COMPILER LAB

CEN-792

SUBMITTED TO

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DFA (String Acceptance)

```
#include<stdio.h>

#include<string.h>

#include<stdlib.h>


        FILE *fp;

        char s[50],ch;

        int
n,i=0,k=0,j=0,init,final[10],n_final,tab[100][100],newstate,count=0,row=-1,col=0;

int column_no(char c)

{

        switch(c)

        {

                case 'a':

                return 0;

                case 'b':

                return 1;

                case 'c':

                return 2;

                case 'd':

                return 3;

                case 'e':
```

```
                return 4;

                case 'f':

                return 5;

                case 'g':

                return 6;

        }

}

void Read_Automaton()

{

        fp=fopen("dfa.txt","r");


        if(!fp)

        {

                        printf("Cannot open the file\n");

                return ;

        }


        ch=fgetc(fp);


        init=ch-'0';


        while(!feof(fp))
```

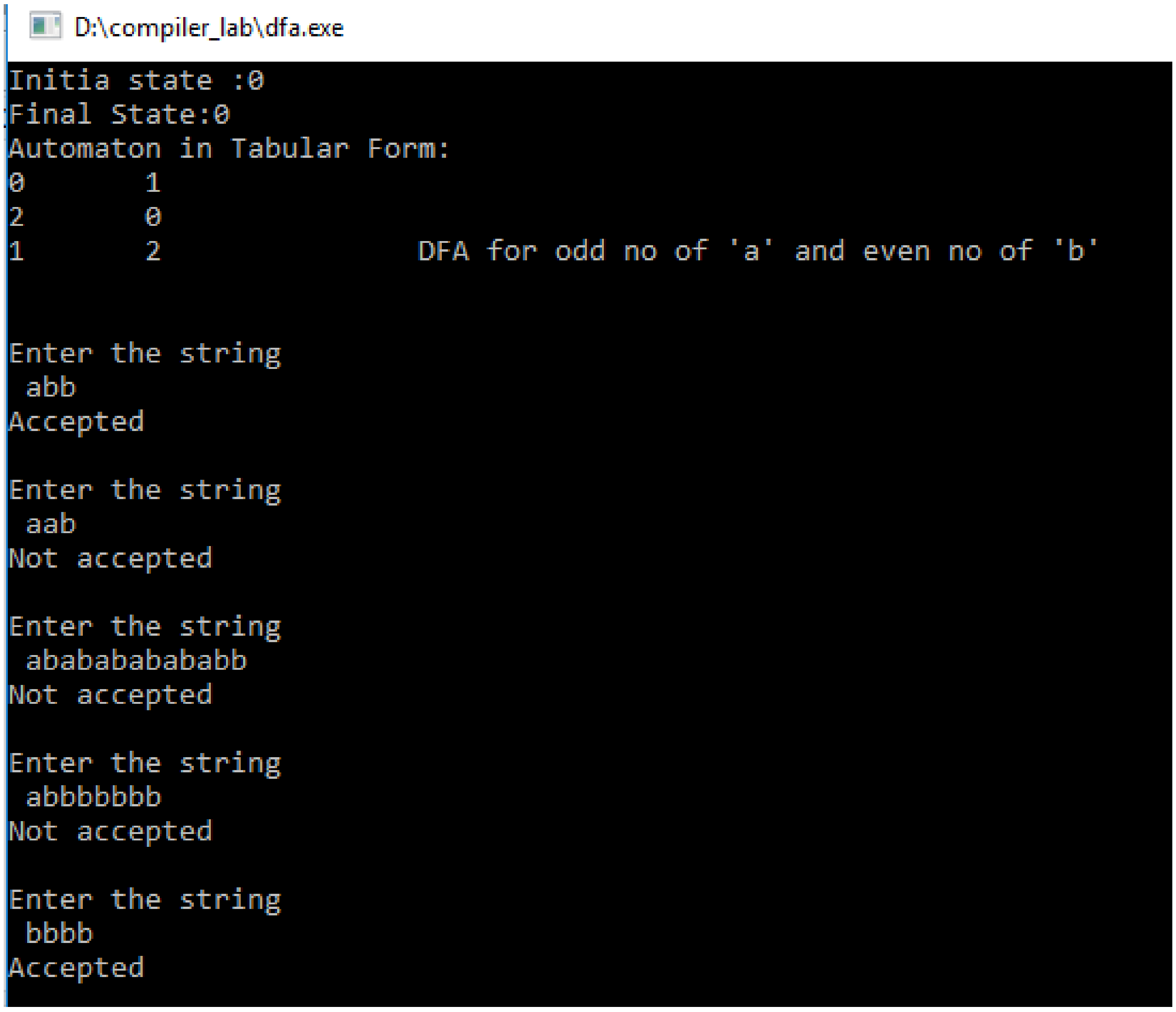
```
{
    ch=fgetc(fp);

    if(ch=='\n')
    {
        count++;
    }

    else if(count == 1 && (ch>='0' && ch<='9') )
    {
        final[i]=ch-'0';
        i++;
    }
    if(count >= 2)
    {
            if(ch>='0' && ch<='9')
            {
                tab[row][col]=ch-'0';
                col++;
            }
            else if(ch=='\n')
            {
```

```
                                        col=0;

                                        row++;

                                }

                        }

                }

                        n_final=i;

////////////////////////////////////////////////////////////////////


                        //Print

                printf("Initia state :%d\n",init);


                printf("Final State:");

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

                printf("%d ",final[j]);


                printf("\nAutomaton in Tabular Form:");

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

                {

                                printf("\n");

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

                                {

                                printf("%d\t",tab[i][j]);
```

```
                    }
            }
    }
    int main()
    {

            Read_Automaton();

            while(1)
            {
                    a20:
                    printf("\nEnter the string");
                    scanf("%s",s);
                    if(strlen(s)>49)
                    {
                    printf("string size should be less than 50\n");
                    return 0;
                    }
                    newstate=init;
                    j=0;
                    while(s[j]!='\0')
                    {
```

```
                if(s[j]>='a' && s[j]<='z')
                {
                        i=column_no(s[j]);
                        if(i>col-1)
                        {
                                printf("Not accepted\n");
                                goto a20;
                        }
                        newstate=tab[newstate][i];
                        if(newstate==-1)
                        {
                                printf("Not accepted\n");
                                goto a20;
                        }
                }
                else
                {
                        printf("Enter string in the form of
letters\n");
                        goto a20;
                }
        j++;
```

```
                    }


                    for(i=0;i<n_final;i++)
                    {
                        if(newstate == final[i])
                        {
                            printf("Accepted\n");
                            goto a20;
                        }
                    }
                        printf("Not accepted\n");
                        goto a20;
            }


        }
```


D:\compiler_lab\dfa.exe

```
Initia state :0
Final State:0
Automaton in Tabular Form:
0       1
2       0
1       2               DFA for odd no of 'a' and even no of 'b'


Enter the string
 abb
Accepted

Enter the string
 aab
Not accepted

Enter the string
 abababababab b
Not accepted

Enter the string
 abbbbbbb
Not accepted

Enter the string
 bbbb
Accepted
```

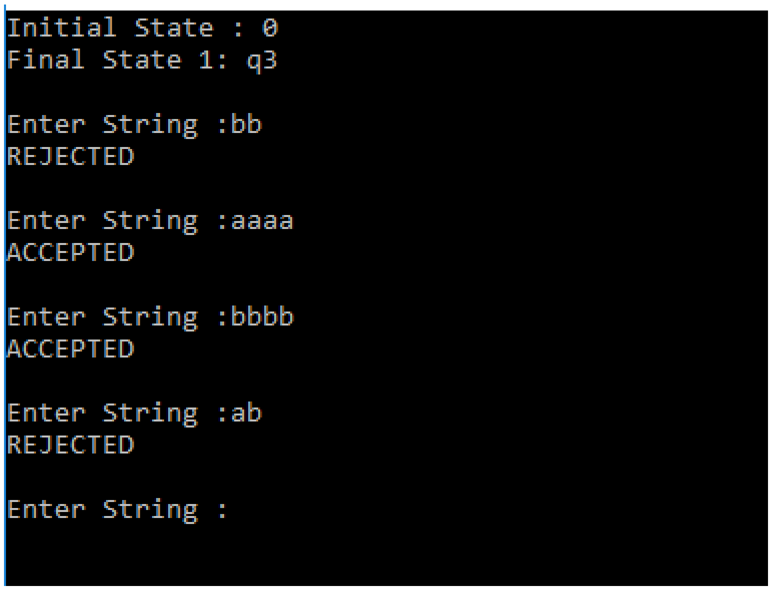
2. NFA (String acceptance or not using nfa)

```
#include<stdio.h>

#include<string.h>

#include<stdlib.h>

int main()

{

        char ch,str[100];

        int count,initial,final[5],k,curstate,flag,col=0;

        int i,j,l;

        int nfa[10][10][10];

        FILE *f;

        f=fopen("nfa.txt","r");

        if(f == NULL)

        {

                printf("Empty File ");

        }


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

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

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

   nfa[i][j][k]=-2;
```

```
          ch=getc(f);

          count=0;

          k=0;


      while(ch !=EOF )

          {   if(count==0 && ch!='\n')

             {

                   initial=ch-48;                    printf("Initial State : %d\n",initial);

             }

          if(ch=='\n')

          count++;

                   if(count==1)

                   {   ch=getc(f);

                            if(ch!=',')

                            {

                                     final[k]=ch-48;

                                     printf("Final State %d: q%d\n",k+1,final[k]);

                                     k++;    col++;}

   }

                   if(count==2)

                    break;
```

```
        ch=getc(f);
                    }
ch=getc(f);
i=0; j=0; k=0;
while(ch!=EOF)
{
    if(ch==',')
    {
        k++;    ch=getc(f);    nfa[i][j][k]=ch-48;
    }
    if(ch==' ')
    {  j++;     k=0;
    }
    if(ch=='\n')
    {
        j=0;     k=0;      i++;
    }
    if(ch=='-')
    {
        ch=getc(f);
                    nfa[i][j][k]=ch-48;
    nfa[i][j][k]= (-1)*nfa[i][j][k];

    }

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

    {

    nfa[i][j][k]=ch-48;

    }

    ch=getc(f);

}

fclose(f);

while(1)

      { curstate=initial;    flag=0;    printf("\nEnter String :");

      gets(str);

      for(i=0;i<strlen(str);i++)

      {

                  if(str[i]-97 > 1)

                  {

                              printf("Invalid String\n");

                              break;

                  }

                  if(nfa[curstate][str[i]-97][0]== -1 || nfa[curstate][str[i]-97][1]==-1)

                  {

                              printf("REJECTED.\n");
```

```
                        flag=-1;

                        break;

                }

                if(nfa[curstate][str[i]-97][0] >0 && nfa[curstate][str[i]-97][1] > 0 )

                {

                curstate=nfa[curstate][str[i]-97][1] || nfa[curstate][str[i]-97][0] ;

          }}

        if(flag!=-1)

        {

          if(curstate==final[i])

                        { printf("ACCEPTED\n");

                          flag=1;

                         // break;          }

        }

        if(flag==0)

        {

                printf("REJECTED\n");

        }

        }


}
```



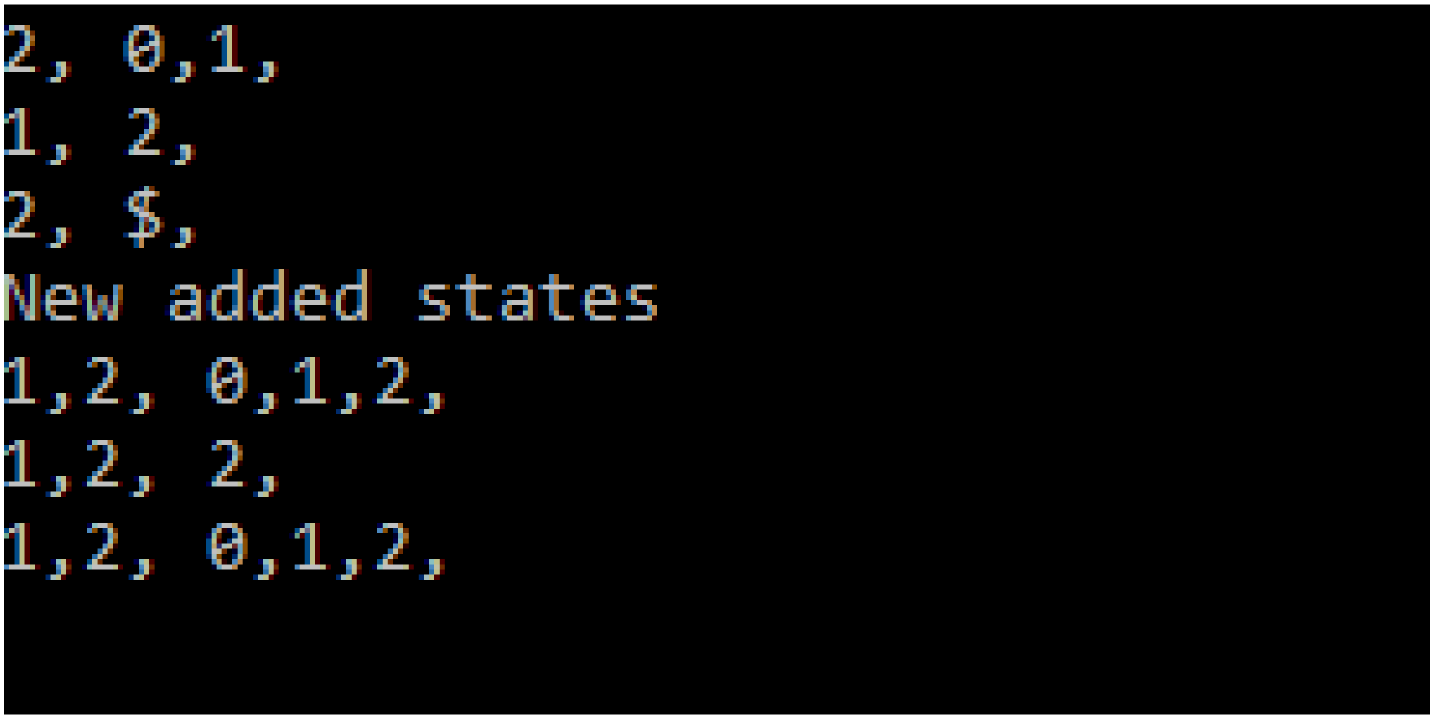
```
Initial State : 0
Final State 1: q3

Enter String :bb
REJECTED

Enter String :aaaa
ACCEPTED

Enter String :bbbb
ACCEPTED

Enter String :ab
REJECTED

Enter String :
```

3. NFA to DFA (Conversion)

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

char MY_NFA[10][10][10], MY_array[10][10],curstate,end[10];
int rm,cm,tm=0;
void _ad(int j)
{
	int l; int pt,k,t=0;
	int u[10];int fu[10];
	for(l=0;l<=rm-1;l++)
	{
		if(MY_array[tm-1][l]>='0'&&MY_array[tm-1][l]<='9')
		{
			pt=MY_array[tm-1][l]-48;
			for(k=0;k<=rm-1;k++)
			{
				if(MY_NFA[pt][j][k]>='0'&&MY_NFA[pt][j][k]<='9')
				{
					u[t]=MY_NFA[pt][j][k];
					t++;
				}}}}
	if(t==0)
		MY_NFA[rm][j][0]='$';
	 else if(t==1)
		MY_NFA[rm][j][0]=u[0];
	else
	{
		for(l=0;l<t;l++)
			for(pt=0;pt<t-1;pt++)
			{
				if(u[pt]>u[pt+1])
				{
					k=u[pt];
					u[pt]=u[pt+1];
					u[pt+1]=k;
			}				}
		pt=0;
		for(l=0;l<t;l++)
		{
			if(u[l+1]==u[l])
				continue;
```

```
                        fu[pt]=u[l];
                        pt++;

                    }
                    for(l=0;l<pt;l++)
                        MY_NFA[rm][j][l]=fu[l];
        }               }

int _chak(int i, int j)
{
        int l,k,flag=0;
        for(l=0;l<tm;l++)
        { flag=0;
                for(k=0;k<=rm;k++)
                {
                        if(MY_NFA[i][j][k]>='0'&&MY_NFA[i][j][k]<='9')
                                if(MY_array[l][k]==MY_NFA[i][j][k])
                                        flag=flag+1;

                }
                if(flag==countk(i,j))
                        break;
        }
        if(flag==0)
        return 1;
return 0;               }
void MY_arrayentry(int i,int j)
{       int l=0,k=0,p=0; char t;
        for(k=0;k<=rm;k++)
                if(MY_NFA[i][j][k]>='0'&&MY_NFA[i][j][k]<='9')
                {                       MY_array[tm][l]=MY_NFA[i][j][k];    l++;
                }
 tm=tm+1;       }
int countk(int i ,int j)
{       int k=0,count=0;
        for(k=0;k<=rm;k++)
        {

                        if(MY_NFA[i][j][k]>='0'&&MY_NFA[i][j][k]<='9')
                                count++;        }
                return count;}
int main()
{
        FILE *f;
        int i=0,j=0,k=0; int l; int orgcount=0,col, flag=0; int fcol=0; char ch;
        f=fopen("mynfa.txt","r");
        if(f==NULL)
        {
                printf("FILE NOT PRESENT\n");
                exit(0);
        }
        ch=fgetc(f);
        while(ch!=EOF)
        {
                if (flag==0)
                {       curstate=ch;    flag=2;}
                else if(flag==2)
                {       ch=fgetc(f);    end[i]=ch;      i++;    ch=fgetc(f);
                        while(ch!='\n')
                        {       if(ch!=',' && ch!=(char)13)
                                {
                                        end[i]=ch;      i++;    }
                                ch=fgetc(f);    }
        flag=3; fcol=i-1;               i=0;
                }
                else if(flag==3)
                {
                if(ch=='\n')
        {
                i++;    col=j;  j=0;    k=0;    }
        else if(ch==',')
        {       ch=getc(f);     MY_NFA[i][j][k]=ch;     k++;
        }
        else if(ch==' ')
        {
                j++;    k=0;    }
        else if(ch!=',' && ch!=' ')
        {
                if(ch=='$')
                {
                        MY_NFA[i][j][0]=ch;     }
                else
                {
                        MY_NFA[i][j][0]=ch;             k++;
                }       }       }
                ch=fgetc(f);            }
        rm=i;   orgcount=i;     cm=col;         flag=0;
    for(i=0;i<=rm;i++)
```

```
{           for(j=0;j<=col;j++)
            {           flag=0;
                        if(countk(i,j)>1)
                        {
                                    if(tm==0)
                                    {           MY_arrayentry(i,j);                           rm=rm+1;
                                                for(l=0;l<=col;l++)
                                                            _ad(l);  }
                                    else if(_chak(i,j))
                                    {           MY_arrayentry(i,j);               rm=rm+1;
                                                for(l=0;l<=col;l++)
                                                            _ad(l);  }
                                     else
                                     {          flag=1; break;
                                     }                              }           }
 if(flag==1)
            break;
}
 for(i=0;i<=rm;i++)
 {
            if(i==orgcount+1)
                        printf("New States\n");
            for(j=0;j<=col;j++)
            {                       for(l=0;l<=rm;l++)
                                    if(MY_NFA[i][j][l]!='\0')
                                                printf("%c,",MY_NFA[i][j][l]);
                                    printf(" ");        }    printf("\n");            } }
return 0;
```



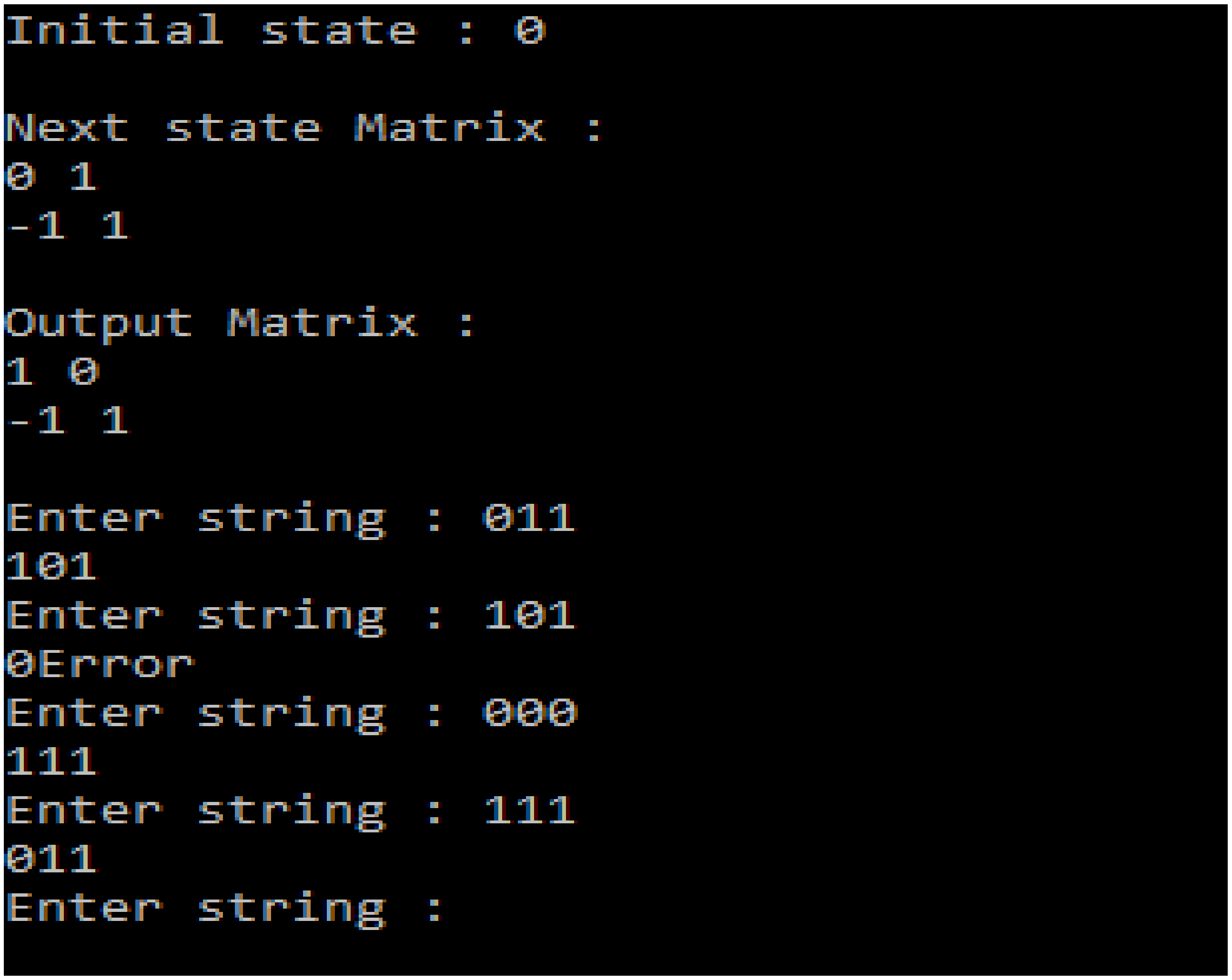
```
2, 0,1,
1, 2,
2, $,
New added states
1,2, 0,1,2,
1,2, 2,
1,2, 0,1,2,
```

4. **Mealy machine**

```
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int main()
{
        FILE *f;
        char ch,path[20];
        int i,j,_st[5][5],_o[5][5],initial_state,len,matrix[10][10],k,curstate;
        f=fopen("mealy.txt","r");
        if(f==NULL)
        {
                printf("Not a file ");
        }
        ch=getc(f);     initial_state=ch-48;
        printf("Initial state : %d\n",initial_state);
        ch=getc(f);
        //printf("%c",ch);
       i=0;        j=0;
        while(ch!=EOF)
        {
          if(ch==' ')     j++;
          if(ch=='\n')
          {     j=0;   i++;
           }
          if(j%2==0)
         {
                    if(ch=='-')
                          {       ch=getc(f);           _st[i][j]=ch-48;      _st[i][j]= (-1)* _st[i][j];
                          }
                   if(_st[i][j]!=-1)
                   _st[i][j]=ch-48;       }
          else
          {
                    if(ch=='-')
                          {       ch=getc(f);    _o[i][j]=ch-48;    _o[i][j]= (-1)* _o[i][j];
                          }
                   if(_o[i][j]!=-1)
                   _o[i][j]=ch-48;       }
           ch=getc(f);
        }
        fclose(f);
        while(1)
```

```
          {
                    scanf("%s",&path);                    len=strlen(path);          curstate=initial_state;
                    for(i=0;i<len;i++)
                    {
                              if(_st[curstate][path[i]-48]==-1)
          {         printf("Error");                                  break;
                              }
                              if(_st[curstate][path[i]-48]!=-1)
                              {
                              printf("%d",_o[curstate][path[i]-48]);
                                        curstate=_st[curstate][path[i]-48];
                                        } }}}
```

OUTPUT :

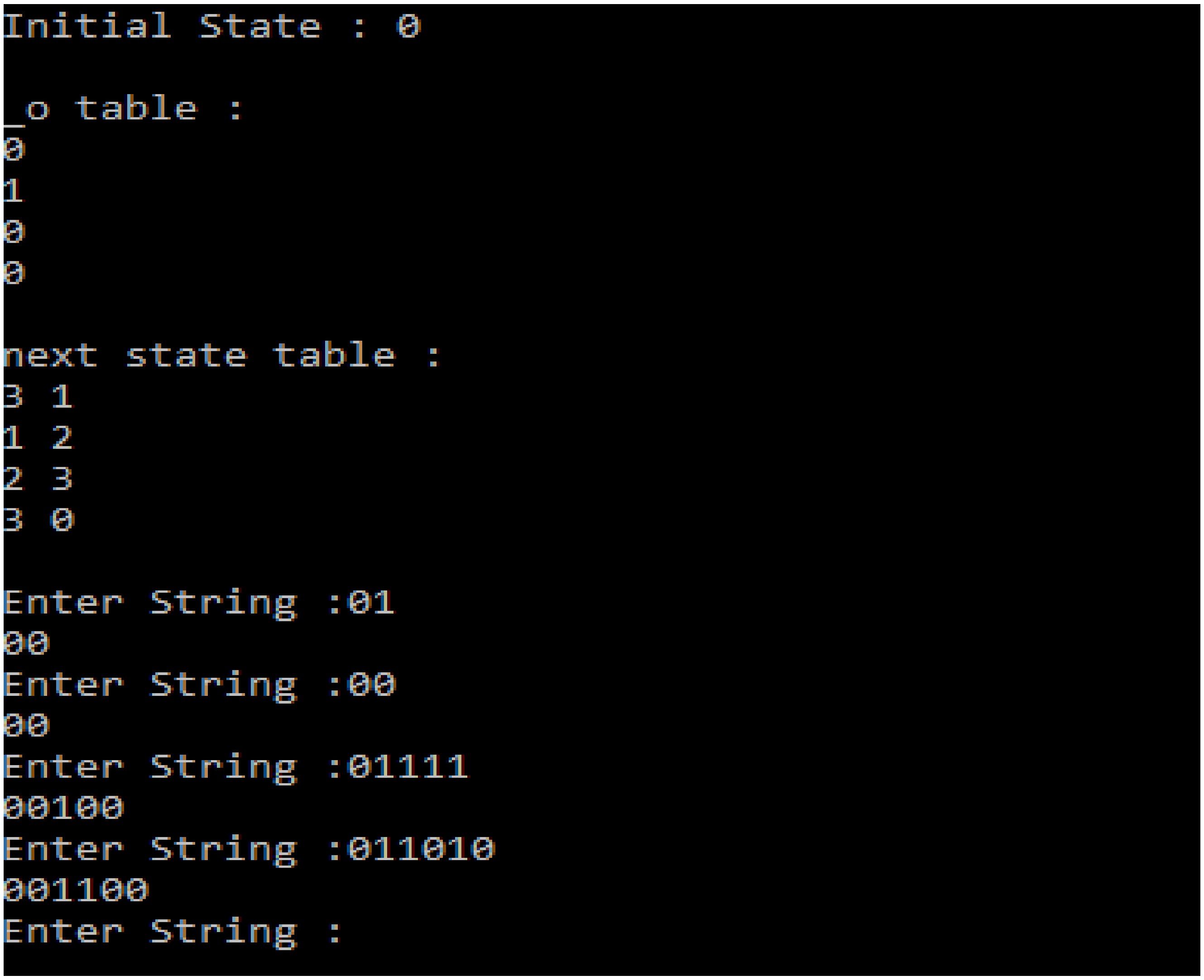


```
Initial state : 0

Next state Matrix :
0 1
-1 1

Output Matrix :
1 0
-1 1

Enter string : 011
101
Enter string : 101
0Error
Enter string : 000
111
Enter string : 111
011
Enter string :
```

5. **Moore Machine**

```
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int main()
{
        FILE *f;
        char ch,str[20];
        int i,j,_r[5],_o[5][5],initial_state,len,MY_MOORE[10][10],k,curstate,l;
        f=fopen("moore.txt","r");
        if(f==NULL)
        {
                printf("Empty File ");
        }
        ch=getc(f);     initial_state=ch-48;
        printf("Initial State : %d\n",initial_state);
        ch=getc(f);
        for(i=0;i<4;i++)
        {       for(j=0;j<3;j++)
                {
                                fscanf(f,"%d",&MY_MOORE[i][j]);
                }
//              printf("\n");
        }
        k=0;
        for(i=0;i<4;i++)
        {       for(j=0;j<3;j++)
                {               if(j==0)
                        {
                                _r[k++]=MY_MOORE[i][j];
                        }
                        else
                        {               l=j-1;    _o[i][l]=MY_MOORE[i][j];
                        }}}
        fclose(f);
        while(1)
        {       curstate=initial_state;
                scanf("%s",&str);       len=strlen(str);
                for(i=0;i<len;i++)
                {
                        curstate=_o[curstate][str[i]-48];
                        if(_r[curstate]== -1 )
{           printf("Error");
            break;}
if(_r[curstate] != -1)
{
            printf("%d",_r[curstate]);
}}}}
```

OUTPUT :



```
Initial State : 0

_o table :
0
1
0
0

next state table :
3 1
1 2
2 3
3 0

Enter String :01
00
Enter String :00
00
Enter String :01111
00100
Enter String :011010
001100
Enter String :
```