Programming Fundamentals

Lab Report

Lab03

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Class	Programming Fundamentals CSC103 (**BCE-2B**)
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In Lab Tasks

Question no: 1

Write a C program that solves a simple user-entered mathematical expression. It should take input from the user (two floating type values and operations like *, /, + and -), calculate the result and show it on screen.

Solution:

In this Program, I used Switch and Case Operators, I made a separate Case for each of multiplication, addition, subtraction and division.

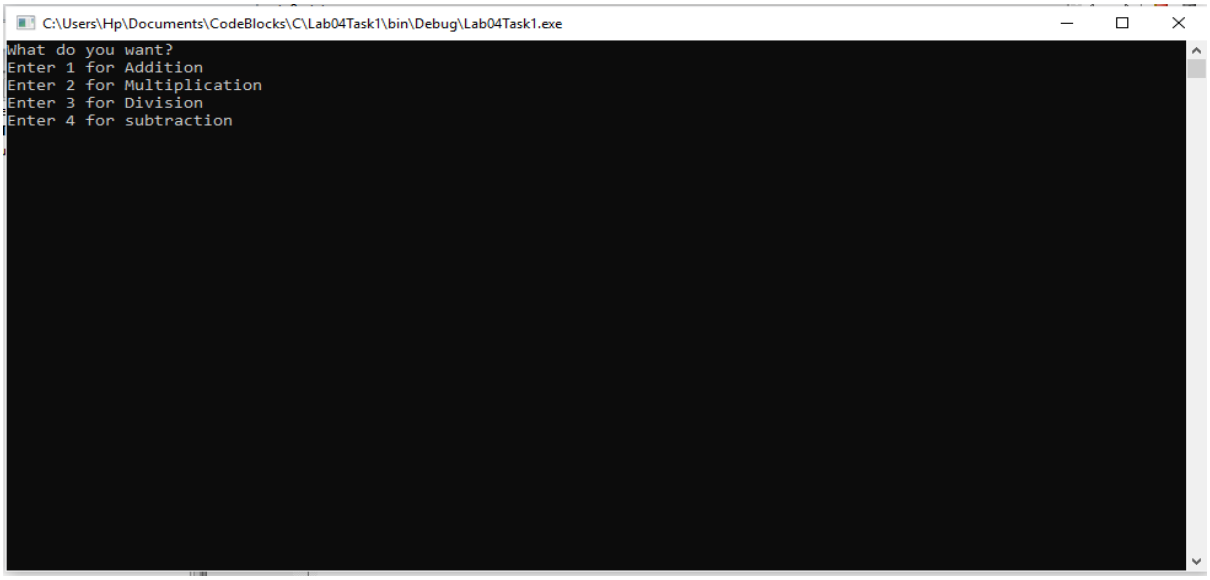
Code and results attached below

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

int main()
{
    int op;
    float num1,num2,total;
    printf("What do you want?\n");
    printf("Enter 1 for Addition\n");
    printf("Enter 2 for Multiplication\n");
    printf("Enter 3 for Division\n");
    printf("Enter 4 for subtraction\n");
    scanf("%d",&op);
    switch(op)
    {
    case 1:
        {
     printf("Enter the First Digit?");
     scanf("%f",&num1);
     printf("Enter the Second Digit?");
     scanf("%f",&num2);
     total= num1 + num2;
     printf("The Value of %f plus %f is : %f ",num1,num2,total);
     break;
        }

   case 2:
```

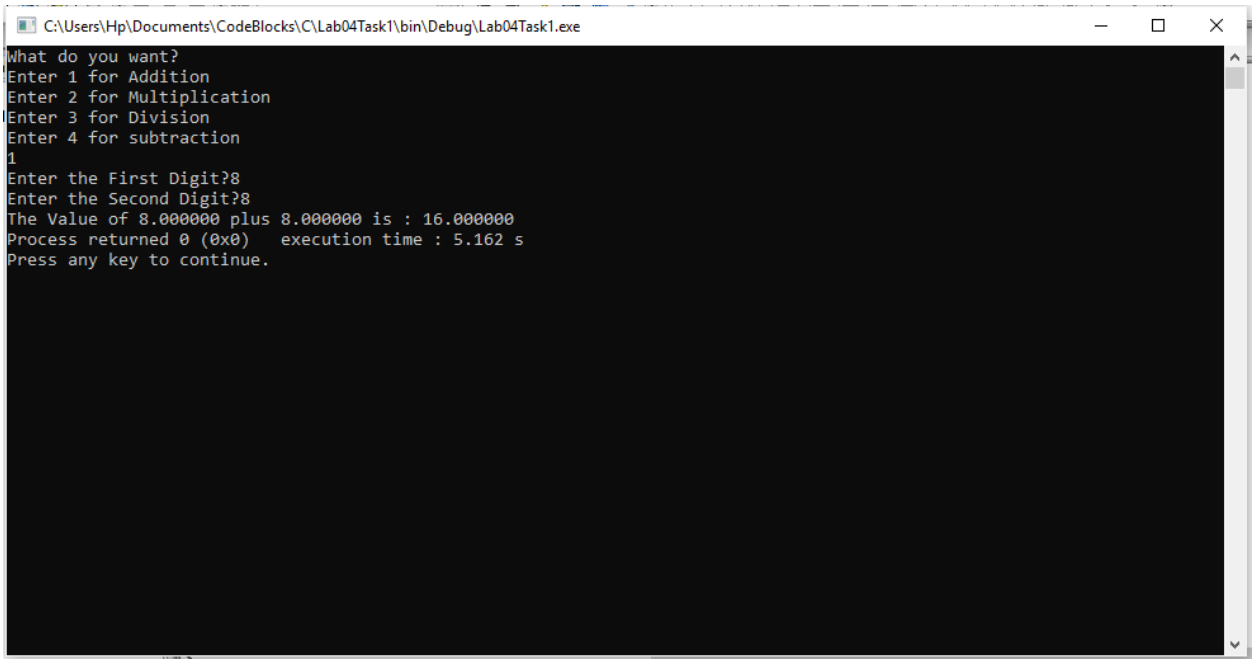
```
        }

    case 2:
        {
      printf("Enter the First Digit?");
      scanf("%f",&num1);
      printf("Enter the Second Digit?");
      scanf("%f",&num2);
      total= num1 * num2;
      printf("The Value of %f Multiplied with %f is : %f ",num1,num2,total);
      break;
        }

        case 3:
        {
      printf("Enter the First Digit?");
      scanf("%f",&num1);
      printf("Enter the Second Digit?");
      scanf("%f",&num2);
      total= num1 / num2;
      printf("The Value of %f divided by %f is : %f ",num1,num2,total);
      break;
        }

        case 4:
        {
      printf("Enter the First Digit?");
```

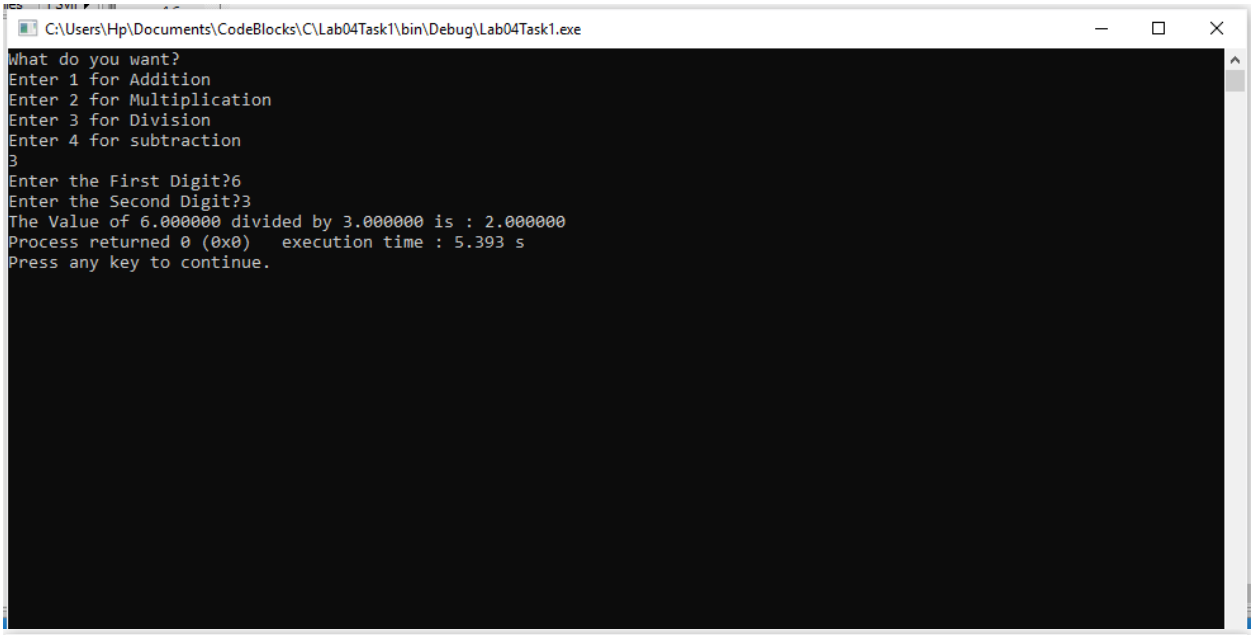
```
      break;
        }

        case 4:
        {
      printf("Enter the First Digit?");
      scanf("%f",&num1);
      printf("Enter the Second Digit?");
      scanf("%f",&num2);
      total= num1 - num2;
      printf("The Value of %f Minus %f is : %f ",num1,num2,total);
      break;
        }

        default:
        {
            printf("Select the above options only!!");
        }

    }


    return 0;
}
```

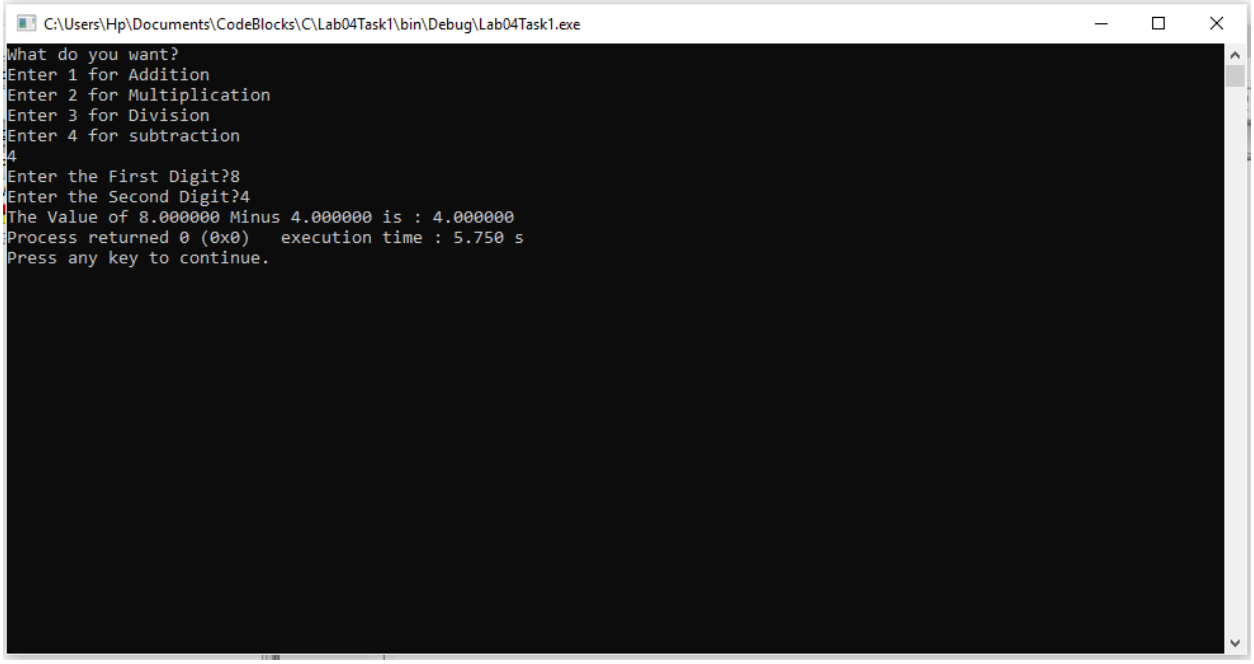
Now below is the Menu:



Now I have Tested all 4 for different values, there result is attached below,







Hence, these results further verify the that our program works for all values and is correct.

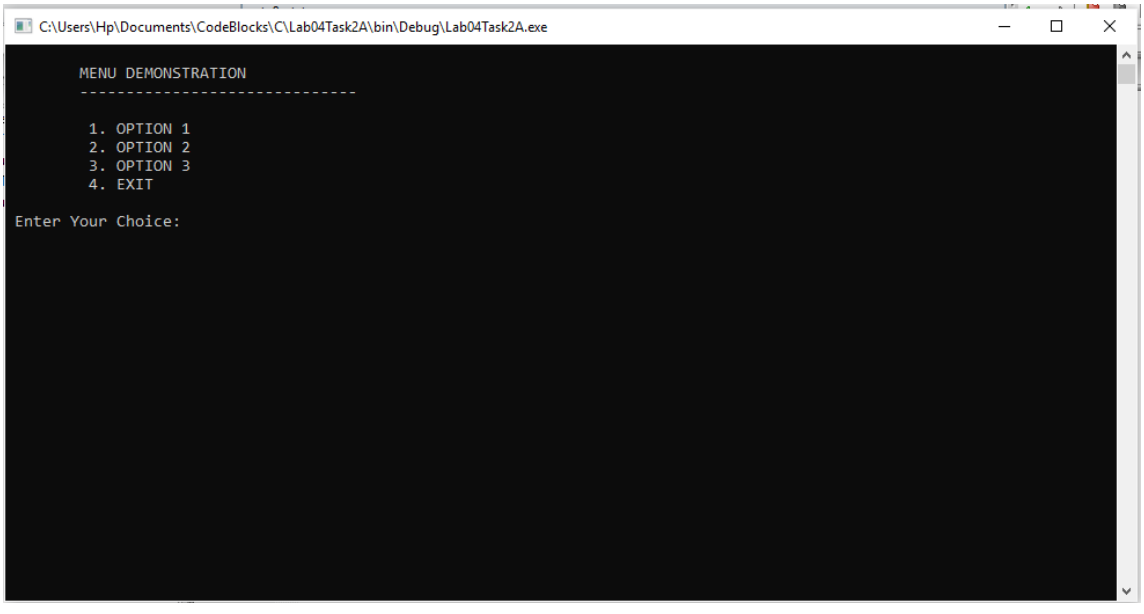
Question no: 2(a)

Following program prints a menu. It then takes input from user and displays the entered choice. Type-in the C program given below into a new project, compile and run to see how it works..

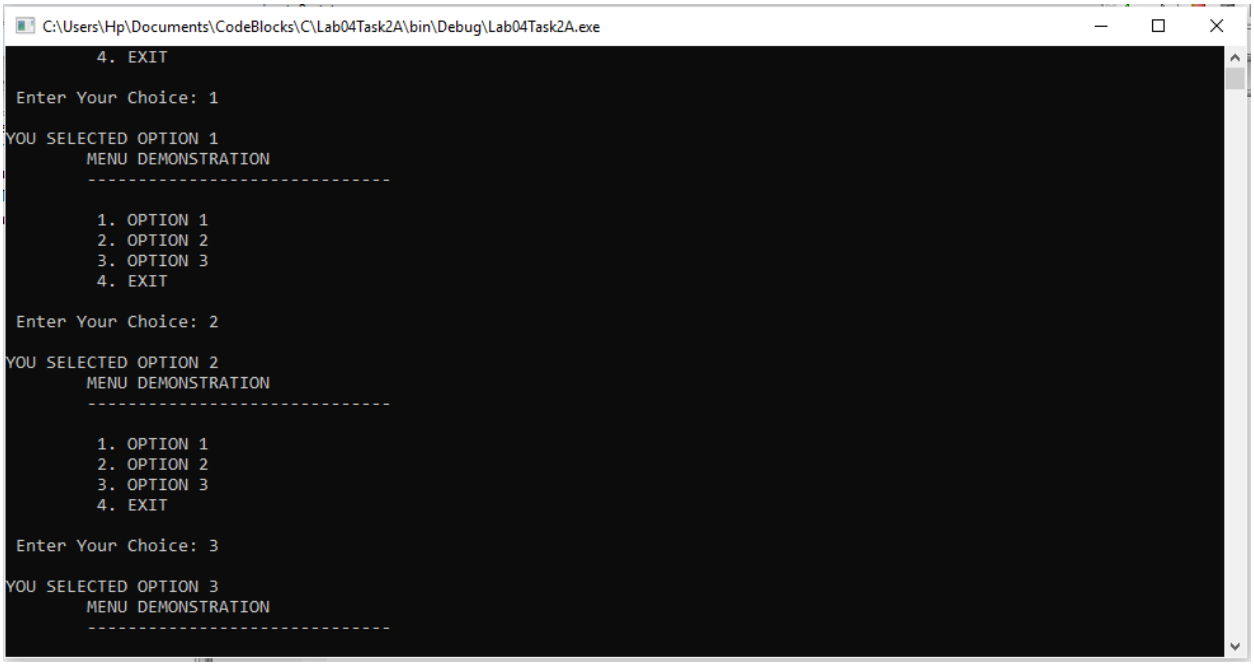
```
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int choice=0;    while(choice!=4)
    {
     printf("\n\tMENU DEMONSTRATION");
     printf("\n\t------------------------------");
printf("\n\n\t 1. OPTION 1");    printf("\n\t 2.
OPTION 2");    printf("\n\t 3. OPTION 3");
printf("\n\t 4. EXIT");
     printf("\n\n Enter Your Choice: ");
scanf("%d",&choice);       switch(choice)
     {          case
1:
                  printf("\nYOU SELECTED OPTION %d",choice);
break;         case 2:
                  printf("\nYOU SELECTED OPTION %d",choice);
break;         case 3:

                  printf("\nYOU SELECTED OPTION %d",choice);
break;         case 4:

                  printf("\nYOU SELECTED OPTION %d",choice);
exit(0);        default:

                  printf("\nINVALID SELECTION...Please try again");

       }

       getchar();
    }
}
```

Solution

I compiled and ran the following program in codeblocks, its result is attached below,
This is the menu,



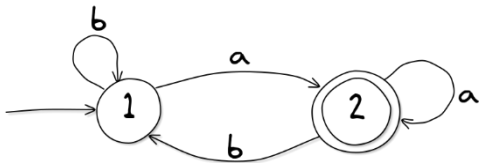
It tells us which option we selected when we enter an option, for eg:



Hence, this verifies our program.

Question no: 2(b)

Modify the above program to implement following sate machine. Here ***'a'*** and ***'b'*** are user input characters. The program should print out appropriate messages to the console when a user enters a character.



Solution

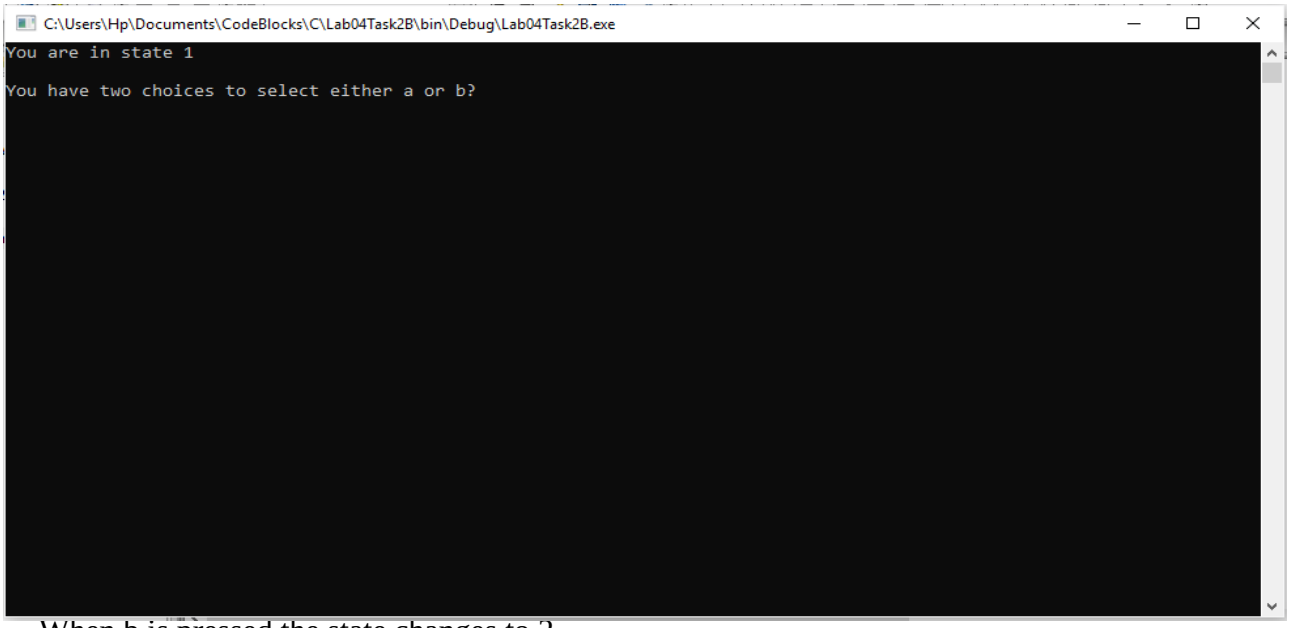
In this program I used switch and case statements as well as the goto statement, initially we are in state one, if the user inputs ***'a'***, state is changed to 2, if ***'b'*** is entered the state is not changed, similarly when in state 2, if the user enters '***b'*** then state is changed and if ***'a'*** is entered the state remains same.

The code and results are attached below,

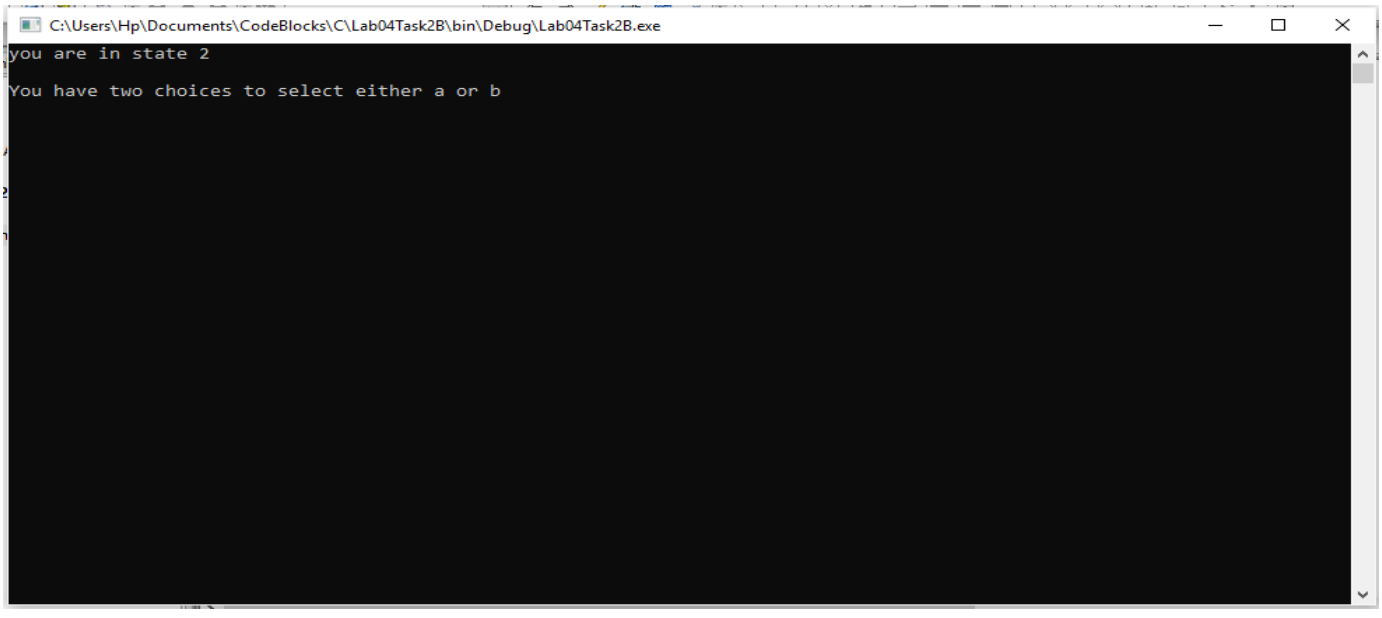
```c
#include <stdio.h>
#include <stdlib.h>

int main()
{

    char op='a';
    switch(op)
    {
char op1;
    case 'a':
        {
            c1:
            printf("You are in state 1\n\n");
            printf("You have two choices to select either a or b?\n");
           op1= getch(op1);
            if(op1=='a'|| op1=='A')
            {
                system("CLS");
               goto c2;
            }

            else if ( op1=='B'||op1=='b')
            {

            system("CLS");

                    goto c1;
      }
       else
       {

           printf("the option is not given");
       }

         break;
         }

    case'b':
{

      c2:

         printf("you are in state 2\n\n");
         printf("You have two choices to select either a or b\n");

         op1=getch(op1);

         if(op1=='b'||op1=='B')
         {
             system("CLS");
             goto c1;

         }

         else if (op1== 'a'|| op1=='A')
         {
             system("CLS");

             goto c2;
```

```
49
50          if(op1=='b'||op1=='B')
51          {
52              system("CLS");
53              goto c1;
54
55          }
56
57          else if (op1== 'a'|| op1=='A')
58          {
59              system("CLS");
60
61              goto c2;
62
63          }
64
65          else
66          {
67
68              system("CLS");
69              printf("the Given option is not mentioned");
70          }
71
72
73      break;
74      }
75      }
76      return 0;
77  }
78
```

Now, initially we are in state 1,



When b is pressed the state changes to 2.

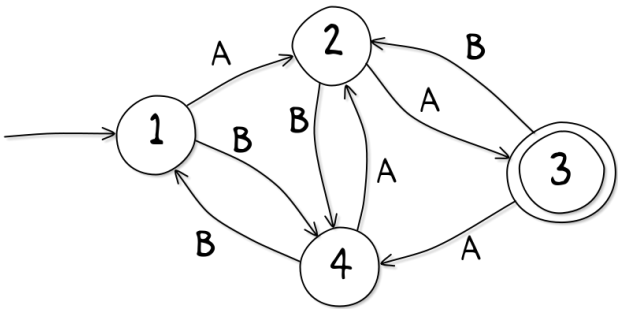


and this is also valid vice versa, the above results show that our program is valid and correct.

POST LAB

Question:

Write a C program to implement the following state machine.



Solution:

I am attaching my code below for this program, its code is similar to the above program, I used case and goto statements in this program.

The code and result is attached below,

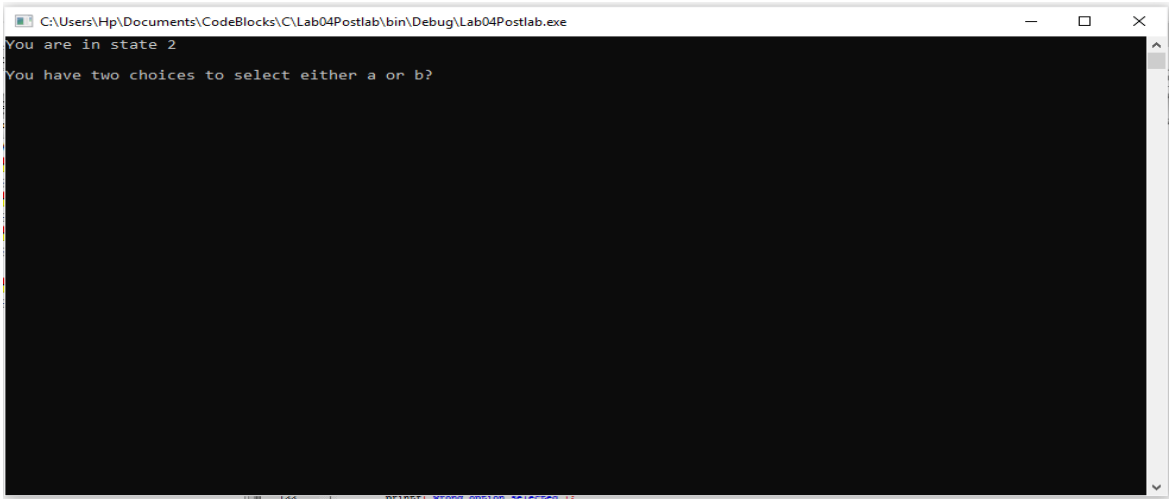
```c
#include <stdio.h>
#include <stdlib.h>

int main()
{

    int op=1;
    switch(op)
    {
char op1;
    case 1:
        {
            c1:
            printf("You are in state 1\n\n");
            printf("You have two choices to select either a or b?\n");
           op1= getch(op1);
            if(op1=='a'|| op1=='A')
            {
                system("CLS");
               goto c2;
            }

            else if ( op1=='B'||op1=='b')
            {
            system("CLS");
                    goto c4;
                    }

      else
      {

          printf("the option is not given");
      }

        break;
        }

    case 2:
```

```c

    case 2:
        {
            c2:
            printf("You are in state 2\n\n");
            printf("You have two choices to select either a or b?\n");
           op1= getch(op1);
            if(op1=='a'|| op1=='A')
            {
                system("CLS");
               goto c3;
            }

            else if ( op1=='B'||op1=='b')
            {

            system("CLS");

                    goto c4;
      }

      else
      {

          printf("the option is not given");
      }

        break;


        }


    case 3:
        {

            c3:
            printf("You are in state 3\n\n");
```

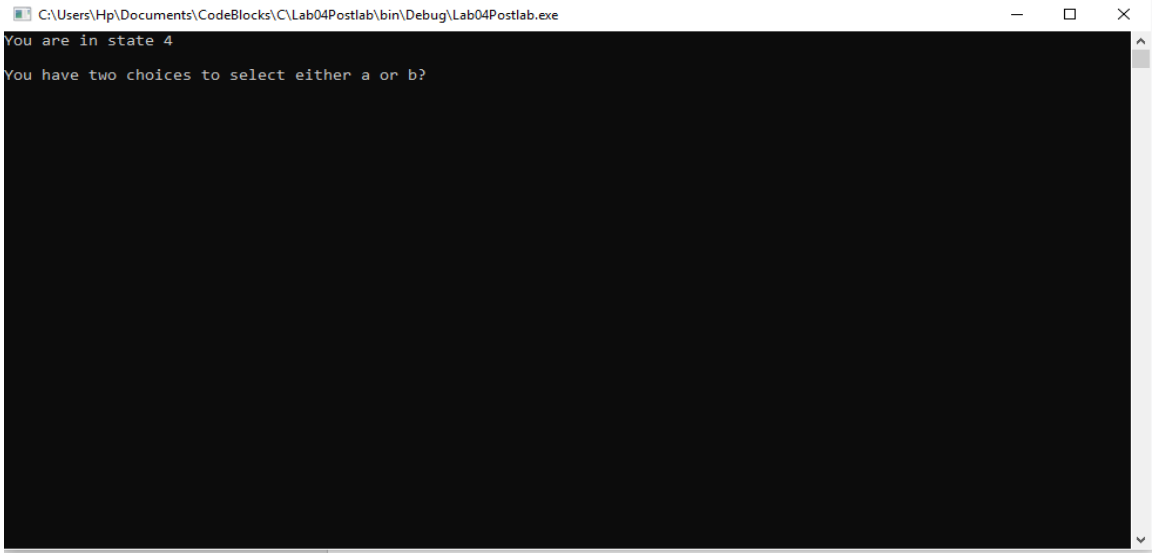
```c
    case 3:
        {

            c3:
            printf("You are in state 3\n\n");
            printf("You have two choices to select either a or b?\n");
           op1= getch(op1);
            if(op1=='a'|| op1=='A')
            {
                system("CLS");
               goto c4;
            }

            else if ( op1=='B'||op1=='b')
            {

            system("CLS");

                    goto c2;
      }

      else
      {

          printf("the option is not given");
      }

        break;
        }


    case 4:
        {
            c4:
            printf("You are in state 4\n\n");
            printf("You have two choices to select either a or b?\n");
           op1= getch(op1);
            if(op1=='a'|| op1=='A')
```

```
101     case 4:
102         {
103             c4:
104             printf("You are in state 4\n\n");
105             printf("You have two choices to select either a or b?\n");
106            opl= getch(opl);
107             if(opl=='a'|| opl=='A')
108             {
109                 system("CLS");
110                goto c2;
111             }
112
113             else if ( opl=='B'||opl=='b')
114             {
115
116             system("CLS");
117
118                     goto c1;
119       }
120
121       else
122       {
123
124           printf("the option is not given");
125       }
126
127         break;
128         }
129
130
131         default:
132         {
133         printf("wrong option selected");
134         }
135
136     }
137 }
138
```

When we press a in state 1, it goes to state b



when I press b in state 2 it goes to state 4



Hence, The working shows that our code works for all states and is correct.

THE END