# Compiler Design

# EXP-3 NFA to DFA

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**Class: -** CSE-IT (L2 Section)

**AIM**:

To write a program for converting NFA to DFA.

**ALGORITHM**:

1. Start
2. Get the input from the user
3. Set the only state in SDFA to "unmarked".
4. while SDFA contains an unmarked state do:

a. Let T be that unmarked state

b. for each a in % do S = e-Closure(MoveNFA(T,a))

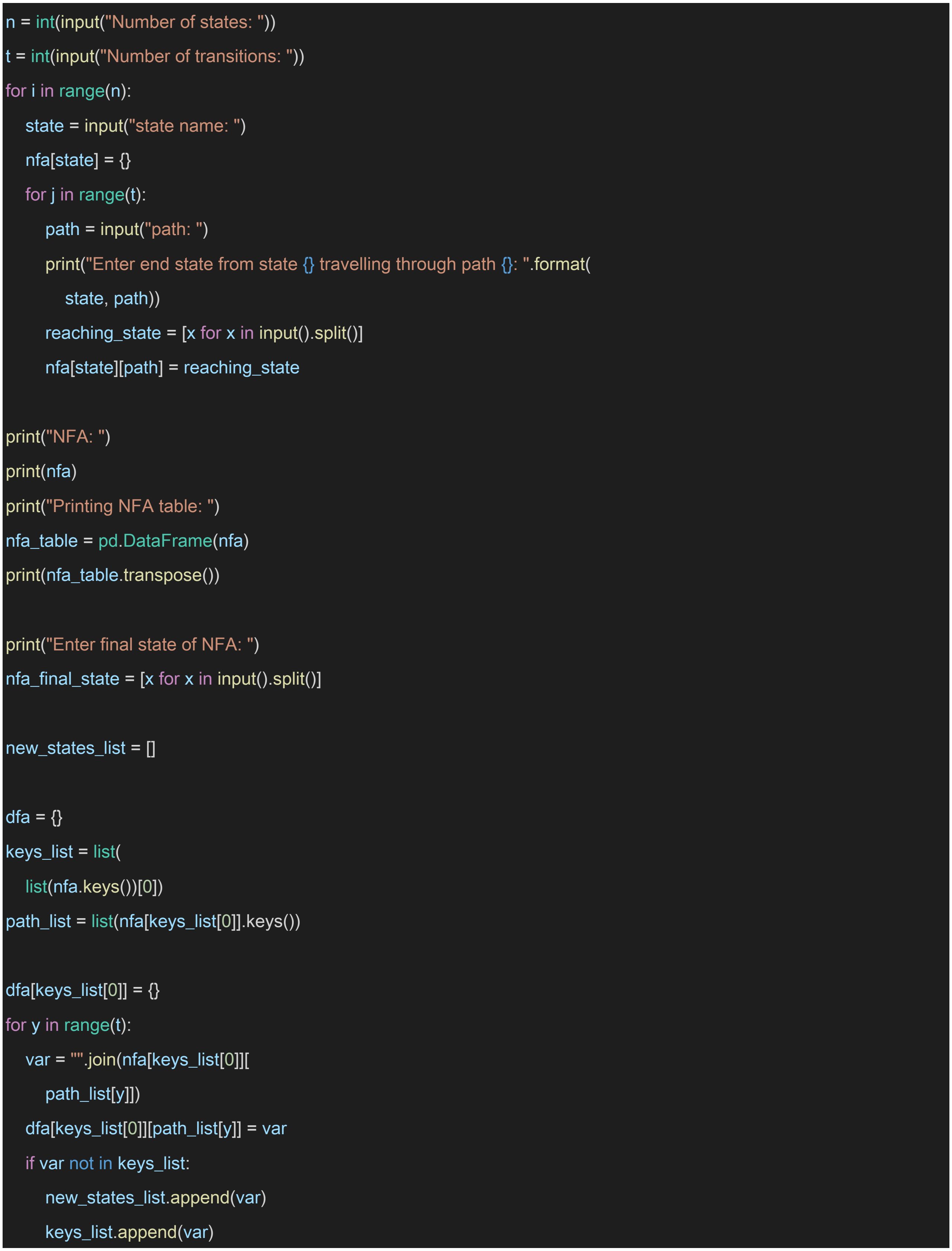
c. if S is not in SDFA already then, add S to SDFA (as an "unmarked" state)

d. Set MoveDFA(T,a) to S

5. For each S in SDFA if any s & S is a final state in the NFA then, mark S an a final state in the DFA
6. Print the result.
7. Stop the program

**PROGRAM**:

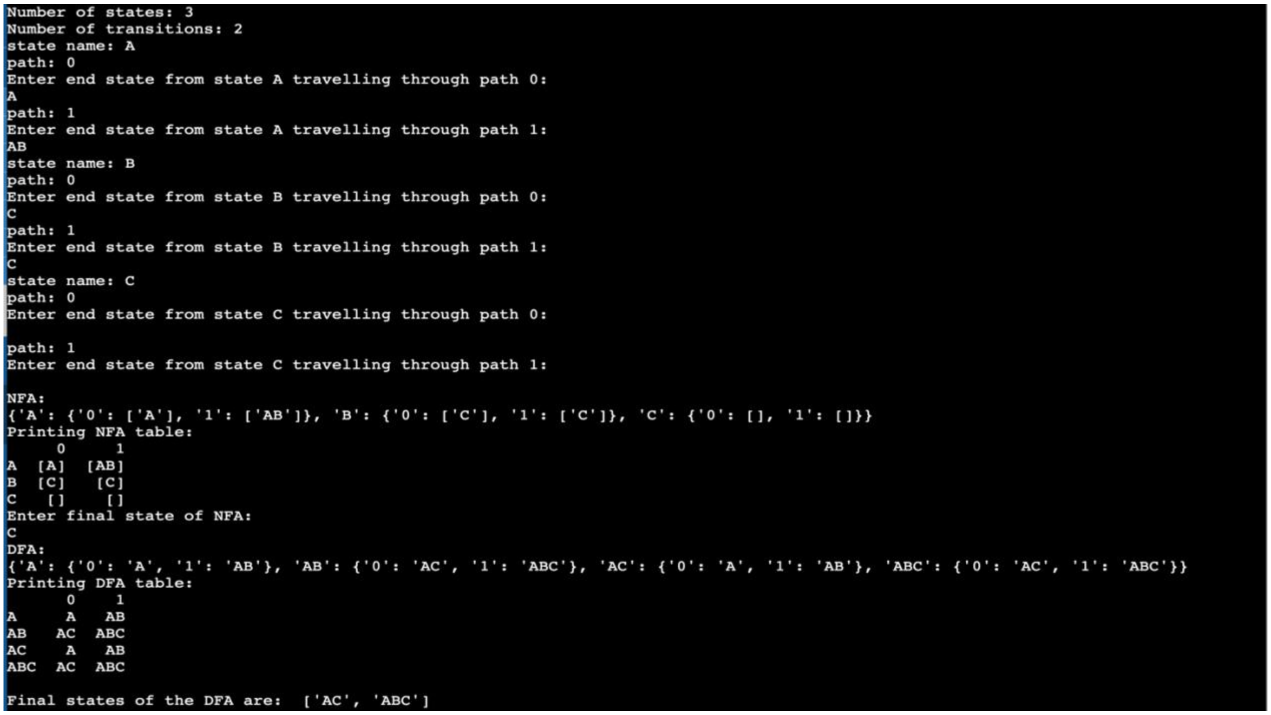
```
import pandas as pd


nfa = {}
```



```python
n = int(input("Number of states: "))
t = int(input("Number of transitions: "))
for i in range(n):
    state = input("state name: ")
    nfa[state] = {}
    for j in range(t):
        path = input("path: ")
        print("Enter end state from state {} travelling through path {}: ".format(
            state, path))
        reaching_state = [x for x in input().split()]
        nfa[state][path] = reaching_state

print("NFA: ")
print(nfa)
print("Printing NFA table: ")
nfa_table = pd.DataFrame(nfa)
print(nfa_table.transpose())

print("Enter final state of NFA: ")
nfa_final_state = [x for x in input().split()]

new_states_list = []

dfa = {}
keys_list = list(
    list(nfa.keys())[0])
path_list = list(nfa[keys_list[0]].keys())

dfa[keys_list[0]] = {}
for y in range(t):
    var = "".join(nfa[keys_list[0]][
        path_list[y]])
    dfa[keys_list[0]][path_list[y]] = var
    if var not in keys_list:
        new_states_list.append(var)
        keys_list.append(var)
```

```
while len(new_states_list) != 0:
    dfa[new_states_list[0]] = {}
    for _ in range(len(new_states_list[0])):
        for i in range(len(path_list)):
            temp = []
            for j in range(len(new_states_list[0])):
                temp += nfa[new_states_list[0][j]][path_list[i]]
            s = ""
            s = s.join(temp)
            if s not in keys_list:
                new_states_list.append(s)
                keys_list.append(s)
            dfa[new_states_list[0]][path_list[i]] = s

    new_states_list.remove(new_states_list[0])

print("DFA: ")
print(dfa)
print("Printing DFA table: ")
dfa_table = pd.DataFrame(dfa)
print(dfa_table.transpose())

dfa_states_list = list(dfa.keys())
dfa_final_states = []
for x in dfa_states_list:
    for i in x:
        if i in nfa_final_state:
            dfa_final_states.append(x)
            break

print("\nFinal states of the DFA are: ", dfa_final_states)
```

**OUTPUT :**



```
Number of states: 3
Number of transitions: 2
state name: A
path: 0
Enter end state from state A travelling through path 0:
A
path: 1
Enter end state from state A travelling through path 1:
AB
state name: B
path: 0
Enter end state from state B travelling through path 0:
C
path: 1
Enter end state from state B travelling through path 1:
C
state name: C
path: 0
Enter end state from state C travelling through path 0:

path: 1
Enter end state from state C travelling through path 1:

NFA:
{'A': {'0': ['A'], '1': ['AB']}, 'B': {'0': ['C'], '1': ['C']}, 'C': {'0': [], '1': []}}
Printing NFA table:
     0     1
A  [A]  [AB]
B  [C]   [C]
C   []    []
Enter final state of NFA:
C
DFA:
{'A': {'0': 'A', '1': 'AB'}, 'AB': {'0': 'AC', '1': 'ABC'}, 'AC': {'0': 'A', '1': 'AB'}, 'ABC': {'0': 'AC', '1': 'ABC'}}
Printing DFA table:
      0    1
A     A   AB
AB   AC  ABC
AC    A   AB
ABC  AC  ABC

Final states of the DFA are:  ['AC', 'ABC']
```

**RESULT :**

The given NFA was converted to a DFA using python successfully.