Name: Bhavya Patel

Roll No: 20BCE198

Course: Compiler construction

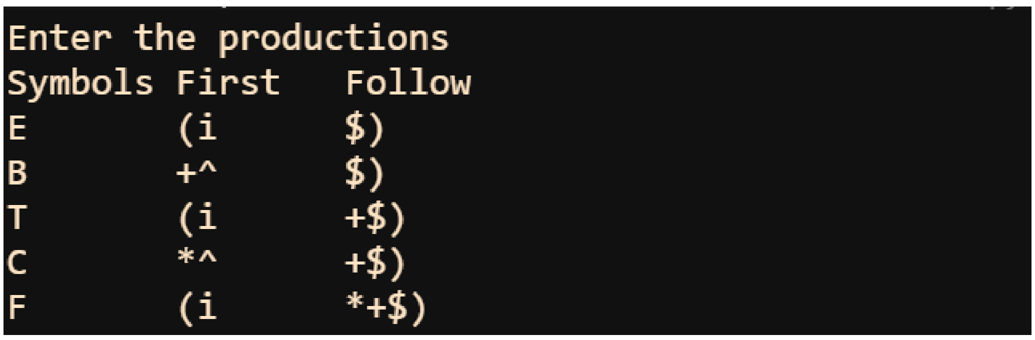
Practical No: 3

Aim: Write a program to find first( ), and follow() set for each non-terminal of given grammar.

Methodology followed:

```
#include <iostream>
#include <string.h>
#define max 20

using namespace std;

char prod[max][10];
char ter[10], nt[10];
char first[10][10], follow[10][10];
int eps[10];
int count_var = 0;

int findpos(char ch)
{
    int n;
    for (n = 0; nt[n] != '\0'; n++)
        if (nt[n] == ch)
            break;
    if (nt[n] == '\0')
        return 1;
    return n;
}

int IsCap(char c)
{
    if (c >= 'A' && c <= 'Z')
        return 1;
    return 0;
}

void add(char *arr, char c)
{
    int i, flag = 0;
    for (i = 0; arr[i] != '\0'; i++)
    {
        if (arr[i] == c)
        {
            flag = 1;
            break;
        }
    }
    if (flag != 1)
        arr[strlen(arr)] = c;
}

void addarr(char *s1, char *s2)
{
    int i, j, flag = 99;
    for (i = 0; s2[i] != '\0'; i++)
    {
        flag = 0;
        for (j = 0;; j++)
        {
            if (s2[i] == s1[j])
            {
                flag = 1;
                break;
            }
            if (j == strlen(s1) && flag != 1)
            {
                s1[strlen(s1)] = s2[i];
                break;
            }
        }
    }
}

void addprod(char *s)
{
    int i;
    prod[count_var][0] = s[0];
    for (i = 3; s[i] != '\0'; i++)
    {
        if (!IsCap(s[i]))
            add(ter, s[i]);
        prod[count_var][i - 2] = s[i];
    }
    prod[count_var][i - 2] = '\0';
    add(nt, s[0]);
    count_var++;
}

void findfirst()
{
    int i, j, n, k, e, n1;
    for (i = 0; i < count_var; i++)
    {
        for (j = 0; j < count_var; j++)
        {
            n = findpos(prod[j][0]);
            if (prod[j][1] == (char)152)
                eps[n] = 1;
            else
            {
                for (k = 1, e = 1; prod[j][k] != '\0' && e == 1; k++)
                {
                    if (!IsCap(prod[j][k]))
                    {
                        e = 0;
                        add(first[n], prod[j][k]);
                    }
                    else
                    {
                        n1 = findpos(prod[j][k]);
                        addarr(first[n], first[n1]);
                        if (eps[n1] == 0)
                            e = 0;
                    }
                }
                if (e == 1)
                    eps[n] = 1;
            }
        }
    }
}

void findfollow()
{
    int i, j, k, n, e, n1;
    n = findpos(prod[0][0]);
    add(follow[n], '#');
    for (i = 0; i < count_var; i++)
    {
        for (j = 0; j < count_var; j++)
        {
            k = strlen(prod[j]) - 1;
            for (; k > 0; k--)
            {
                if (IsCap(prod[j][k]))
                {
                    n = findpos(prod[j][k]);
                    if (prod[j][k + 1] == '\0')
                    {
                        n1 = findpos(prod[j][0]);
                        addarr(follow[n], follow[n1]);
                    }
                    if (IsCap(prod[j][k + 1]))
                    {
                        n1 = findpos(prod[j][k + 1]);
                        addarr(follow[n], first[n1]);
                        if (eps[n1] == 1)
                        {
                            n1 = findpos(prod[j][0]);
                            addarr(follow[n], follow[n1]);
                        }
                    }
                    else if (prod[j][k + 1] != '\0')
                        add(follow[n], prod[j][k + 1]);
                }
            }
        }
    }
}

int main()
{
    char s[max], i;
    cout << "Enter the productions\n";
    cin >> s;
    while (strcmp("end", s))
    {
        addprod(s);
        cin >> s;
    }
    findfirst();
    findfollow();
    cout << "Symbols"
         << "\t"
         << "First"
         << "\t"
         << "Follow"
         << "\t" << endl;
    for (i = 0; i < strlen(nt); i++)
    {
        cout << nt[i] << "\t";
        cout << first[i];
        if (eps[i] == 1)
            cout << ((char)152) << "\t";
        else
            cout << "\t";
        cout << follow[i] << "\n";
    }
    return 0;
    ;
}
```

Output:



```
Enter the productions
Symbols First   Follow
E       (i      $)
B       +^      $)
T       (i      +$)
C       *^      +$)
F       (i      *+$)
```