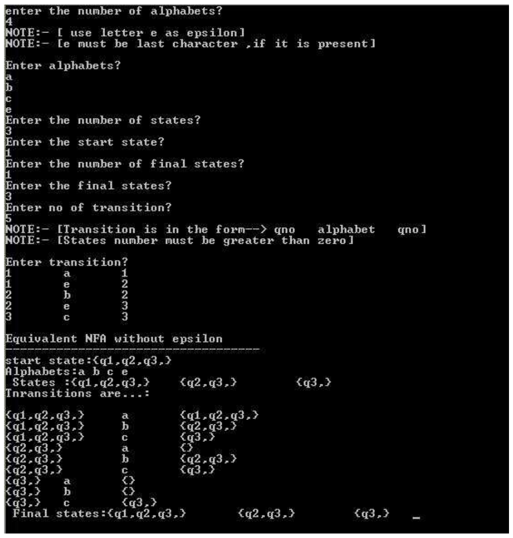
```
Enter the start state?
1
Enter the number of final states?
1
Enter the final states?
3
Enter no of transition?
5
NOTE:- [Transition is in the form--> qno   alphabet
qno]
NOTE:- [States number must be greater than zero]

Enter transition?
1 a 1
1 e 2
2 b 2
2 e 3
3 c 3

Equivalent NFA without epsilon
----------------------------------
start state:{q1,q2,q3,}
Alphabets:a b c e
 States :{q1,q2,q3,}    {q2,q3,}        {q3,}
Tnransitions are...:

{q1,q2,q3,}     a       {q1,q2,q3,}
{q1,q2,q3,}     b       {q2,q3,}
{q1,q2,q3,}     c       {q3,}
{q2,q3,}        a       {}
{q2,q3,}        b       {q2,q3,}
{q2,q3,}        c       {q3,}
{q3,}   a       {}
{q3,}   b       {}
{q3,}   c       {q3,}
 Final states:{q1,q2,q3,}       {q2,q3,}        {q3,}   [cs1636@LabServer s7comp]$
```



```
enter the number of alphabets?
4
NOTE:- [ use letter e as epsilon]
NOTE:- [e must be last character ,if it is present]

Enter alphabets?
a
b
c
e
Enter the number of states?
3
Enter the start state?
1
Enter the number of final states?
1
Enter the final states?
3
Enter no of transition?
5
NOTE:- [Transition is in the form--> qno   alphabet   qno]
NOTE:- [States number must be greater than zero]

Enter transition?
1       a       1
1       e       2
2       b       2
2       e       3
3       c       3

Equivalent NFA without epsilon
------------------------------------
start state:{q1,q2,q3,}
Alphabets:a b c e
 States :{q1,q2,q3,}    {q2,q3,}        {q3,}
Tnransitions are...:

{q1,q2,q3,}     a       {q1,q2,q3,}
{q1,q2,q3,}     b       {q2,q3,}
{q1,q2,q3,}     c       {q3,}
{q2,q3,}        a       {}
{q2,q3,}        b       {q2,q3,}
{q2,q3,}        c       {q3,}
{q3,}   a       {}
{q3,}   b       {}
{q3,}   c       {q3,}
 Final states:{q1,q2,q3,}       {q2,q3,}        {q3,}   _
```

7. NFA to DFA

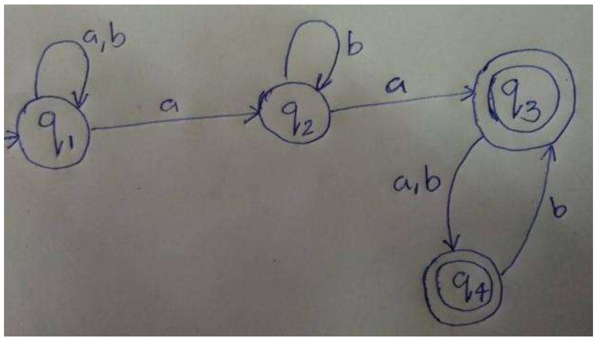
```
#include<stdio.h>
#include<stdlib.h>
struct node
{
        int st;
        struct node *link;
};
struct node1
{

        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");
        scanf("%d",&noalpha);
        getchar();
        printf("\nEnter alphabets?\n");
        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++)
```

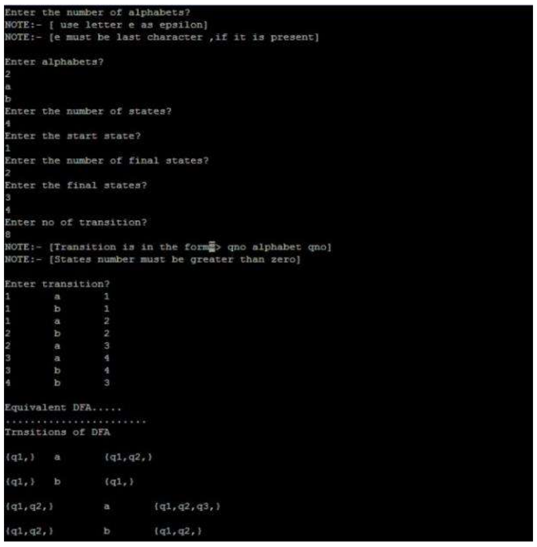
```
  {
        for(j=1;j<=nostate;j++)
        {
                for(k=0;k<nofinal;k++)
                {
                        if(hash[i].nst[j]==finalstate[k])
                        {
                                printnewstate(hash[i]);
                                printf("\t");
       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

}
```



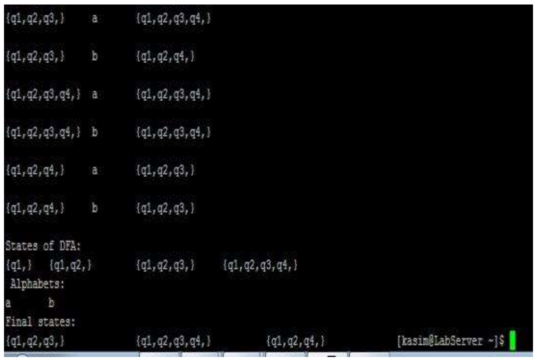
Output

```
[cs1636@LabServer s7comp]$ ./a.out
Enter the number of alphabets?
NOTE:- [ use letter e as epsilon]
NOTE:- [e must be last character ,if it is present]
2
Enter the alphabets
a
b
Enter the number of states?
4
Enter the start state?
1
Enter the number of final states?
2
Enter the final states?
3
```

```
4
Enter no of transition?
8
NOTE:- [Transition is in the form–> qno alphabet qno]
NOTE:- [States number must be greater than zero]

Enter transition?
1 a 1
1 b 1
1 a 2
2 b 2
2 a 3
3 a 4
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,}             [cs1636@LabServer s7comp]$
```



```
Enter the number of alphabets?
NOTE:- [ use letter e as epsilon]
NOTE:- [e must be last character ,if it is present]

Enter alphabets?
2
a
b
Enter the number of states?
4
Enter the start state?
1
Enter the number of final states?
2
Enter the final states?
3
4
Enter no of transition?
8
NOTE:- [Transition is in the form=> qno alphabet qno]
NOTE:- [States number must be greater than zero]

Enter transition?
1       a       1
1       b       1
1       a       2
2       b       2
2       a       3
3       a       4
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,}
 Alphabets:
a       b
Final states:
{q1,q2,q3,}             {q1,q2,q3,q4,}          {q1,q2,q4,}             [kasim@LabServer ~]$
```