



IUBAT – International University of Business Agriculture and Technology

Assignment No: 1

Title of Assignment:

DFA for string pattern ab^*cb^* and

Implementation of DFA in C program for the string pattern ab^*cb^*

Course Name: Theory of Computation

Course Code: CSC 397

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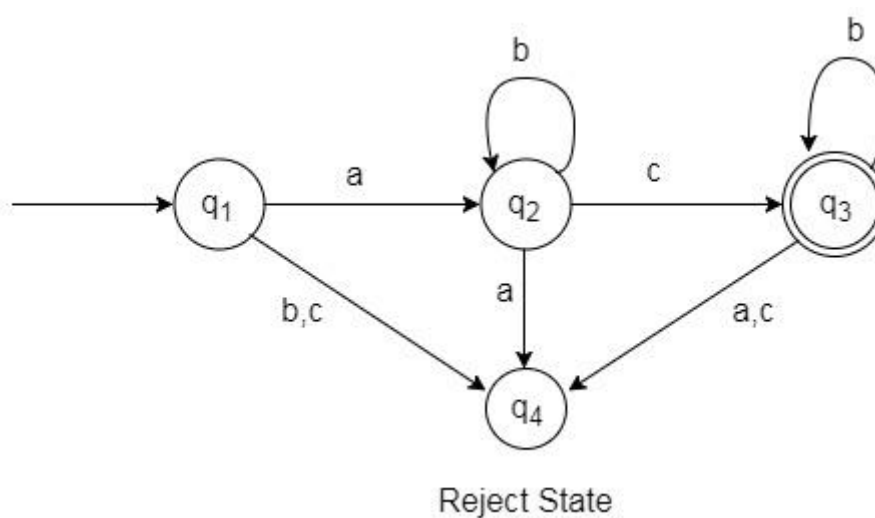
Formal definition of Deterministic finite automaton (DFA)

A Deterministic finite automaton M is a 5-tuple $(Q, \Sigma, \delta, q_0, F)$ where

1. Q is a finite set of states called the states,
2. Σ is a finite set of input symbols called the alphabet,
3. $\delta: Q \times \Sigma \rightarrow Q$ is the transition function
4. $q_0 \in Q$ is the start state, and
5. $F \subseteq Q$ is the set of accept states.

DFA for the string pattern ab^*cb^*

Complete State Diagram:



Here,

1. $Q = \{q_1, q_2, q_3, q_4\}$
2. $\Sigma = \{a, b, c\}$
 $\Sigma^* = \{ac, abc, acb, abcb, abbcbb, abbbcbbb, abcbbb, abbbcb, \dots\}$
3. $q_0 = q_1 \in Q$
4. $F = \{q_3\} \subseteq Q$

Transition Table:

CurrentStates \ Input> ↓	A	b	c
q ₁	q ₂	q ₄	q ₄
q ₂	q ₄	q ₂	q ₃
q ₃	q ₄	q ₃	q ₄

Implementation using C program:

```
#include<stdio.h>
#define EOS '\0'
int main()
{
    char c, inpstr[50];
    int i, q;
    printf("Enter String: ");
    scanf("%s",inpstr);
    q=1;
    i=0;
    c=inpstr[i];
    printf("\n");
    printf("%s ", inpstr);
    while(c!=EOS)
    {
        if(q==1 && c=='a')
        {
            q=2;
        }
        else if(q==2 && c=='b')
        {
            q=2;
        }
        else if(q==2 && c=='c')
        {
            q=3;
        }
        else if(q==3 && c=='b')
        {
            q=3;
        }
        else
        {
            q=4;
            break;
        }

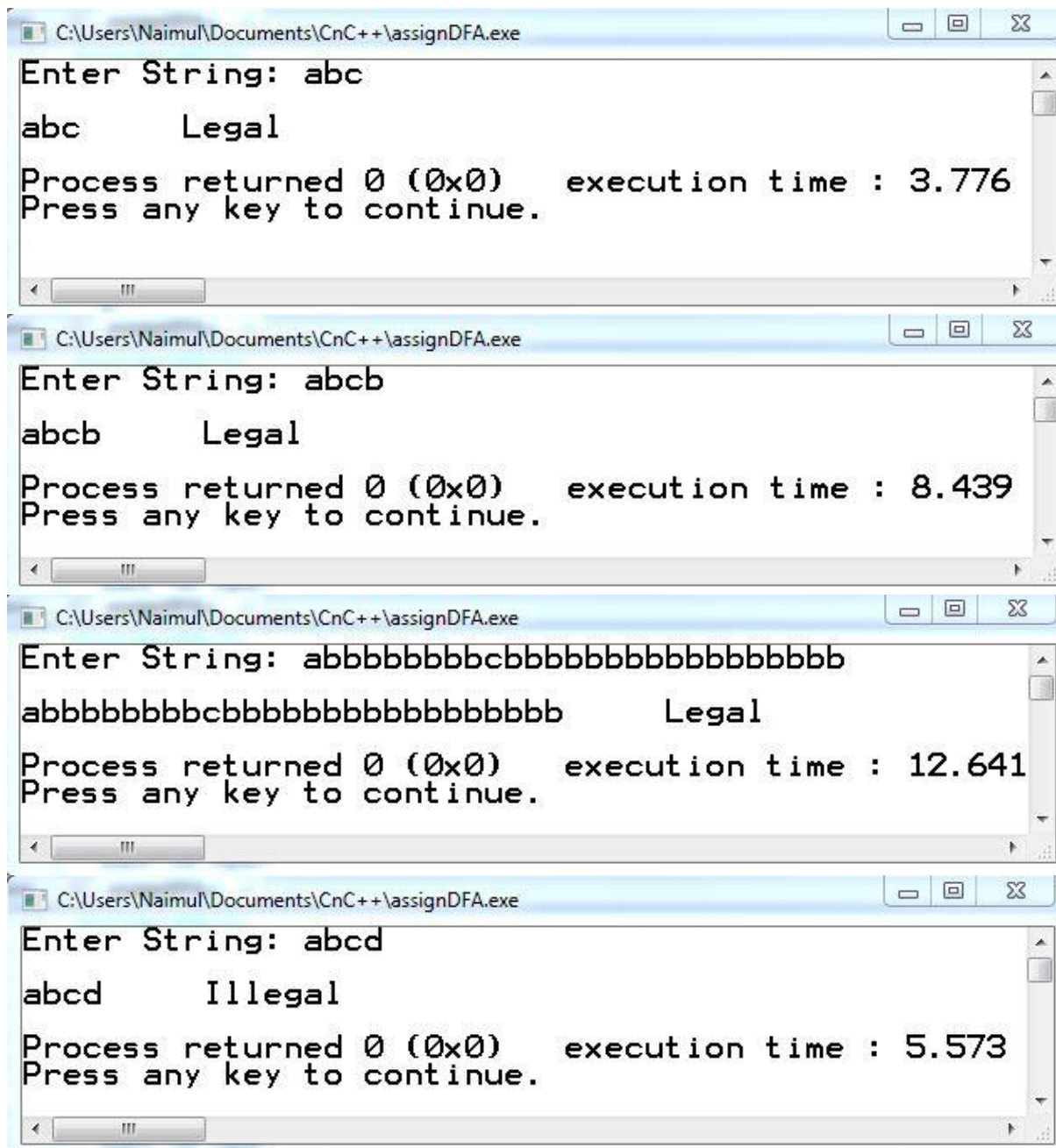
        i++;
        c=inpstr[i];
    }

    if(q==4)
        printf(" Illegal");
    else
        printf(" Legal");

    printf("\n");

    return 0;
}
```

Specimen Input with Results:



Conclusion:

In DFA, for each input symbol, one can determine the state to which the machine will move. Hence, it is called Deterministic Automaton. As it has a finite number of states, the machine is called Deterministic Finite Machine or Deterministic Finite Automaton.