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Lab Report

CSE 2206

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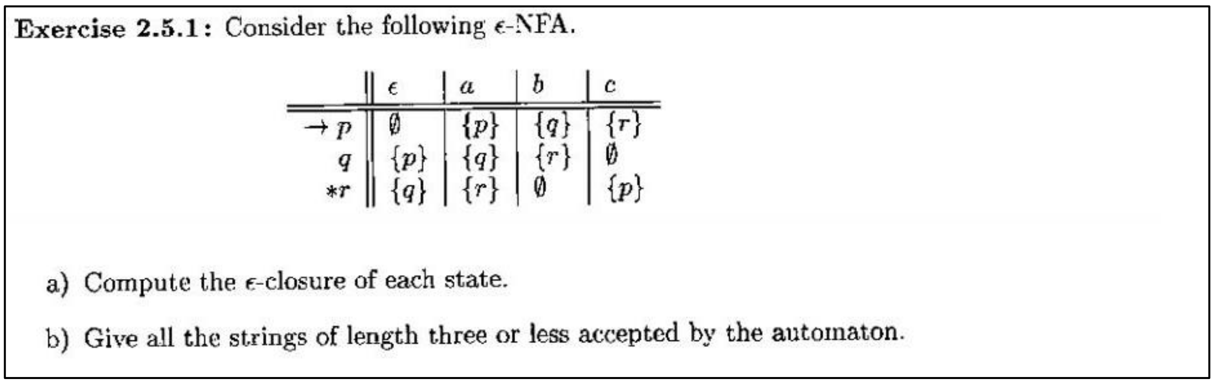
ROLL: 1603007
SECTION: A

Theory:

We extend the class of NFAs by allowing instantaneous (ε) transitions:
1. The automaton may be allowed to change its state without reading the input symbol.
2. In diagrams, such transitions are depicted by labeling the appropriate arcs with ε.
3. Note that this does not mean that ε has become an input symbol. On the contrary, we assume that *the symbol ε does not belong to any alphabet.*

ε -NFAs add a convenient feature but (in a sense) they bring us nothing new: they do not extend the class of languages that can be represented. Both NFAs and ε-NFAs recognize exactly the same languages.
ε-transitions are a convenient feature: try to design an NFA for the even or divisible by 3 language that does not use them!



Exercise 2.5.1: Consider the following ϵ-NFA.

	ϵ	a	b	c
$\rightarrow p$	$\emptyset$	$\{p\}$	$\{q\}$	$\{r\}$
q	$\{p\}$	$\{q\}$	$\{r\}$	$\emptyset$
$*r$	$\{q\}$	$\{r\}$	$\emptyset$	$\{p\}$

a) Compute the ϵ-closure of each state.

b) Give all the strings of length three or less accepted by the automaton.

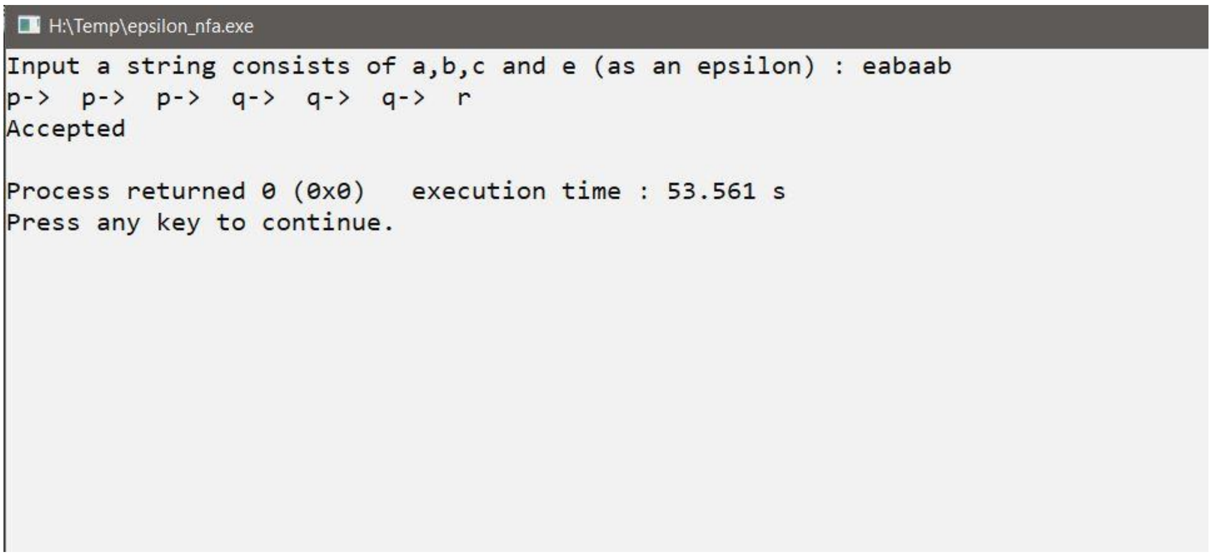
Code:

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
   string s;
   cout<<"Input a string consists of a,b,c and e (as an epsilon) : ";
   cin>>s;
   int flag=0,i,m;
   int l=s.size();
   vector<int>v;
   int c=0;
   v.push_back(0);

   for( i=0; i<l; i++)
   {
         if(s[i]=='a'&&c==0)
         {
            v.push_back(0);
         }
         else if(s[i]=='b'&&c==0)
         {
            v.push_back(1);
```

```
    c=1;

  }
      else if(s[i]=='c'&&c==0)
  {
    v.push_back(2);
    c=2;
    flag=1;
  }
   else if(s[i]=='e'&&c==0)
  {
    v.push_back(0);

  }

  else if(s[i]=='a'&&c==1)
  {
    v.push_back(1);

  }
  else if(s[i]=='b'&&c==1)
  {
    v.push_back(2);
    c=2;
    flag=1;
  }

      else if(s[i]=='e'&&c==1)
  {
    v.push_back(1);
    c=0;
  }




  else if(s[i]=='a'&&c==2)
  {
    v.push_back(2);

  }
      else if(s[i]=='e'&&c==2)
  {
    v.push_back(1);
    c=1;
  }
  else if(s[i]=='c'&&c==2)
  {
    v.push_back(0);
    c=0;
  }
```

```
    }
  m=v.size();

   for(i=0;i<m;i++)
   {
      if(v[i]==0)
        cout<<"p->";
        else if(v[i]==1)
        cout<<"q->";
        else if(v[i]==2)
           cout<<"r->";
   }
  cout<<endl;

  if(flag==1)
     cout<<"Accepted"<<endl;
  else
     cout<<"Not Accepted"<<endl;

  return 0;

}
```

Input & Output:



H:\Temp\epsilon_nfa.exe

```
Input a string consists of a,b,c and e (as an epsilon) : eabaab
p->  p->  p->  q->  q->  q->  r
Accepted

Process returned 0 (0x0)   execution time : 53.561 s
Press any key to continue.
```