Bangladesh Army International University of Science and Technology

Department of Computer Science and Engineering

Lab Report

Lab Report No	:	7						
Lab Report Name	:	Write a Program to Find FIRST in a Context Free Grammar						
Course Title	:	Compiler Design and Construction Sessional						
Course Code	:	CSE-414						
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ID	:	0822220105101052						
Level	:	4	**Term**	: 1	**Section**	: B	**Group**	:
Date of Submission	:	08/01/26	**Semester**	: FALL 25	**Year**	: 2026		

Key Learnings:

- **Understanding FIRST Sets in CFGs:** Learned how to compute the FIRST set for terminals and non-terminals, which is a fundamental concept in **syntax analysis** and **parsing**.
- **Recursive Algorithm Implementation:** Gained experience in designing **recursive functions** to handle grammar rules and non-terminal dependencies**Practical Compiler Insight:** Developed insight into how **lexical tokens and grammar rules** are analyzed by a compiler to predict possible starting symbols of productions.

Code Implementation:

Lab Works > lab7.c > main()

```c
#include <stdio.h>
#include <string.h>
#include <ctype.h>

int n;
char production[10][10];
char first[10][10];
int firstCount[10];

void addToFirst(int index, char ch){
    for(int i=0; i<firstCount[index]; i++){
        if(first[index][i] == ch){
            return;
        }
    }

    first[index][firstCount[index]++] = ch;
}

void findFirst(int index){
    char rhs[10];
    strcpy(rhs, production[index]+2);

    if(!isupper(rhs[0])){
        addToFirst(index, rhs[0]);
        return;
    }

    int ntIndex = rhs[0] - 'A';
    findFirst(ntIndex);
}
```

```c

int main(){
    printf("Enter number of productions: ");
    scanf("%d", &n);

    printf("Enter productions {For example: E=TR:}\n");
    for(int i=0; i<n; i++){
        scanf("%s", production[i]);
        firstCount[i] = 0;
    }

    for(int i=0; i<n; i++){
        findFirst(i);
    }

    printf("\nFirst sets: \n");
    for(int i=0; i<n; i++){
        printf("First(%c) = { ", production[i][0]);
        for(int j=0; j<firstCount[i]; j++){
            printf("%c", first[i][j]);
        }
        printf("}\n");
    }

    return 0;
}
```

Input Sample:

Enter number of productions: 3

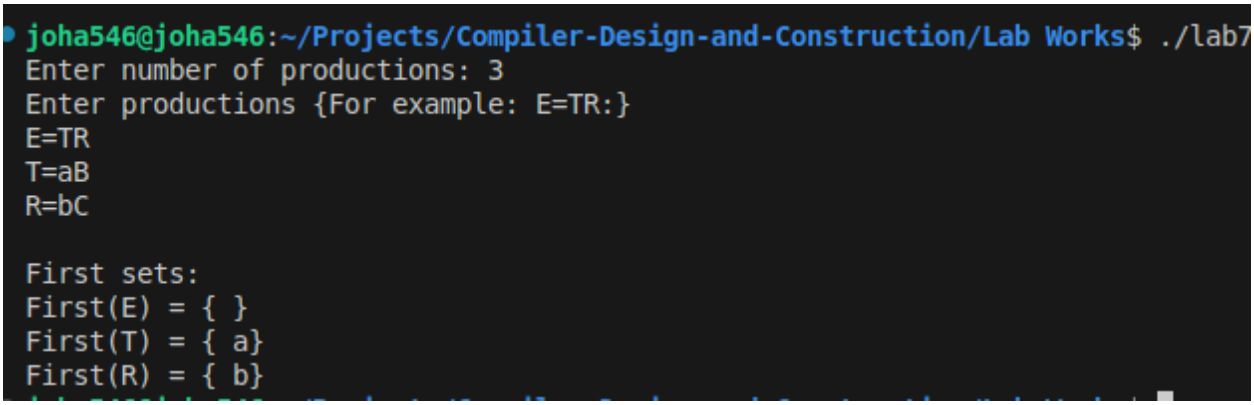
Enter productions {For example: E=TR:}

E=TR

T=aB

R=bC

Output Sample:


joha546@joha546:~/Projects/Compiler-Design-and-Construction/Lab Works$ ./lab7
Enter number of productions: 3
Enter productions {For example: E=TR:}
E=TR
T=aB
R=bC
First sets:
First(E) = { }
First(T) = { a}
First(R) = { b}