  }
 for(i=2;line[i]!='\0';i++)
 {
  if(line[i]=='+' || line[i]=='-')
   {
    printf("\n");
    if(s[i]==0)
     {
      if(s[i+1]==0)
       {
        printf(":=\t%c\t\t t%d\n",line[i+1],t);
        s[i+1]=t++;
       }
      printf("%c\t",line[i]);
      (s[i-1]==0)?printf("%c\t",line[i-1]):printf("t%d\t",s[i-1]);
      printf("t%d \t t%d",s[i+1],t);
      s[i-1]=s[i+1]=t++;
      s[i]=1;
     }
   }
 }
 printf("\n:=\tt%d\t\t%c",t-1,line[0]);
}
```

OUTPUT:

```
Enter string : a=b*-c+b*-c
op      a1      a2      res

:=      -               t1
*       b       t1      t2
:=      -               t3
*       b       t3      t4

+       c       t4      t5

:=      t5              a
```

PRACTICAL : 7

Write a lex program to count the number of vowels and consonants in a given string.

CODE:

```
%{
  #include<stdio.h>
  #include<string.h>
  int vcount=0, ccount=0;
%}

%%
[a|e|i|o|u|A|E|I|O|U] {vcount++;}
[a-z A-Z (^a|e|i|o|u|A|E|I|O|U)] {ccount++;}
%%
int yywrap(void){}
int main()
{
  printf("Enter String: "); yylex();
  printf("Number of vowels are: %d\n", vcount);
  printf("Number of consonants are: %d\n", ccount);
  return 0;
}
```

OUTPUT:

```
Enter String: hello everyone

^Z
Number of vowels are:  6
Number of consonants are:  8
```

PRACTICAL : 8

Write a lex program to count the number of characters, words, spaces, end of lines.

CODE:

```
%{
#include <stdio.h> int c=0,w=0,s=0,l=1;
%}
word [^ \t\n,\.:]+ eol [\n]
blank [ ]
%%
{word} {w++; c=c+yyleng;}
{eol} {l++;}
{blank} {s++;}
%%
void main(int argc,char *argv[])
{
     if (argc!=2) {
    printf("usage : ./a.out in.txt \n"); exit(0);
    }
   yyin=fopen(argv[1],"r"); yylex();
printf("no. of word %d \n",w); printf("no. of char %d \n",c); printf("no. of line %d \n",l);
printf("no. of space %d \n",s);
}
int yywrap()  {  return 1;  }
```

INPUT:

Hello
I am Nirali

OUTPUT:

```
no. of word 4
no. of char 14
no. of line 2
no. of space 2
```

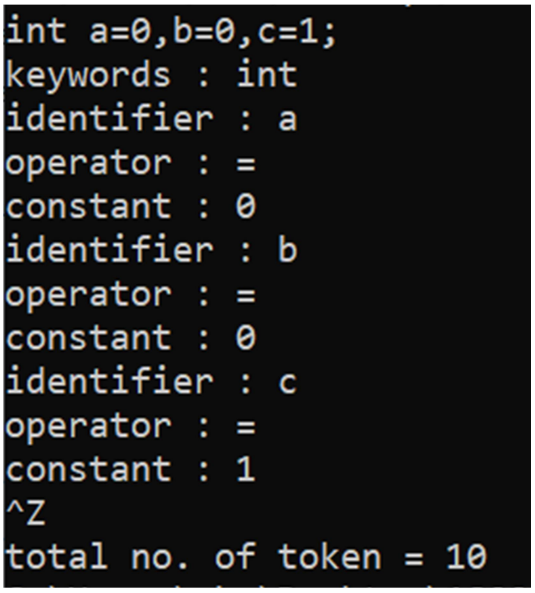
PRACTICAL : 9

Write a lex program to identify identifiers, constants, and keywords (int, float) for C language.

CODE:

```
%{
  int n = 0 ;
%}
%%
"while"|"if"|"else"|"int"|"float" {n++;printf("keywords : %s", yytext);}
[a-zA-Z_][a-zA-Z0-9_]* {n++;printf("\nidentifier : %s", yytext);}
"<="|"=="|"="|"++"|"-"|"*"|"+" {n++;printf("\noperator : %s", yytext);}
[0-9]+ {n++;printf("\nconstant : %s", yytext);}
. ;
%%
int main()  {
 yylex();
 printf("total no. of token = %d", n);
}
int yywrap(){  return(1);  }
```

OUTPUT:



PRACTICAL : 10

Write a lex program to count and display comments (// and /* */) for C language.

CODE:

```
%{   #include<stdio.h>
      #include<stdlib.h>
      int a=0,c=0,d,e=1;
%}
%%
"/*" {if(e==1)e++;}
"*/" {if(e==1)e=1;c++;}
"//".* {if(e==1)a++;}
. {if(e==0)ECHO;}
%%
void main(int argc) {
  yylex();
  printf("single line comment: %d \nmultiline comment: %d \n",a,c);
  d=a+c;
  printf("total: %d \n",d);
}
int yywrap()  {   return(1);  }
```

OUTPUT:

```
#include<stdio.h>

int main()

{

//this is single line comment

printf("Hello");

//return 0

/*Sample MultiLine comment

line 1

line 2...*/

^Z
single line comment: 2
multiline comment: 1
total: 3
```