Design, Develop and Implement a Program for the following Stack Applications:

a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
b. Solving Tower of Hanoi problem with n disks.

Student Name:- Neha Sharma	**UID:-**20BCS4576
Branch: - (CSE_IOT)	**Section/Group: -** 20BIT (A)
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Subject Name:-Data Structure Lab	

1. Aim/Overview of the practical: To Design, Develop and Implement Stack Applications

2. Task to be done:

a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
b. Solving Tower of Hanoi problem with n disks.

3. Algorithm/Flowchart:

Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^

Step->1: While reading the expression from left to right, push the element in the stack if it is an operand.

Step->2: Pop the two operands from the stack, if the element is an operator and then evaluate it.
Step->3: Push back the result of the evaluation. Repeat it till the end of the expression.

Solving Tower of Hanoi problem with n disks.

Step->1: Move n-1 disks from start to auxillary

Step->2: Move nth disk from start to end

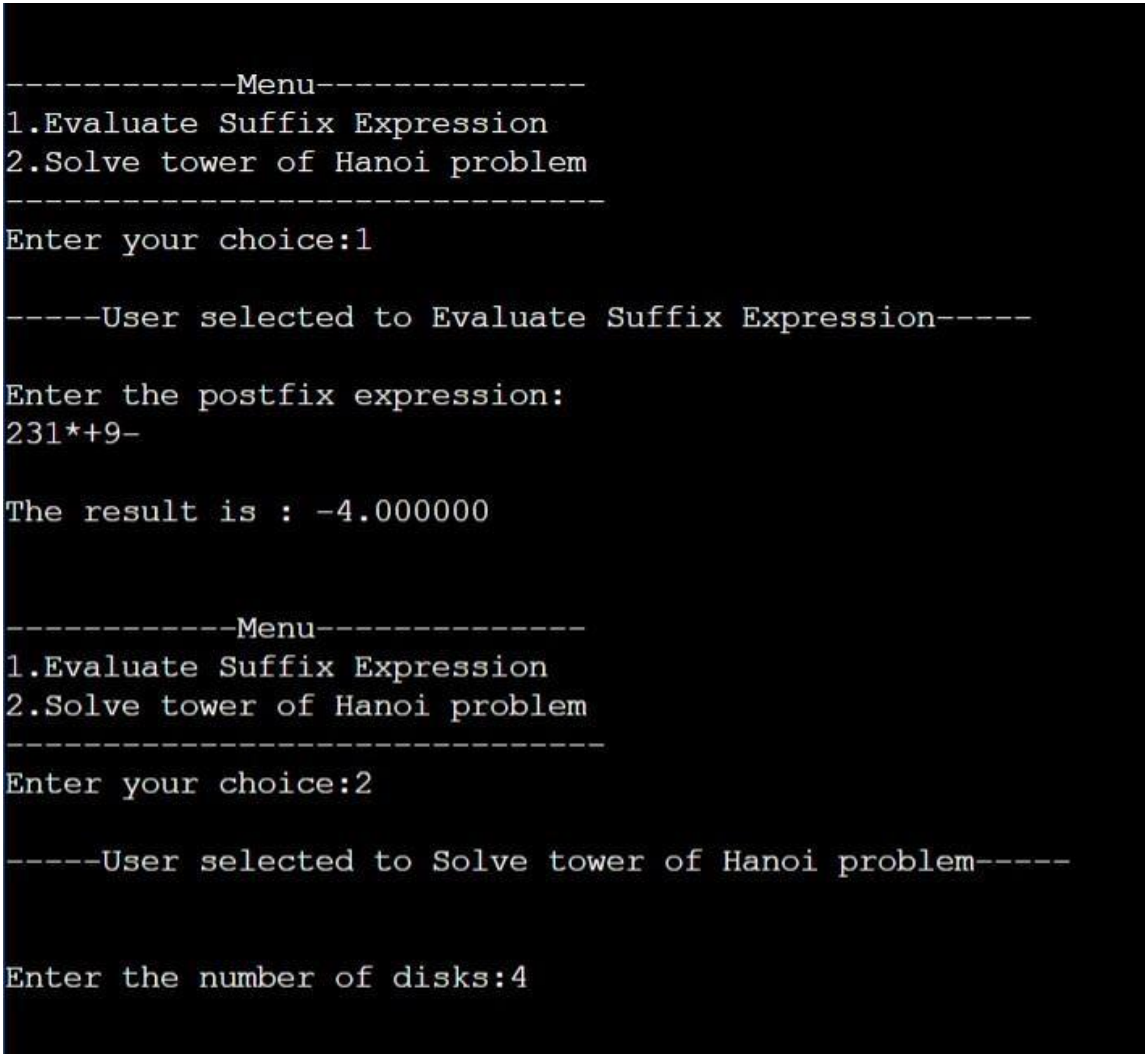
Step->3: Move n-1 disks from auxillary to end

4. Programme Code:

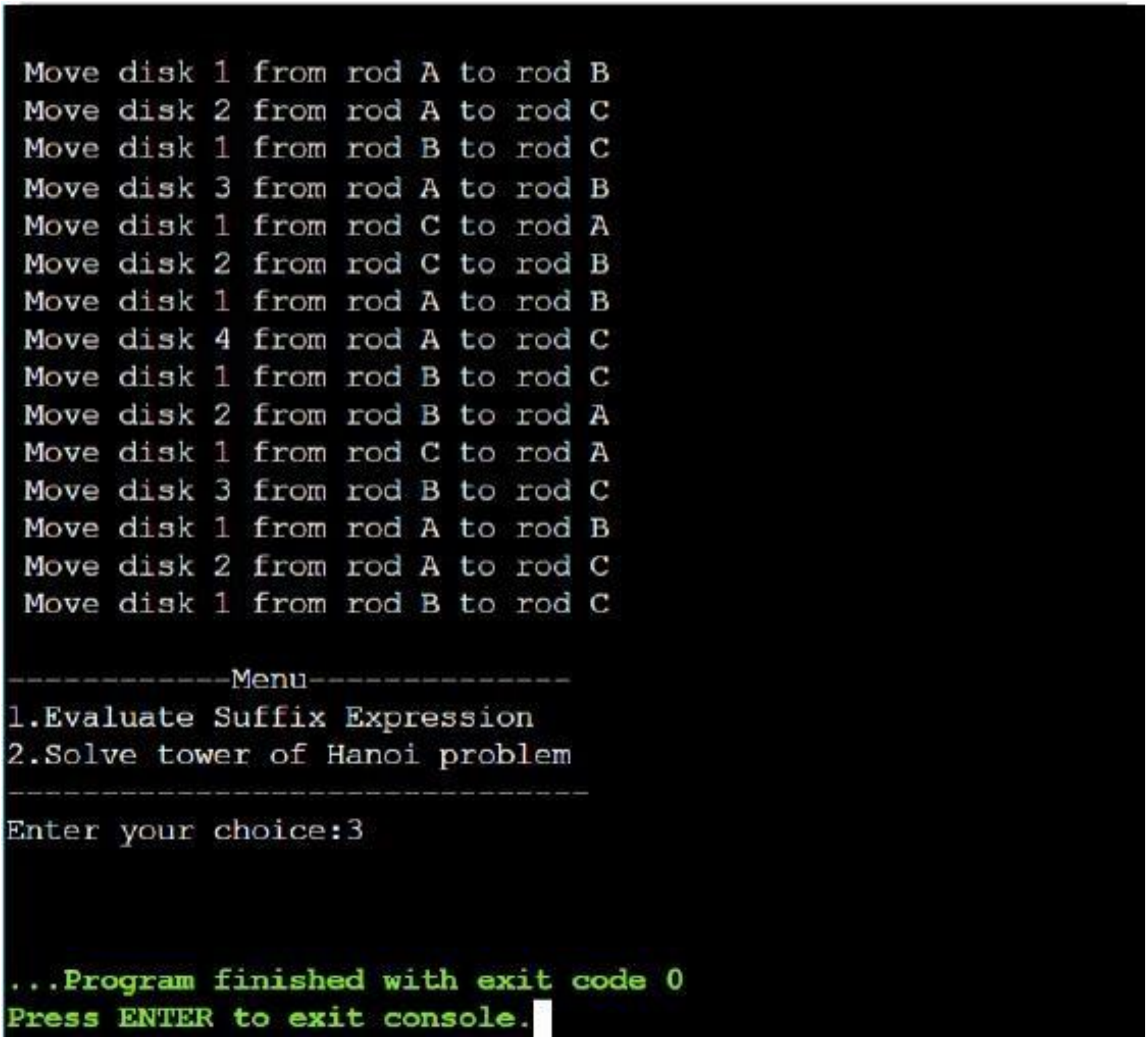
```
#include<stdlib.h>
#include<stdio.h>
#include<math.h>
#include<conio.h>
#include  <ctype.h>
#include <string.h>


float compute(char symbol, float op1, float op2)

{

 switch (symbol)

  {

  case '+': return op1 + op2;

  case '-': return op1 - op2;
  case '*': return op1 * op2;

  case '/': return op1 / op2;

  case '$':

  case '^': return pow(op1,op2);

  default : return 0;

 }

}

void towerOfHanoi(int n, char from_rod, char to_rod, char aux_rod)

{

    if (n == 1)

    {

        printf("\n Move disk 1 from rod %c to rod %c", from_rod, to_rod);

        return;

    }

    towerOfHanoi(n-1, from_rod, aux_rod, to_rod);
    printf("\n Move disk %d from rod %c to rod %c", n, from_rod, to_rod);

    towerOfHanoi(n-1, aux_rod, to_rod, from_rod);

}


int main()
{
 int choice;

 do{
 printf("\n\n________Menu__________\n");
 printf("1.Evaluate Suffix Expression\n");
 printf("2.Solve tower of Hanoi problem\n");
 printf("_______________________");

 printf("\nEnter your choice:");
 scanf("%d",&choice);
 printf("\n");
 switch(choice)

 {
case 1: printf("-----User selected to Evaluate Suffix Expression-----\n");

float s[20], res, op1, op2;

int top, i;
```

```
char postfix[20], symbol;

printf("\nEnter the postfix expression:\n");

scanf ("%s", postfix);

top=-1;

for (i=0; i<strlen(postfix) ;i++)

{

symbol = postfix[i];

if(isdigit(symbol))

s[++top]=symbol - '0';

else

 {

 op2 = s[top--];

 op1 = s[top--];

 res = compute(symbol, op1, op2);
 s[++top] = res;

 }

}

res = s[top--];
printf("\nThe result is : %f\n", res);
 break;

 case 2: printf("-----User selected to Solve tower of Hanoi problem ---- \n");
 int n;
 printf("\n\nEnter the number of disks:");
 scanf("%d",&n);
 printf("\n");
 towerOfHanoi(n, 'A', 'C', 'B');
 break;

 case 3: exit(0);
 break;

 default: printf("\nInvalid choice:\n");
 break;
 }
 }
while(choice!=3);
 return 0;
}
```

5. Output:



```
------------Menu--------------
1.Evaluate Suffix Expression
2.Solve tower of Hanoi problem
-------------------------------
Enter your choice:1

-----User selected to Evaluate Suffix Expression-----

Enter the postfix expression:
231*+9-

The result is : -4.000000


------------Menu--------------
1.Evaluate Suffix Expression
2.Solve tower of Hanoi problem
-------------------------------
Enter your choice:2

-----User selected to Solve tower of Hanoi problem-----


Enter the number of disks:4
```



```
 Move disk 1 from rod A to rod B
 Move disk 2 from rod A to rod C
 Move disk 1 from rod B to rod C
 Move disk 3 from rod A to rod B
 Move disk 1 from rod C to rod A
 Move disk 2 from rod C to rod B
 Move disk 1 from rod A to rod B
 Move disk 4 from rod A to rod C
 Move disk 1 from rod B to rod C
 Move disk 2 from rod B to rod A
 Move disk 1 from rod C to rod A
 Move disk 3 from rod B to rod C
 Move disk 1 from rod A to rod B
 Move disk 2 from rod A to rod C
 Move disk 1 from rod B to rod C

------------Menu--------------
1.Evaluate Suffix Expression
2.Solve tower of Hanoi problem
--------------------------------
Enter your choice:3



...Program finished with exit code 0
Press ENTER to exit console.
```

6. Learning outcomes (What I have learnt):

1. Learnt to evaluate the suffix expression.
2. Learnt to solve tower of Hanoi problem with n disc.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			