Cycle 1

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CS7B – Roll No :31

Question 4

Write program to minimize any given DFA.

Program

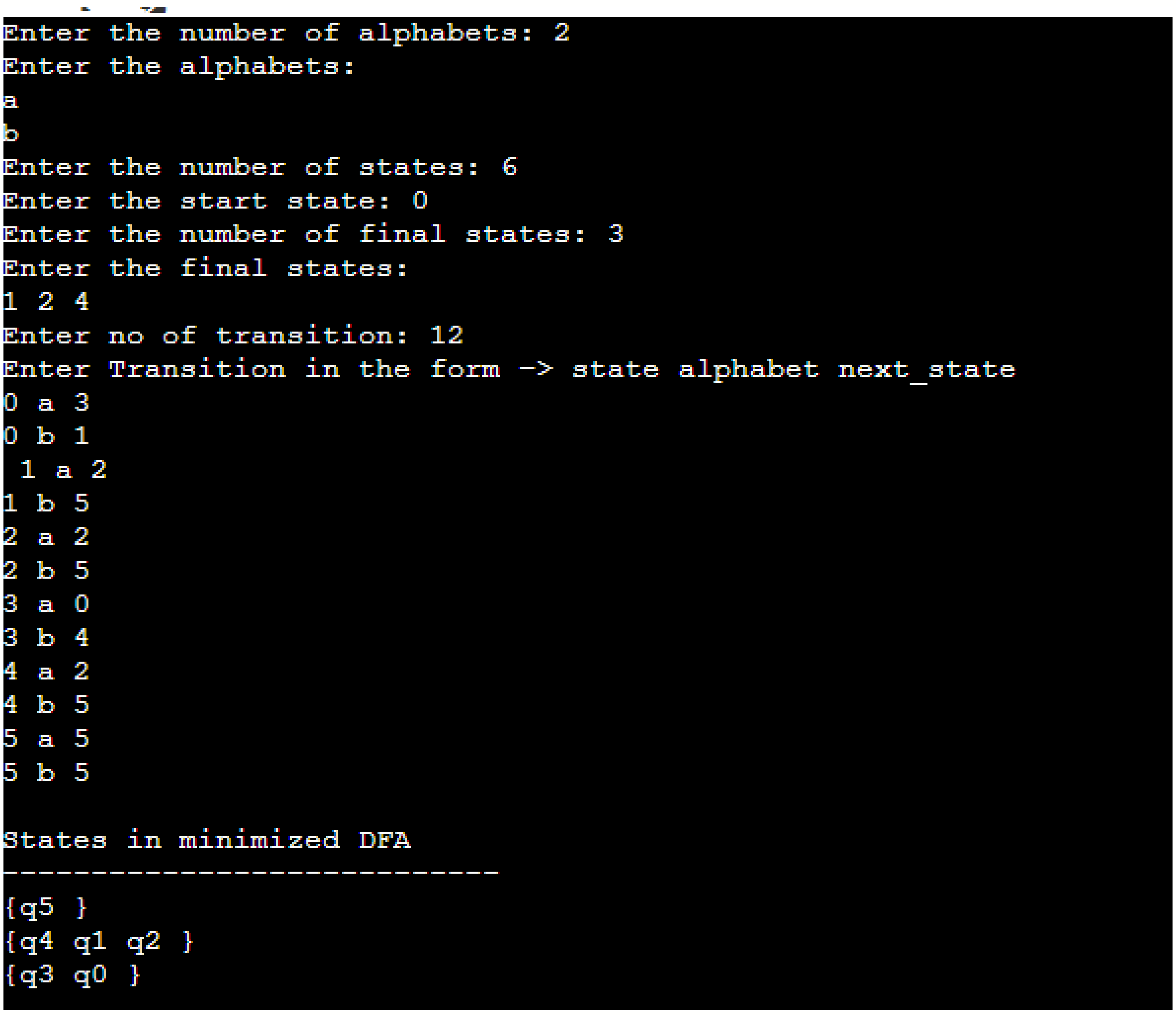
```
#include <stdio.h>
#include <stdlib.h>

static int nostate,noalpha,s,notransition,nofinal,start,finalstate[20],r;
char alphabet[20];
int transition_map[30][30], table[30][30], nonfinalstate[20], partition[20][20];

int findalpha(char a)
{
 int i;
 for(i=0;i<noalpha;i++)
 if(alphabet[i]==a)
  return i;
 return(-1);
}

int main() {
 int i,j,p[20],q[20],k;
 char a;

 for(i=0;i<30;i++){
           for(j=0;j<30;j++)
                     transition_map[i][j]=-1;
 }
 printf("Enter the number of alphabets: ");
 scanf("%d",&noalpha);
 getchar();
 printf("Enter the alphabets: \n");
 for(i=0;i<noalpha;i++)
 {
  alphabet[i]=getchar();
  getchar();
 }
 printf("Enter the number of states: ");
 scanf("%d",&nostate);
 printf("Enter the start state: ");
 scanf("%d",&start);
 printf("Enter the number of final states: ");
```

```
scanf("%d",&nofinal);
printf("Enter the final states:\n");
for(i=0;i<nofinal;i++)
  scanf("%d",&finalstate[i]);
printf("Enter no of transition: ");
scanf("%d",&notransition);
printf("Enter Transition in the form –> state alphabet next_state\n");
for(i=0;i<notransition;i++)
{
 scanf("%d %c %d",&r,&a,&s);
 j=findalpha(a);
 if (j==-1){printf("\nerror\n"); exit(1);}
 transition_map[r][j] = s;
}
for(i=0;i<nostate;i++){
          for(j=0;j<i;j++){
                    table[i][j]=0;
          }
}

int f=0;
k=0;
for(i=0;i<nostate;i++){
          f=0;
          for(j=0;j<nofinal;j++){
                    if(i==finalstate[j])
                    { f=1;break;}
          }
          if(f==0){nonfinalstate[k++]=i;}
}

for(i=0;i<nofinal;i++){
         for(j=0;j<(nostate-nofinal);j++)
      if(nonfinalstate[j]>finalstate[i])
              table[nonfinalstate[j]][finalstate[i]]=1;
      else
              table[finalstate[i]][nonfinalstate[j]]=1;
}
int change = 1;
while(change==1){
          change=0;
          for(i=0;i<nostate;i++){
            for(j=0;j<i;j++){
                    if(table[i][j]!=1){
                              for(k=0;k<noalpha;k++)
                                        p[k]=transition_map[i][k];
                              for(k=0;k<noalpha;k++)
```

```
                q[k]=transition_map[j][k];
            for(k=0;k<noalpha;k++){
                if(p[k]>q[k]){
                    if (table[p[k]][q[k]]==1){
                        change=1;
                        table[i][j]=1;
                        break;
                    }
                }
                else if(p[k]<q[k]){
                    if (table[q[k]][p[k]]==1){
                        change=1;
                        table[i][j]=1;
                        break;
                    }
                }
            }
         }
     }
  }
}
k=0;
for(i=0;i<nostate;i++){
    k=0;
    partition[i][k++]=i;
    for(j=0;j<i;j++)
        if(table[i][j]==0){
            partition[i][k++]=j;
        }
    partition[i][k]=-1;
}
int newstate[20]={0},m;

printf("\nStates in minimized DFA");
printf("\n----------------------------\n");
for(i=nostate-1;i>=0;i--){
    k=0;
    if(newstate[i]==0){
    printf("{");
    while(partition[i][k]!=-1){
        if(newstate[partition[i][k]]==0){
            newstate[partition[i][k]]=1;
            printf("q%d ",partition[i][k]);
        }
        k++;
    }
    printf("}\n");
```

```
        }
 }
 return 0;
}
```

Output :



```
Enter the number of alphabets: 2
Enter the alphabets:
a
b
Enter the number of states: 6
Enter the start state: 0
Enter the number of final states: 3
Enter the final states:
1 2 4
Enter no of transition: 12
Enter Transition in the form -> state alphabet next_state
0 a 3
0 b 1
 1 a 2
1 b 5
2 a 2
2 b 5
3 a 0
3 b 4
4 a 2
4 b 5
5 a 5
5 b 5

States in minimized DFA
----------------------------
{q5 }
{q4 q1 q2 }
{q3 q0 }
```