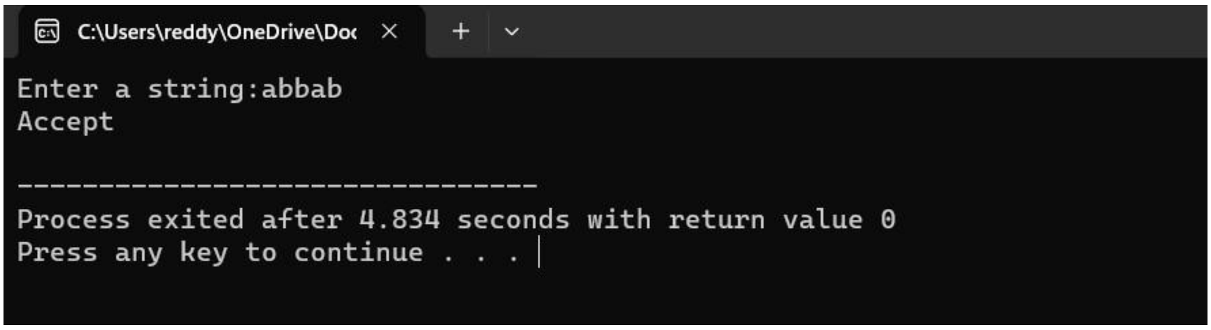
1. DETERMINISTIC FINITE AUTOMATA (DFA)

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];
else
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:



```
Enter a string:abbab
Accept

--------------------------------
Process exited after 4.834 seconds with return value 0
Press any key to continue . . .
```

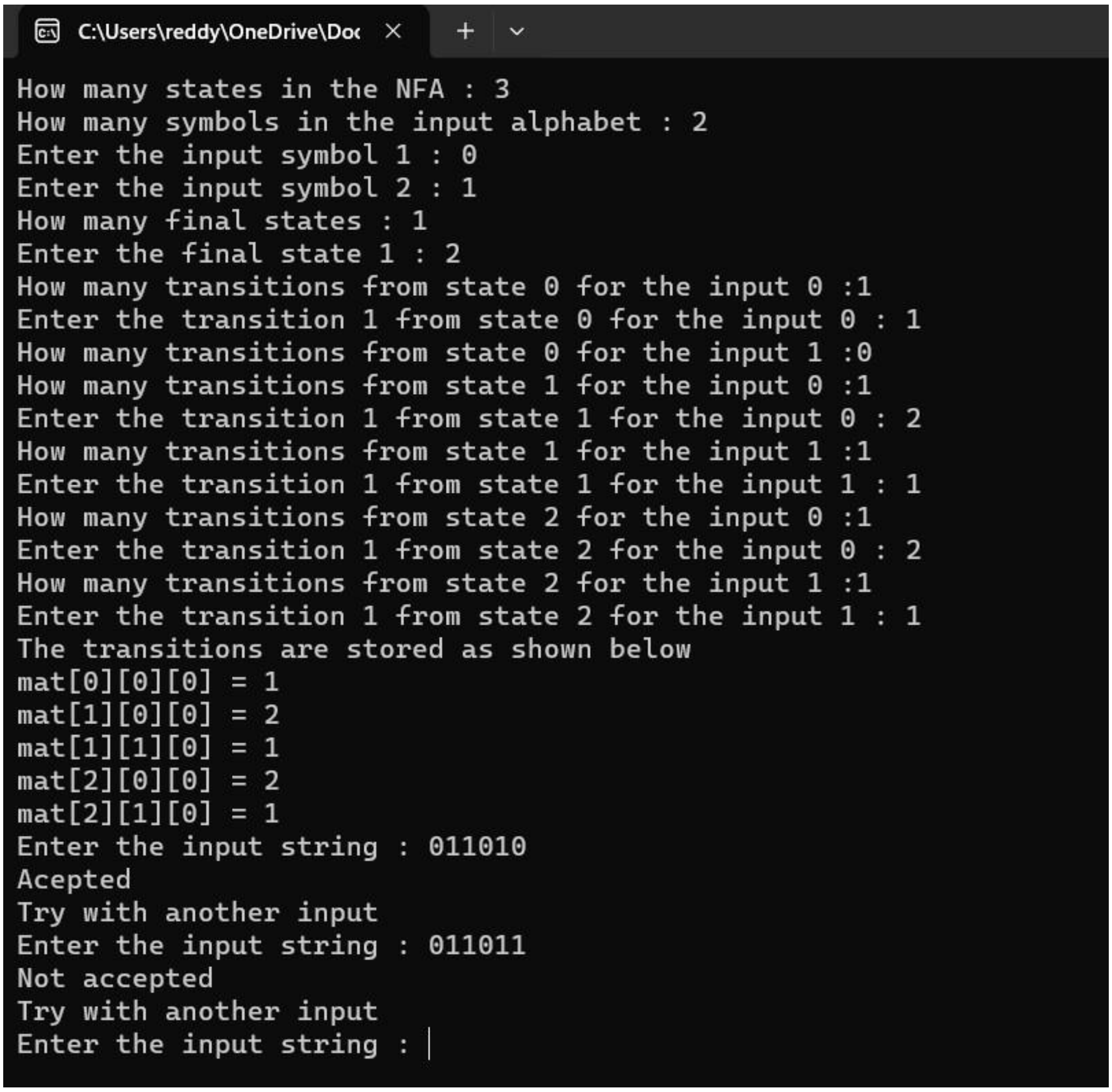
2. NON-DETERMINISTIC FINITE AUTOMATA (NFA)

PROGRAM:

```
#include<stdio.h>
#include<string.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:



```
How many states in the NFA : 3
How many symbols in the input alphabet : 2
Enter the input symbol 1 : 0
Enter the input symbol 2 : 1
How many final states : 1
Enter the final state 1 : 2
How many transitions from state 0 for the input 0 :1
Enter the transition 1 from state 0 for the input 0 : 1
How many transitions from state 0 for the input 1 :0
How many transitions from state 1 for the input 0 :1
Enter the transition 1 from state 1 for the input 0 : 2
How many transitions from state 1 for the input 1 :1
Enter the transition 1 from state 1 for the input 1 : 1
How many transitions from state 2 for the input 0 :1
Enter the transition 1 from state 2 for the input 0 : 2
How many transitions from state 2 for the input 1 :1
Enter the transition 1 from state 2 for the input 1 : 1
The transitions are stored as shown below
mat[0][0][0] = 1
mat[1][0][0] = 2
mat[1][1][0] = 1
mat[2][0][0] = 2
mat[2][1][0] = 1
Enter the input string : 011010
Acepted
Try with another input
Enter the input string : 011011
Not accepted
Try with another input
Enter the input string :
```

3. FINDING ε-CLOSURE FOR NFA WITH ε-MOVES

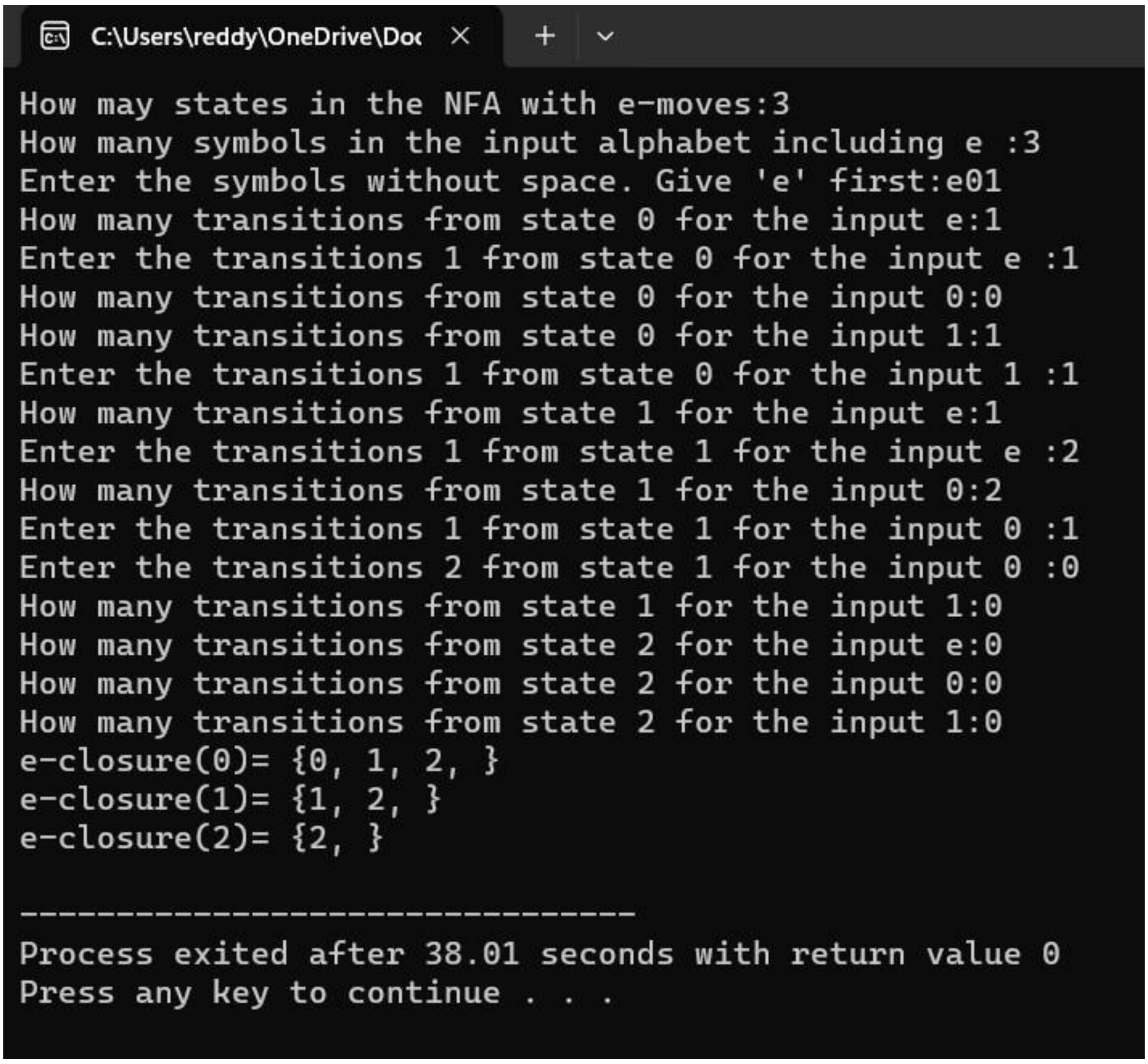
PROGRAM:

```
#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:



C:\Users\reddy\OneDrive\Doc

```
How may states in the NFA with e-moves:3
How many symbols in the input alphabet including e :3
Enter the symbols without space. Give 'e' first:e01
How many transitions from state 0 for the input e:1
Enter the transitions 1 from state 0 for the input e :1
How many transitions from state 0 for the input 0:0
How many transitions from state 0 for the input 1:1
Enter the transitions 1 from state 0 for the input 1 :1
How many transitions from state 1 for the input e:1
Enter the transitions 1 from state 1 for the input e :2
How many transitions from state 1 for the input 0:2
Enter the transitions 1 from state 1 for the input 0 :1
Enter the transitions 2 from state 1 for the input 0 :0
How many transitions from state 1 for the input 1:0
How many transitions from state 2 for the input e:0
How many transitions from state 2 for the input 0:0
How many transitions from state 2 for the input 1:0
e-closure(0)= {0, 1, 2, }
e-closure(1)= {1, 2, }
e-closure(2)= {2, }

--------------------------------
Process exited after 38.01 seconds with return value 0
Press any key to continue . . .
```

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

$S \rightarrow 0\ A\ 1$
$A \rightarrow 0\ A \mid 1\ A \mid \varepsilon$

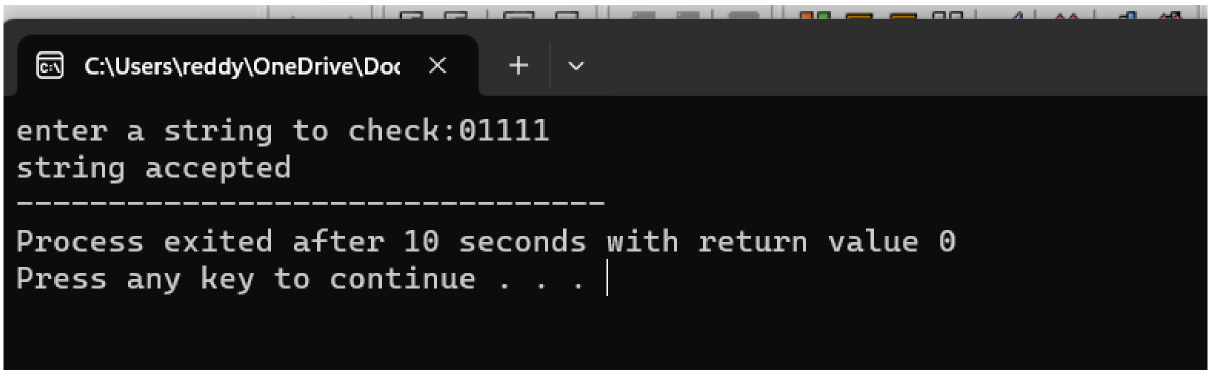
PROGRAM:

```
#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:



C:\Users\reddy\OneDrive\Doc

```
enter a string to check:01111
string accepted
--------------------------------
Process exited after 10 seconds with return value 0
Press any key to continue . . .
```

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

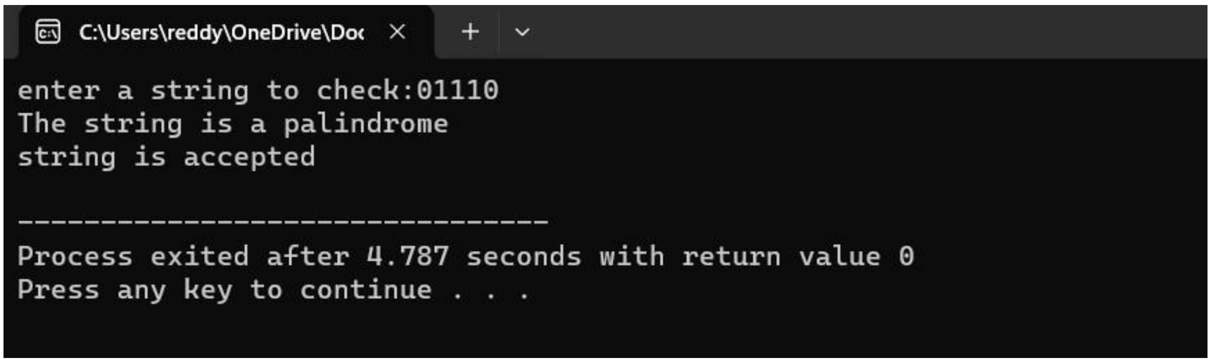
S -> 0 S 0 | 1 S 1 | 0 | 1 | ε

Program:

```
#include<stdio.h>
#include<string.h>
void 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:



```
enter a string to check:01110
The string is a palindrome
string is accepted

--------------------------------
Process exited after 4.787 seconds with return value 0
Press any key to continue . . .
```