**Assignment 5 | 22nd January 2021**

### Q uestion 1

Name 5 sorting algorithms, also write their time complexities(best, average, worst).

**Ans:**

* **Bubble sort and Insertion sort –**  
  Average and worst case time complexity: n^2  
  Best case time complexity: n when array is already sorted.  
  Worst case: when the array is reverse sorted.
* **Selection sort –**  
  Best, average and worst case time complexity: n^2 which is independent of distribution of data.
* **Merge sort –**  
  Best, average and worst case time complexity: nlogn which is independent of distribution of data.
* **Heap sort –**  
  Best, average and worst case time complexity: nlogn which is independent of distribution of data.
* **Quick sort –**  
  It is a divide and conquer approach with recurrence relation:

T(n) = T(k) + T(n-k-1) + cn

**Worst case:** when the array is sorted or reverse sorted, the partition algorithm divides the array in two subarrays with 0 and n-1 elements. Therefore,

T(n) = T(0) + T(n-1) + cn

Solving this we get, T(n) = O(n^2)

**Best case and Average case**: On an average, the partition algorithm divides the array in two subarrays with equal size. Therefore,

T(n) = 2T(n/2) + cn

Solving this we get, T(n) = O(nlogn)

**Q uestion 3**

Implement pop operation of the stack

Ans: Pop: Removes an item from the stack. The items are popped in the reversed order in which they are pushed. If the stack is empty, then it is said to be an Underflow condition.