Aim: Write program to convert NFA to DFA.

Program:

```
#include<stdio.h>
#include<stdlib.h>
struct node
{
 int st;
 struct node *link;
};
struct node1
{

 int nst[20];
};

void insert(int ,char, int);
int findalpha(char);
void findfinalstate(void);
int insertdfastate(struct node1);
int compare(struct node1,struct node1);
void printnewstate(struct node1);
static int set[20],nostate,noalpha,s,notransition,nofinal,start,finalstate[20],c,r,buffer[20];
int complete=-1;
char alphabet[20];
static int eclosure[20][20]={0};
struct node1 hash[20];
struct node * transition[20][20]={NULL};
void main()
{
 int i,j,k,m,t,n,l;
 struct node *temp;
 struct node1 newstate={0},tmpstate={0};

 printf("Enter the number of alphabets?\n");
 printf("NOTE:- [ use letter e as epsilon]\n");
 printf("NOTE:- [e must be last character ,if it is present]\n");
 printf("\nEnter No of alphabets and alphabets?\n");
 scanf("%d",&noalpha);
 getchar();
 for(i=0;i<noalpha;i++)
 {

 alphabet[i]=getchar();
```

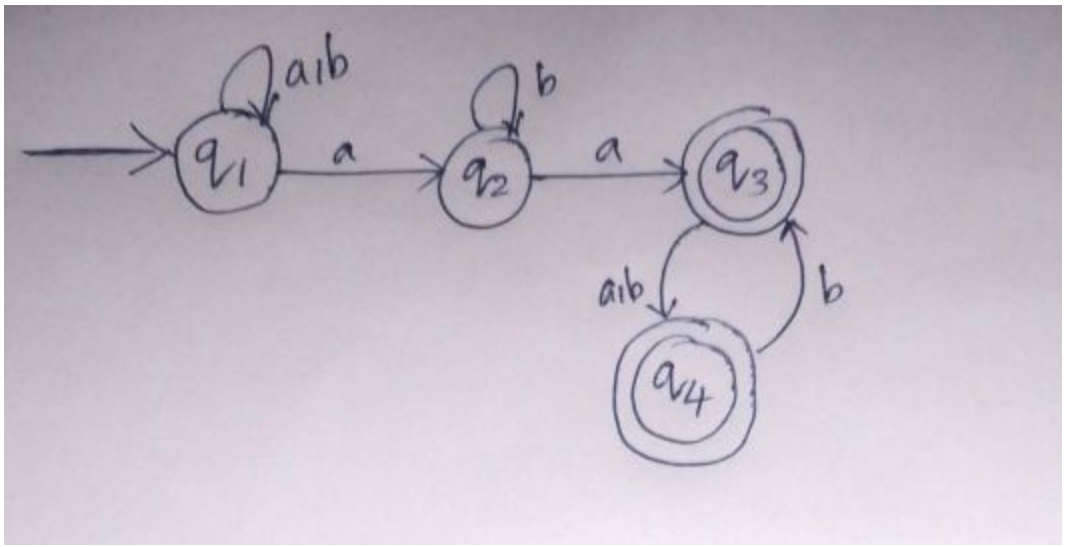
```
getchar();
}
printf("Enter the number of states?\n");
scanf("%d",&nostate);
printf("Enter the start state?\n");
scanf("%d",&start);
printf("Enter the number of final states?\n");
scanf("%d",&nofinal);
printf("Enter the final states?\n");
for(i=0;i<nofinal;i++)
scanf("%d",&finalstate[i]);
printf("Enter no of transition?\n");

scanf("%d",&notransition);
printf("NOTE:- [Transition is in the form–> qno alphabet qno]\n",notransition);
printf("NOTE:- [States number must be greater than zero]\n");
printf("\nEnter transition?\n");


for(i=0;i<notransition;i++)
{


 scanf("%d %c%d",&r,&c,&s);
 insert(r,c,s);

}
for(i=0;i<20;i++)
{
 for(j=0;j<20;j++)
 hash[i].nst[j]=0;
}
complete=-1;
i=-1;
printf("\nEquivalent DFA.....\n");
printf(".....\n");

printf("Trnsitions of DFA\n");

newstate.nst[start]=start;
insertdfastate(newstate);
while(i!=complete)
{
 i++;
```

```
newstate=hash[i];
for(k=0;k<noalpha;k++)
{
 c=0;
 for(j=1;j<=nostate;j++)
 set[j]=0;
 for(j=1;j<=nostate;j++)
 {
  l=newstate.nst[j];
  if(l!=0)
  {
   temp=transition[l][k];
   while(temp!=NULL)
   {
    if(set[temp->st]==0)
    {
     c++;
     set[temp->st]=temp->st;
    }
    temp=temp->link;


   }
  }
 }
 printf("\n");
 if(c!=0)
 {
  for(m=1;m<=nostate;m++)
   tmpstate.nst[m]=set[m];

  insertdfastate(tmpstate);

  printnewstate(newstate);
  printf("%c\t",alphabet[k]);
  printnewstate(tmpstate);
  printf("\n");
  }
  else
  {
  printnewstate(newstate);
  printf("%c\t", alphabet[k]);
  printf("NULL\n");
  }
```

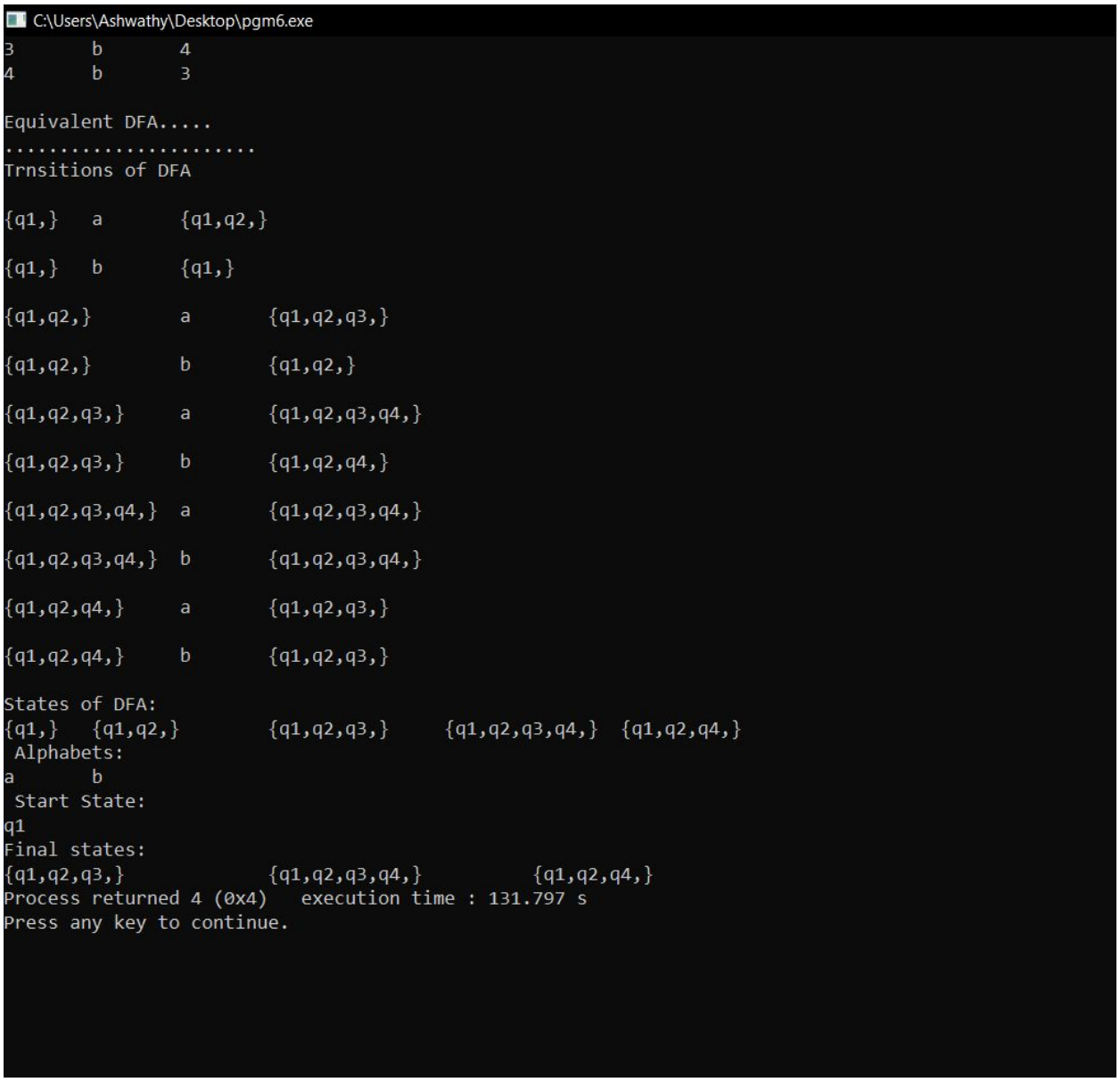
```
  }
   }
 printf("\nStates of DFA:\n");
 for(i=0;i<=complete;i++)
 printnewstate(hash[i]);
 printf("\n Alphabets:\n");
 for(i=0;i<noalpha;i++)
 printf("%c\t",alphabet[i]);
 printf("\n Start State:\n");
  printf("q%d",start);
 printf("\nFinal states:\n");
 findfinalstate();

}
int insertdfastate(struct node1 newstate)
{
 int i;
 for(i=0;i<=complete;i++)
 {
  if(compare(hash[i],newstate))
   return 0;
 }
 complete++;
 hash[complete]=newstate;
 return 1;
}
int compare(struct node1 a,struct node1 b)
{
 int i;


  for(i=1;i<=nostate;i++)
  {
   if(a.nst[i]!=b.nst[i])
    return 0;
  }
  return 1;


}

void insert(int r,char c,int s)
{
```

```
        int j;
        struct node *temp;
        j=findalpha(c);
        if(j==999)
        {
  printf("error\n");
  exit(0);
        }
        temp=(struct node *) malloc(sizeof(struct node));
        temp->st=s;
        temp->link=transition[r][j];
        transition[r][j]=temp;
}

int findalpha(char c)
{
 int i;
 for(i=0;i<noalpha;i++)
 if(alphabet[i]==c)
  return i;

  return(999);


}


void findfinalstate()
{
 int i,j,k,t;

  for(i=0;i<=complete;i++)
  {
  for(j=1;j<=nostate;j++)
  {
   for(k=0;k<nofinal;k++)
   {
    if(hash[i].nst[j]==finalstate[k])
    {
     printnewstate(hash[i]);
     printf("\t");
     j=nostate;
     break;
    }
```

```
   }
  }
  }
}

void printnewstate(struct node1 state)
{
 int j;
 printf("{");
  for(j=1;j<=nostate;j++)
  {
   if(state.nst[j]!=0)
    printf("q%d,",state.nst[j]);
  }
  printf("}\t");

}
```



Output


C:\Users\Ashwathy\Desktop\pgm6.exe
3 b 4
4 b 3
Equivalent DFA.....
.....
Trnsitions of DFA
{q1,} a {q1,q2,}
{q1,} b {q1,}
{q1,q2,} a {q1,q2,q3,}
{q1,q2,} b {q1,q2,}
{q1,q2,q3,} a {q1,q2,q3,q4,}
{q1,q2,q3,} b {q1,q2,q4,}
{q1,q2,q3,q4,} a {q1,q2,q3,q4,}
{q1,q2,q3,q4,} b {q1,q2,q3,q4,}
{q1,q2,q4,} a {q1,q2,q3,}
{q1,q2,q4,} b {q1,q2,q3,}
States of DFA:
{q1,} {q1,q2,} {q1,q2,q3,} {q1,q2,q3,q4,} {q1,q2,q4,}
Alphabets:
a b
Start State:
q1
Final states:
{q1,q2,q3,} {q1,q2,q3,q4,} {q1,q2,q4,}
Process returned 4 (0x4) execution time : 131.797 s
Press any key to continue.