Ex: No: 1a	Implementation of lexical analyzer using C programming
Date:	

AIM:

To implement lexical analyzer using C programming.

ALGORITHM:

STEP 1: Start
STEP 2: Declare all variables and file pointers
STEP 3: Display the input program.
STEP 4: Separate the keyword in the program and display it.
STEP 5: Display the reader files of the input program.
STEP 6: Separate the operators of the input program and display it.
STEP 7: Print the punctuation marks.
STEP 8: Print the constant that are present in the input program
STEP 9: Print the identifiers of the input program.

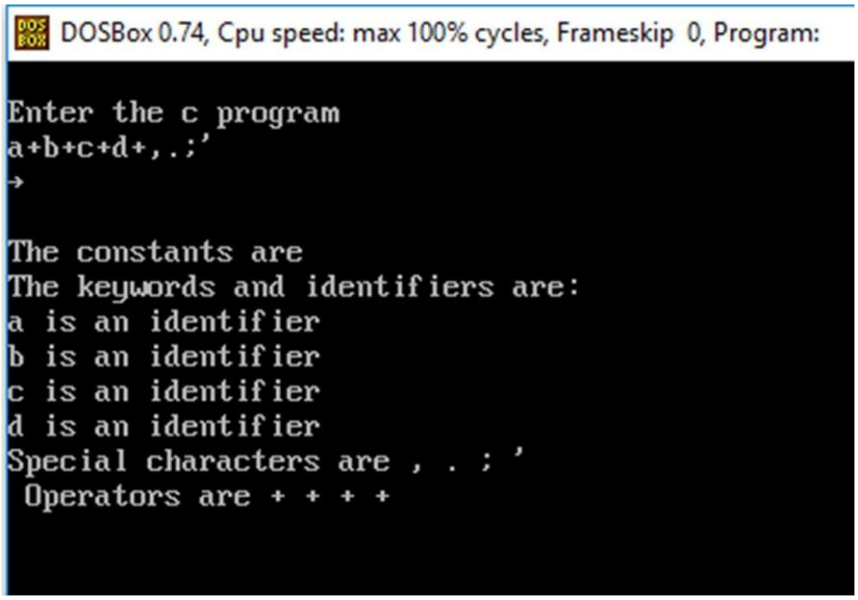
PROGRAM:

```
#include<string.h>
#include<ctype.h>
#include<stdio.h>
void keyword(char str[10])
{
   char keywords[10][10]={"int","float","char","while","do","for","if"};
   if(!strcmp(*keywords,str))
   {
     printf("\n%s is a keyword",str);
   }
    else
   printf("\n%s is an identifier",str);

}
void main()
{
   FILE *f1,*f2,*f3,*f4;
   char c,str[10],st1[10];

   int num[100],tokenvalue=0,i=0,j=0,k=0;
   printf("\nEnter the c program\n");
   f1=fopen("input","w");
   while((c=getchar())!=EOF)
   putc(c,f1);
   fclose(f1);
```

```
f1=fopen("input.txt","r");
f2=fopen("identifier.txt ","w");
f3=fopen("specialchar.txt ","w");
f4=fopen("operators.txt ","w");
while((c=getc(f1))!=EOF)
{
   if(isdigit(c)) {
      tokenvalue=c-'0';
      c=getc(f1);
      while(isdigit(c))
      {
         tokenvalue*=10+c-'0';
         c=getc(f1);
      }
      num[i++]=tokenvalue;
      ungetc(c,f1);
   }
   else if(isalpha(c))
   {
      putc(c,f2);
      c=getc(f1);
      while(isdigit(c)||isalpha(c)||c=='_'||c=='$')
      {
         putc(c,f2);
         c=getc(f1);
      }
      putc(' ',f2);
      ungetc(c,f1);
   }

   else if(c=='+' || c=='-' ||c=='*' ||c=='<'||c=='>'||c=='/'||c=='&'||c=='%' ||c=='^' ||c== '=')
   putc(c,f4);
   else
   putc(c,f3);
}
fclose(f4);
fclose(f2);
fclose(f3);
fclose(f1);
printf("\nThe constants are ");
for(j=0;j<i;j++)
printf("%d",num[j]);
printf("\n");
f2=fopen("identifier.txt ","r");
k=0;
printf("The keywords and identifiers are:");
```

```
    while((c=getc(f2))!=EOF)
    {
       if(c!=' ')
       str[k++]=c;
       else
       {
          str[k]='\0';
          keyword(str);
          k=0;
       }
    }
    fclose(f2);
    f3=fopen("specialchar.txt ","r");
    printf("\nSpecial characters are ");
    while((c=getc(f3))!=EOF)
    printf("%c ",c);
    fclose(f3);
    f4=fopen("operators.txt ","r");
    printf("Operators are ");
    while((c=getc(f4))!=EOF)
    printf("%c ",c);
    printf("\n");
    fclose(f4);
}
```

OUTPUT:



RESULT:

Thus, the lexical analyzer using C programming is implemented successfully.

Ex: No:1b	Implementation of Lexical analyzer using LEX
Date:	

Aim:

To implement the lexical analyzer using LEX tool.

Algorithm:

Step 1: Start.
Step 2: Declare all variables or header files in definition part.
Step 3: Define action and pattern in transition rule.
Step 4: Call yylex() function in main function.
Step 5: Open the text file or c.file.
Step 6: Print the number of lines, words, characters in text file.
Step 7: Print the keywords, Special characters in c file.
Step 8: Stop the program

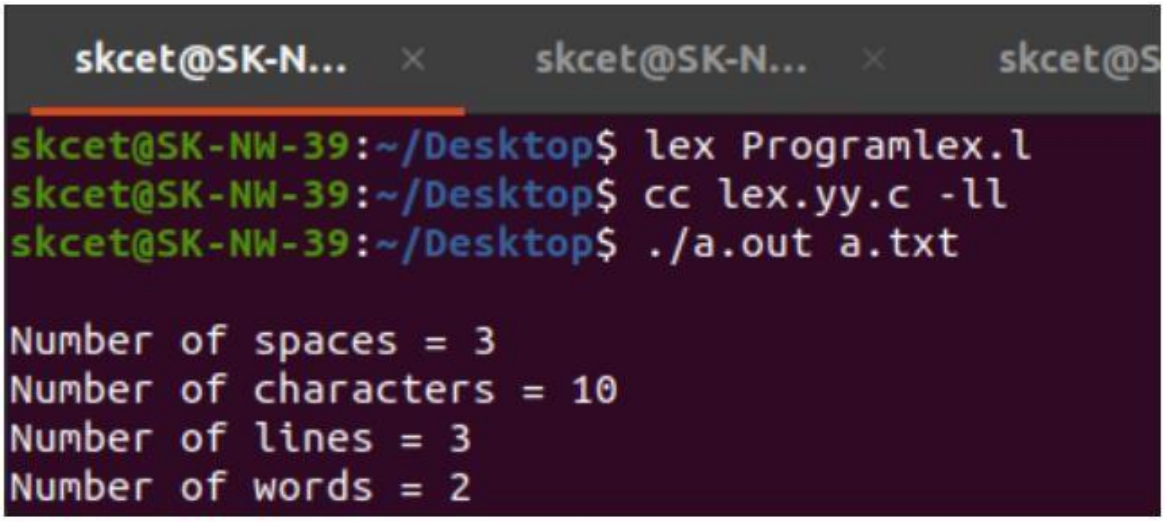
Program for count the word, character, space and line from the file using LEX:

```
%{
int c=0,w=0,l=0,s=0;
%}
%%
[\n] l++;s++;
[\t "] s++;
[^ " \t \n]+ w++;c+=yyleng;
%%
int main(int argc,char *argv[])
{
	if(argc==2)
	{
		yyin=fopen(argv[1],"r");
		yylex();
		printf("\nNumber of spaces = %d",s);
		printf("\nNumber of characters = %d",c);
		printf("\nNumber of lines = %d",l);
		printf("\nNumber of words = %d\n",w);
	}
	else
		printf("ERROR");
}
```

abc.txt

```
hai
hello
how are you?
```

Output :



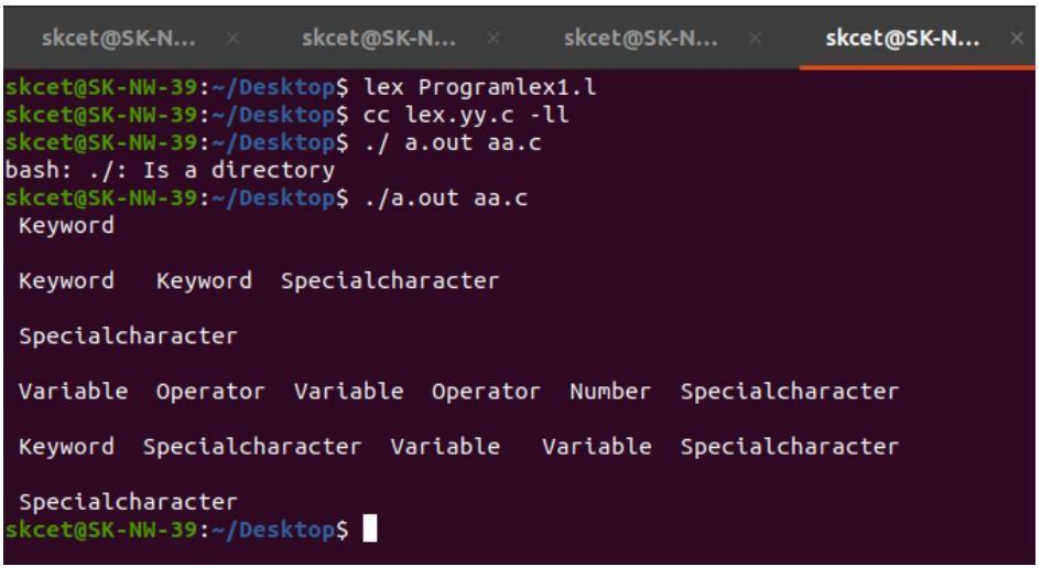
Program for Lexical Analyzer using LEX tool :

```
%{
#include<stdio.h>
%}
letter [a-zA-Z]
digit[0-9]
operators [+*/=%&|<>-]
specialcharacters [();{}"]
%%
(#include<stdio.h>|void|main|int|float|char|printf|while|do|for|if|else|double|break|continue|sca
nf|switch|case)+ {printf(" Keyword ");}
{letter}({letter}|{digit})* {printf(" Variable ");}
{digit}+ {printf(" Number ");}
{operators}+ {printf(" Operator ");}
{specialcharacters}+ {printf(" Specialcharacter ");}
%%
int main(int argc,char *argv[])
{
      yyin = fopen(argv[1],"r");
      yylex();
}
```

abc.c:

```
#include<stdio.h>
void main()
{
a=b+3;
printf("Hello world");
}
```

Output :



Result :

Thus the lexical analyser is implemented successfully in lex.

Ex: No:2	Implementation of a calculator that takes an expression (with digits, + and *), computes and prints its value, using YACC.
Date:	

Aim:

To implement calculator that takes an expression (with digits, + and *), computes and prints its value, using YACC.

ALGORITHM:

STEP 1: A YACC source program has three parts as declaration %%translation rules%%.

STEP 2: Declaration section include standard I/O header file,define global variables,define the operations and their precedence.

STEP 3: Rules section, define the rules that parse the input stream.

STEP 4: Program section contains the subroutines.

STEP 5: calc. per file include statements for standard input and output.calc.lex contain the rules to generate these tokens from input stream.

Program 1 :

//calc.l

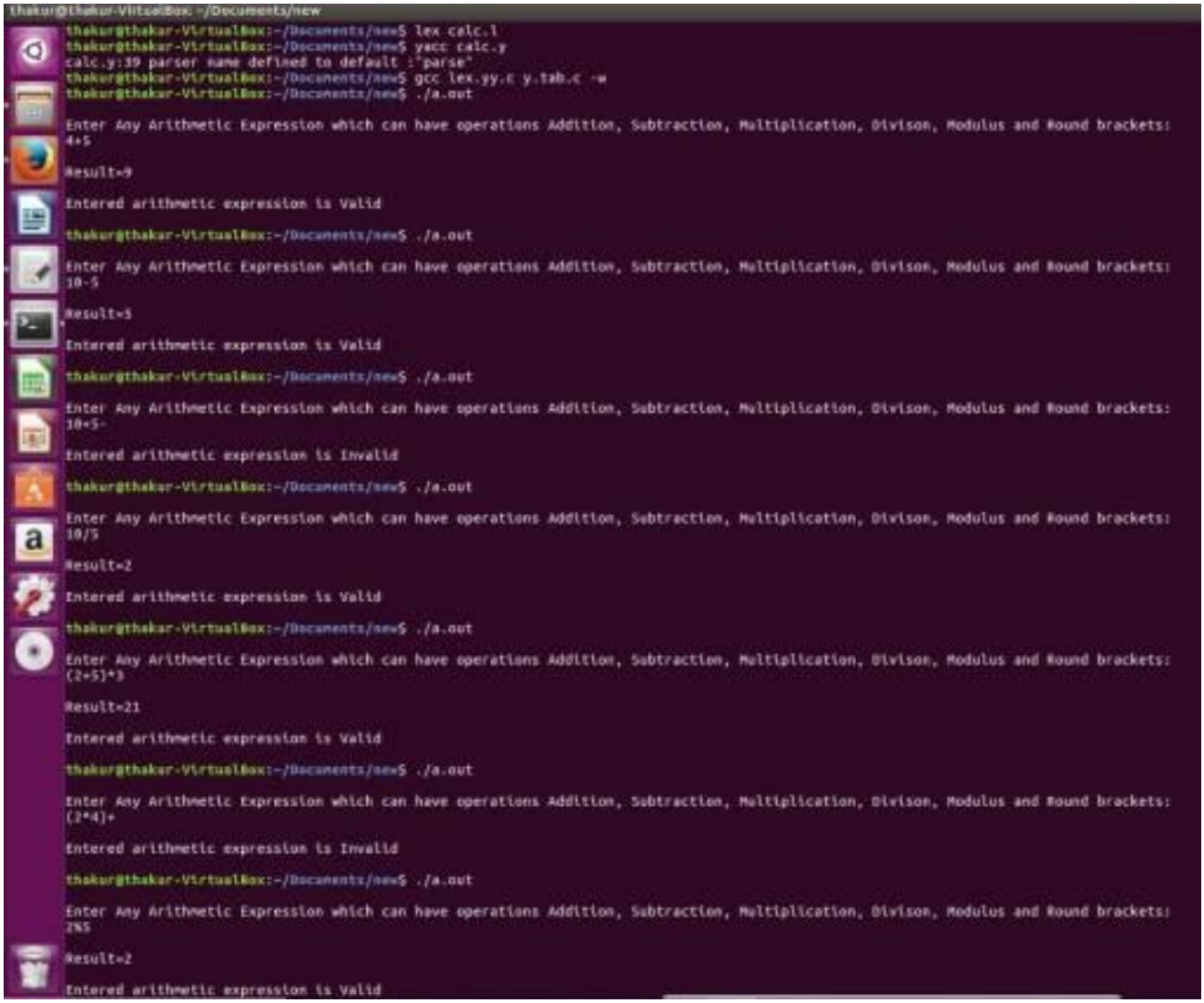
```
%{
/* Definition section */
#include<stdio.h>
#include "y.tab.h"
extern int yylval;
%}
/* Rule Section */
%%
[0-9]+ {
yylval=atoi(yytext);
return NUMBER;
}
[\t] ;
[\n] return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

//calc.y

```
%{
/* Definition section */
```

```
#include<stdio.h>
int flag=0;
%}
%token NUMBER
%left '+' '-'
%left '*' '/' '%'
%left '(' ')'
/* Rule Section */
%%
ArithmeticExpression: E{
printf("\nResult=%d\n", $$);
return 0;
};
E:E'+'E {$$=$1+$3;}

|E'-'E {$$=$1-$3;}

|E'*'E {$$=$1*$3;}

|E'/'E {$$=$1/$3;}

|E'%'E {$$=$1%$3;}

|'('E')' {$$=$2;}

| NUMBER {$$=$1;}

;

%%

//driver code
void main()
{
printf("\nEnter Any Arithmetic Expression which
can have operations Addition,
Subtraction, Multiplication, Division, Modulus and Round brackets:\n");

yyparse();
if(flag==0)

printf("\nEntered arithmetic expression is Valid\n\n");
}
void yyerror()
{
printf("\nEntered arithmetic expression is Invalid\n\n");
flag=1;
}
```

Output:



RESULT:

Thus the calculator that takes the expression computes and prints its value using YACC was implemented successfully.

Ex: No:3	Implementation of Parser using LEX and YACC tool
Date:	

Aim :

To implement the parser using LEX and YACC tool by C programming.

Algorithm :

Step 1: Start.
Step 2: Declare all variables or header files.
Step 3: Define action and pattern.
Step 4: Call the yylex() function in the main function.
Step 5: Stop.

Program :

lexx1.l :

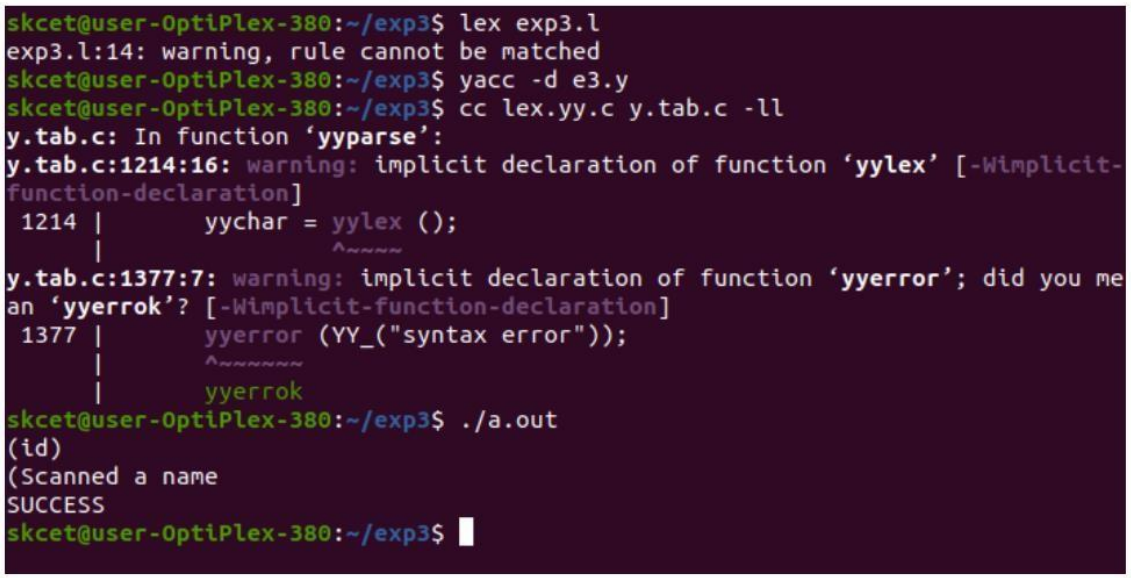
```
%{
#include "y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);
printf("Scanned the number %d\n",yylval);
return NUMBER;}
[a-zA-Z]+ {printf("Scanned a name\n");
return NAME;}
[\t] {printf("Skipped whitespace\n");}
\n {return 0;}
{printf("Found other data \"%s\"\n",yytext);
return yytext[0];
}
%%
```

yacc1.y :

```
%{
#include<stdio.h>
%}
%token NAME NUMBER
%%
stmt:S {printf("SUCCESS\n");}
```

```
S : '('L')'{}
|NAME{}
|NUMBER{};
L : L','S{}
|S{}
%%
int main(void)
{
return yyparse();
}
int yyerror(char *msg)
{
return fprintf(stderr,"YACC:%s\n",msg);
}
```

Output:



Result :

Thus the parser using YACC is successfully completed.

Ex: No:4	Implementation of Symbol table
Date:	

Aim

To implement the symbol table using C programming.

Algorithm :

Step 1 : Start the program.
Step 2 : Read the input file "input.txt" in read mode.
Step 3 : Scan the entire input till eof.
1. If the string found was either int, float, double… copy into the datatype in symbol table.
2. Update the corresponding variable and value if any in symbol table.
3. If no value is in initializer the update the table as "garbage".

Step 4 : Close the file.
Step 5 : Stop the program.

Program:

```
#include<stdio.h>
#include<ctype.h>
#include<string.h>
struct symtab
{
  int lineno;
  char var[25],dt[25],val[10];
}sa[20];

void main()
{

   int i=0,j,k,max,f=0,xx,h,m,n,l,r,ty=1,m1,line=0;
   char s[25],typ[25],temp[25],gar[]="garbage",t[25],got[10],e[10];
   float m2;
   FILE *fn,*ft,*fp
fn=fopen("input.txt","r");
printf("\n\nSYMBOL TABLE MANAGEMENT\n\n");
printf("Variable\tDatatype\tLine.no.\t\tValue\n");
        while(!(feof(fn)))
        {
          fscanf(fn,"%s",s);
          if((strcmp(s,"int")==0)||(strcmp(s,"float")==0))
        {
            strcpy(typ,s); line++;
                  while(s,";"!=0)
```

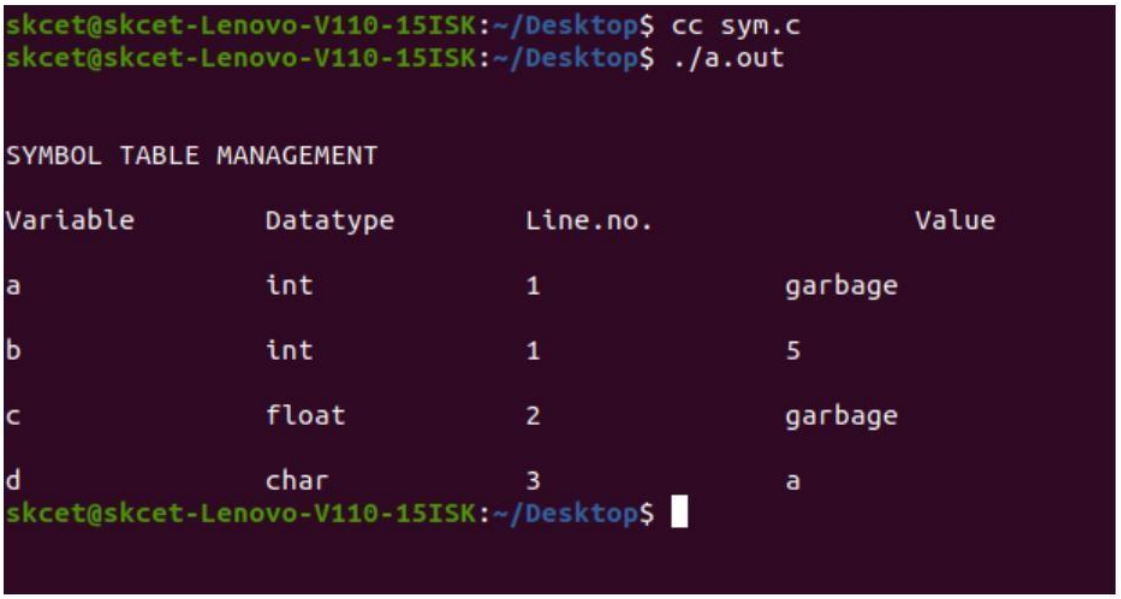
```
                    {
                i++;
                    max=i;      sa[i].lineno=line;
                    fscanf(fn,"%s",s);
                                strcpy(sa[i].var,s);
                                strcpy(sa[i].dt,typ);


                        fscanf(fn,"%s",s);
                        if(strcmp(s,"=")==0)
                        {
                        fscanf(fn,"%s",s);
                        strcpy(sa[i].val,s);
                        fscanf(fn,"%s",s);
                        }
                        else
                                strcpy(sa[i].val,gar);
                        if(strcmp(s,",")==0)
                                continue;
                        else break;
                    }
            }
  else if(strcmp(s,"char")==0)
       {
        strcpy(typ,s); line++;
          while(strcmp(s,";")!=0)
          {
           i++;
            max=i; sa[i].lineno=line;
fscanf(fn,"%s",s);
strcpy(sa[i].var,s);
strcpy(sa[i].dt,typ);
fscanf(fn,"%s",s);
                    if(strcmp(s,"=")==0)
                    {
                    fscanf(fn,"%s",s);
                    fscanf(fn,"%s",s);
                    strcpy(sa[i].val,s);
                    fscanf(fn,"%s",s);
                    fscanf(fn,"%s",s);
                    }

        }//while
                    fscanf(fn,"%s",s);
                            if(strcmp(s,",")==0)
                                    continue;
                            }//else if
    }//while

for(i=1;i<=max;i++)
printf("\n%s\t\t%s\t\t%d\t\t%s\n",sa[i].var,sa[i].dt,sa[i].lineno,sa[i].val);
```

```
fclose(fn);
}
```

Input File:

```
int a , b = 5 ;
float c ;
char d = " a " ;
```

Output :



Result :

Thus, the implementation of symbol table has been successfully completed using C programming.

Ex: No:5	Implementation of Predictive Parser
Date:	

Aim:

To implement Predictive parser using C Programming.

ALGORITHM:

STEP 1: Start the program.

STEP 2: Read the input for the production rules.

STEP 3: Compute first and follow of production rules.

STEP 4: construct the predictive parsing table

STEP 5: Read the input for the string to be parsed.

STEP 6: Parse the input string with the help of table

STEP 7: Return if the string is accepted or not accepted

STEP 8: Stop the Program.

Program:

```
#include<stdio.h>
#include<ctype.h>
#include<string.h>
struct tran
{
      char node;
      int n,k,g,fi,fo;
      char t[5][20];
      char first[10],follow[10];
      char par[10][10];
}b[20];
void first(int);
void follow(int);
void get_parse_table();
void manipulate_string();
int count,c=0;
char a[10][20],t[15],stack[10],string[10],e;
int main()
{
        int i,j,k,h;
        printf("Enter the productions:\n");
        for(count=0;;count++)
        {
                scanf("%s",a[count]);
                if(!strcmp(a[count],"quit"))
```

```
                        break;
                b[count].node=a[count][0];
                for(i=3,j=0;i<strlen(a[count]);i++)
                {
                        if(a[count][i]=='/')
                        {
                                b[count].n++;
                                j=0;
                                i++;
                        }
        if(!isupper(a[count][i])&&a[count][i]!='@')
        {
                for(k=0,h=0;k<c;k++)
                        if(a[count][i]==t[k])
                     h=1;
          if(h==0)
                        t[c++]=a[count][i];
        }
                        b[count].t[b[count].n][j++]=a[count][i];
                }


        }
t[c++]='$';
        for(i=0;i<count;i++)
                if(b[i].k==0)
                        first(i);
        b[0].follow[b[0].fo++]='$';
        for(i=0;i<count;i++)
        if(b[i].g==0)
                        follow(i);
get_parse_table();
printf("NT\t");
for(i=0;i<c;i++)
        printf("%c\t",t[i]);
printf("\n");
for(i=0;i<50;i++)
printf("-");
printf("\n");
for(i=0;i<count;i++)
{
        printf("%c\t",b[i].node);
   for(j=0;j<c;j++)
   {
        if(b[i].par[j][0])
                printf("%c->%s ",b[i].node,b[i].par[j]);
        printf("\t");
   }
   printf("\n");
```

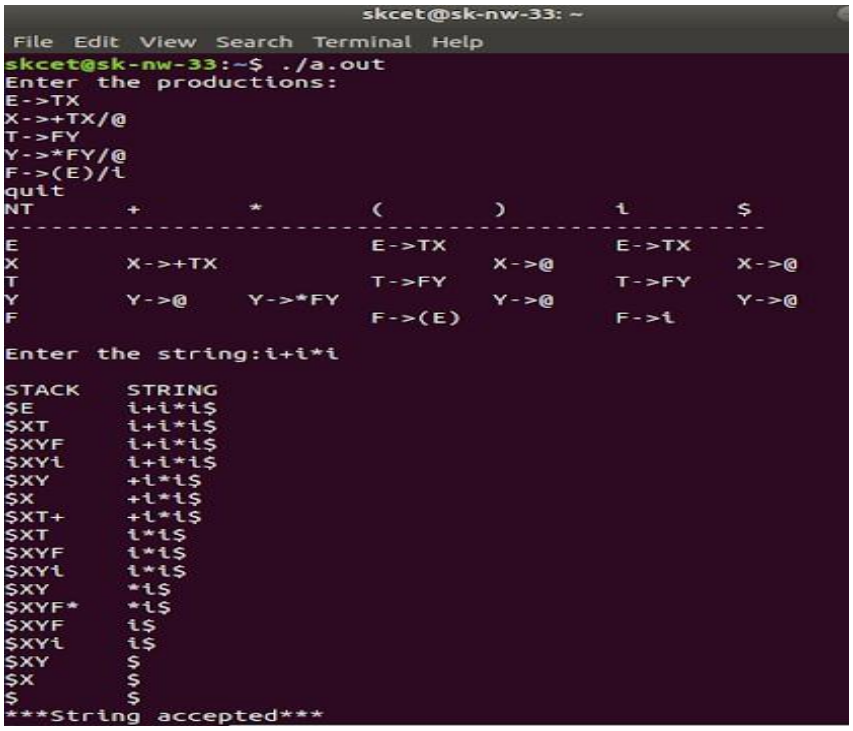
```
  }
  manipulate_string();
}
void first(int x)
{
        int i,h,j,k;
        b[x].k=1;
        for(i=0;i<=b[x].n;i++)
        {
                for(j=0,h=0;j<count;j++)
                {
                        if(b[x].t[i][0]==b[j].node)
                        {
                                if(b[j].k==0)
                                        first(j);
                                h=1;
                                for(k=0;k<b[j].fi;k++)
                                        b[x].first[b[x].fi++]=b[j].first[k];
                        }
                }
                if(h==0)
                        b[x].first[b[x].fi++]=b[x].t[i][0];
        }
}
void follow(int x)
{
        int i,j,l,h,n,k,g;
  b[x].g=1;
        for(i=0;i<count;i++)
        {
                for(j=0;j<=b[i].n;j++)
                {
                        for(k=strlen(b[i].t[j])-1;k>=0;k--)
                        {
                                if(b[x].node==b[i].t[j][k])
                                {
                                        if(k==strlen(b[i].t[j])-1)
                                        {
                if(b[i].g==0)

                                                follow(i);
                                        for(l=0;l<b[i].fo;l++)
                                                b[x].follow[b[x].fo++]=b[i].follow[l];
                                        }
                                        else
                                        {
                                                for(l=0,h=0;l<count;l++)
                                                {
                                                        if(b[l].node==b[i].t[j][k+1])
```

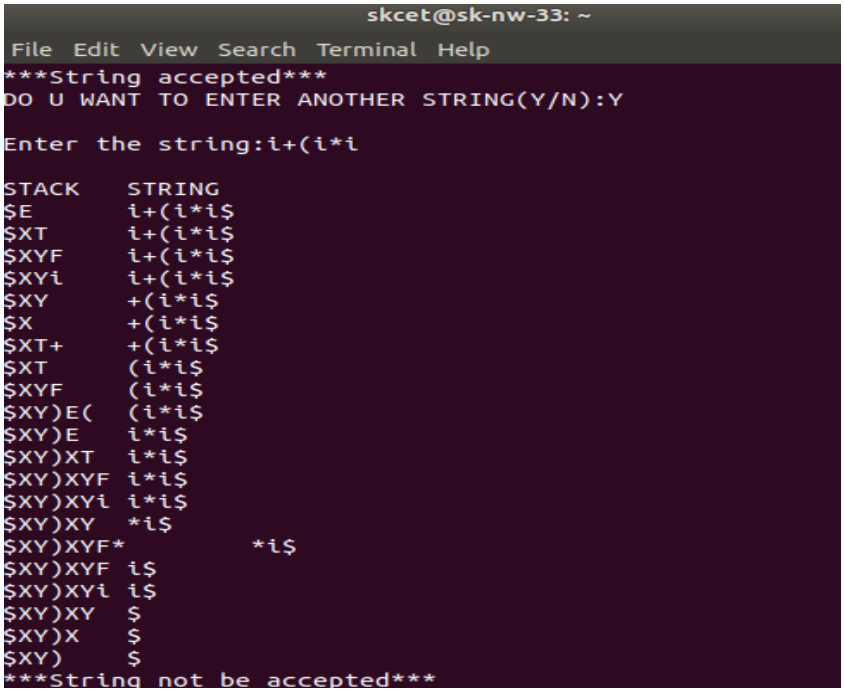
```
                                                {
                                                        for(n=0;n<b[l].fi;n++)
                                                        {
                                                                if(b[l].first[n]!='@')
b[x].follow[b[x].fo++]=b[l].first[n];
                                                                else
                                                                {
                                                                        if(b[i].g==0)
                                                                                follow(i);
for(g=0;g<b[i].fo;g++)
b[x].follow[b[x].fo++]=b[i].follow[g];
                                                                }
                                                        }
                                                        h=1;
                                                }
                                        }

                                        if(h==0)
                                                b[x].follow[b[x].fo++]=b[i].t[j][k+1];
                                }
                return;
                        }
                }
        }
        }
}

void get_parse_table()
{
        int i,j,k,t1,l,n;
  char temp[5];
  for(i=0;i<count;i++)
  {
        for(j=0;j<=b[i].n;j++)
    {
        t1=0;
        if(b[i].t[j][0]=='@')
                for(k=0;k<b[i].fo;k++)
                        temp[t1++]=b[i].follow[k];
        else if(!isupper(b[i].t[j][0]))
                temp[t1++]=b[i].t[j][0];
         else
                for(k=0;k<b[i].fi;k++)
                        temp[t1++]=b[i].first[k];
         for(l=0;l<t1;l++)
           for(n=0;n<c;n++)
                if(t[n]==temp[l])
```

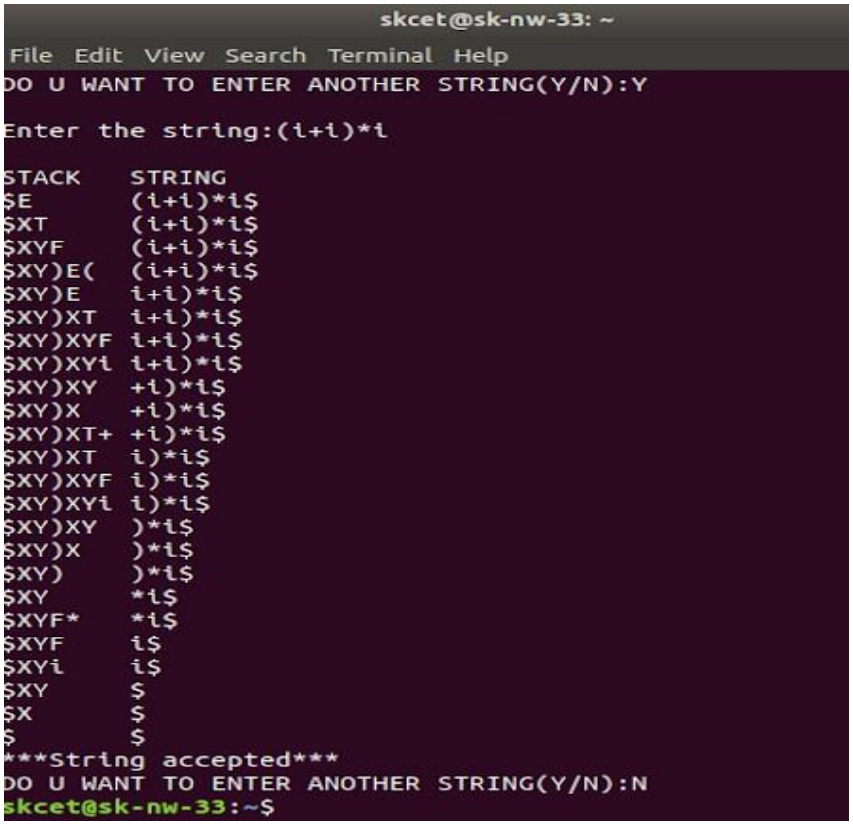
```
                strcat(b[i].par[n],b[i].t[j]);
    }
  }
}
void manipulate_string()
{
        int top=0,i=0,h,h1,j,k,n;
        printf("\nEnter the string:");
        scanf("%s",string);
        string[strlen(string)]='$';
        stack[top++]='$';
        stack[top++]=b[0].node;
        printf("\nSTACK\tSTRING");
        while(1)
        {
                printf("\n");
                for(k=0;k<top;k++)
                printf("%c",stack[k]);
                printf("\t");
                for(k=i;k<strlen(string);k++)
                printf("%c",string[k]);
                if(stack[top-1]==string[i])
                {
                        if(string[i]=='$')
                        {
                                printf("\n***String accepted***");
                                break;
                        }
                        top--;
                        i++;
                }

                else if(isupper(stack[top-1])&&!isupper(string[i]))
                {
                        for(j=0,h=0;j<count;j++)
                                if(b[j].node==stack[top-1])
                                {
                                        h=1;
                                        break;
                                }
        for(k=0,h1=0;k<c;k++)

                                if(string[i]==t[k])
                                {
                                        h1=1;
                                        break;
                                }
        if(h==0||h1==0)
        {

                                printf("\n***Wrong Symbol***");
```

```
                        break;
            }
                    if(b[j].par[k][0])
                    {
                                top--;
                                for(n=strlen(b[j].par[k])-1;n>=0;n--)
                                    if(b[j].par[k][n]!='@')
                                        stack[top++]=b[j].par[k][n];
                    }
                    else
                    {
                                printf("\n**String not be accepted**");
                                break;
                    }
                }
                else
                {

                    printf("\n***String not be accepted***");
                    break;
                }
            }
        printf("\nDO U WANT TO ENTER ANOTHER STRING(Y/N):");
        scanf(" %c",&e);
        if(e=='Y'||e=='y')
            manipulate_string();
    }
```

Output :







RESULT:

Thus, the implementation of Predictive Parser using C Programming is done successfully and the output is verified.

Ex: No:6	Implementation of Shift Reduce Parser
Date:	

Aim:

To implement Shift Reduce Parser using C programming.

ALGORITHM:

STEP 1: Start with the sentence to be parsed as initial sentential form.

STEP 2: Shift reduce parsing uses a stack to hold the grammar and input tape holds the string.

STEP 3: Shift reduce parsing performs the two actions: shift and reduce.

STEP 4: In shift action: the current symbol in the input string is pushed to a stack.

STEP 5: In reduced action: the symbols will be replaced by non terminal. The symbol is the right side of production and non terminal is the left side of production.

STEP 6: Stop the program.

Program :

```
#include<stdio.h>
#include<string.h>
struct stack
{
   char s[20];
   int top;
};
struct stack st;
int isempty()
{  return (st.top==1);
}
void push(char p)
{
   st.s[st.top++]=p;
}
char pop()
{
   if(isempty())
      printf("stack empty");
   else
      return st.s[st.top--];
}
void disp()
{ int i;
   for(i=0;i<st.top;i++)
      printf("%c",st.s[i]);
}
int reduce(int *j,char rp[10][10],int n)
```

```
{ int i,t,k;
   char u[10];
   t=st.top-1;
   for (i=0;i<=st.top;i++)
   {   u[i]=st.s[t];
      u[i+1]='\0';
      for(k=0;k<n;k++)
      {
         if(strcmp(rp[k],u)==0)
            {
               st.top=st.top-i-1;
               return k;
         }
      }
      t--;
   }
   return 99;
}
int shift(char ip[],int *j)
{ push(ip[*j]);
   (*j)++;
   disp();
   return 1;
}
void main()
{ int n,i,j=0,k,h;
   char lp[10];
   char ip[10];
   char rp[10][10];
   st.top=0;
   printf("\nEnter the number of productions:");
   scanf("%d",&n);
   for(i=0;i<n;i++)
   {    printf("\nEnter the left side of the production %d:",i+1);
         scanf(" %c",&lp[i]);
         printf("\nEnter the right side of the production %d:",i+1);
         scanf("%s",rp[i]);
   }
   printf("\nEnter the input:");
   scanf("%s",ip);
   printf("================================================================
====");
   printf("\nSTACK              INPUT                  OUTPUT        ");
   printf("\n================================================================
=====\n");
   strcat(ip,"$");
   push('$');
   printf("$                %s          \n",ip);
```

```
    while(!(st.s[st.top-1]==lp[0]&&st.s[st.top-2]=='$'&&(j==(strlen(ip)-1))&&st.top==2))
    {
       if((h=reduce(&j,rp,n))!=99)
       { push(lp[h]);disp();printf("\t\t\t");
          for(k=j;k<strlen(ip);k++)
             printf("%c",ip[k]);
          printf("\t\t\tReduce %c->%s\n",lp[h],rp[h]);
       }
       else if(shift(ip,&j))
       {     printf("\t\t\t");
                for(k=j;k<strlen(ip);k++)
                printf("%c",ip[k]);
             printf("\t\t\tshift %c\n",ip[j-1]);
       }
    }
    disp();
    printf("\t\t\t");
    for(k=j;k<strlen(ip);k++)
       printf("%c",ip[k]);
    printf("\t\t\taccept\n");
}
```

OUTPUT :

```
skcet@sk-nw-33: ~
File  Edit  View  Search  Terminal  Help
skcet@sk-nw-33:~$ cc ShiftReduceParser.c
skcet@sk-nw-33:~$ ./a.out

Enter the number of productions:3

Enter the left side of the production 1:E

Enter the right side of the production 1:E+E

Enter the left side of the production 2:E

Enter the right side of the production 2:E*E

Enter the left side of the production 3:E

Enter the right side of the production 3:i

Enter the input:i+i*i
================================================================
STACK                   INPUT                          OUTPUT
================================================================
$                      i+i*i$
$i                        +i*i$                       shift i
$E                        +i*i$                       Reduce E->i
$E+                       i*i$                        shift +
$E+i                      *i$                         shift i
$E+E                      *i$                         Reduce E->i
$E                        *i$                         Reduce E->E+E
$E*                       i$                          shift *
$E*i                      $                           shift i
$E*E                      $                           Reduce E->i
$E                        $                           Reduce E->E*E
$E                        $                           accept
skcet@sk-nw-33:~$
```

RESULT:

Thus, the implementation of Shift Reduce Parser is done successfully and the output is verified.

Ex: No:7	Implementation of LR Parser
Date:	

Aim:

To implement the LR parser using C Programming.

ALGORITHM:

STEP 1: Write the augmented grammar by introducing a new non terminal of start symbol.

STEP 2: Form the item sets from augmented grammar.

STEP 3: Construct the SLR parsing table from the obtained item sets by using the action: Shift, Reduce, Accept And Error.

STEP 4: Obtain the stack implementation for input string: id+id*id

STEP 5: To construct SLR(1) parsing table,canonical collection of LR(0) items.

Program:

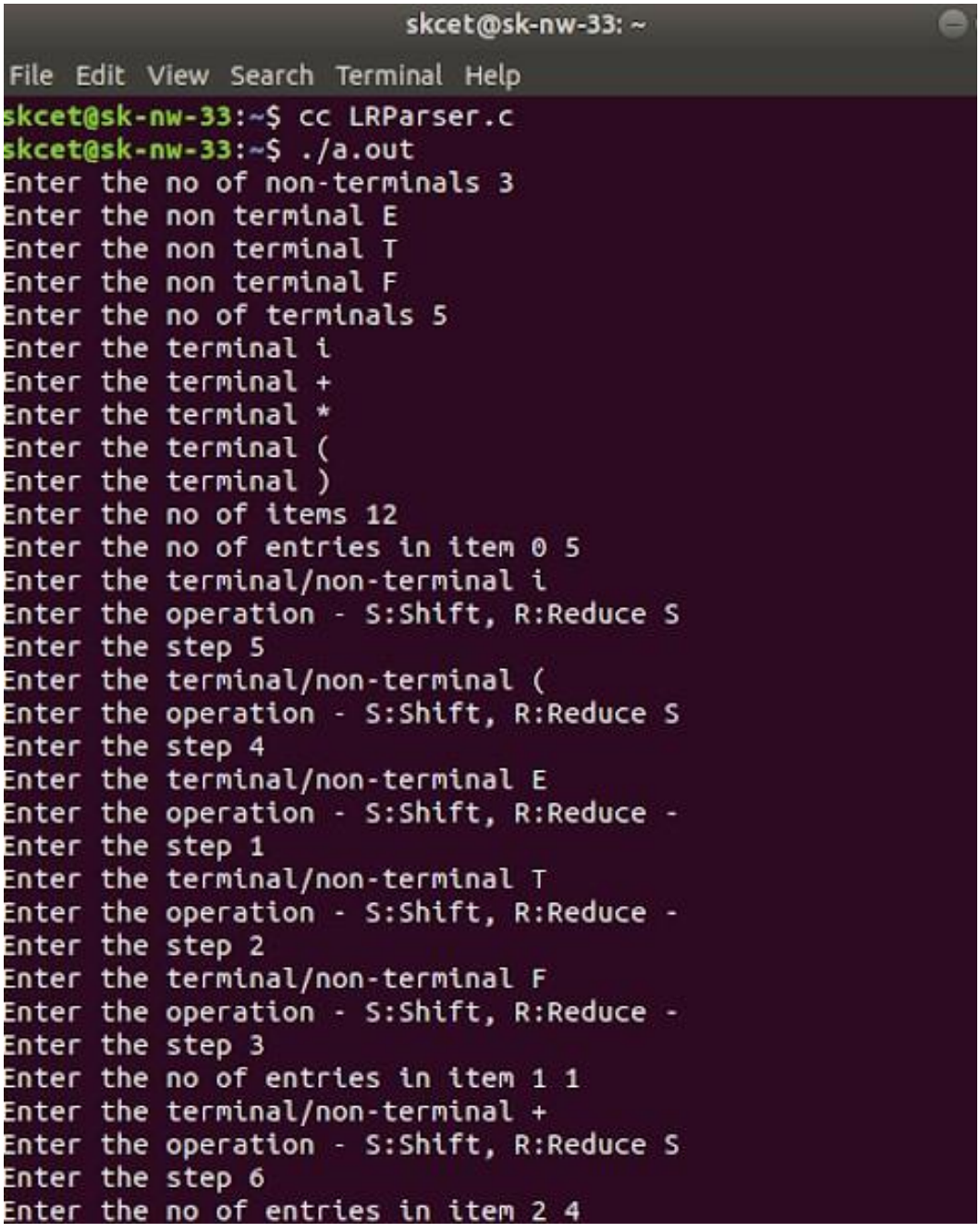
```
#include<stdio.h>
#include<string.h>
struct table
{
        char   op;
        char   set;
        int value;
}ta[50][50];
void main()
{
      char nt[20],t[20],temp,ip[50],s[50],prod[20][20],rhs[20][20],lhs[20][20],temparr[20];
      int non,not,i,j,l,ni,ch=1,n,tos,n1,temp1,np,no;
      printf("Enter the no of non-terminals ");
      scanf("%d",&non);
      for ( i=0;i<non;i++ )
      {
            printf("Enter the non terminal ");
            scanf("%s",&nt[i]);
      }
      printf("Enter the no of terminals ");
      scanf("%d",&not);
      for ( i=non;i<not+non;i++ )
      {
            printf("Enter the terminal ");
            scanf("%s",&t[i-non]);
            nt[i]=t[i-non];
      }
      nt[i]='$';
```

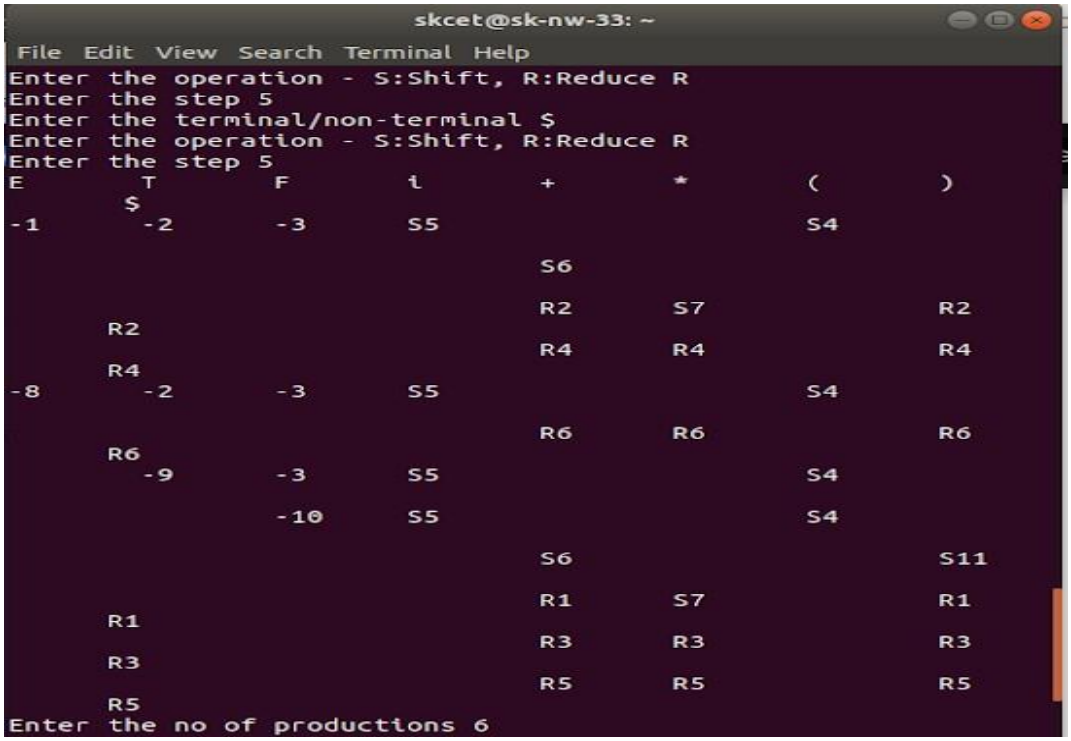
```
nt[i+1]='\0';
printf("Enter the no of items ");
scanf("%d",&ni);
for ( i=0;i<ni;i++ )
{
        printf("Enter the no of entries in item %d ",i);
        scanf("%d",&ch);
        for ( l=0;l<ch;l++ )
        {
                printf("Enter the terminal/non-terminal ");
                scanf("%s",&temp);
                for ( j=0;temp!=nt[j];j++);
                printf("Enter the operation - S:Shift, R:Reduce ");
                scanf("%s",&ta[i][j].op);
                printf("Enter the step ");
                scanf("%d",&ta[i][j].value);
                ta[i][j].set='t';
        }
}
for ( i=0;i<=non+not+3;i++ )
  printf("%c\t",nt[i]);
printf("\n");
for ( i=0;i<ni;i++ )
{
        for ( j=0;j<=non+not+3;j++ )
        {
                if ( ta[i][j].set == 't' )
                        printf("%c%d\t",ta[i][j].op,ta[i][j].value);
                else
                        printf("\t");
        }

        printf("\n");
}
printf("Enter the no of productions ");
scanf("%d",&np);
for ( i=0;i<np;i++ )
{
        scanf("%s",prod[i]);
        lhs[i][0]=prod[i][0];
        lhs[i][1]='\0';
        for ( j=3;j<strlen(prod[i]);j++ )
                rhs[i][j-3]=prod[i][j];
        rhs[i][j-3]='\0';
}
ch=1;

while ( ch == 1 )
{
        printf("Enter the input string ");
```

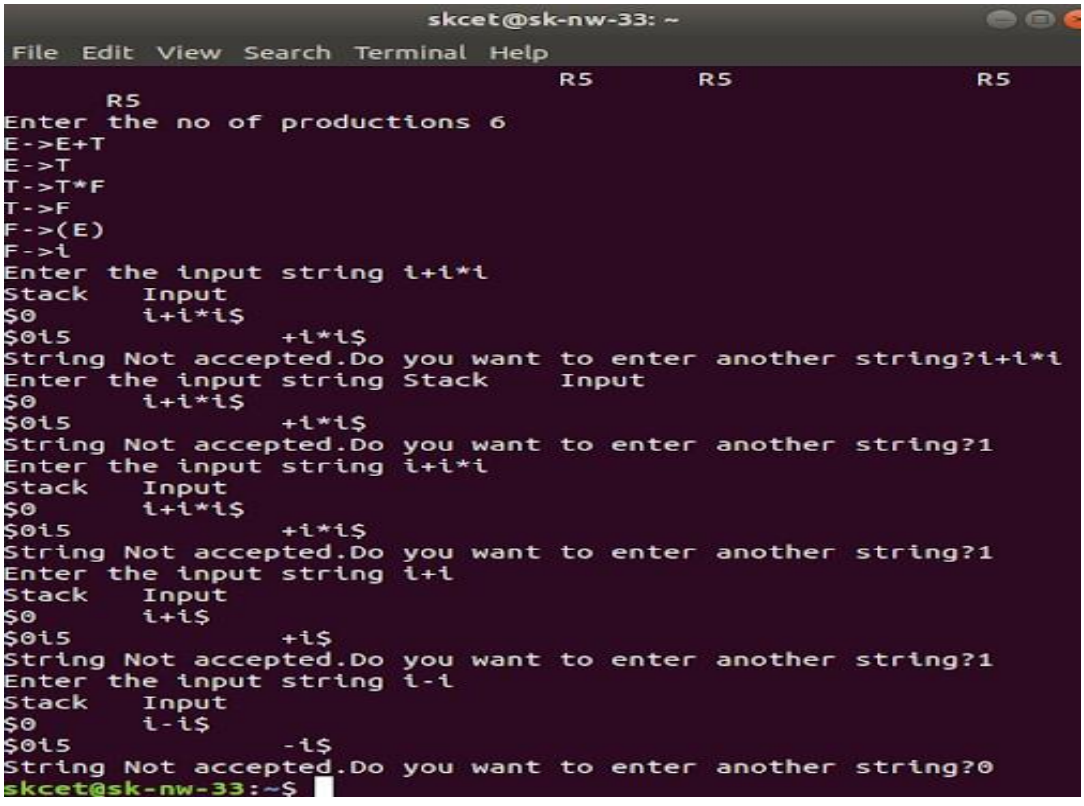
```
scanf("%s",ip);
n=strlen(ip);
ip[n]='$';
ip[n+1]='\0';

s[0]='$';
s[1]='0';
s[2]='\0';
tos=1;
i=0;
n1=s[tos]-48;
printf("Stack\tInput\n%s\t%s\n",s,ip);
while (i<strlen(ip))
{
        if ( i != 0 )
                1=s[tos];
        for(l=0;nt[l]!=ip[i];l++);
        temp=ta[n1][l].op;
        if ( temp != 'S' && temp != 's' && temp !='r' && temp !='R' && temp !='-' )
                break;
        temp1=ta[n1][l].value;
        if ( temp == 'S' || temp == 's' )
        {
           s[++tos]=ip[i++];
                s[++tos]=temp1;
                s[tos+1]='\0';
        }
        else
        {
                no=2*strlen(rhs[temp1-1]);
                for ( j=0;j<no;j++ )
                        s[tos--]='\0';
                s[++tos]=lhs[temp1-1][0];
                if ( s[tos-1] == '0' )
                        n1=0;
                else
                        n1=s[tos-1];
                for ( l=0;nt[l]!=s[tos];l++);
                if (ta[n1][l].value == 0 )
                        s[++tos]='0';
                else
                        s[++tos]=ta[n1][l].value;
        }

        for ( l=0;l<strlen(s);l+=2)
                printf("%c%d",s[l],s[l+1]==48?0:s[l+1]);
        printf("\t\t");
        for ( l=i;l<strlen(ip);l++ )
                printf("%c",ip[l]);
```

```
                printf("\n");
            }
            if ( s[tos] == 1 && ip[i] == '$' )
                printf("String Accepted!");
            else
                printf("String Not accepted.");
            printf("Do you want to enter another string?");
            scanf("%d",&ch);
        }
    }
```

OUTPUT:







RESULT:

Thus, the implementation of the LR parser is done successfully and the output is verified.

Ex: No:8	Implementation of front end of a compiler that generates the three address code
Date:	

Aim:

To implement the front end of a compiler that generates the three address code for a simple language.

ALGORITHM:

STEP 1: Start the program

STEP 2: Obtain the high level language as input

STEP 3: Based on pattern and lexemes stored in the symbol table in the three address code is obtained

STEP 4: Three address code generated will be optimized and displayed

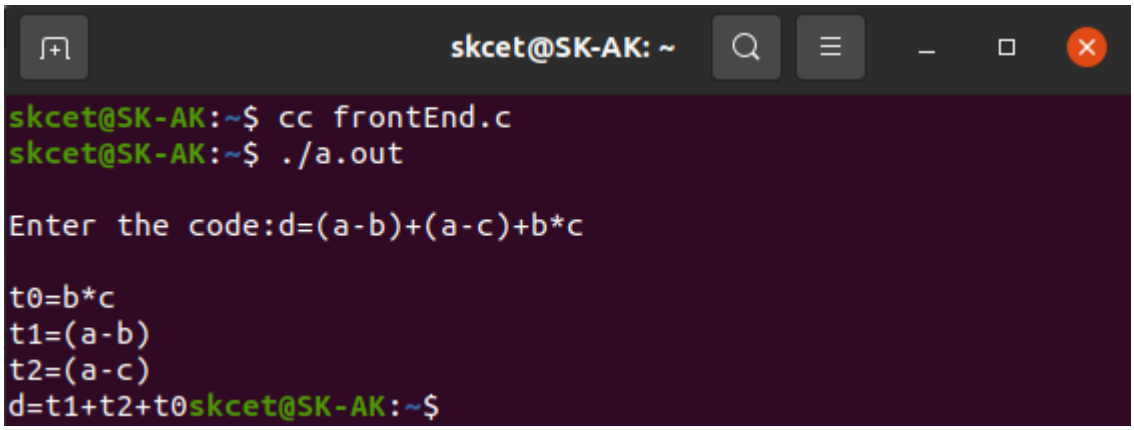
STEP 5:stop the program.

Program :

```
#include<stdio.h>
#include<ctype.h>
#include<string.h>
int ag=0,z=1;
void main()
{
char
a[50],id[50],b[50],op[50],mov[]="MOVF",mul[]="MULF",div[]="DIVF",add[]="ADDF",sub[]
= "SUBF",ti=0;
int i=0,j=0,k=0,len=0,s=0,e=0,r=1,count;
FILE *fp;
fp=fopen("out.txt","w");
printf("\nEnter the code:");
scanf("%s",a);
strcpy(b,a);
len=strlen(a);
for ( i=0;i<strlen(b);i++ ){
if ( b[i] == '*' || b[i] == '/' ){
for ( j=i-1;b[j]!='-'&&b[j]!='+'&&b[j]!='*'&&b[j]!='/'&&b[j]!='=';j--);
k=j+1;
count=0;
printf("\nt%d=",ti++);
for ( j=j+1;count<2&&b[j]!='\0';j++ ){
if ( b[j+1] == '+' || b[j+1] == '-' || b[j+1] == '*' || b[j+1] == '/' )
count++;
printf("%c",b[j]);
```

```
}
b[k++]='t';
b[k++]=ti-1+48;
for ( j=j,k=k;k<strlen(b);k++,j++ )
b[k]=b[j];
i=0;
}
}
for ( i=0;i<strlen(b);i++ ){
if ( b[i] == '+' || b[i] == '-' ){
for ( j=i-1;b[j]!='-'&&b[j]!='+'&&b[j]!='=';j--);
k=j+1;
count=0;
printf("\nt%d=",ti++);
for ( j=j+1;count<2&&b[j]!='\0';j++ )
{
if ( b[j+1] == '+' || b[j+1] == '-' )
count++;
printf("%c",b[j]);
}
b[k++]='t';
b[k++]=ti-1+48;
for ( j=j,k=k;k<strlen(b);k++,j++ )
b[k]=b[j];
}
}
printf("\n%s",b);
}
```

OUTPUT :



RESULT:

Thus, the implementation of the front end of a compiler that generates the three address code for a simple language is done successfully.

Ex: No:9	Implementation of the back end of the compiler
Date:	

Aim:

To implement the backend of the complier which generate the assembly code.

ALGORITHM:

STEP 1: Start the program

STEP 2: Read the input with the intermediate representation

STEP 3: Based on the three address code the given input will be processed will converted to assembly code with an operation like ADD,SUB,MUL,MOV,STORE,LOAD.

STEP 4: Generated output will be returned in the file called out.txt

STEP 5: Stop the program

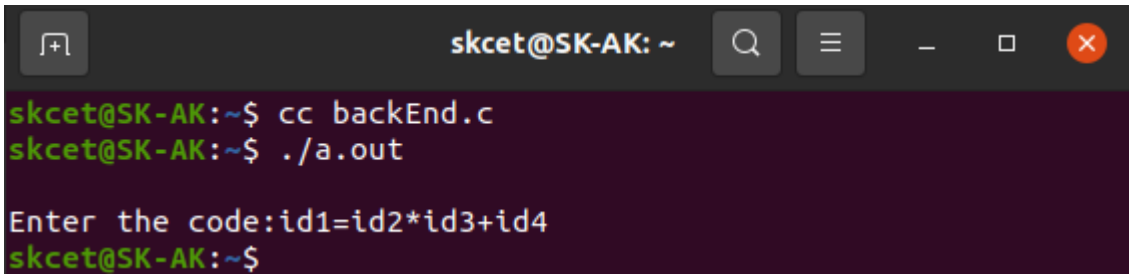
Program:

```
#include<stdio.h>
#include<ctype.h>
#include<string.h>
int ag=0,z=1;
void main()
{
char
a[50],id[50],mov[]="MOVF",mul[]="MULF",div[]="DIVF",add[]="ADDF",sub[]="SUBF";
int i=0,j=0,len=0,s=0,e=0,r=1;
FILE *fp;
fp=fopen("out.txt","w");
printf("\nEnter the code:");
gets(a);
len=strlen(a);
for(i=0;i<len;i++)
{
if(a[i]=='=')
{
for(j=i;j<len;j++)
if(a[j]=='i')
{
fprintf(fp,"\n%s ",mov);
fprintf(fp,"%c%c%c,R%d",a[j],a[j+1],a[j+2],r++);
}
}
else if((a[i]<=57)&&(a[i]>=48))
if((a[i+1]<=57)&&(a[i+1]>=48))
```

```
fprintf(fp,"\n%s #%c%c,R%d",mov,a[i],a[i+1],r++);
}
for(i=len-1;i>=0;i--)
{
if(a[i]=='+')
{
fprintf(fp,"\n%s ",add);
e=a[i-1];
e--;
s=e;

if(a[i+1]=='i')
fprintf(fp,"R%c,R%d",e,r-1);
}
else if(a[i]=='-')
{
fprintf(fp,"\n%s ",sub);
e=a[i-1];
e--;
s=e;
if(a[i+1]=='i')
fprintf(fp,"R%c,R%c",(a[i+3]-1),s);
else
fprintf(fp,"R%c,R%d",e,r-1);
}
else if(a[i]=='*')
{
fprintf(fp,"\n%s ",mul);
e=a[i-1];
e--;
s=e;
if(a[i+1]=='i')
fprintf(fp,"R%c,R%c",(a[i+3]-1),s);
else
fprintf(fp,"R%c,R%d",e,r-1);
}
else if(a[i]=='/')
{
fprintf(fp,"\n%s ",div);
e=a[i-1];
e--;
s=e;
if(a[i+1]=='i')
fprintf(fp,"R%c,R%c",(a[i+3]-1),s);
else
fprintf(fp,"R%c,R%d",e,r-1);
}
}
```

```
 fprintf(fp,"\n%s R1,id1",mov);
}
```

OUTPUT:



RESULT:

Thus, the implementation the backend of the complier which generate the assembly code is done successfully and the output is verified.

Ex: No:10	Implementation of Code optimization
Date:	

Aim:

To implement the code optimization of compiler using C programming.

ALGORITHM:

STEP 1: Start the program

STEP 2: Read the input given as assembly code

STEP 3: Apply the function preserving algorithm such as common subexpression elimination,code propagation,dead code elimination and constant folding.

STEP 4:obtain the final optimizing code for display

STEP 5:stop the program.

PROGRAM :

```
#include<stdio.h>
#include<string.h>
struct op
{
char l;
char r[20];
}op[10],pr[10];

void main()
{
int a,i,k,j,n,z=0,m,q;
char *p,*l,*tem,temp,t;
char nu[]="\0";
printf("\nEnter the no of values:");
scanf("%d",&n);
for(i=0;i<n;i++)
{
printf("\nLeft ");
scanf("%s",&op[i].l);
printf("Right ");
scanf("%s",op[i].r);
}

printf("\nIntermediate code\n");
for(i=0;i<n;i++)
printf("%c=%s\n",op[i].l,op[i].r);

for(i=0;i<n;i++)
```

```
{
temp=op[i].l;
p=NULL;
for(j=0;j<n;j++)
{
p=strchr(op[j].r,temp);
if(p)
{
pr[z].l=op[i].l;
strcpy(pr[z].r,op[i].r);

z++;
break;
}
}
}

printf("\nAfter dead code elimination\n");
for(k=0;k<z;k++)
printf("%c\t=%s\n",pr[k].l,pr[k].r);

for(m=0;m<z;m++)
{
tem=pr[m].r;
for(j=m+1;j<z;j++)
{
p=strstr(tem,pr[j].r);
if(p)
{
pr[j].l=pr[m].l;
for(i=0;i<z;i++)
{
if(l)
{
 a=l-pr[i].r;
 pr[i].r[a]=pr[m].l;
}
}
}
}
}
printf("\nEliminate common expression\n");
for(i=0;i<z;i++)
printf("%c\t=%s\n",pr[i].l,pr[i].r);
for(i=0;i<z;i++)
{
for(j=i+1;j<z;j++)
{
```

```
q=strcmp(pr[i].r,pr[j].r);
if((pr[i].l==pr[j].l)&&!q)
{
pr[i].l='\0';
strcpy(pr[i].r,nu);
}
}
}

printf("\nOptimized code\n");
for(i=0;i<z;i++)
if(pr[i].l!='\0')
printf("%c\t=%s\n",pr[i].l,pr[i].r);
}
```

Output :

```
Enter the no of values:5

Left a
Right 10

Left b
Right 20

Left c
Right a+b

Left d
Right a+b

Left e
Right c+d

Intermediate code
a=10
b=20
c=a+b
d=a+b
e=c+d

After dead code elimination
a          =10
b          =20
c          =a+b
d          =a+b

Eliminate common expression
a          =10
b          =20
c          =a+b
c          =a+b
```

```
Eliminate common expression
a          =10
b          =20
c          =a+b
c          =a+b

Optimized code
a          =10
b          =20
c          =a+b
```

RESULT:

Thus, the implementation of the code optimization of compiler using C programming is done successfully and the output is verified.