PRN: 2020BTEIT00041
DSA LAB ASSIGNMENT 1

Q.1 Write a recursive program to generate factorial of number

ALGORITHM:

Algorithm fact(n)

Pre n is number being raised factorially

Post n! is returned

1.if (n equals 0)

1.return 1

2.else

1.(n*fact(n-1))

3.end if

End fact

```cpp
#include <bits/stdc++.h>
using namespace std;
typedef long long ll;

ll Factorial(ll x){
    if(x<=1) return 1;
    return x*Factorial(x-1);
}

int main(){
    ll n;

    cout<<"Enter a number:";
    cin>>n;

    cout<<"The factorial of entered number ("<<n<<") is: "<<Factorial(n)<<endl;

    return 0;
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

Windows PowerShell
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PS F:\Assignments\DSA\Assignment 1 DSA> cd "f:\Assignments\DSA\Assignment 1 DSA\" ; if ($?) { g++ factorial.cpp -o factorial }
}
Enter a number:5
The factorial of entered number (5) is: 120
PS F:\Assignments\DSA\Assignment 1 DSA>
```

Q.2 Write a recursive program to display Fibonacci series

ALGORITHM:

Algorithm Fibonacci(i)

Pre i identifies Fibonacci number

Post return n Fibonacci numbers

1.if(i is 0)

  1.return 0

2.else if (i is 1)

  1.return 1

3.else

  1. return (Fibonacci(i-1)+Fibonacci(i-2))

4.end if

End Fibonacci

```cpp
//CPP program to generate fibonacci series by using recursion
#include<iostream>
using namespace std;

int fibo(int n){
    if(n<=1)
       return n;

    return (fibo(n-1) + fibo(n-2));
}

int main(){
    int num;
    cout<<"Enter integer:";
    cin>>num;
    int fibo(int);

    cout<<"Fibonacci series is:";
    for(int i=0; i<num; i++){
        cout<<fibo(i)<<" ";
    }
    return 0;
}
```

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```
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PS F:\Assignments\DSA\Assignment 1 DSA> cd "f:\Assignments\DSA\Assignment 1 DSA\" ; if ($?) { g++
}
Enter integer:5
Fibonacci series is:0 1 1 2 3
PS F:\Assignments\DSA\Assignment 1 DSA>
```

Q.3 Write a program to solve tower of Hanoi

ALGORITHM:

Algorithm towerofhanoi(n,sor,dest,person)

Pre The tower consists of n disks

Source,destination,auxillary

Post steps for moves forward

1.print(“Towers”,n,sor,dest,person)

2.if(n is 0)

1. return

3.towrofhanoi(n-1,sor,person,dest)

4.print(“move from”sor “to” dest)

5.towerofhanoi(n-1,person,dest,sor)

6.end if

End towerofhanoi

towerOfHanoi.cpp > main()

```cpp
// Program for Tower Of Hanoi

#include <iostream>

using namespace std;
int count=0;
void TowerOfHanoi(int n, char src, char dest, char helper){

    if(n == 0){
        return;
    }

    TowerOfHanoi(n-1, src, helper, dest);
    cout <<(++count)<< ". move disk "<<n<<" from " << src << " to " << dest << endl;
    TowerOfHanoi(n-1, helper, dest, src);
}

int main(){

    int height;
    cin >> height;

    TowerOfHanoi(height, 'A', 'C', 'B');

    return 0;

}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS F:\Assignments\DSA\Assignment 1 DSA> cd "f:\Assignments\DSA\Assignment 1 DSA\" ; if ($?) { g++ towerOfH
rOfHanoi }
3
1. move disk 1 from A to C
2. move disk 2 from A to B
3. move disk 1 from C to B
4. move disk 3 from A to C
5. move disk 1 from B to A
6. move disk 2 from B to C
7. move disk 1 from A to C
PS F:\Assignments\DSA\Assignment 1 DSA>
```

Q.4 Write a recursive program for Ackerman problem

Algorithm Ackermann(x,y)

Pre Function contains two values x and y

Post required result

1.if(x is 0)

  1.return y+1

2.else if(x>0 and y is 0)

  1.return (Ackermann((x-1),1)

3.else

  1.return (Ackermann((x-1),Ackermann(x,(y-1)))

4.End if

End Ackermann

```cpp
//   Ackerman Function :-

#include <bits/stdc++.h>
using namespace std;
typedef long long ll;

int Ackermann(int y, int x){
    if(!y){
        return (x + 1);
    }
    else if((y>0) && (!x)){
        return Ackermann(y-1, 1);
    }
    else if((y>0) && (x>0)){
        return Ackermann(y-1, Ackermann(y, x-1));
    }
}

int main(){
    int ack, y, x;
    cin>>y>>x;

    ack = Ackermann(y, x);
    cout<<ack<<endl;

    return 0;
}

```

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```
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PS F:\Assignments\DSA\Assignment 1 DSA> cd "f:\Assignments\DSA\Assignment 1 DSA\" ; if ($?)
$?) { .\Ackermann_Function }
1 4
6
PS F:\Assignments\DSA\Assignment 1 DSA>
```