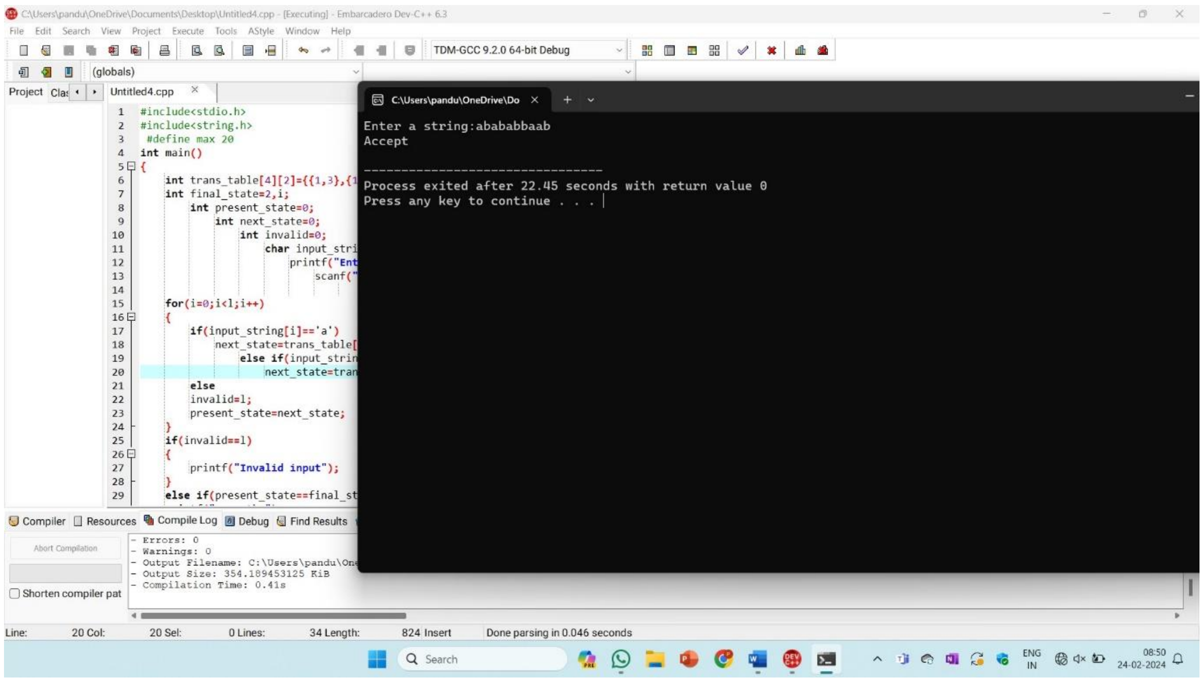
1.DETERMINISTIC FINITE AUTOMATA (DFA)

Code:

```
#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");
}
```

Execution:



```
#include<stdio.h>
#include<string.h>
 #define max 20
int main()
{
    int trans_table[4][2]={{1,3},{1
    int final_state=2,i;
        int present_state=0;
            int next_state=0;
                int invalid=0;
                    char input_stri
                        printf("Ent
                            scanf("

    for(i=0;i<l;i++)
    {
        if(input_string[i]=='a')
            next_state=trans_table[
                else if(input_strin
                    next_state=tran
        else
        invalid=1;
        present_state=next_state;
    }
    if(invalid==1)
    {
        printf("Invalid input");
    }
    else if(present_state==final_st
```

```
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\pandu\One
- Output Size: 354.189453125 KiB
- Compilation Time: 0.41s
```

```
Enter a string:abababbaab
Accept

--------------------------------
Process exited after 22.45 seconds with return value 0
Press any key to continue . . .
```

2.NON-DETERMINISTIC FINITE AUTOMATA (NFA)

Code:

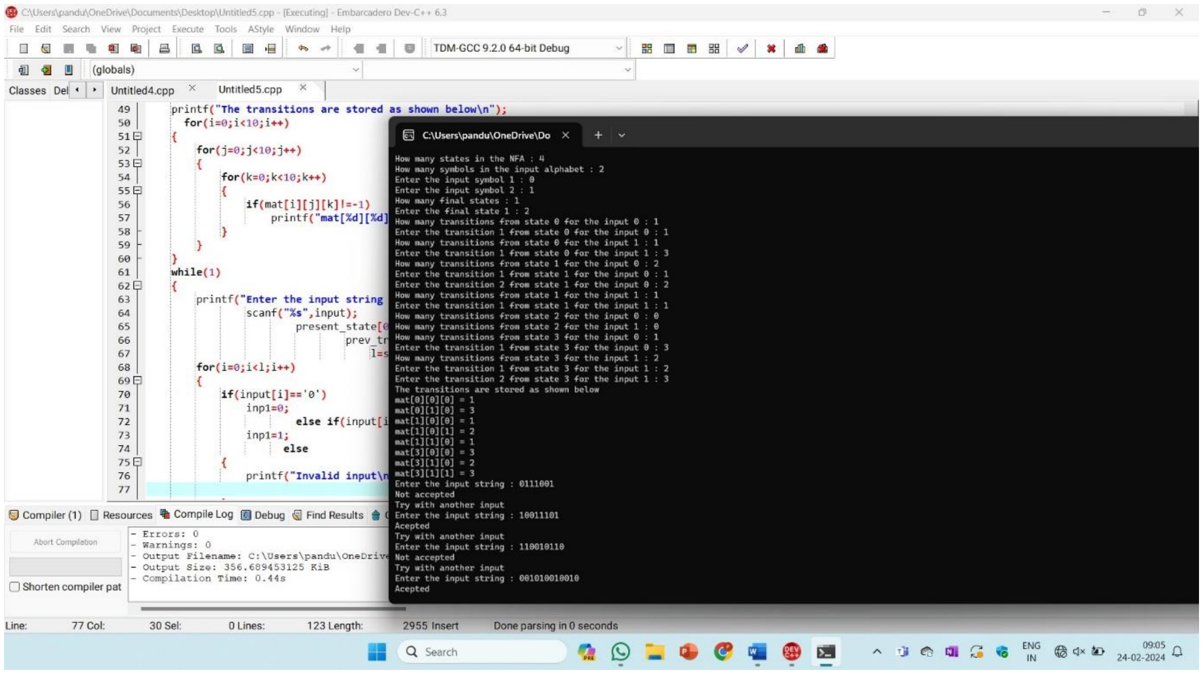
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

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("Accepted\n");
        else
          printf("Not accepted\n");

        printf("Try with another input\n");
    }

    return 0;
}
```

Execution:



```
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]
        }
    }
}
while(1)
{
    printf("Enter the input string
            scanf("%s",input);
                present_state[0
                    prev_tr
                        l=s
    for(i=0;i<l;i++)
    {
        if(input[i]=='0')
            inp1=0;
                else if(input[i
            inp1=1;
              else
        {
            printf("Invalid input\n
```

```
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\pandu\OneDriv
- Output Size: 356.689453125 KiB
- Compilation Time: 0.44s
```

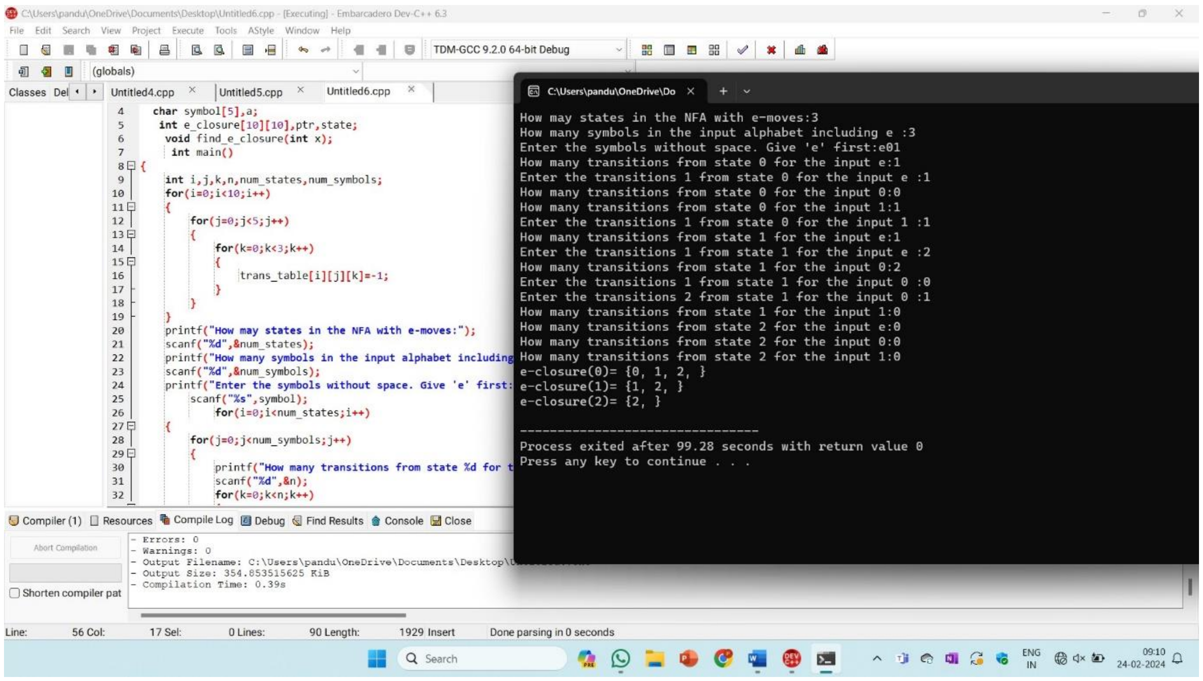
```
How many states in the NFA : 4
How many symbols in the input alphabet : 2
Enter the input symbol 1 : 0
Enter the input symbol 2 : 1
How many final states : 1
Enter the final state 1 : 2
How many transitions from state 0 for the input 0 : 1
Enter the transition 1 from state 0 for the input 0 : 1
How many transitions from state 0 for the input 1 : 1
Enter the transition 1 from state 0 for the input 1 : 3
How many transitions from state 1 for the input 0 : 2
Enter the transition 1 from state 1 for the input 0 : 1
Enter the transition 2 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 : 0
How many transitions from state 2 for the input 1 : 0
How many transitions from state 3 for the input 0 : 1
Enter the transition 1 from state 3 for the input 0 : 3
How many transitions from state 3 for the input 1 : 2
Enter the transition 1 from state 3 for the input 1 : 2
Enter the transition 2 from state 3 for the input 1 : 3
The transitions are stored as shown below
mat[0][0][0] = 1
mat[0][1][0] = 3
mat[1][0][0] = 1
mat[1][0][1] = 2
mat[1][1][0] = 1
mat[3][0][0] = 3
mat[3][1][0] = 2
mat[3][1][1] = 3
Enter the input string : 0111001
Not accepted
Try with another input
Enter the input string : 10011101
Acepted
Try with another input
Enter the input string : 110010110
Not accepted
Try with another input
Enter the input string : 001010010010
Acepted
```

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

Code:

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

int trans_table[10][5][3]; char
symbol[5]; 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 many 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 transition %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")
        ;
    }

    return 0;
}

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]);
    }
}
```

Execution:



```
 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
   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 t
           scanf("%d",&n);
           for(k=0;k<n;k++)
```

```
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\pandu\OneDrive\Documents\Desktop\
- Output Size: 354.853515625 KiB
- Compilation Time: 0.39s
```

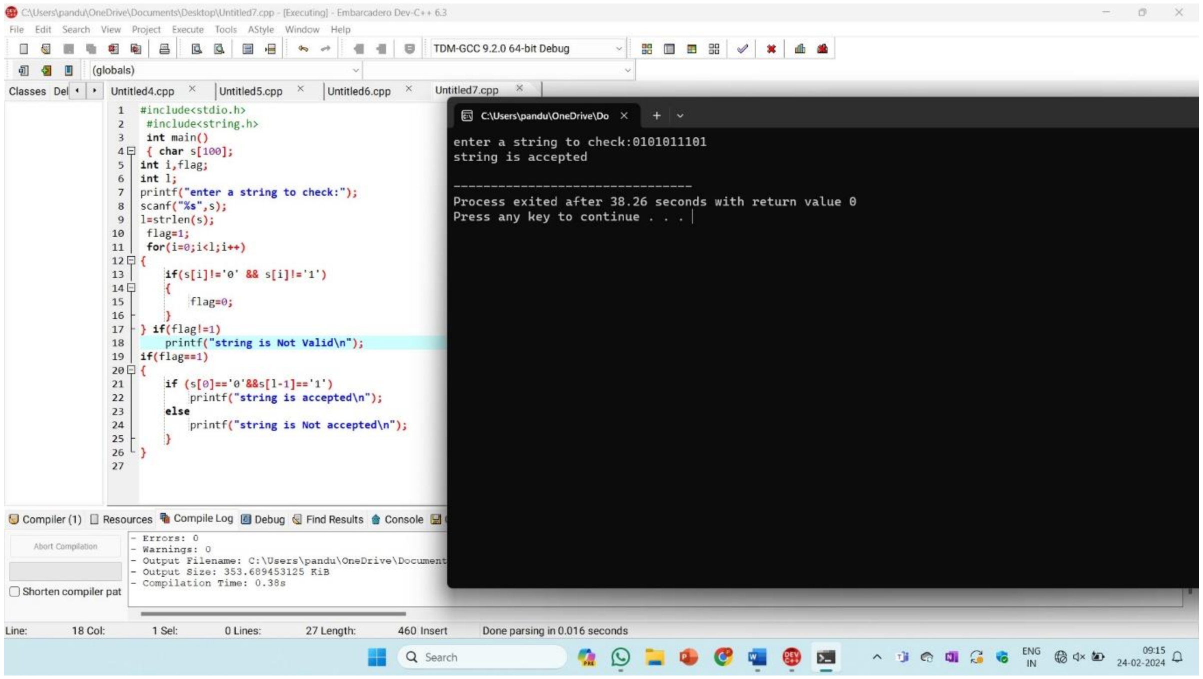
```
How may states in the NFA with e-moves:3
How many symbols in the input alphabet including e :3
Enter the symbols without space. Give 'e' first:e01
How many transitions from state 0 for the input e:1
Enter the transitions 1 from state 0 for the input e :1
How many transitions from state 0 for the 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 :0
Enter the transitions 2 from state 1 for the input 0 :1
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 99.28 seconds with return value 0
Press any key to continue . . .
```

4.CHECKING WHETHER A STRING BELONGS TO A GRAMMAR

Code:

```
#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");
}
}
```

Execution:



```c
#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");
    }
}
```

```
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\pandu\OneDrive\Document
- Output Size: 353.689453125 KiB
- Compilation Time: 0.38s
```

```
enter a string to check:0101011101
string is accepted

--------------------------------
Process exited after 38.26 seconds with return value 0
Press any key to continue . . .
```