Compiler Design

Exp-4A Elimination of Left Recursion

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CSE-IT (L2)

AIM: 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.

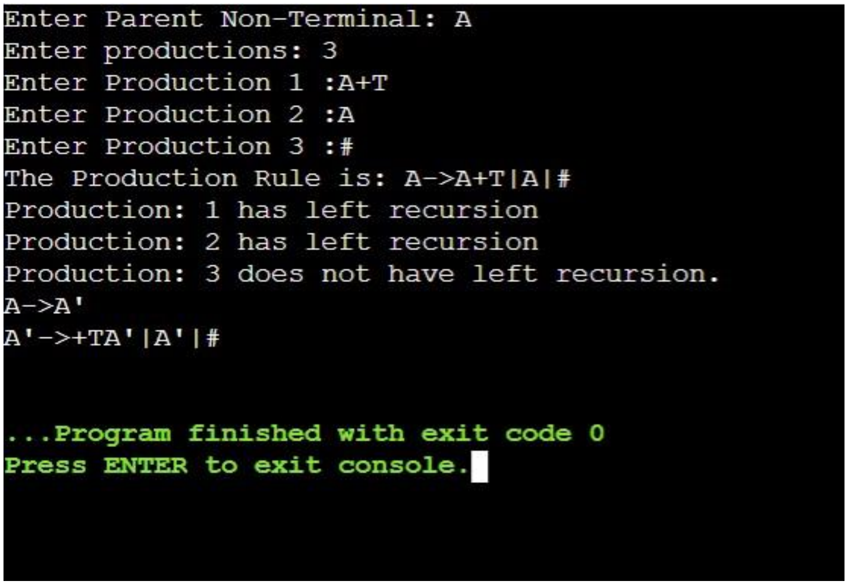
PROGRAM:

```
#include <iostream>
#include <string> using
namespace std; int
main()
{     int n, j, l, i, k;
int length[10] = {};
string d, a, b, flag;
char c;
   cout << "Enter Parent Non-Terminal: ";
cin >> c;
   d.push_back(c);     a += d +
"\'->";     d += "->";     b += d;
cout << "Enter productions: ";
cin >> n;     for (int i = 0; i < n;
i++)
   {
      cout << "Enter Production ";
cout << i + 1 << " :";        cin >>
flag;        length[i] = flag.size();
d += flag;        if (i != n - 1)
      {           d
+= "|";
      }
   }
   cout << "The Production Rule is: ";
cout << d << endl;     for (i = 0, k = 3; i
< n; i++)
   {
      if (d[0] != d[k])
```

```
    {
      cout << "Production: " << i + 1;
cout << " does not have left recursion.";
cout << endl;            if (d[k] == '#')
      {
        b.push_back(d[0]);
b += "\'";           }
else
      {
        for (j = k; j < k + length[i]; j++)
        {
          b.push_back(d[j]);
        }
k = j + 1;
        b.push_back(d[0]);
b += "\'|";
      }
}
else
    {
      cout << "Production: " << i + 1;
cout << " has left recursion";            cout
<< endl;            if (d[k] != '#')
      {
        for (l = k + 1; l < k + length[i]; l++)
        {
          a.push_back(d[l]);
        }
k = l + 1;
```

```
            a.push_back(d[0]);
a += "\'|";
         }
      }
   }
   a += "#";     cout
<< b << endl;     cout
<< a << endl;
return 0;
}
```

<u>OUTPUT</u>:



```
Enter Parent Non-Terminal: A
Enter productions: 3
Enter Production 1 :A+T
Enter Production 2 :A
Enter Production 3 :#
The Production Rule is: A->A+T|A|#
Production: 1 has left recursion
Production: 2 has left recursion
Production: 3 does not have left recursion.
A->A'
A'->+TA'|A'|#


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

<u>RESULT</u>:

A program for Elimination of Left Recursion was run successfully.

Exp-4B Elimination of Left Factoring

AIM: A program for implementation 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

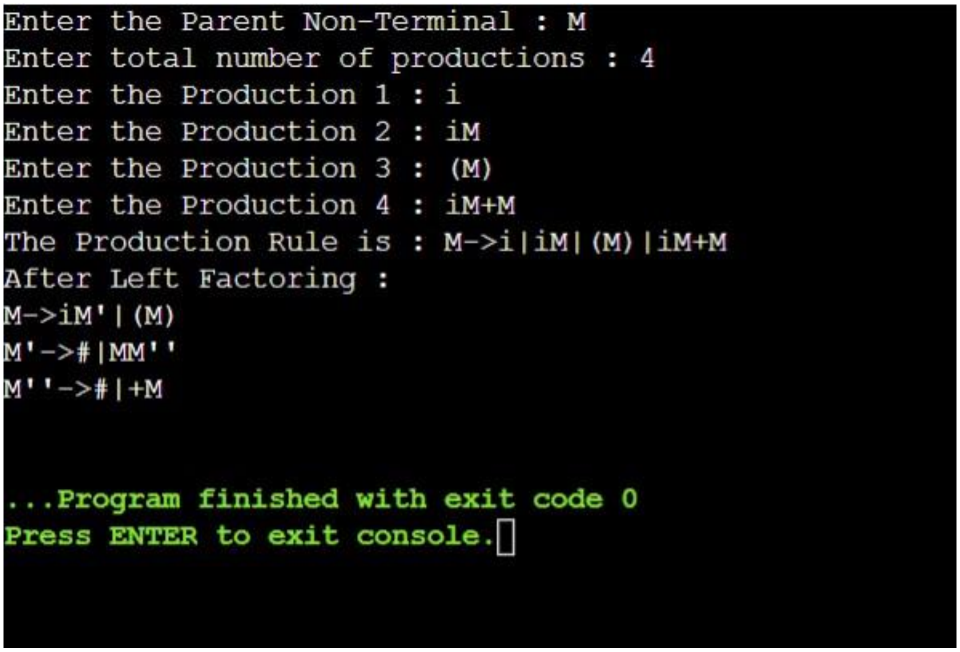
6. Exit

PROGRAM:

```
#include <iostream>

#include <string>

using namespace std; int

main()

{     int n, j, l, i, m;     int len[10] = {};     string a,

b1, b2, flag;     char c;     cout << "Enter the

Parent Non-Terminal : ";

   cin >> c;
```

```
    a.push_back(c);
b1 += a + "\'->";     b2
+= a + "\'\'->";
    ;
    a += "->";     cout << "Enter total number of
productions : ";     cin >> n;     for (i = 0; i < n; i++)
    {
        cout << "Enter the Production " << i + 1 << " : ";
cin >> flag;         len[i] = flag.size();         a += flag;
if (i != n - 1)
        {
            a += "|";
        }
    }
    cout << "The Production Rule is : " << a << endl;
char x = a[3];     for (i = 0, m = 3; i < n; i++)
    {
        if (x != a[m])
        {
            while (a[m++] != '|')
                ;
}         else
        {
            if (a[m + 1] != '|')
            {
                b1 += "|" + a.substr(m + 1, len[i] - 1);
                a.erase(m - 1, len[i] + 1);
            }
else
            {
b1 += "#";
                a.insert(m + 1, 1, a[0]);
                a.insert(m + 2, 1, '\'');
                m += 4;
            }
        }
    }
    char y = b1[6];     for (i = 0, m
= 6; i < n - 1; i++)
    {
        if (y == b1[m])
        {
            if (b1[m + 1] != '|')
            {                flag.clear();                for (int s
= m + 1; s < b1.length(); s++)
                {
                    flag.push_back(b1[s]);
                }
                b2 += "|" + flag;
b1.erase(m - 1, flag.length() + 2);
            }
else
            {
                b1.insert(m + 1, 1, b1[0]);
b1.insert(m + 2, 2, '\'');                b2
+= "#";

                m += 5;
            }
        }
    }
    b2.erase(b2.size() - 1);     cout << "After
Left Factoring : " << endl;     cout << a <<
endl;     cout << b1 << endl;     cout << b2
<< endl;     return 0;
}
```

OUTPUT:



```
Enter the Parent Non-Terminal : M
Enter total number of productions : 4
Enter the Production 1 : i
Enter the Production 2 : iM
Enter the Production 3 : (M)
Enter the Production 4 : iM+M
The Production Rule is : M->i|iM|(M)|iM+M
After Left Factoring :
M->iM'|(M)
M'->#|MM''
M''->#|+M


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

RESULT:

A program for implementation of Left Factoring was compiled and run successfully.