
**Name: PRATYUSH V KHARE** **Subject: Compiler Const.**
**Roll No: 20BCE519** **Semester :- 7** **Subject Code: 2CS701**

## ***Practical 3***

**Aim:** Write a program to find first( ) and follow() set for each nonterminal of given grammar.

**P3 > Code**

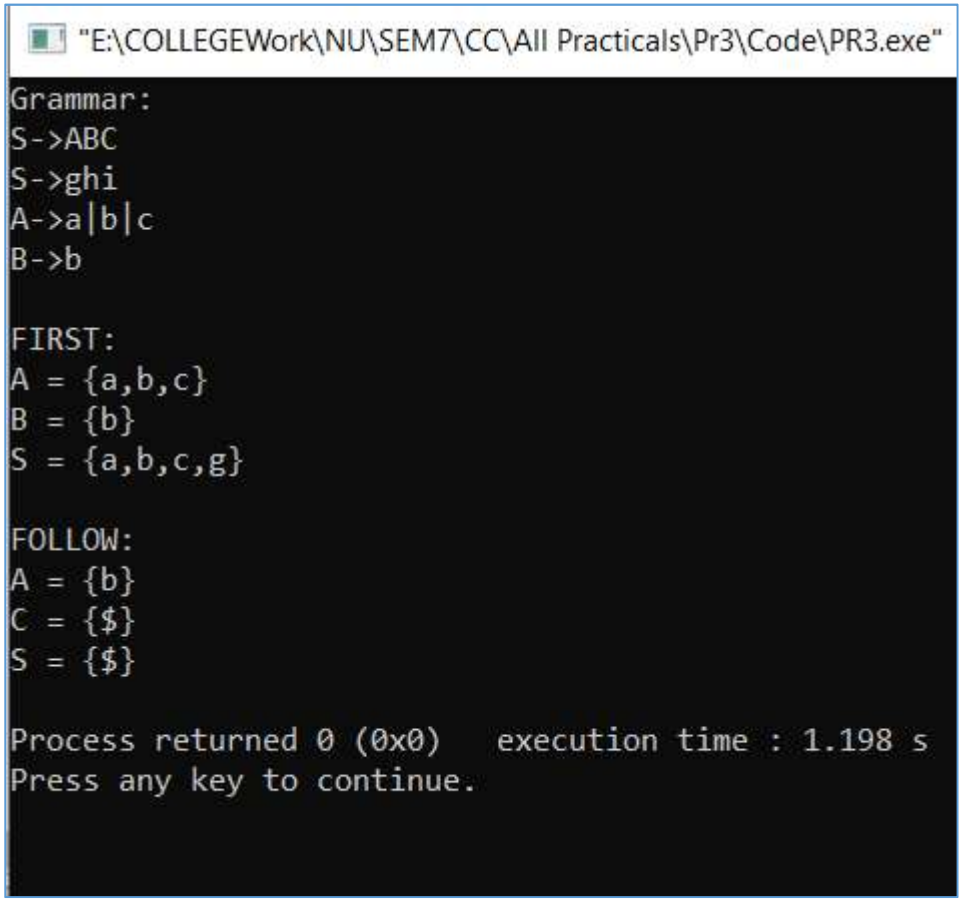
```
#include<bits/stdc++.h>
using namespace std;
set<char> ss;
bool dfs(char i, char org, char last, map<char,vector<vector<char>>>
&mp){
    bool rtake = false;
    for(auto r : mp[i]){
        bool take = true;
        for(auto s : r){
            if(s == i) break;
            if(!take) break;
            if(!(s>='A'&&s<='Z')&&s!='e'){
                ss.insert(s);
                break;
            }
            else if(s == 'e'){
                if(org == i||i == last)
                ss.insert(s);
                rtake = true;
                break;
            }
            else{
```

```
                take = dfs(s,org,r[r.size()-1],mp);
                rtake |= take;
            }
        }
    }
    return rtake;
}
int main(){
    int i,j;
    ifstream fin("grammar.txt");

    string num;
    vector<int> fs;
    vector<vector<int>> a;
    map<char,vector<vector<char>>> mp;
    char start;
    bool flag = 0;

    cout<<"Grammar: "<<'\n';
    while(getline(fin,num)){
        if(flag == 0) start = num[0],flag = 1;
        cout<<num<<'\n';
        vector<char> temp;
        char s = num[0];
        for(i=3;i<num.size();i++){
            if(num[i] == '|'){
                mp[s].push_back(temp);
                temp.clear();
            }
            else temp.push_back(num[i]);
        }
        mp[s].push_back(temp);
    }
    map<char,set<char>> fmp;
    for(auto q : mp){
        ss.clear();
        dfs(q.first,q.first,q.first,mp);
        for(auto g : ss) fmp[q.first].insert(g);
    }
    cout<<'\n';
    cout<<"FIRST: "<<'\n';
    for(auto q : fmp){
        string ans = "";
        ans += q.first;
        ans += " = {";
        for(char r : q.second){
            ans += r;
```

```
            ans += ',';
        }
        ans.pop_back();
        ans+="}";
        cout<<ans<<'\n';
    }
    map<char,set<char>> gmp;
    gmp[start].insert('$');
    int count = 10;
    while(count--){
        for(auto q : mp){
            for(auto r : q.second){
                for(i=0;i<r.size()-1;i++){
                    if(r[i]>='A'&&r[i]<='Z'){
                        if(!(r[i+1]>='A'&&r[i+1]<='Z'))
gmp[r[i]].insert(r[i+1]);
                        else {
                            char temp = r[i+1];
                            int j = i+1;
                            while(temp>='A'&&temp<='Z'){
                                if(*fmp[temp].begin()=='e'){
                                    for(auto g : fmp[temp]){
                                        if(g=='e') continue;
                                        gmp[r[i]].insert(g);
                                    }
                                    j++;
                                    if(j<r.size()){
                                        temp = r[j];
                                        if(!(temp>='A'&&temp<='Z')){
                                            gmp[r[i]].insert(temp);
                                            break;
                                        }
                                    }
                                    else{
                                        for(auto g : gmp[q.first])
gmp[r[i]].insert(g);
                                        break;
                                    }
                                }
                                else{
                                    for(auto g : fmp[temp]){
                                        gmp[r[i]].insert(g);
                                    }
                                    break;
                                }
                            }
                        }
```

```
                    }
                }
                if(r[r.size()-1]>='A'&&r[r.size()-1]<='Z'){
                    for(auto g : gmp[q.first]) gmp[r[i]].insert(g);
                }
            }
        }
    }
    cout<<'\n';
    cout<<"FOLLOW: "<<'\n';
    for(auto q : gmp){
        string ans = "";
        ans += q.first;
        ans += " = {";
        for(char r : q.second){
            ans += r;
            ans += ',';
        }
        ans.pop_back();
        ans+="}";
        cout<<ans<<'\n';
    }
    return 0;
}
```

**Output:**


"E:\COLLEGEWork\NU\SEM7\CC\All Practicals\Pr3\Code\PR3.exe"
Grammar:
S->ABC
S->ghi
A->a|b|c
B->b
FIRST:
A = {a,b,c}
B = {b}
S = {a,b,c,g}
FOLLOW:
A = {b}
C = {$}
S = {$}
Process returned 0 (0x0) execution time : 1.198 s
Press any key to continue.

***END***