**CSA1322**

**THEORY OF COMPUTATION**

**PRACTICAL SESSION**

**1. To write a C program to simulate a Deterministic Finite Automata**

**PROGRAM:**

#include<stdio.h>

#include<string.h>

#define max 20

int main()

{

int trans\_table[4][2]={{1,3},{1,2},{1,2},{3,3}};

int final\_state=2,i;

int present\_state=0;

int next\_state=0;

int invalid=0;

char input\_string[max];

printf("Enter a string:");

scanf("%s",input\_string);

int l=strlen(input\_string);

for(i=0;i<l;i++)

{

if(input\_string[i]=='a')

next\_state=trans\_table[present\_state][0];

else if(input\_string[i]=='b')

next\_state=trans\_table[present\_state][1];

invalid=l;

present\_state=next\_state;

}

if(invalid==l)

{

printf("Invalid input");

}

else if(present\_state==final\_state)

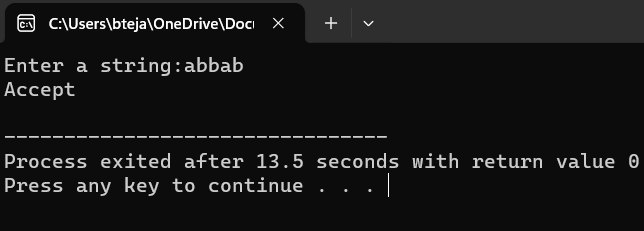
printf("Accept\n");

else

printf("Don't Accept\n");

}

**OUTPUT:**

****

**2. To write a C program to simulate a Non-Deterministic Finite Automata.**

**PROGRAM:**

#include<stdio.h>

#include<string.h>

#include<stdlib.h>

int main()

{

int i,j,k,l,m,next\_state[20],n,mat[10][10][10],flag,p;

int num\_states,final\_state[5],num\_symbols,num\_final;

int present\_state[20],prev\_trans,new\_trans;

char ch,input[20];

int symbol[5],inp,inp1;

printf("How many states in the NFA : ");

scanf("%d",&num\_states);

printf("How many symbols in the input alphabet : ");

scanf("%d",&num\_symbols);

for(i=0;i<num\_symbols;i++)

{

printf("Enter the input symbol %d : ",i+1);

scanf("%d",&symbol[i]);

}

printf("How many final states : ");

scanf("%d",&num\_final);

for(i=0;i<num\_final;i++)

{

printf("Enter the final state %d : ",i+1);

scanf("%d",&final\_state[i]);

}

//Initialize all entries with -1 in Transition table

for(i=0;i<10;i++)

{

for(j=0;j<10;j++)

{

for(k=0;k<10;k++)

{

mat[i][j][k]=-1;

}

}

}

//Get input from the user and fill the 3D transition table

for(i=0;i<num\_states;i++)

{

for(j=0;j<num\_symbols;j++)

{

printf("How many transitions from state %d for the input %d:",i,symbol[j]);

scanf("%d",&n);

for(k=0;k<n;k++)

{

printf("Enter the transition %d from state %d for the input %d:",k+1,i,symbol[j]);

scanf("%d",&mat[i][j][k]);

}

}

}

printf("The transitions are stored as shown below\n");

for(i=0;i<10;i++)

{

for(j=0;j<10;j++)

{

for(k=0;k<10;k++)

{

if(mat[i][j][k]!=-1)

printf("mat[%d][%d][%d] = %d\n",i,j,k,mat[i][j][k]);

}

}

}

while(1)

{

printf("Enter the input string : ");

scanf("%s",input);

present\_state[0]=0;

prev\_trans=1;

l=strlen(input);

for(i=0;i<l;i++)

{

if(input[i]=='0')

inp1=0;

else if(input[i]=='1')

inp1=1;

else

{

printf("Invalid input\n");

exit(0);

}

for(m=0;m<num\_symbols;m++)

{

if(inp1==symbol[m])

{

inp=m;

break;

}

}

new\_trans=0;

for(j=0;j<prev\_trans;j++)

{

k=0;

p=present\_state[j];

while(mat[p][inp][k]!=-1)

{

next\_state[new\_trans++]=mat[p][inp][k];

k++;

}

}

for(j=0;j<new\_trans;j++)

{

present\_state[j]=next\_state[j];

}

prev\_trans=new\_trans;

}

flag=0;

for(i=0;i<prev\_trans;i++)

{

for(j=0;j<num\_final;j++)

{

if(present\_state[i]==final\_state[j])

{

flag=1;

break;

}

}

}

if(flag==1)

printf("Acepted\n");

else

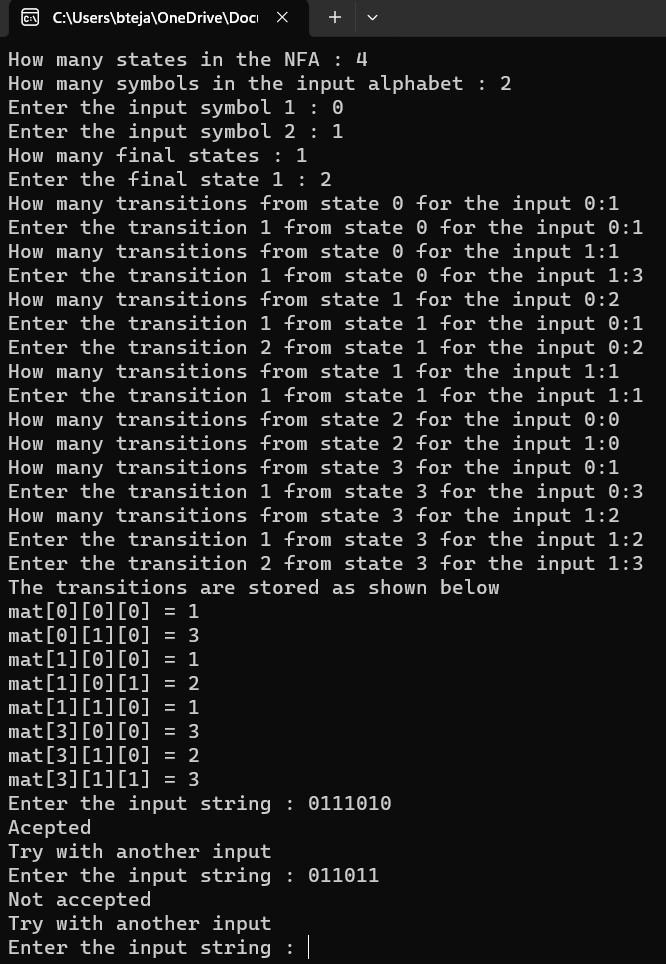
printf("Not accepted\n");

printf("Try with another input\n");

}

}

**OUTPUT:**

****

**3. To write a C program to find ε-closure of a Non-Deterministic Finite Automata with ε-moves**

**PROGRAM:**

#include<stdio.h>

#include<string.h>

int trans\_table[10][5][3];

char symbol[5],a;

int e\_closure[10][10],ptr,state;

void find\_e\_closure(int x);

int main()

{

int i,j,k,n,num\_states,num\_symbols;

for(i=0;i<10;i++)

{

for(j=0;j<5;j++)

{

for(k=0;k<3;k++)

{

trans\_table[i][j][k]=-1;

}

}

}

printf("How may states in the NFA with e-moves:");

scanf("%d",&num\_states);

printf("How many symbols in the input alphabet including e :");

scanf("%d",&num\_symbols);

printf("Enter the symbols without space. Give 'e' first:");

scanf("%s",symbol);

for(i=0;i<num\_states;i++)

{

for(j=0;j<num\_symbols;j++)

{

printf("How many transitions from state %d for the input %c:",i,symbol[j]);

scanf("%d",&n);

for(k=0;k<n;k++)

{

printf("Enter the transitions %d from state %d for the input %c :", k+1,i,symbol[j]);

scanf("%d",&trans\_table[i][j][k]);

}

}

}

for(i=0;i<10;i++)

{

for(j=0;j<10;j++)

{

e\_closure[i][j]=-1;

}

}

for(i=0;i<num\_states;i++)

e\_closure[i][0]=i;

for(i=0;i<num\_states;i++)

{

if(trans\_table[i][0][0]==-1)

continue;

else

{

state=i;

ptr=1;

find\_e\_closure(i);

}

}

for(i=0;i<num\_states;i++)

{

printf("e-closure(%d)= {",i);

for(j=0;j<num\_states;j++)

{

if(e\_closure[i][j]!=-1)

{

printf("%d, ",e\_closure[i][j]);

}

}

printf("}\n");

}

}

void find\_e\_closure(int x)

{

int i,j,y[10],num\_trans;

i=0;

while(trans\_table[x][0][i]!=-1)

{

y[i]=trans\_table[x][0][i];

i=i+1;

}

num\_trans=i;

for(j=0;j<num\_trans;j++)

{

e\_closure[state][ptr]=y[j];

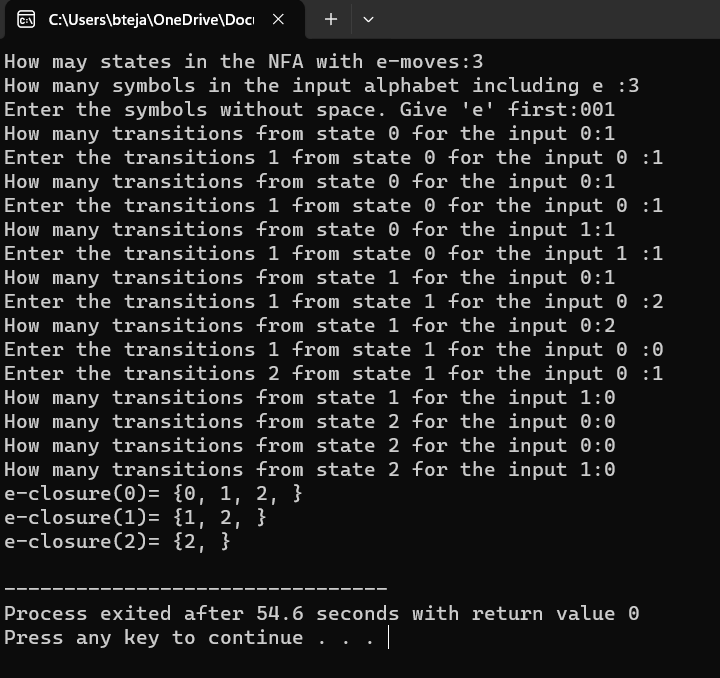
ptr++;

find\_e\_closure(y[j]);

}

}

**OUTPUT:**

****

**4. CHECKING WHETHER A STRING BELONGS TO A GRAMMAR**

**4(a). To write a C program to check whether a string belongs to the grammar**

**S → 0 A 1**

**A → 0 A | 1 A | ε**

**PROGRAM:**

#include<stdio.h>

#include<string.h>

int main(){

char s[100];

int i,flag;

int l;

printf("enter a string to check:");

scanf("%s",s);

l=strlen(s);

flag=1;

for(i=0;i<l;i++)

{

if(s[i]!='0' && s[i]!='1')

{

flag=0;

}

}

if(flag!=1)

printf("string is Not Valid\n");

if(flag==1)

{

if (s[0]=='0'&&s[l-1]=='1')

printf("string is accepted\n");

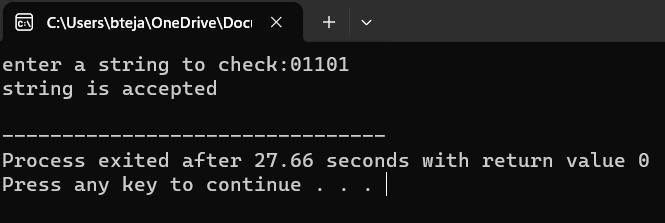
else

printf("string is Not accepted\n");

}

}

**OUTPUT:**

****

**4(b). To write a C program to check whether a string belongs to the grammar**

**S -> 0 S 0 | 1 S 1 | 0 | 1 | ε**

**PROGRAM:**

#include<stdio.h>

#include<string.h>

int main()

{

char s[100];

int i,flag,flag1,a,b;

int l;

printf("enter a string to check:");

scanf("%s",s);

l=strlen(s);

flag=1;

for(i=0;i<l;i++)

{

if(s[i]!='0' && s[i]!='1')

{

flag=0;

}

}

if(flag!=1)

printf("string is Not Valid\n");

if(flag==1)

{

flag1=1;

a=0;b=l-1;

while(a!=(l/2))

{

if(s[a]!=s[b])

{

flag1=0;

}

a=a+1;

b=b-1;

}

if (flag1==1)

{

printf("The string is a palindrome\n");

printf("string is accepted\n");

}

else

{

printf("The string is not a palindrome\n");

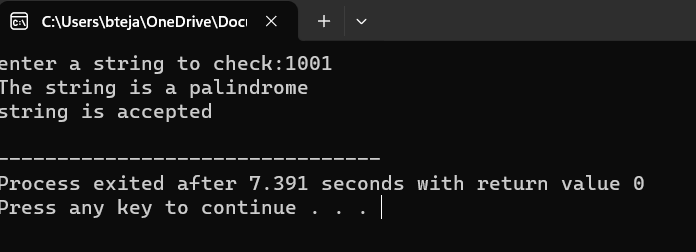
printf("string is Not accepted\n");

}

}

}

**OUTPUT:**

****