NAME: N KARTHIK REDDY

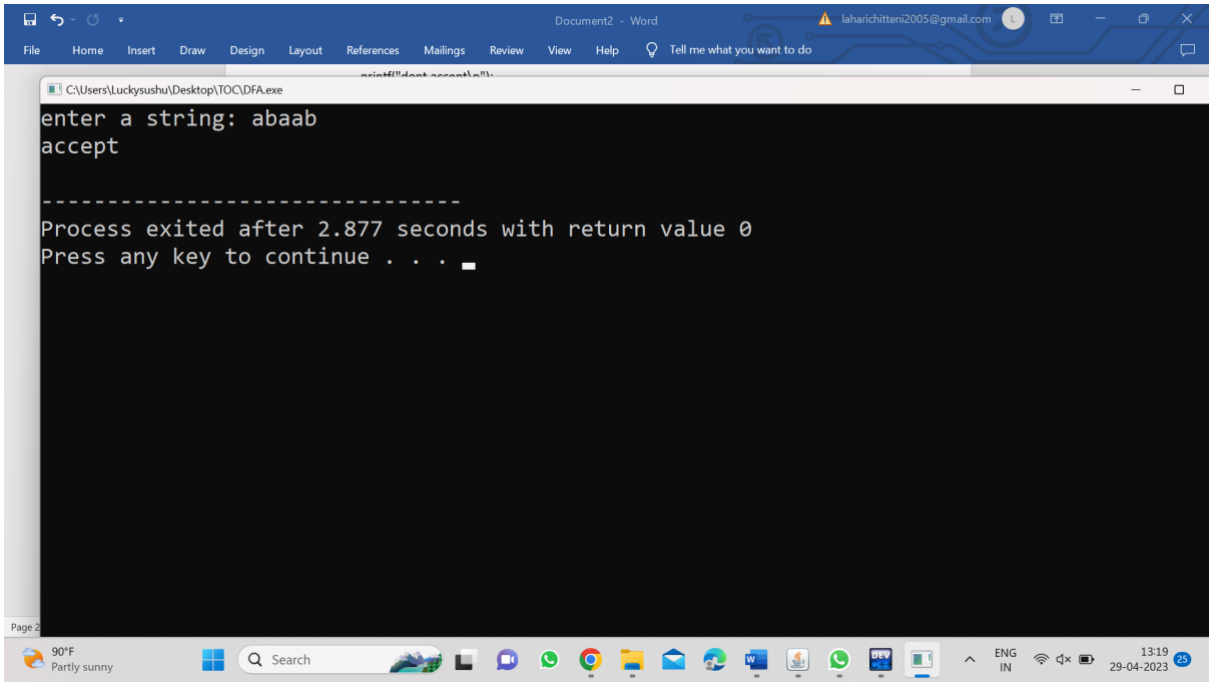
Reg.no.:192111167 1.DETERMINISTIC FINITE AUTOMATA

INPUT:

```
#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("dont accept\n");
}
```

OUTPUT:



2.NON-DETERMINISTIC FINITE AUTOMATA:

INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
```

```
int i,j,k,l,m,next_state[20],n,mat[10][10][10],flag,p,exit;
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]);

}
for(i=0;i<10;i++)
{
        for(j=0;j<10;j++)
        {
                for(k=0;k<10;k++)
                {
                        mat[i][j][k]=-1;
                }
```

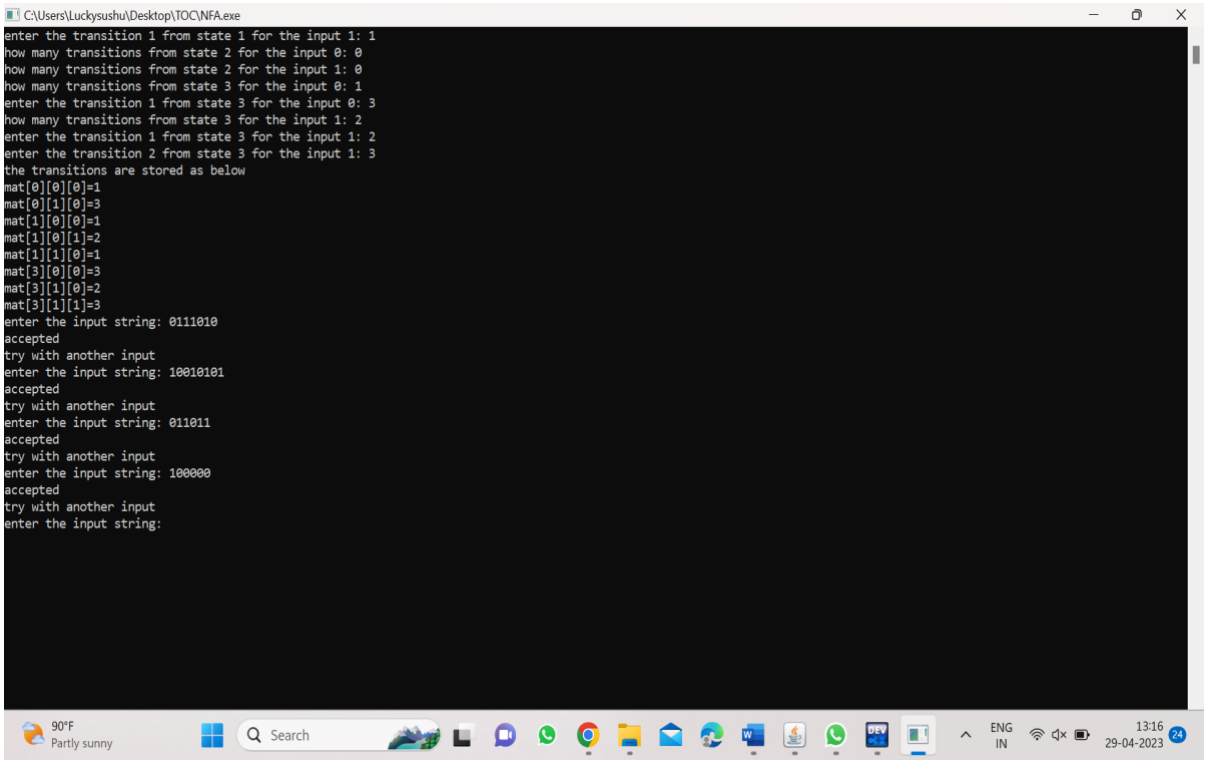
```
		}
	}
	for(i=0;i<num_states;i++)
	{
		for(j=0;j<num_symbols;j++)
		{
			printf("how many transitions from state %d for the input %d:
",i,symbol[j]);
			scanf("%d",&n);
			for(k=0;k<n;k++)
			{
				printf("enter the transition %d from state %d for the input %d:
",k+1,i,symbol[j]);
				scanf("%d",&mat[i][j][k]);
			}
		}
	}
	printf("the transitions are stored as 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')
                inp=1;
                else
                {
                        printf("invalid input\n");
                        exit;
                }
                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");
}
```

}

OUTPUT:



3.EPSILON CLOSURE FOR NFA

INPUT:

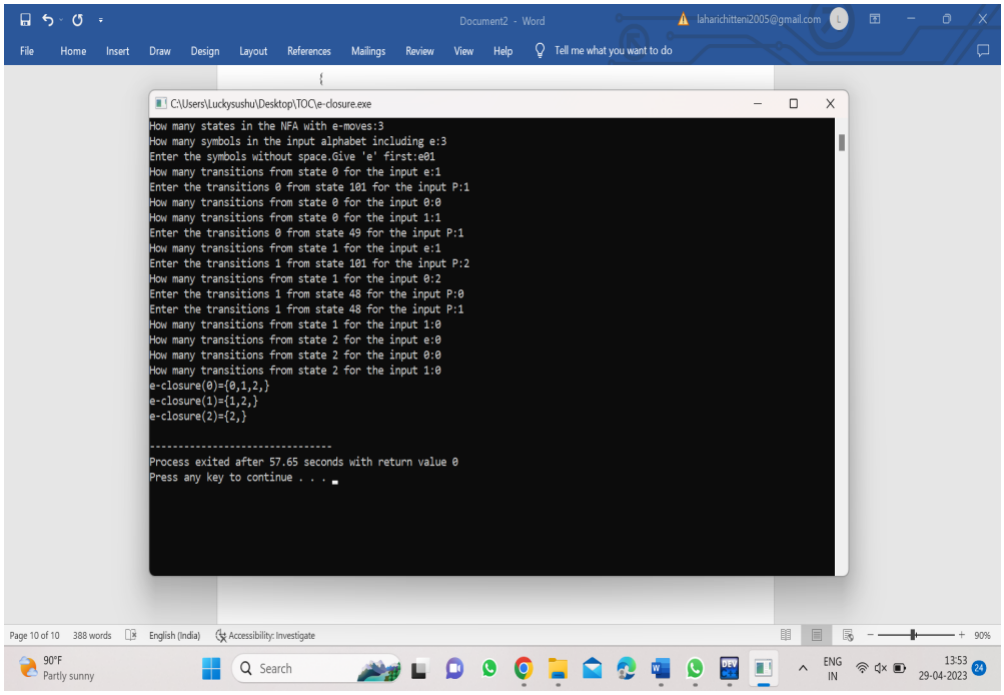
```
#include<stdio.h>
#include<string.h>
int trans_table[10][5][3];
char symbol[5],a;
int e_closure[10][10],ptr,state;
void find_e_closure(int x);
int main()
{
        int i,j,k,n,num_states,num_symbols;
        for(i=0;i<10;i++)
```

```
	{
		for(j=0;j<5;j++)
		{
			for(k=0;k<3;k++)
			{
				trans_table[i][j][k]=-1;
			}
		}
	}
	printf("How 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 transitions %d from state %d for the input
%c:",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");
```

```
}
}
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]);
        }
}
```

OUTPUT:



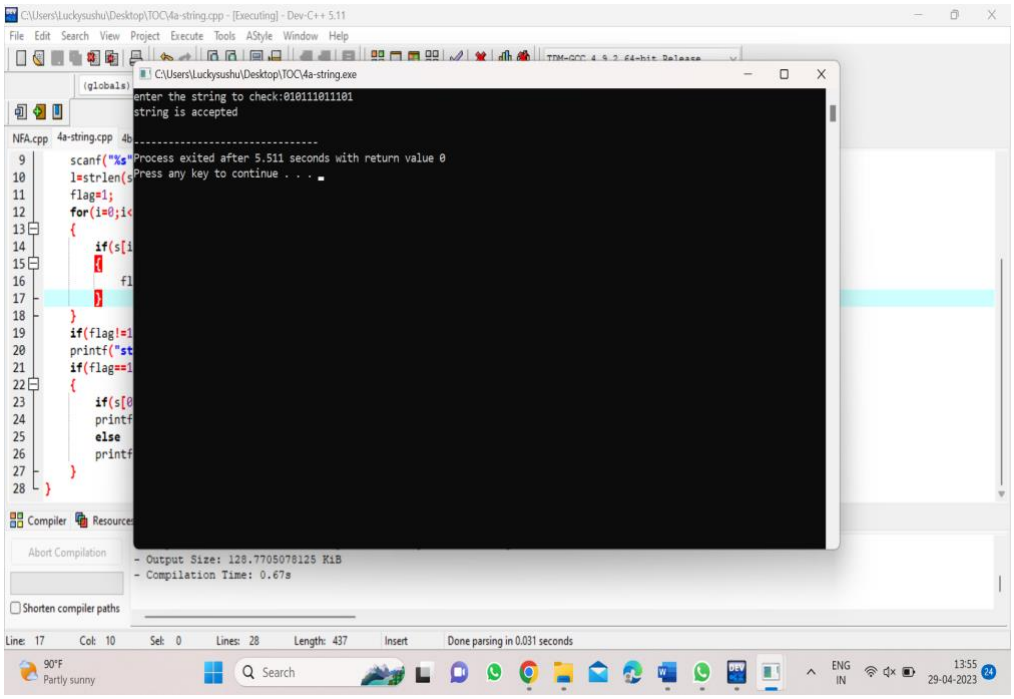
4.CHECKING STRING BELONGS TO THE GRAMMAR

INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
        char s[100];
        int i,flag;
        int l;
        printf("enter the 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");
        }
}
```

OUTPUT:



5.CHECKING WHETHER STRING BELONGS TO THE GRAMMAR

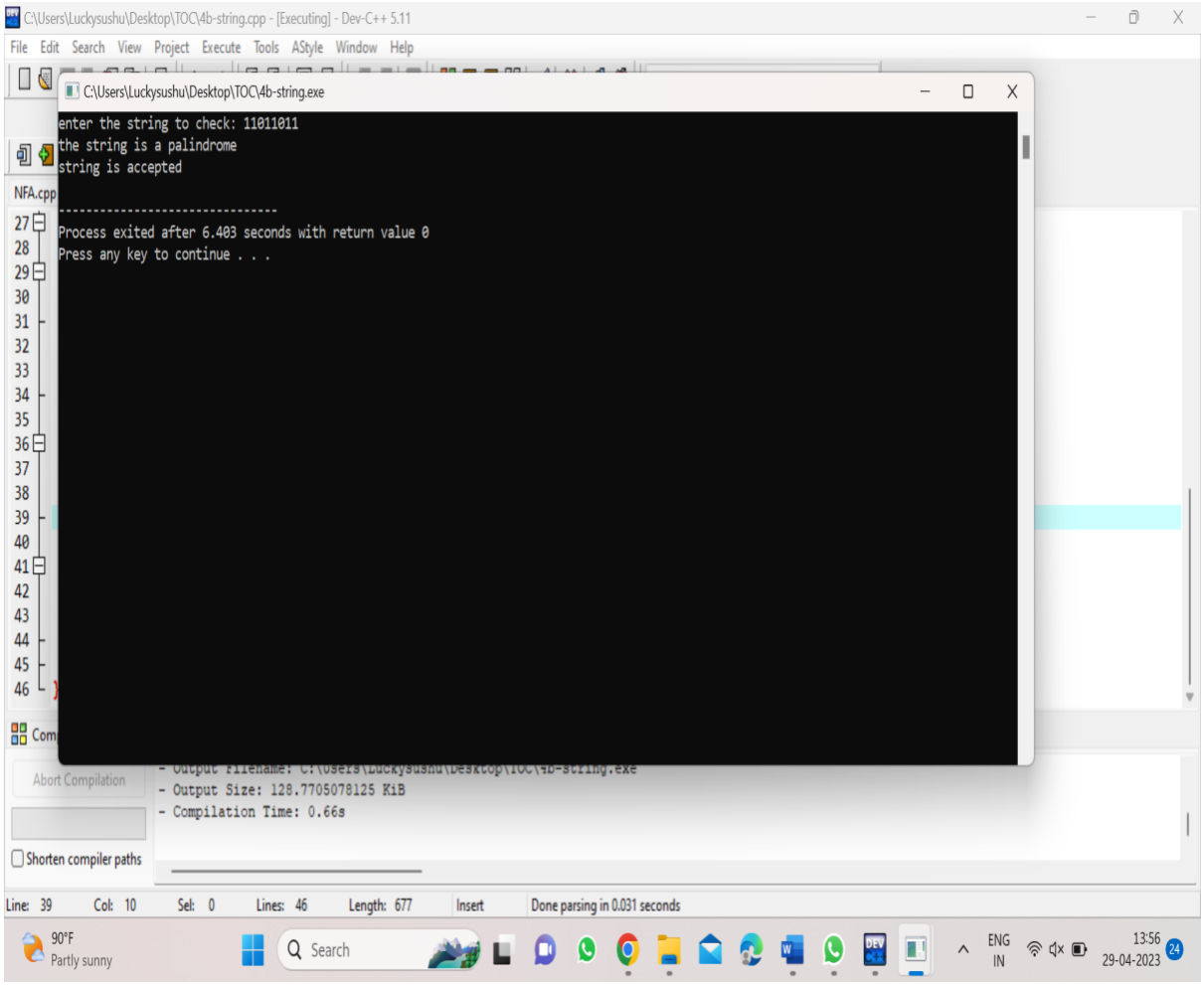
INPUT:

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

```
#include<string.h>
int main()
{
	char s[100];
	int i,flag,flag1,a,b;
	int l;
	printf("enter the 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)
	{
		flag1=1;
		a=0;
		b=l-1;
		while(a!=(1/2))
		{
			if(s[a]!=s[b])
			{
				flag1=0;
			}
```

```
                a=a+1;
                b=b-1;
        }
        if(flag1==1)
        {
                printf("the string is a palindrome\n");
                printf("string is accepted\n");
        }
        else
        {
                printf("the string is not a palindrome\n");
                printf("string is not accepted\n");
        }
    }
}
```

OUTPUT:



6.CHECKING WHETHER STRING BELONGS TO THE GRAMMAR

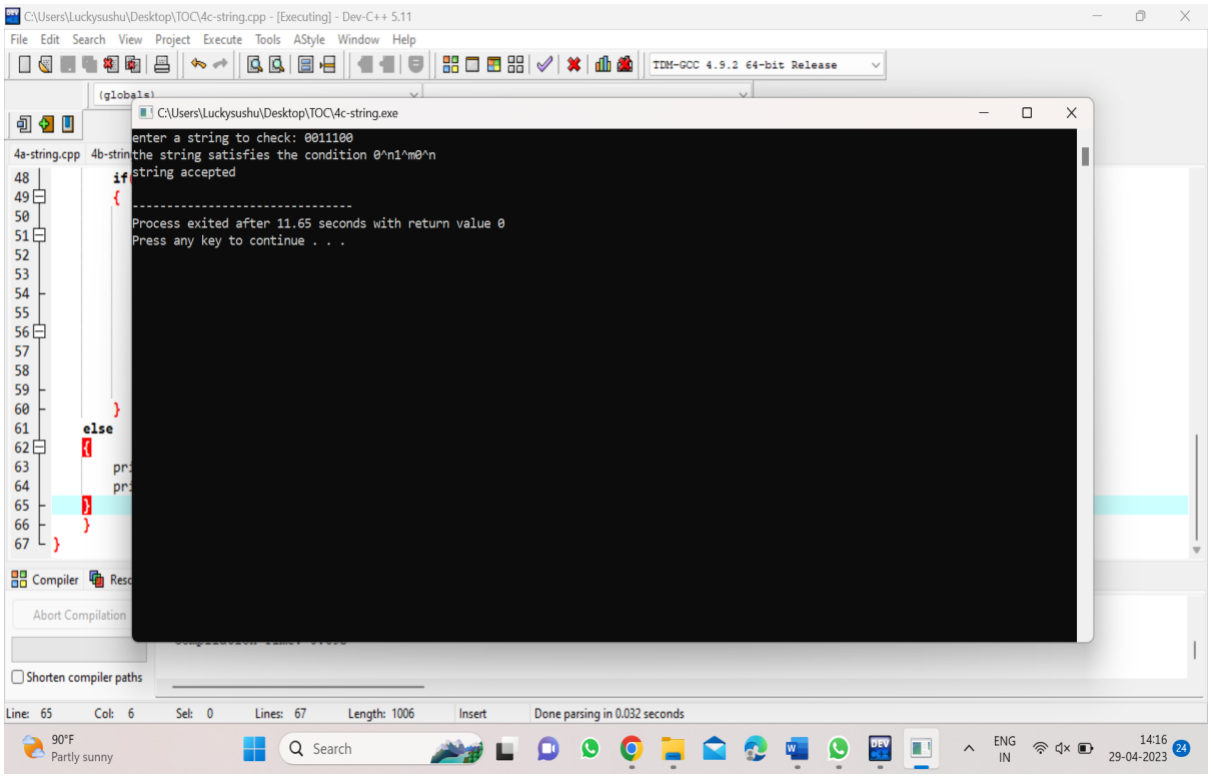
INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
        char s[100];
        int i,flag,flag1,a,b;
        int l,count1,count2;
        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)
{
	i=0;
	count1=0;
	while(s[i]=='0')
	{
		count1++;
		i++;
	}
	while(s[i]=='1')
	{
		i++;
	}
	flag1=1;
	count2=0;
	while(i<l)
	{
		if(s[i]=='0')
		{
			count2++;
```

```
                }
                else
                {
                        flag1=0;
                }
                i++;
        }
        if(flag1==1)
        {
                if(count1==count2)
                {
                        printf("the string satisfies the condition 0^n1^m0^n\n");
                        printf("string accepted\n");
                }
                else
                {
                        printf("the string does not satisfy the condition 0^n1^m0^n\n");
                        printf("string not accepted\n");
                }
        }
    else
    {
        printf("the string does not satisfy the condition 0^n1^m0^n\n");
        printf("string not accepted\n");
    }
    }
}
```

OUTPUT:



7.CHECKING WHETHER STRING BELONGS TO THE GRAMMAR

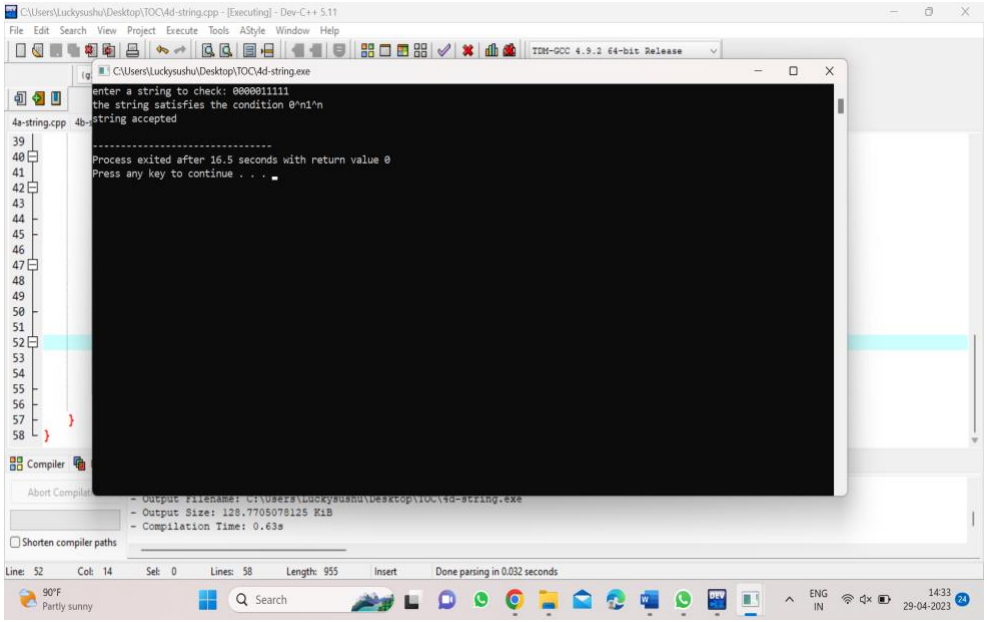
INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
        char s[100];
        int i,flag,flag1,flag2;
        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(l%2!=0)
   {
        printf("the string doesnot satisfy the condition 0^n1^n\n");
        printf("string not accepted\n");
        }
        else
        {
                flag1=1;
                for(i=0;i<(l/2);i++)
                {
                        if(s[i]!='0')
                        {
                                flag1=0;
                        }
                }
                flag2=1;
                for(i=l/2;i<l;i++)
                {
                        if(s[i]!='1')
                        {
                                flag2=0;
                        }
```

```
                }
                if(flag1==1 && flag2==1)
                {
                        printf("the string satisfies the condition 0^n1^n\n\n");
                        printf("string accepted\n");
                }
                else
                {
                   printf("the string does not satisfies the condition 0^n1^n\n\n");
                        printf("string not accepted\n");
                }
            }
        }
}
```

OUTPUT:



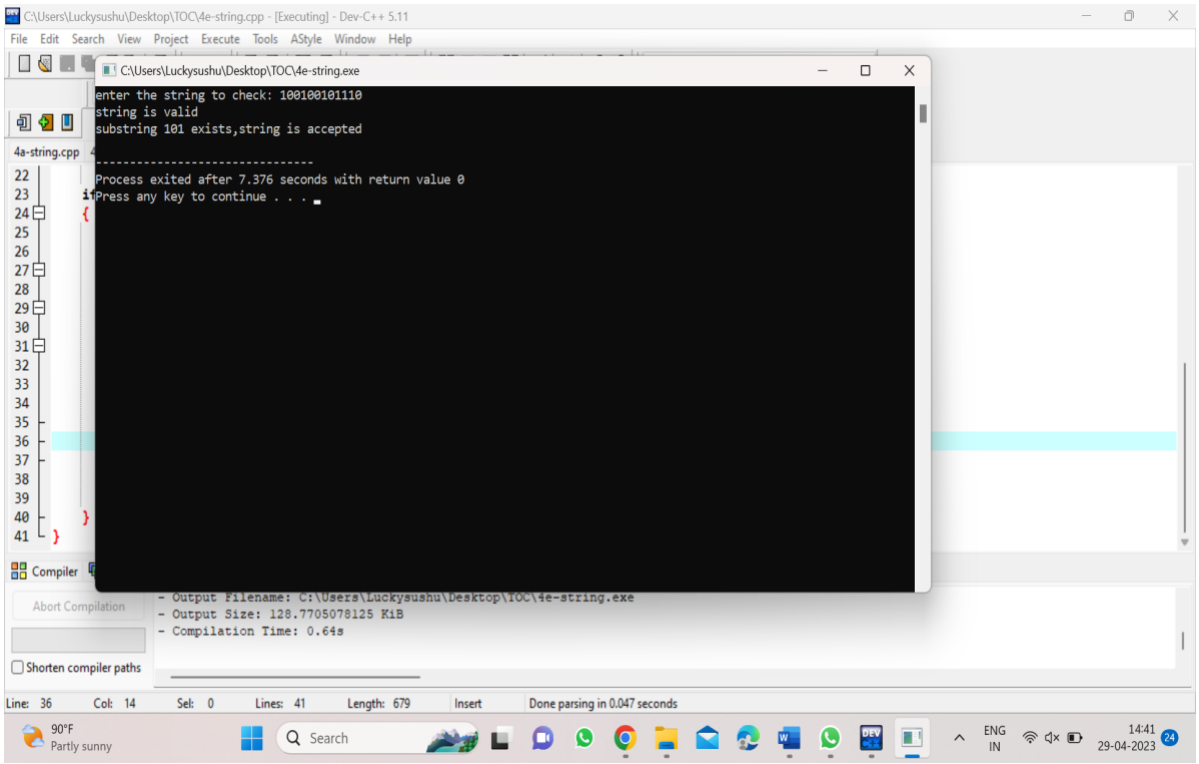
8.CHECKING WHETHER STRING BELONGS TO THE GRAMMAR

INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
	char s[100];
	int i,flag,flag1;
	int l;
	printf("enter the 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 valid\n");
	else
	   printf("string is not valid\n");
	if(flag==1)
	{
		flag1=0;
		for(i=0;i<l-2;i++)
		{
			if(s[i]=='1')
			{
				if(s[i+1]=='0' && s[i+2]=='1')
```

```
                    {
                        flag1=1;
                        printf("substring 101 exists,string is accepted\n");
                        break;
                    }
                }
            }
            if(flag1==0)
               printf("substring 101 does not exist.string is not accepted\n");
        }
}
```

OUTPUT:



9.SIMULATING PUSHDOWN AUTOMATA (0^n1^n):

INPUT:

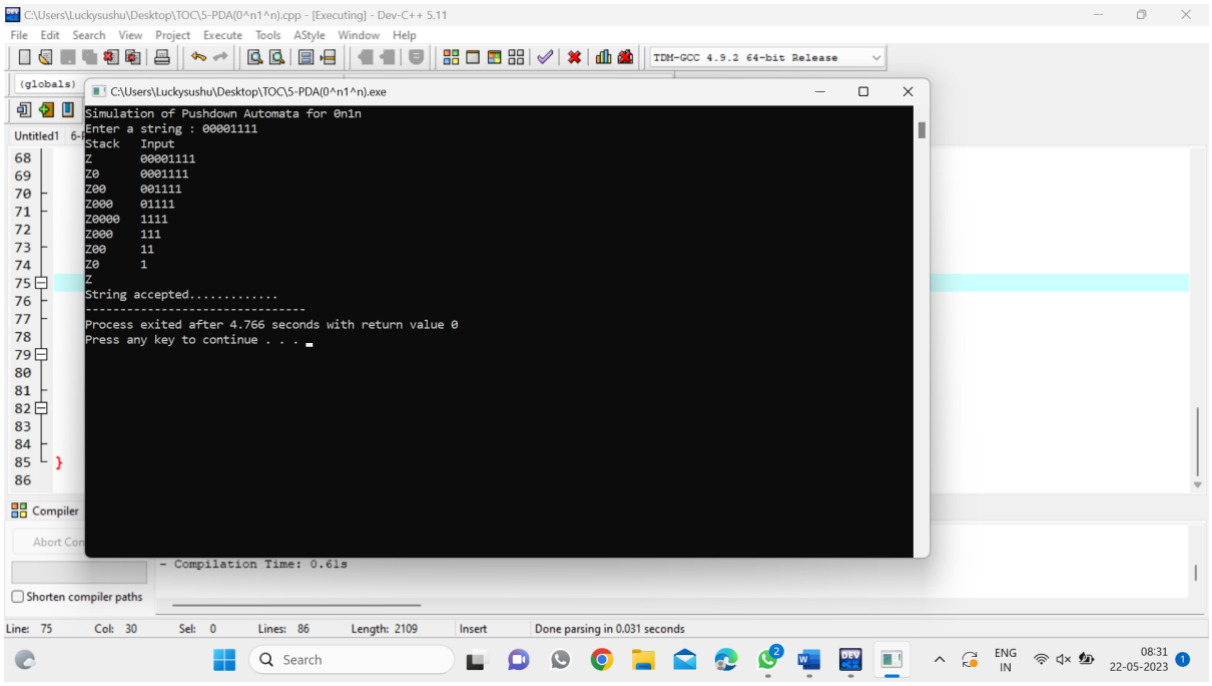
```
#include<stdio.h>
```

```
#include<string.h>
char stack[20];
int top;
int push()
{
   top=top+1;
         stack[top]='0';
   stack[top+1]='\0';
}
int pop()
{
         if(top<1)
         return(0);
   else
   {
      stack[top]='\0';
                  top=top-1;
      return(1);
   }
}
int main()
{
   int m,i,j,k,l,a,len;
   char input[20],rem_input[20];
   printf("Simulation of Pushdown Automata for 0n1n\n");
   printf("Enter a string : ");
         scanf("%s",input);
         l=strlen(input);
         j=0;stack[0]='Z';top=0;
         printf("Stack\tInput\n");
```

```
        printf("%s\t%s\n",stack,input);
while(1)
{
   len=strlen(input);
   while(len>0)
   {
      if(input[0]=='0')
      {
                              push();
         m=0;
         for(k=1;k<len;k++)
         {
            rem_input[m]=input[k];
            m=m+1;
         }
         rem_input[m]='\0';
                                 strcpy(input,rem_input);
                                 printf("%s\t%s\n",stack,input);
      }
      if(input[0]=='1')
      {
         a=pop();
         if(a==0)
         {
            printf("String not accepted");
                                       goto b;
                                       }
                                       else
                                       {
                                       m=0;
```

```
                for(k=1;k<len;k++)
                {
                   rem_input[m]=input[k];
                   m=m+1;
                }
                rem_input[m]='\0';
                                        strcpy(input,rem_input);
                printf("%s\t%s\n",stack,input);
             }
          }
          break;
       }        j=j+1;
       if(j==(l))
       {            break;
       }
    }
    if(top>=1)
    {
       printf("String not accepted");
    }     else
    {
       printf("String accepted");
    }     b:         printf(".............");
}
```

OUTPUT:



10)SIMULATING PUSHDOWN AUTOMATA (0^N1^2N):

INPUT:

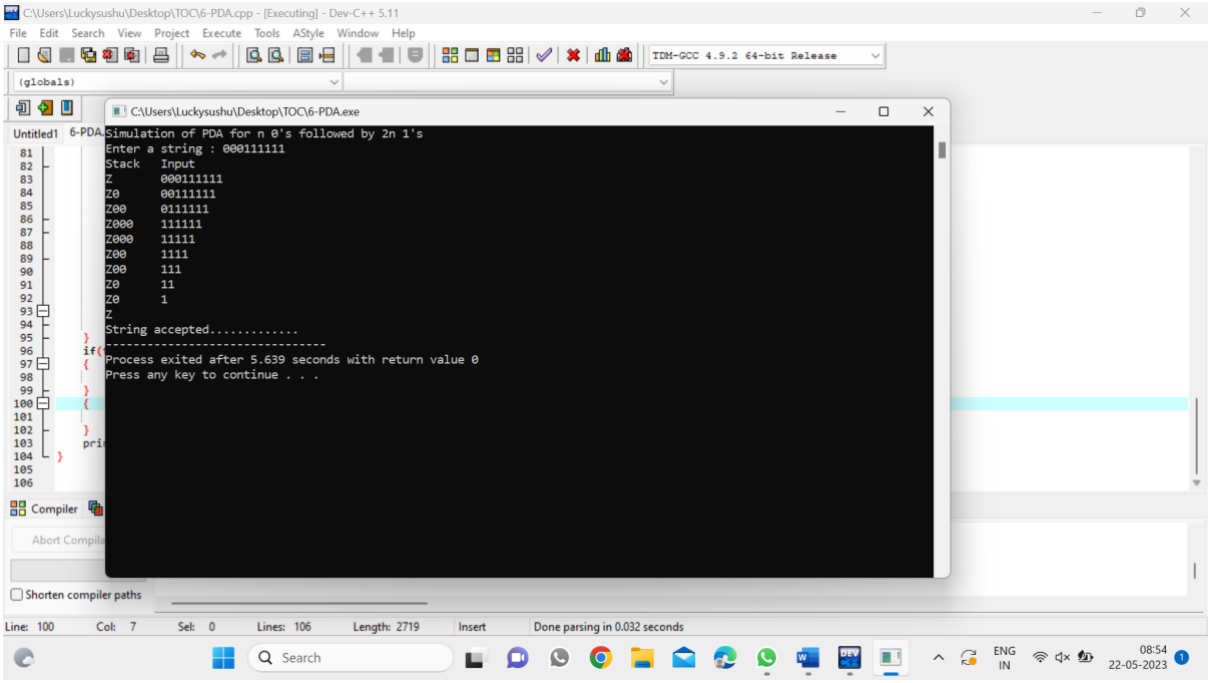
```
#include<stdio.h>
#include<string.h>
char stack[20];
int top,count=0;
int push()
{
   top=top+1;
         stack[top]='0';
         stack[top+1]='\0';
}
int pop()
{
if(top<1)
return(0);
```

```
    else
    {
        stack[top]='\0';
                top=top-1;
        return(1);
    }
}
int main()
{
    int m,i,j,k,l,a,len;
    char input[20],rem_input[20];
    printf("Simulation of PDA for n 0's followed by 2n 1's\n");
    printf("Enter a string : ");
          scanf("%s",input);
          l=strlen(input);
          j=0;
          stack[0]='Z';
          top=0;
          printf("Stack\tInput\n");
          printf("%s\t%s\n",stack,input);
    while(1)
    {
        len=strlen(input);
        while(len>0)
        {
            if(input[0]=='0')
            {
                                    push();
              m=0;
              for(k=1;k<len;k++)
```

```
    {
       rem_input[m]=input[k];
       m=m+1;
    }
    rem_input[m]='\0';
    strcpy(input,rem_input);
    printf("%s\t%s\n",stack,input);
}
if(input[0]=='1')
{
    count++;
                        if(count%2==0)
    {
                        a=pop();
                        if(a==0)
       {
          printf("String not accepted");
                                        goto b;
                                        }
                                        else
                                        {
          m=0;
                                        for(k=1;k<len;k++)
          {
             rem_input[m]=input[k];
             m=m+1;
          }
       }
       rem_input[m]='\0';
                                strcpy(input,rem_input);
```

```
            printf("%s\t%s\n",stack,input);
          }              else              {
            m=0;
                                          for(k=1;k<len;k++)
            {
              rem_input[m]=input[k];
              m=m+1;
            }
            rem_input[m]='\0';
                                          strcpy(input,rem_input);
            printf("%s\t%s\n",stack,input);
          }
        }
        break;
      }
      j=j+1;

            if(j==l)
      {       break;
      }
    }
    if(top>=1)
    {
      printf("String not accepted");
    }    else
    {
      printf("String accepted");
    }    b:
        printf(".............");
}
```

OUTPUT:



11)SIMULATING TURING MACHINE(ON1N2N):

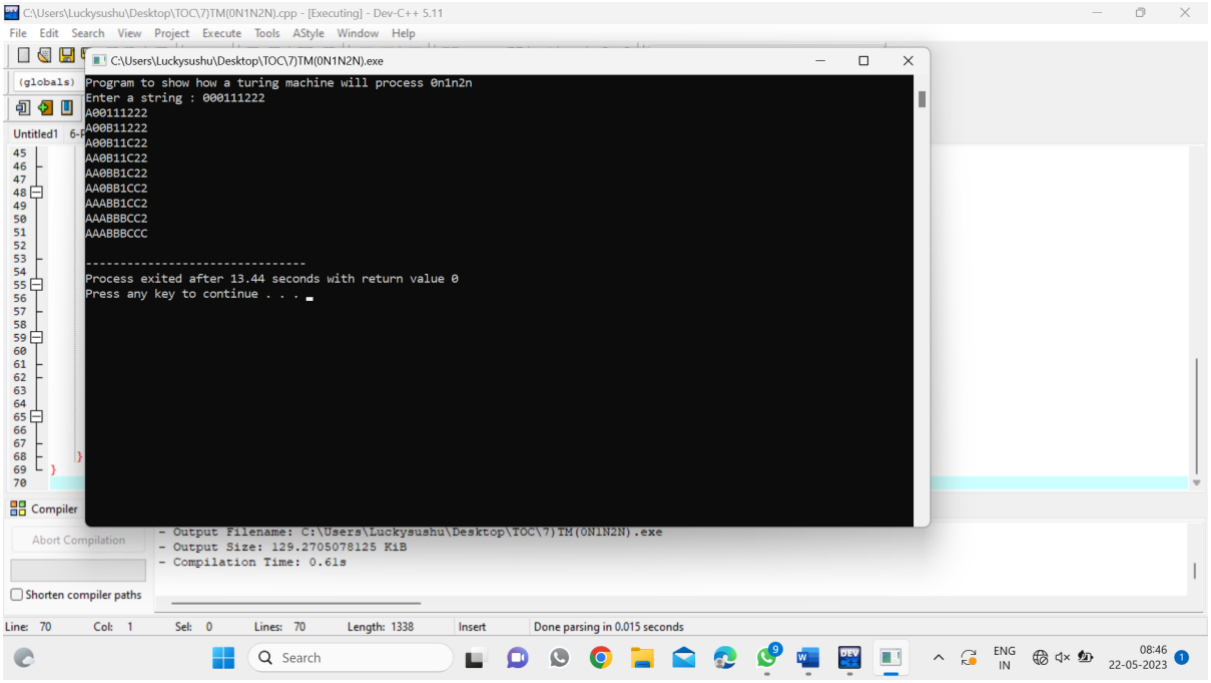
INPUT:

```
#include<stdio.h>
#include<string.h>
int main()
{
        int i,j,le,flag,flag1,flag2;
        char str[20];
        printf("Program to show how a turing machine will process 0n1n2n\n");
         printf("Enter a string : ");
         scanf("%s",str);
        le=strlen(str);
        j=0;    while(1)
        {
                flag=0;flag1=0;
                flag2=0;i=0;
```

```
while(i<le)
{
        if((str[i]=='0')&&(flag==0))
        {
                str[i] = 'A';
                printf("%s\n",str);
                flag=1;
                i=i+1;
        }
        else if((str[i]=='0')&&(flag==1))
        {
                i=i+1;
        }
        else if(str[i]=='A')
        {
                i=i+1;
        }
        else if((str[i]=='1')&&(flag1==0))
        {
                str[i] = 'B';
                printf("%s\n",str);
                flag1=1;
                i=i+1;
        }
        else if((str[i]=='1')&&(flag1==1))
        {
                i=i+1;
        }
        else if(str[i]=='B')
        {
```

```
                    i=i+1;
                }
                else if((str[i]=='2')&&(flag2==0))
                {
                    str[i] ='C';
                    printf("%s\n",str);
                    flag2=1;
                    i=i+1;
                }
                else if((str[i]=='2')&&(flag2==1))
                {
                    i=i+1;
                }
                else if(str[i]=='C')
                {
                    i=i+1;
                }
            }
            j=j+1;
            if(j==le)
            {
               break;
            }
        }
}
```

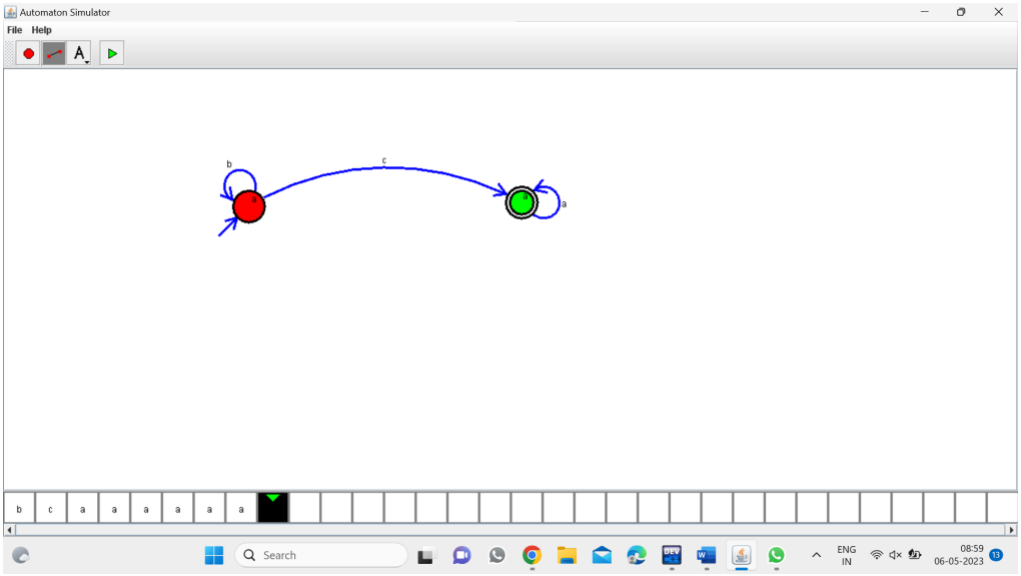
OUTPUT:



SIMULATION PROGRAMS

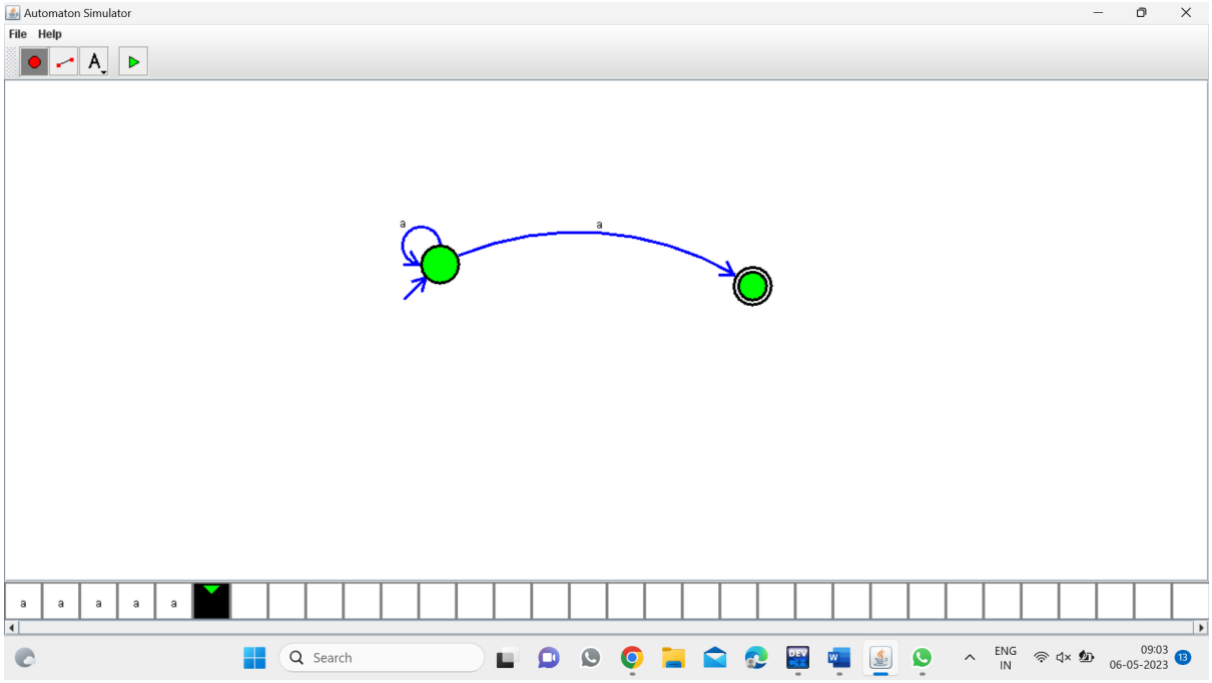
PROGRAM12: 29

DFA to accept bcaaaaa:



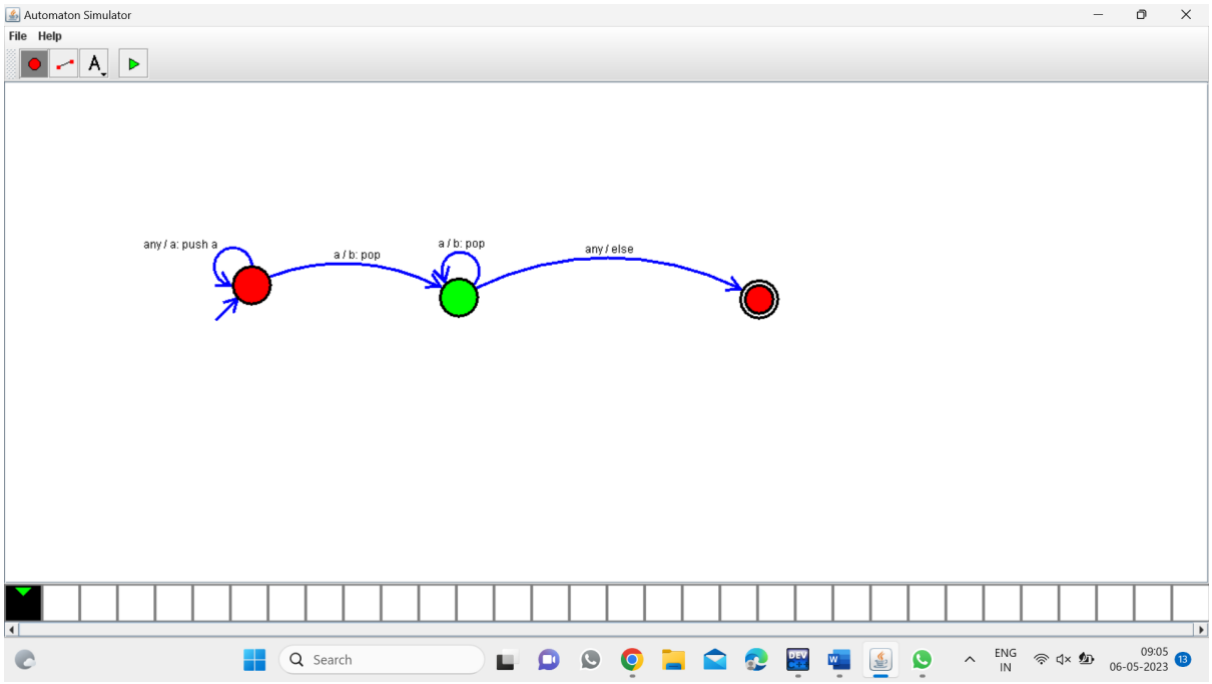
PROGRAM13:

NFA to accept aaaa: 30



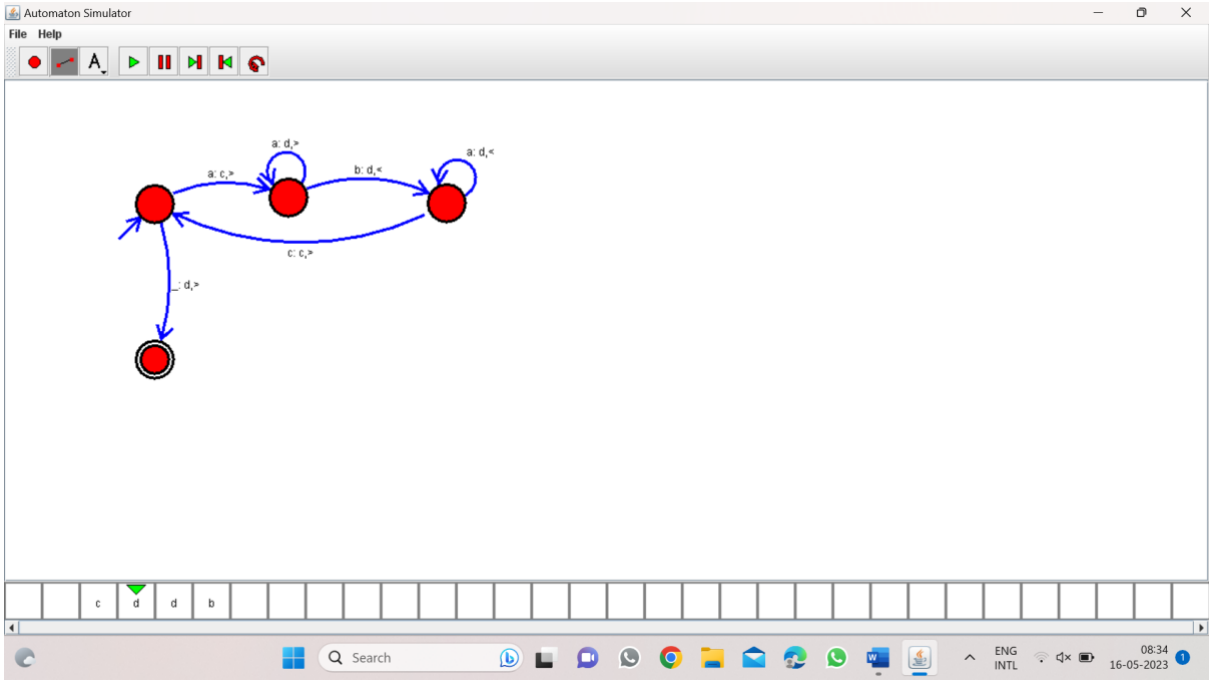
PROGRAM14: 31

PDA for a^nb^n:



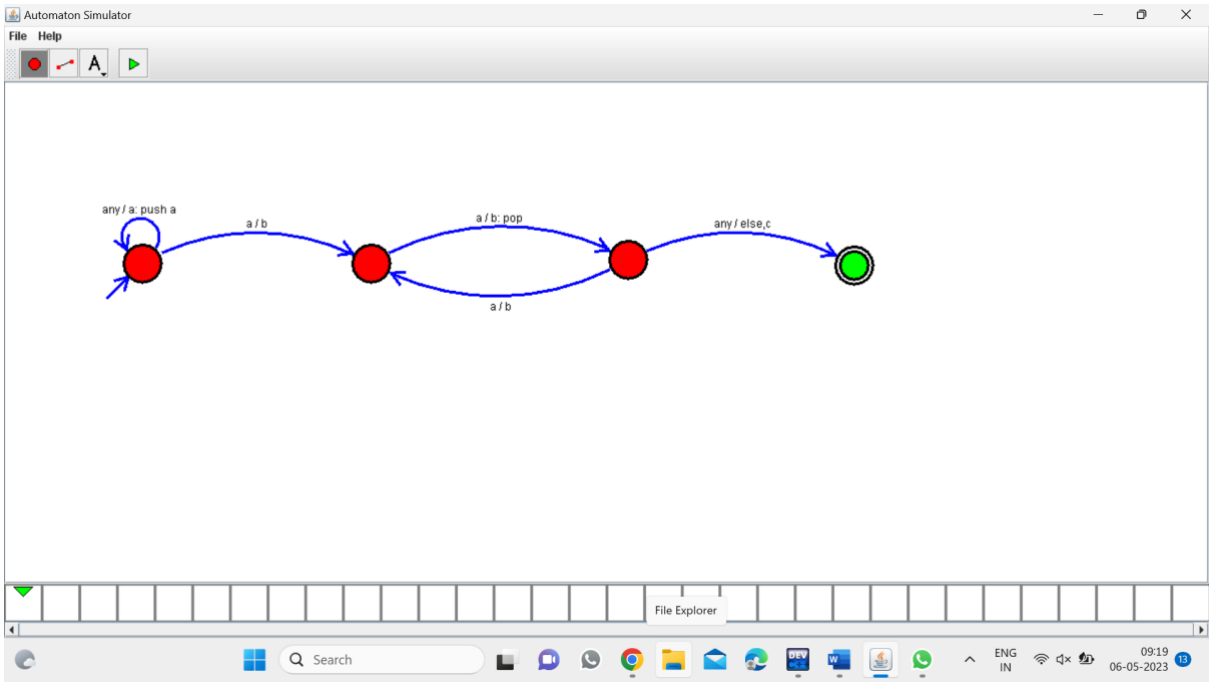
PROGRAM 15:

TM For a^nb^n: 15



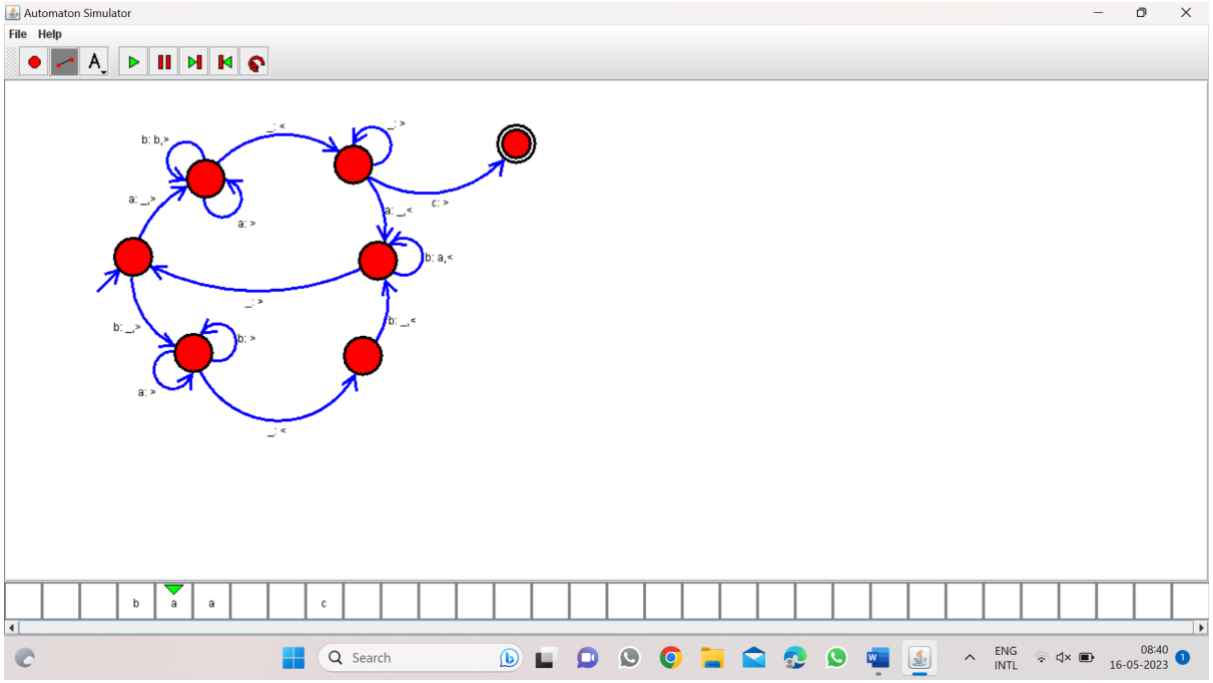
PROGRAM16: 16

TM for a^nb^2n:



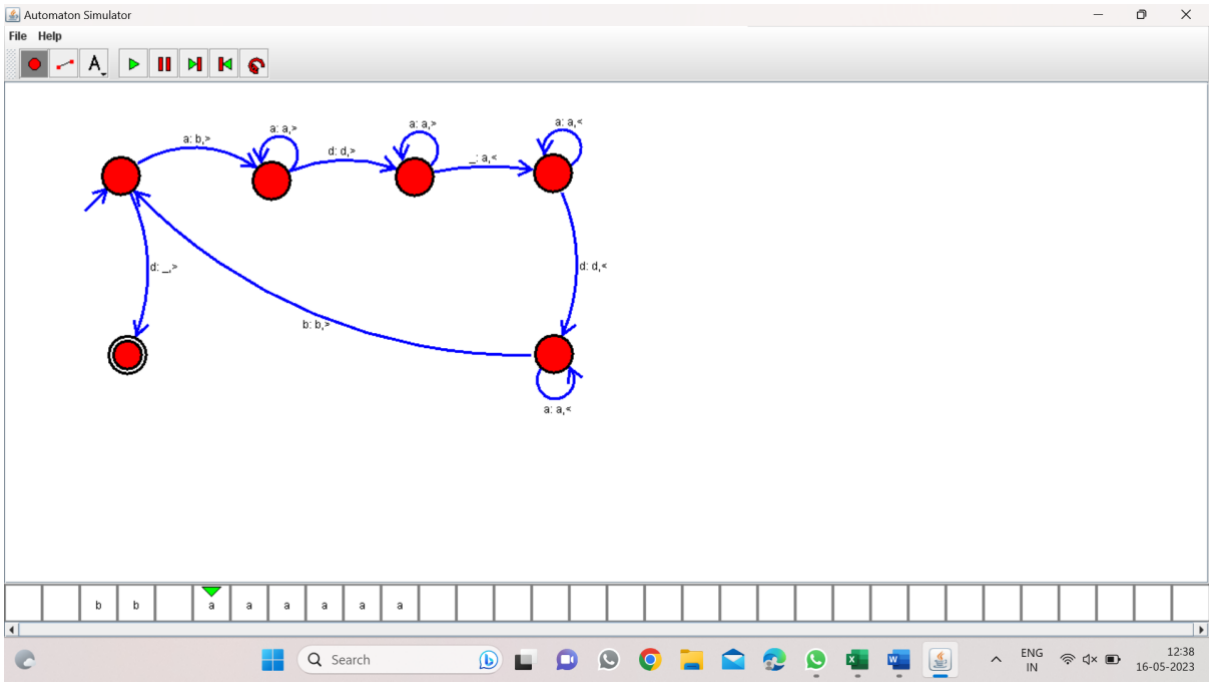
Program17: 17

TM for palindrome



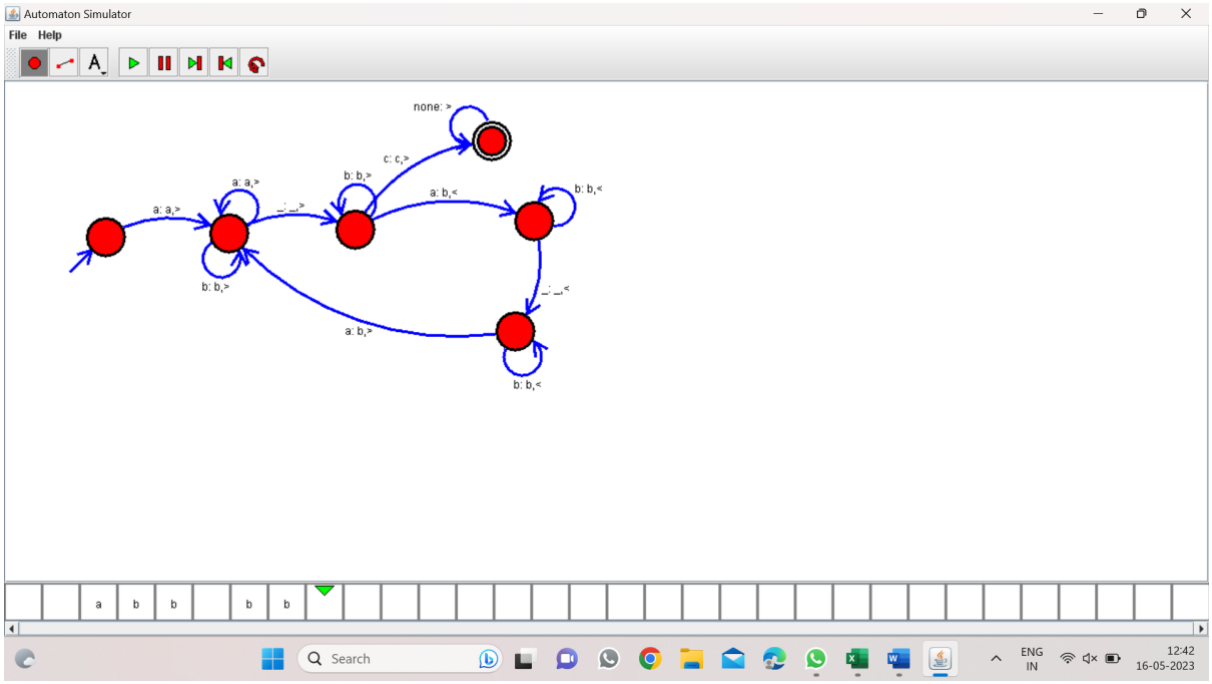
Program 18: 19

TM for addition:



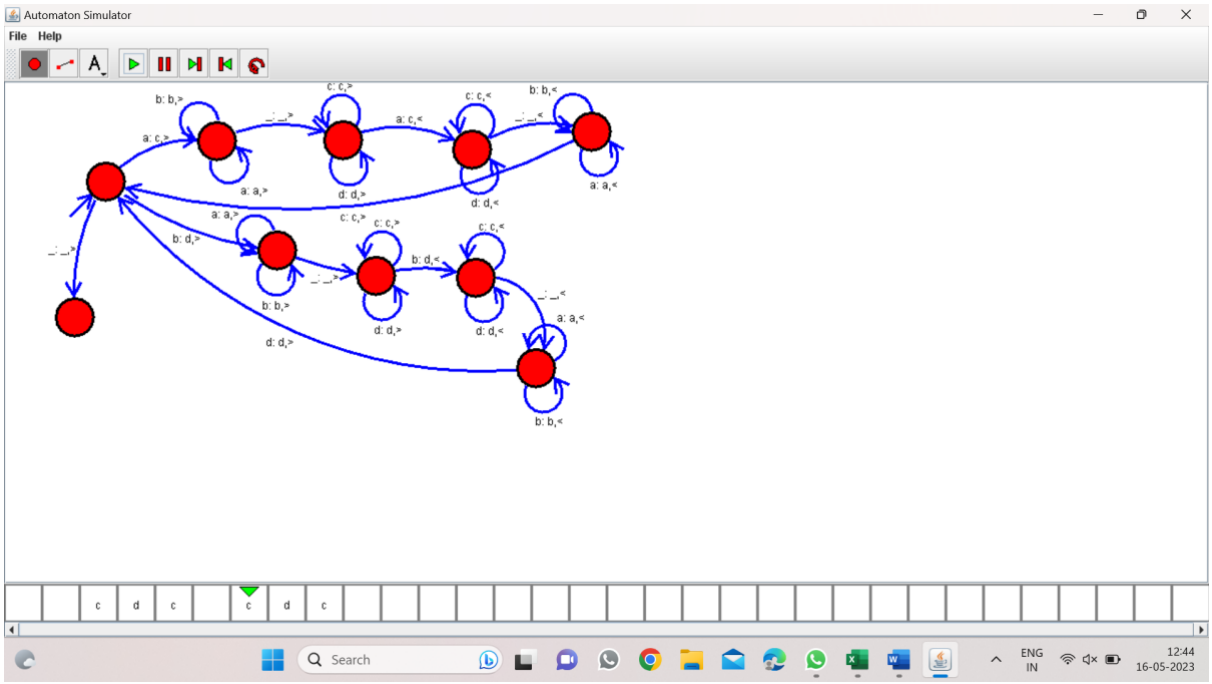
Program 19: 20

TM for subtraction:



Program 20: 32

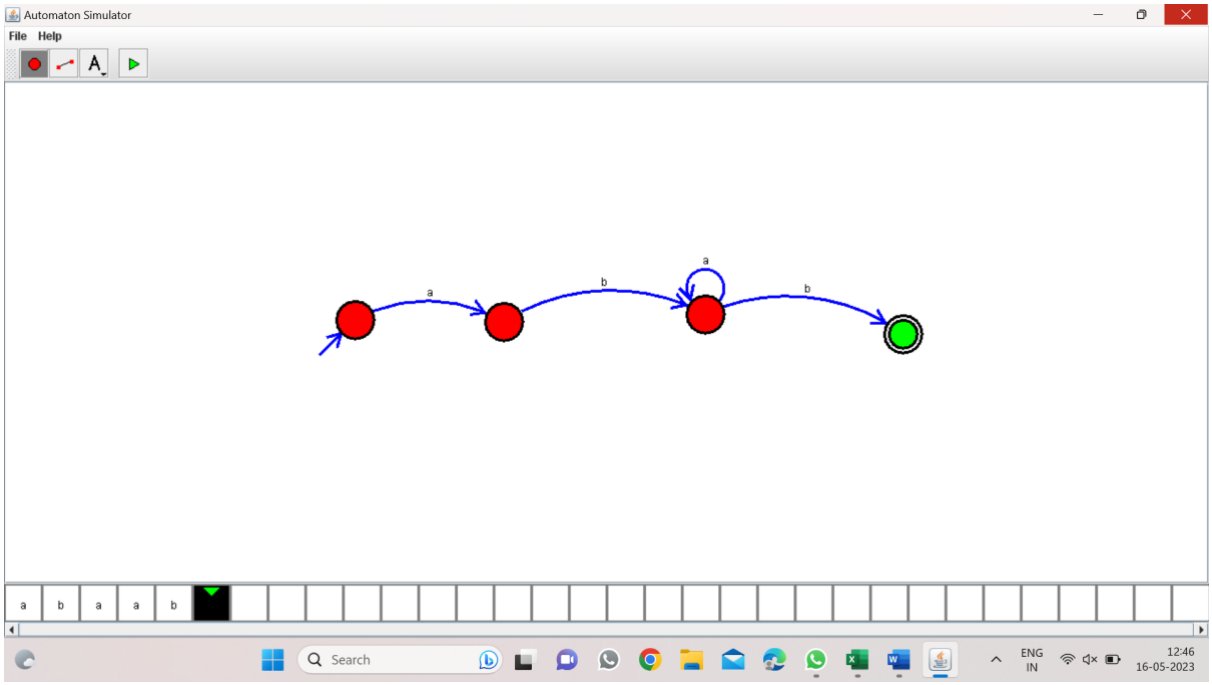
TM for string coparision:



Program 21: 36

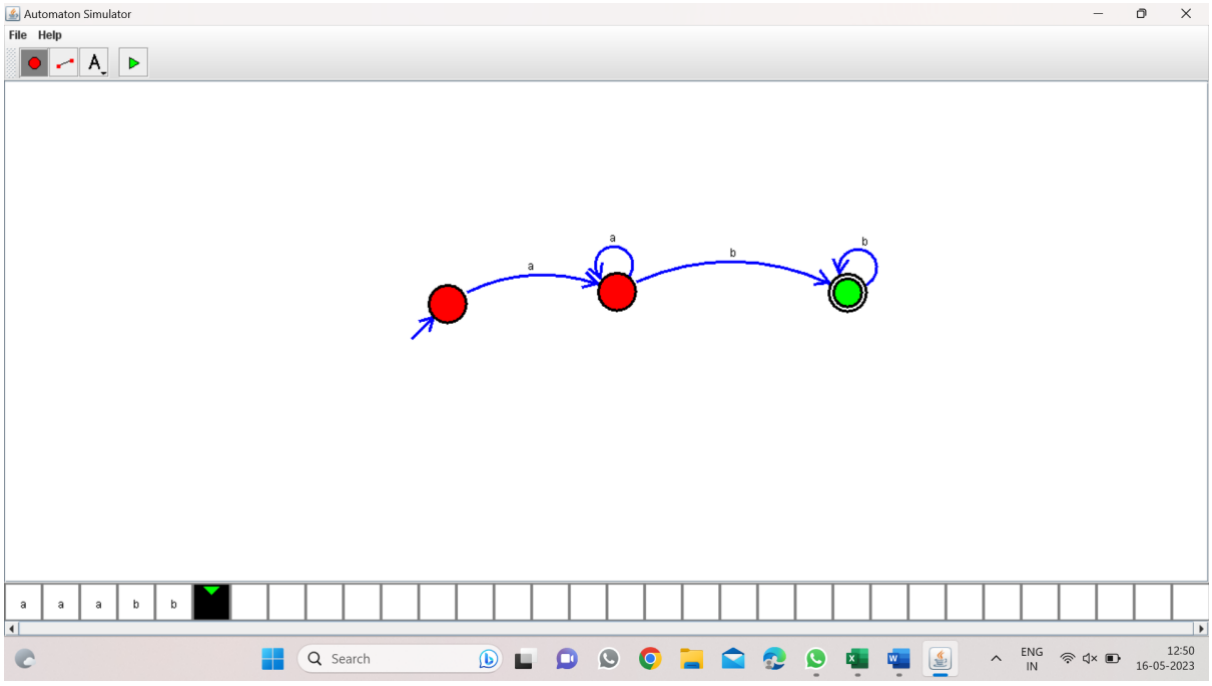
NFA to accept start with a and end with b:

W=abaab



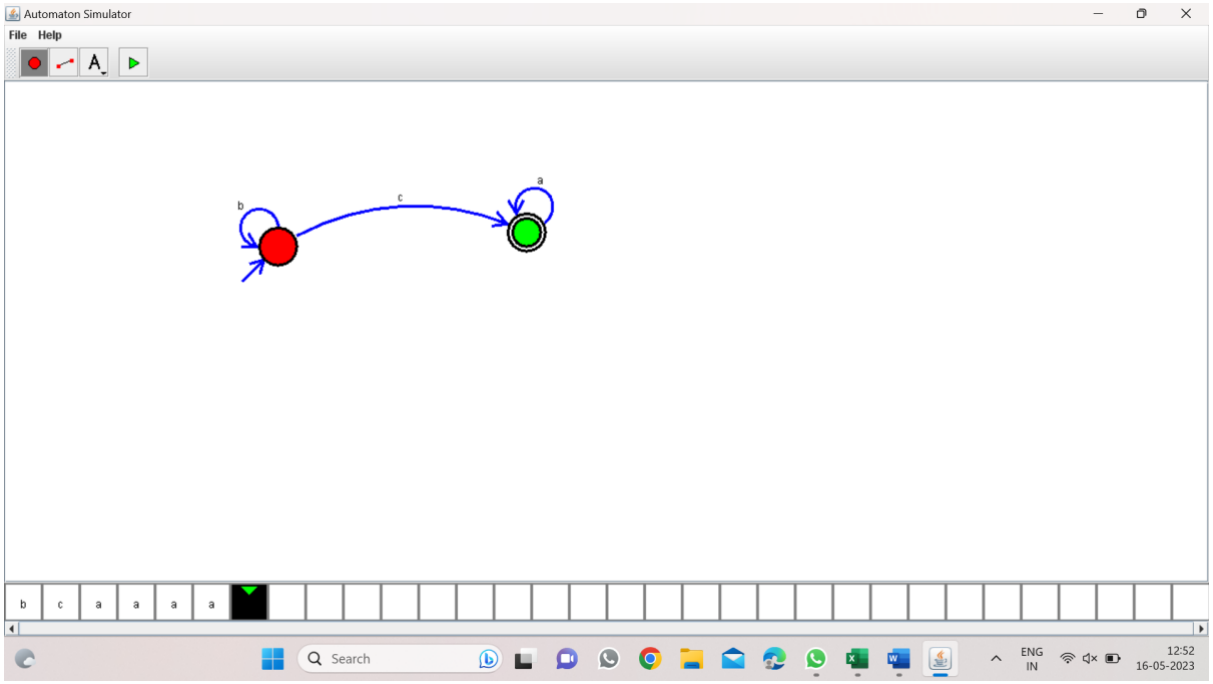
Program 22: 37

NFA to accept string that start and end with different symbols:



Program 23: 38

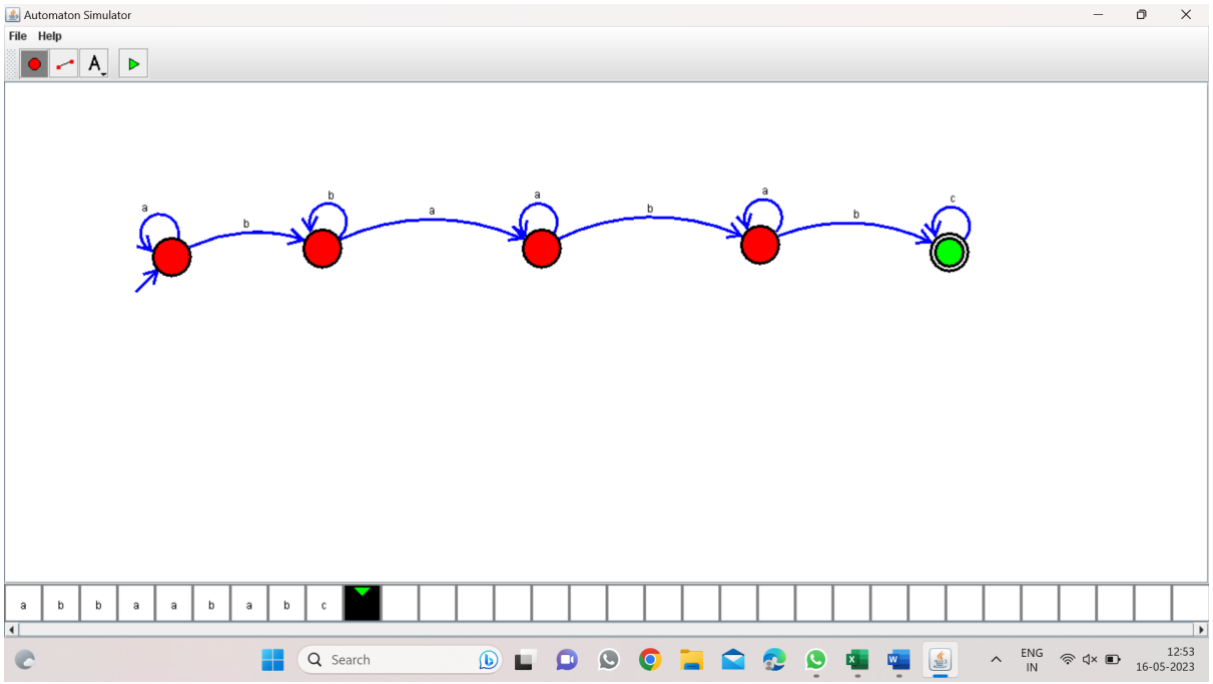
NFA to accept the string bbc,c,bcaaa:



Program 24: 39

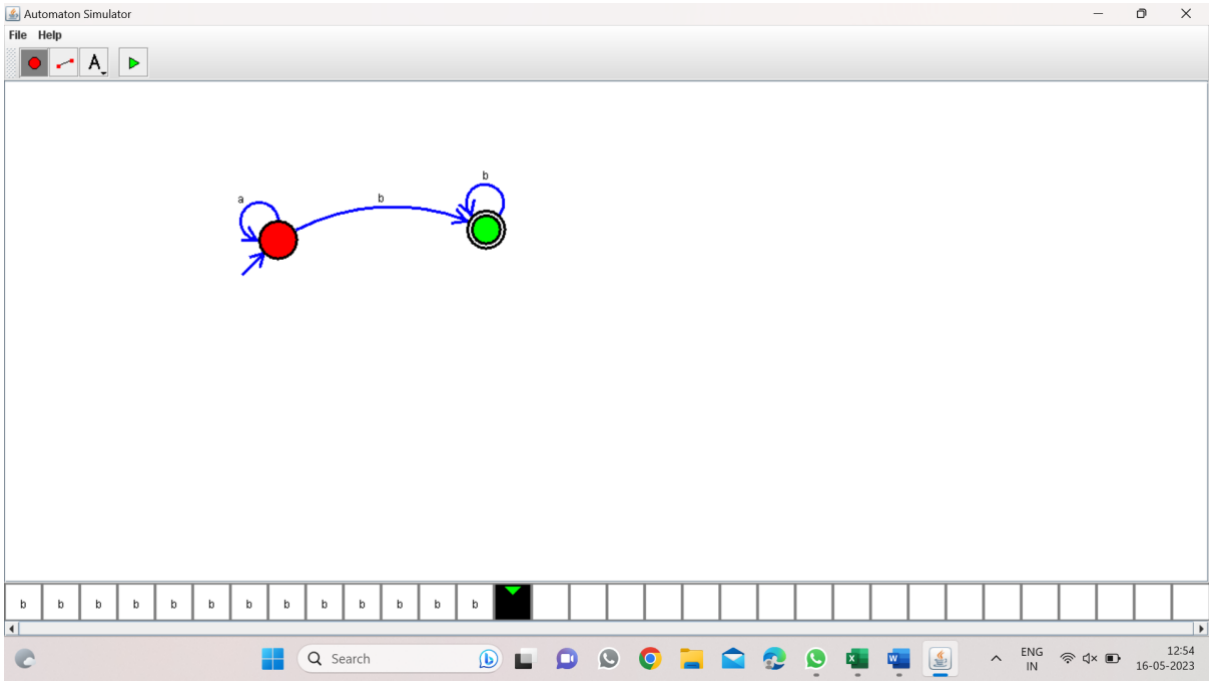
DFA to accept the string that end with abc:

W=abbaababc



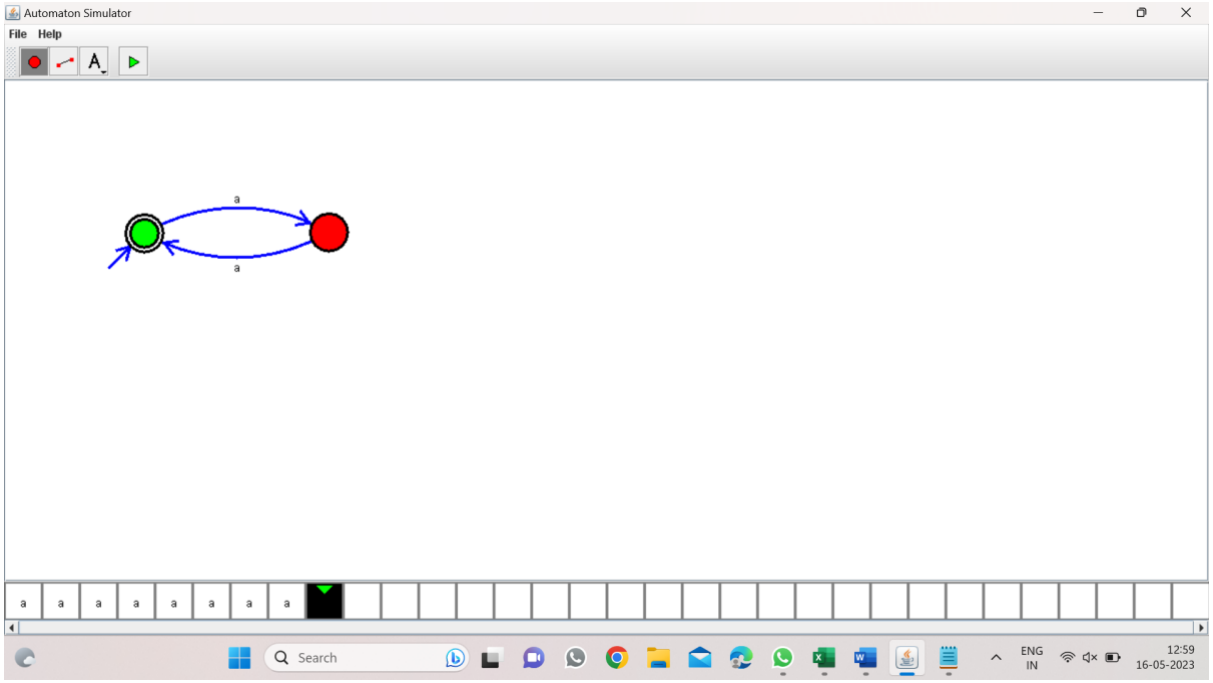
Program 25: 40

NFA to accept any number of b's:



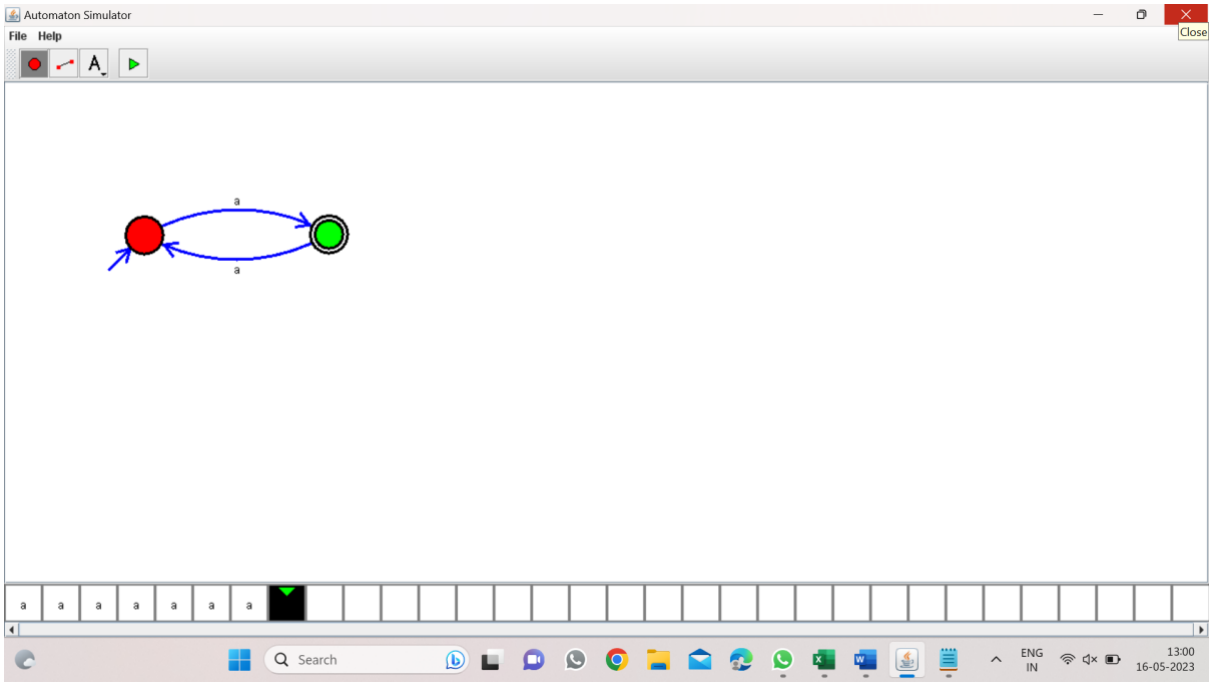
Program 26: 21

DFA for even no.of a's:



Program27: 22

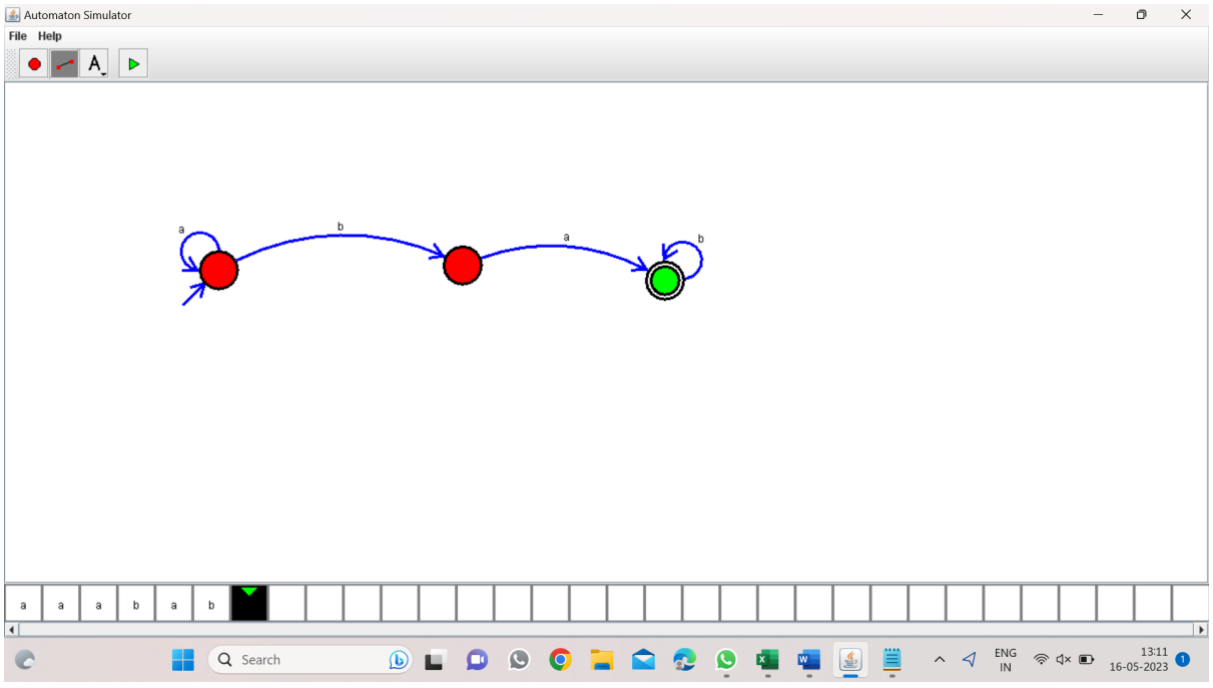
DFA for odd no.of a's:



Program 28: 23

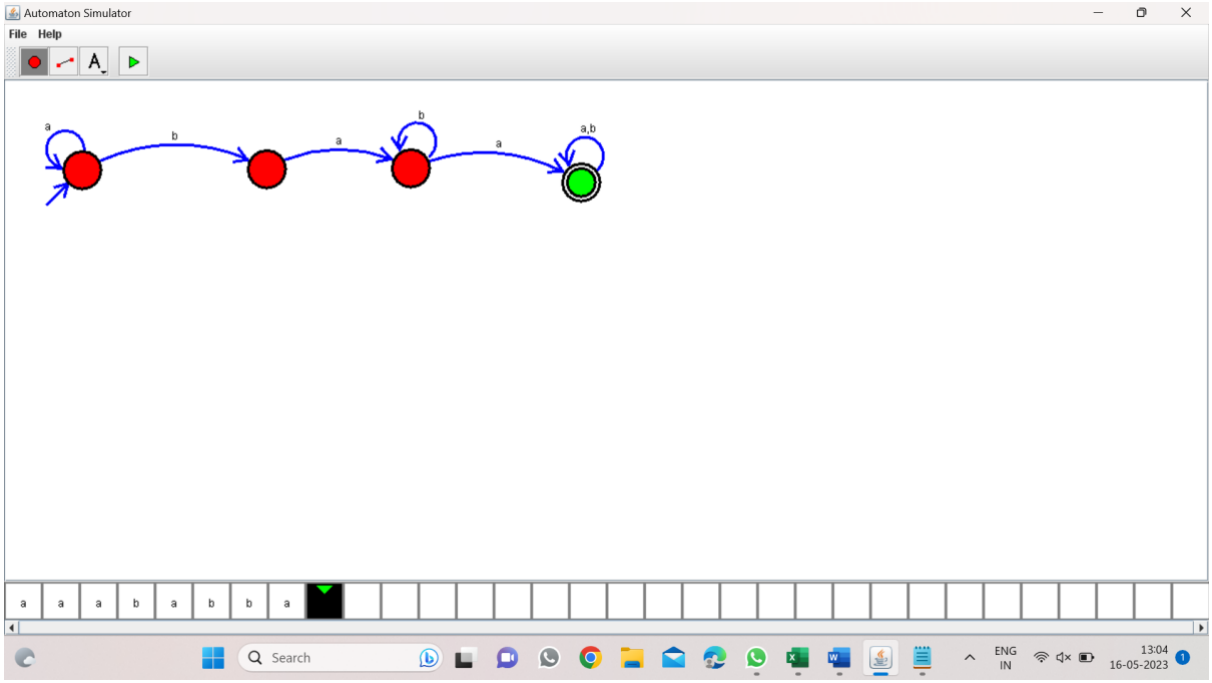
DFA to accept string end with ab:

W=aaabab:



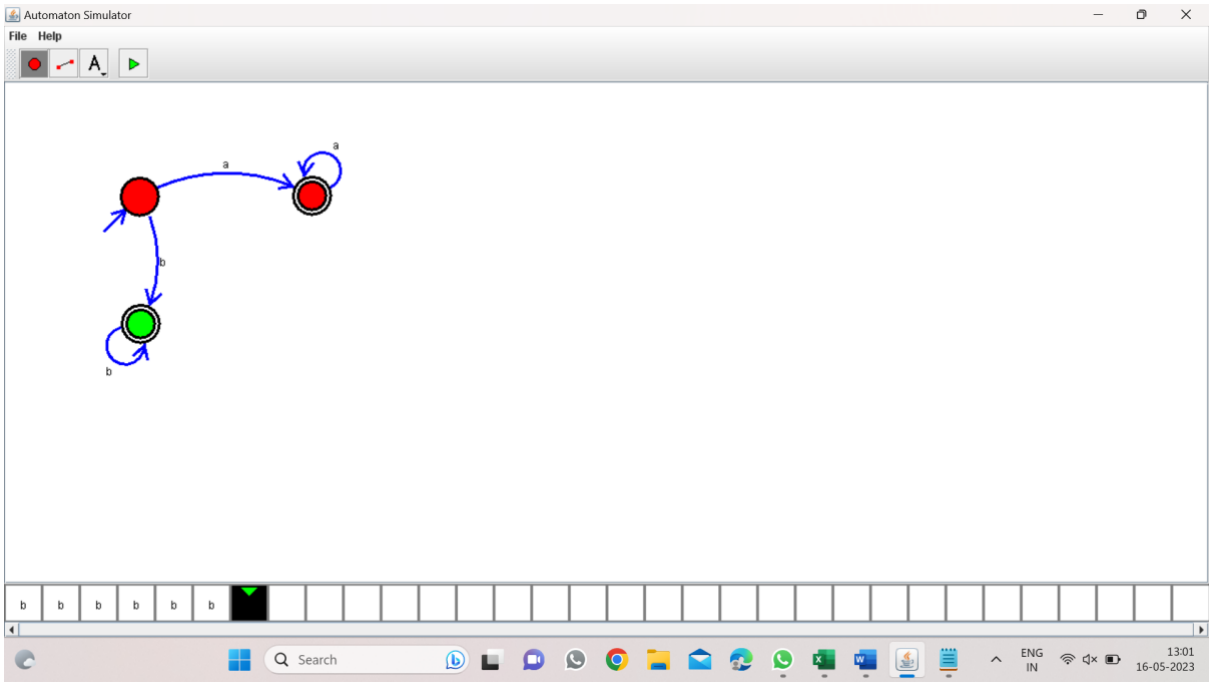
Program 29: 24

DFA consisting substring ab:



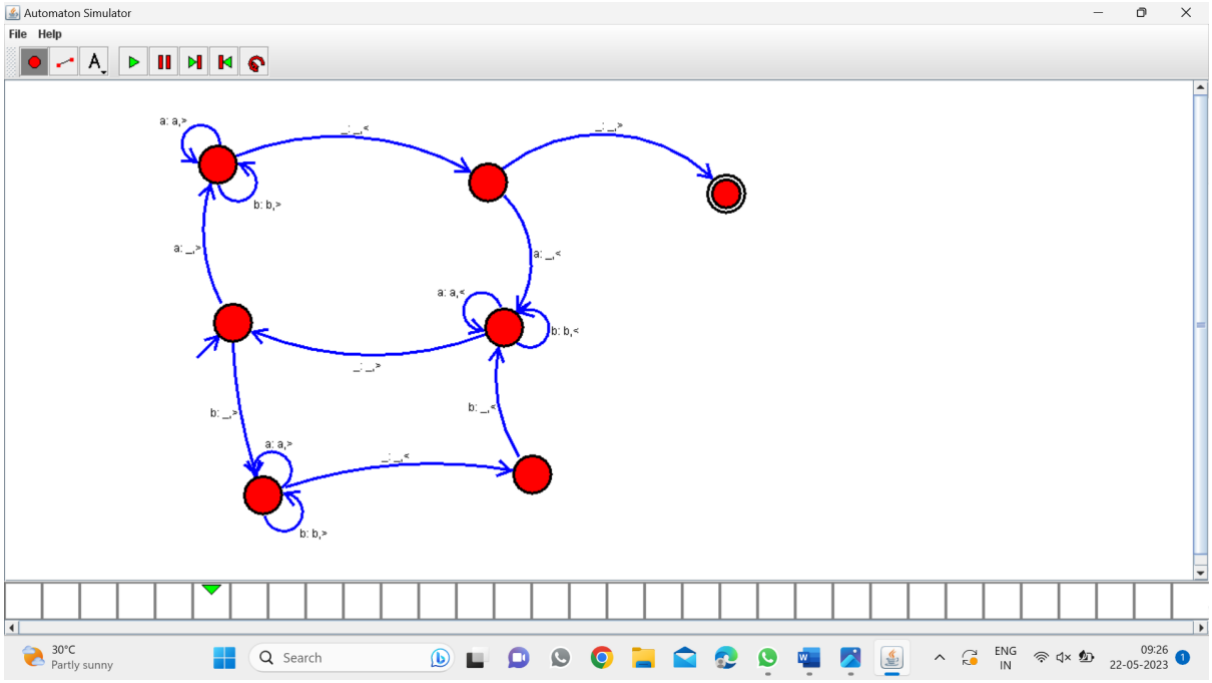
Program 30: 25

DFA start with a or b:



PROGRAM 31: **26**

TM TO ACCEPT STRINNG PALINDROME (bbabb):



PROGRAM 32:

DFA TO ACCEPT EVEN NUMBER OF C's: