**Introduction to algorithms**

**Asssignment-1**

**Flow chart for Non recursive algorithm:-**

STOP

START

Initialise a=0,b=1,c=0,i=1

Assign Input to N

Yes

Print b

No

No

No

Yes

Is N==1

Is N==0

Is i<N

Print c

c=a+b

a=b

b=c

i=i+1

Yes

**Algorithm for Recursive Method:-**

Step 1 :- START

Step 2 :- Initialise a=0,b=1,c=0,i=1

Step 3 :- Assign Input to N

Step 4 :- If N==0, then Jump to step 10

Step 5 :- If N==1, then print b and jump to step 11

Step 6 :- If i<N, then jump to step 10

Step 7 :- c=a+b

Step 8:- a=b , b=c

Step 9 :- i=i+1

Step 10 :- Print c

Step 11 :- STOP

**Outputs:-**

fib( 5 ) == 5

fib( 500 ) == 139423224561697880139724382870407283950070256587697307264108962948325571622863290691557658876222521294125

**Observations:-**

**Space Complexity :- O(1)**

**Time Complexity :- O(n)**

The non recursive method of Fibonacci program works well and fast.It uses very less space compared to all other methods.

**Flow chart for Recursive algorithm:-**

START

Is N==0

Is N==0

return rec(N-1)+rec(N-2)

c=rec(N) (function call)

Assign Input to N

Yes

No

No

Yes

STOP

Print c

return 1

return 0

**Algorithm for Recursive Method:-**

**Fib function:-**

Step 1 : Assign the value to N

Step 2 : IF N is equal to 0, then return 0

Step 3 : IF N is equal to 1,then return 1

Step 4 : Else return fib(N-1)+fib(N-2)

**Main function:**

Step 1: START

Step 2: Assign input to N

Step 3: Call the function fib(n) and assign the result to c.

Step 4: Print the value of c

Step 5: STOP

**Outputs:-**

fib( 5 ) == 5

fib( 500 ) == (The program got hanged )

**Observations:-**

**Space Complexity :- O(n) if we consider the function**

**call stack size, otherwise O(1)**

**Time Complexity :- T(n)=T(n-1)+ T(n-2), which is**

**Exponential**

The non recursive method of Fibonacci program works well and fast for small value of N,but as the value increases the program starts to hang up because as N increases the time to calculate the answers increases exponentially and also the this uses very lot space.Hence non recursive method is suitable for only small range of numbers.

**Conclusion :-**

The non recursive method is the best option over recursive because it uses less space and also works well for large range of values, also it is faster than recursive method.