Finding-FIRST-and-FOLLOW-of-given-grammar

Code:-

```
import sys

sys.setrecursionlimit(60)


def first(string):
    #print("first({})".format(string))
    first_ = set()
    if string in non_terminals:
        alternatives = productions_dict[string]


        for alternative in alternatives:
            first_2 = first(alternative)
            first_ = first_ |first_2


    elif string in terminals:
        first_ = {string}


    elif string=='' or string=='@':
        first_ = {'@'}


    else:
        first_2 = first(string[0])
        if '@' in first_2:
            i = 1
            while '@' in first_2:
```

```
            #print("inside while")


            first_ = first_ | (first_2 - {'@'})
            #print('string[i:]=', string[i:])
            if string[i:] in terminals:
               first_ = first_ | {string[i:]}
               break
            elif string[i:] == '':
               first_ = first_ | {'@'}
               break
            first_2 = first(string[i:])
            first_ = first_ | first_2 - {'@'}
            i += 1
         else:
            first_ = first_ | first_2



   #print("returning for first({})".format(string),first_)
   return  first_



def follow(nT):
   #print("inside follow({})".format(nT))
   follow_ = set()
   #print("FOLLOW", FOLLOW)
   prods = productions_dict.items()
   if nT==starting_symbol:
```

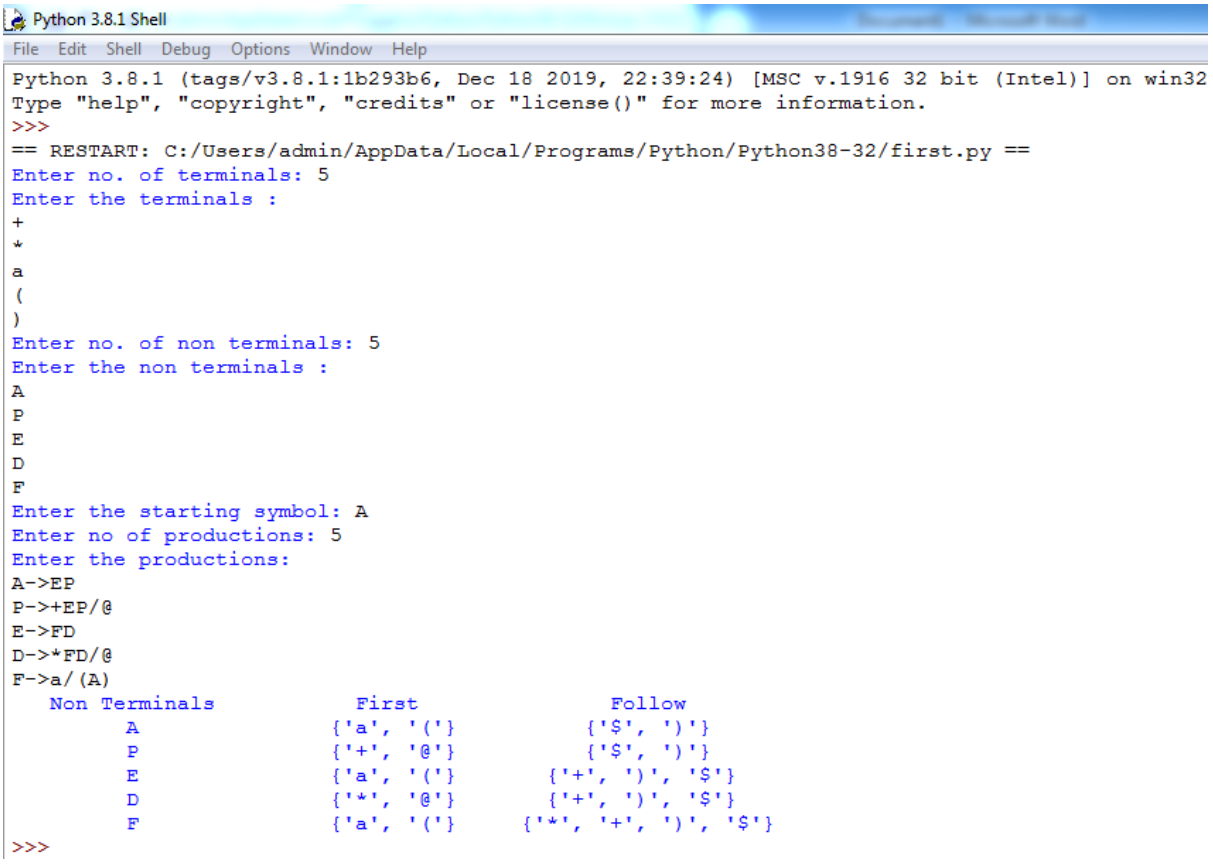
```
        follow_ = follow_ | {'$'}
    for nt,rhs in prods:
        #print("nt to rhs", nt,rhs)
        for alt in rhs:
            for char in alt:
                if char==nT:
                    following_str = alt[alt.index(char) + 1:]
                    if following_str=='':
                        if nt==nT:
                            continue
                        else:
                            follow_ = follow_ | follow(nt)
                    else:
                        follow_2 = first(following_str)
                        if '@' in follow_2:
                            follow_ = follow_ | follow_2-{'@'}
                            follow_ = follow_ | follow(nt)
                        else:
                            follow_ = follow_ | follow_2
    #print("returning for follow({})".format(nT),follow_)
    return follow_




no_of_terminals=int(input("Enter no. of terminals: "))
```

```
terminals = []

print("Enter the terminals :")
for _ in range(no_of_terminals):
    terminals.append(input())

no_of_non_terminals=int(input("Enter no. of non terminals: "))

non_terminals = []

print("Enter the non terminals :")
for _ in range(no_of_non_terminals):
    non_terminals.append(input())

starting_symbol = input("Enter the starting symbol: ")

no_of_productions = int(input("Enter no of productions: "))

productions = []

print("Enter the productions:")
for _ in range(no_of_productions):
    productions.append(input())


#print("terminals", terminals)
```

```
#print("non terminals", non_terminals)


#print("productions",productions)



productions_dict = {}

for nT in non_terminals:
    productions_dict[nT] = []



#print("productions_dict",productions_dict)

for production in productions:
    nonterm_to_prod = production.split("->")
    alternatives = nonterm_to_prod[1].split("/")
    for alternative in alternatives:
        productions_dict[nonterm_to_prod[0]].append(alternative)

#print("productions_dict",productions_dict)

#print("nonterm_to_prod",nonterm_to_prod)
#print("alternatives",alternatives)



FIRST = {}
```

```
FOLLOW = {}

for non_terminal in non_terminals:
    FIRST[non_terminal] = set()

for non_terminal in non_terminals:
    FOLLOW[non_terminal] = set()

#print("FIRST",FIRST)

for non_terminal in non_terminals:
    FIRST[non_terminal] = FIRST[non_terminal] | first(non_terminal)

#print("FIRST",FIRST)


FOLLOW[starting_symbol] = FOLLOW[starting_symbol] | {'$'}
for non_terminal in non_terminals:
    FOLLOW[non_terminal] = FOLLOW[non_terminal] | follow(non_terminal)

#print("FOLLOW", FOLLOW)

print("{: ^20}{: ^20}{: ^20}".format('Non Terminals','First','Follow'))
for non_terminal in non_terminals:
    print("{: ^20}{: ^20}{:
^20}".format(non_terminal,str(FIRST[non_terminal]),str(FOLLOW[non_terminal])))
```

Output:-


Python 3.8.1 Shell
File Edit Shell Debug Options Window Help
Python 3.8.1 (tags/v3.8.1:1b293b6, Dec 18 2019, 22:39:24) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
== RESTART: C:/Users/admin/AppData/Local/Programs/Python/Python38-32/first.py ==
Enter no. of terminals: 5
Enter the terminals :
+
*
a
(
)
Enter no. of non terminals: 5
Enter the non terminals :
A
P
E
D
F
Enter the starting symbol: A
Enter no of productions: 5
Enter the productions:
A->EP
P->+EP/@
E->FD
D->*FD/@
F->a/(A)
Non Terminals First Follow
A {'a', '('} {'$', ')'}
P {'+', '@'} {'$', ')'}
E {'a', '('} {'+', ')', '$'}
D {'*', '@'} {'+', ')', '$'}
F {'a', '('} {'*', '+', ')', '$'}
>>>