EXP 4

LEFT RECURSION

AIM: To write a program for elimination of left recursion

ALGORITHM:

1. Start the program.

2. Initialize the arrays for taking input from the user.

3. Prompt the user to input the no. of non-terminals having left recursion and no. of productions for these non-terminals.

4. Prompt the user to input the production for non-terminals.

5. Eliminate left recursion using the following rules:-

A->Aα1| Aα2 |.......... |Aαm

A->β1| β2|......... | βn

Then replace it by

A-> βi A' i=1,2,3,…. m

A'-> αj A' j=1,2,3,…. n

A'-> Ɛ

6. After eliminating the left recursion by applying these rules, display the productions without left recursion.

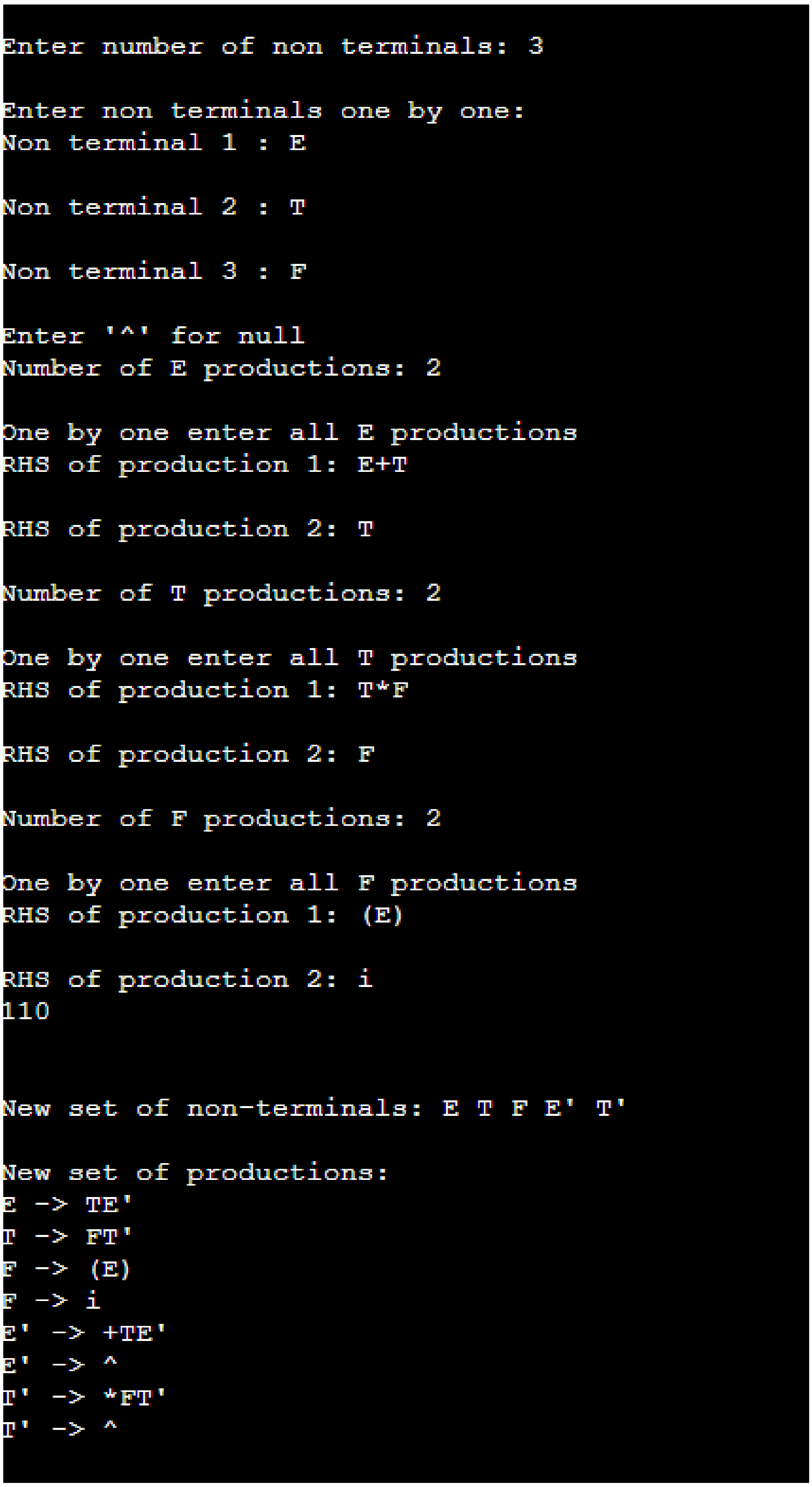
7. Stop

CODE:

```
#include <iostream>
#include <vector>
#include <string>
using namespace std;
int main()
{
int n;
cout<<"\nEnter number of non terminals: ";
cin>>n;
cout<<"\nEnter non terminals one by one: ";
int i;
vector<string> nonter(n);
vector<int> leftrecr(n,0);
for(i=0;i<n;++i) {
cout<<"\nNon terminal "<<i+1<<" : ";
cin>>nonter[i];
}
vector<vector<string> > prod;
cout<<"\nEnter '^' for null";
for(i=0;i<n;++i) {
cout<<"\nNumber of "<<nonter[i]<<" productions: ";
int k;
cin>>k;
int j;
cout<<"\nOne by one enter all "<<nonter[i]<<" productions";
vector<string> temp(k);
```

```
for(j=0;j<k;++j) {

cout<<"\nRHS of production "<<j+1<<": ";

string abc;

cin>>abc;

temp[j]=abc;

if(nonter[i].length()<=abc.length()&&nonter[i].compare(abc.substr(0,nonter[i].l
ength()))==0)

leftrecr[i]=1;

}

prod.push_back(temp);

}

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

{ cout<<leftrecr[

i];

}

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

{ if(leftrecr[i]==

0)

continue;

int j;

nonter.push_back(nonter[i]+"'");

vector<string> temp;

for(j=0;j<prod[i].size();++j) {

if(nonter[i].length()<=prod[i][j].length()&&nonter[i].compare(prod[i][j].substr(
0,nonter[i].length

()))==0) {

string
abc=prod[i][j].substr(nonter[i].length(),prod[i][j].length()-
nonter[i].length())+nonter[i]+"'";

temp.push_back(abc);

prod[i].erase(prod[i].begin()+j); --j;

}

else {

prod[i][j]+=nonter[i]+"'";

}

}

temp.push_back("^");

prod.push_back(temp);

}

cout<<"\n\n";

cout<<"\nNew set of non-terminals: ";

for(i=0;i<nonter.size();++i)

cout<<nonter[i]<<" ";

cout<<"\n\nNew set of productions: ";

for(i=0;i<nonter.size();++i)

{ int j;

for(j=0;j<prod[i].size();++j) {

cout<<"\n"<<nonter[i]<<" -> "<<prod[i][j];

}

}

return 0;

}
```

OUTPUT:



```
Enter number of non terminals: 3

Enter non terminals one by one:
Non terminal 1 : E

Non terminal 2 : T

Non terminal 3 : F

Enter '^' for null
Number of E productions: 2

One by one enter all E productions
RHS of production 1: E+T

RHS of production 2: T

Number of T productions: 2

One by one enter all T productions
RHS of production 1: T*F

RHS of production 2: F

Number of F productions: 2

One by one enter all F productions
RHS of production 1: (E)

RHS of production 2: i
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New set of non-terminals: E T F E' T'

New set of productions:
E -> TE'
T -> FT'
F -> (E)
F -> i
E' -> +TE'
E' -> ^
T' -> *FT'
T' -> ^
```

LEFT FACTORING

AIM: To write a program for elimination of left factoring

ALGORITHM:

1. Start

2. Ask the user to enter the set of productions

3. Check for common symbols in the given set of productions by comparing with:

A->aB1|aB2

4. If found, replace the particular productions with:

A->aA'

A'->B1 | B2|ε

5. Display the output

6. Exit

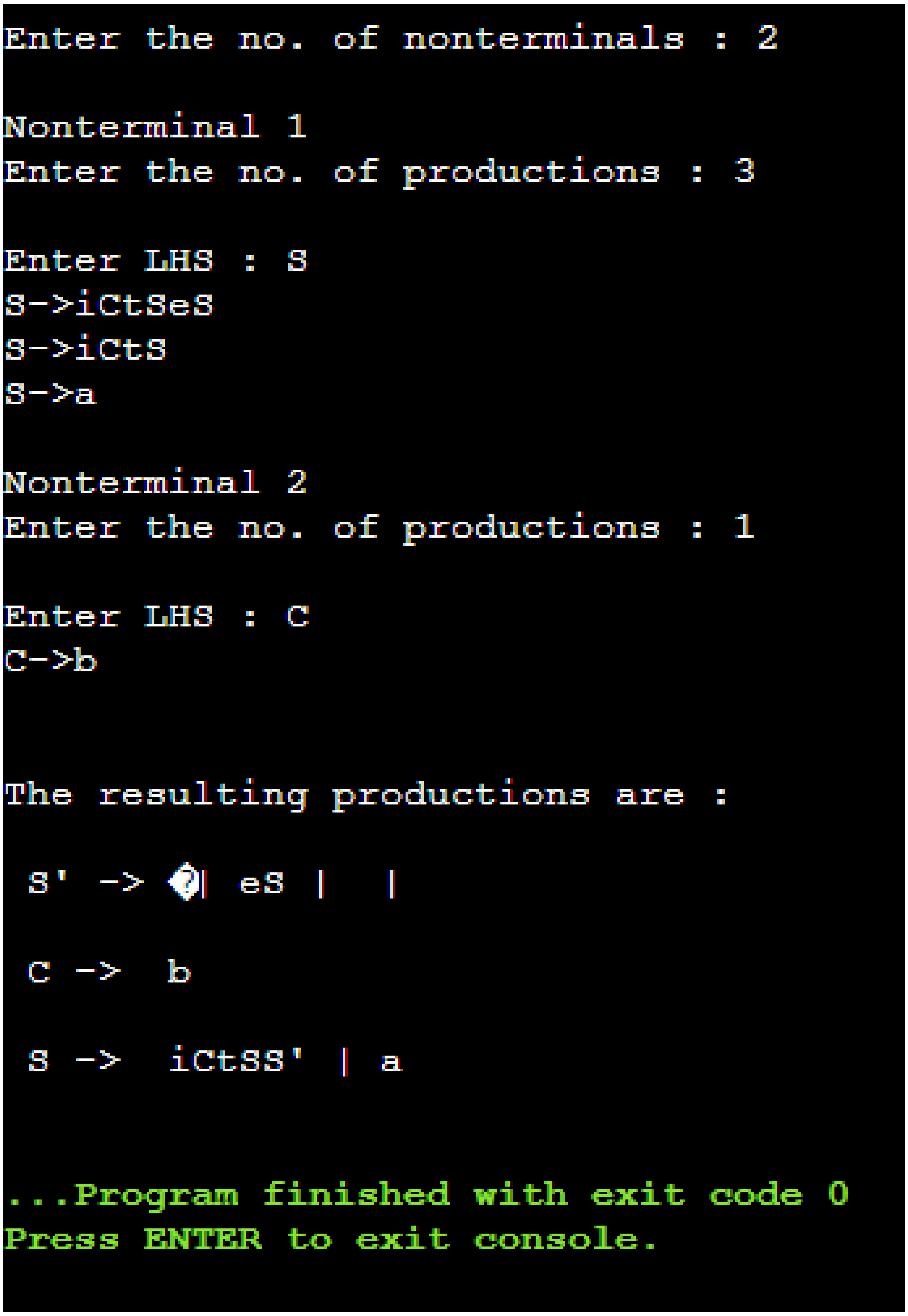
CODE:

```
#include<string.h>
#include<stdio.h>
#include<stdlib.h>
#include<conio.h>
void main()
{
        char ch,lhs[20][20],rhs[20][20][20],temp[20],temp1[20];
        int n,n1,count[20],x,y,i,j,k,c[20];
        printf("\nEnter the no. of nonterminals : ");
        scanf("%d",&n);
        n1=n;
```

```
for(i=0;i<n;i++)
{
        printf("\nNonterminal %d \nEnter the no. of productions : ",i+1);
        scanf("%d",&c[i]);
        printf("\nEnter LHS : ");
        scanf("%s",lhs[i]);
        for(j=0;j<c[i];j++)
        {
                printf("%s->",lhs[i]);
                scanf("%s",rhs[i][j]);
        }
}
for(i=0;i<n;i++)
{
        count[i]=1;
        while(memcmp(rhs[i][0],rhs[i][1],count[i])==0)
                count[i]++;
}
for(i=0;i<n;i++)
{
        count[i]--;
        if(count[i]>0)
        {
                strcpy(lhs[n1],lhs[i]);
                strcat(lhs[i],"'");
                for(k=0;k<count[i];k++)
                        temp1[k] = rhs[i][0][k];
                temp1[k++] = '\0';
                for(j=0;j<c[i];j++)
                {
```

```
                                for(k=count[i],x=0;k<strlen(rhs[i][j]);x++,k++)
                                        temp[x] = rhs[i][j][k];
                                temp[x++] = '\0';
                                if(strlen(rhs[i][j])==1)
                                        strcpy(rhs[n1][1],rhs[i][j]);
                                strcpy(rhs[i][j],temp);
                        }
                        c[n1]=2;
                        strcpy(rhs[n1][0],temp1);
                        strcat(rhs[n1][0],lhs[n1]);
                        strcat(rhs[n1][0],"'");
                        n1++;
                }
        }
        printf("\n\nThe resulting productions are : \n");
        for(i=0;i<n1;i++)
        {
                if(i==0)
                        printf("\n %s -> %c|",lhs[i],(char)238);
                else
                        printf("\n %s -> ",lhs[i]);
                for(j=0;j<c[i];j++)
                {
                        printf(" %s ",rhs[i][j]);
                        if((j+1)!=c[i])
                                printf("|");
                }
                printf("\b\b\b\n");
        }
}
```

OUTPUT:



```
Enter the no. of nonterminals : 2

Nonterminal 1
Enter the no. of productions : 3

Enter LHS : S
S->iCtSeS
S->iCtS
S->a

Nonterminal 2
Enter the no. of productions : 1

Enter LHS : C
C->b


The resulting productions are :

 S' -> �| eS |  |

 C ->  b

 S ->  iCtSS' | a


...Program finished with exit code 0
Press ENTER to exit console.
```

RESULT: **The program for Elimination of Left Recursion and Left Factoring are successfully implemented and executed**

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