

# Data Structures And Algorithms

## Assignment Day 1 | 24th December 2020

### Question 1

1. Find the time complexity for the following scenarios

a.) `for(i=1; i<=n; i++)`  
    `for(j=i; j<=n; j++)`  
        `printf("Hi");`

b.) `for(i=1; i<=n; i*=3)`  
    `for(j=1; j<=n; j++)`  
        `printf("Hello");`

a) `for(i=1; i<=n; i++)`  
    `for(j=1; j<=n; j++)`  
        `Print ("Hi");`  
To find  $T(n)$   
as consider  $(n)$  a constant factor.  
`for(i=1; i<=n; i++)`  $\rightarrow (n)$  times  
`for(j=1; j<=n; j++)`  $\rightarrow \frac{(n) \text{ times}}{n^2 \text{ times}}$   
`if ("Hi")` 40 print  
 $\therefore T(n)$  to print ("Hi")  
 $O(n^2)$   
 $O(1) //$   
b) `for(i=1; i<n; i*=3)`  $\rightarrow n$   
    `for(j=1; j<n; j++)`  $\rightarrow n$   
        `printf("Hello");`  
Ans.  $i/$   
i.e.  $1 \times 3 = 3$   
 $3 \times 3 = 6 \text{ (3}^2\text{)}$   
 $= 3^2 \times 3 = 3^3$   
 $\vdots$   
 $3^k \text{ (till } k\text{)}$

Assume  $i > n$ .

$$\therefore i = 3^k.$$

$$= 2^k > n$$

$$2^k = n$$

$$k = \log_2 n.$$

$$\therefore O(\log_2 n)$$

Assuming  $n = 12$ .

$$\begin{array}{c} i/1 \quad 3 \quad 6 \quad 12 \\ \hline 3 \end{array} \Rightarrow n=3$$

$$\log_{12} 12 = 3$$

$$= \log_3 12^3$$

$$= 3 \cdot \log_3 12$$

$= 2.2 \dots \Rightarrow$  The answer is said to be scaled value  $\lceil \log n \rceil$

A it is next the number of loop that is

$$n=3$$

$$\therefore T(n) = O(\log_3 n).$$

Ag  $(j=1; j \leq n; j++)$

let

$$(+++++1 + \dots + 1) n = n$$

$$\therefore O(n)$$