Day-19

**Algorithms**

**Characteristics:**

1. clear and unambiguous
2. well-defined input
3. well-defined output
4. finiteness
5. feasible
6. language independent

**algorithms vs programming:**

* An algorithm is more like a concept, a technique to solve problem
* A program is related to executing one or more tasks by a computer
* All algorithms cannot be programmed but all programs are algorithms

**Algorithm Design approaches:**

1. Top-down approach
2. Bottom-up approach

**Types of time complexities:**

1. Best Case : if n=1
2. Worst case : if found at last or not found
3. Average case : mid of best and worst

**Big O notation:**

* Describes the performance or complexity of algorithm
* O(1) –

always execute in the same time or space regardless of the size of the input data

ex: Push ,Pop operation for a stack

* O(N) –describes an algorithm whose performance will grow linearly and in direct proportion to the size of input data.

- Big O notation will always assume the upper limit

Ex: Linear search with unsorted data

* O(N^2)---

It represents an algorithm whose performance is directly proportiomal to the square of the size of the input data set.

Comparing 2D array of size.

* O(log N) — Logarithmic Time

The iterative halving of data sets described in the binary search example produces the growth curve that peaks at the beginning and slowly flattens out as the size of the data sets increases

Ex : Binary search: an input data set containing 10 items takes one second to complete, a data set containing 100 items takes two seconds and a data set containing 100 items takes three seconds.

* O(NlogN) – quick sort , merge sort
* O(g(n))—

**Merge sort:**

* Divide and conquer
* We’ll check whether the 1st index is less than last index or not…because if 1st index is greater than the last index then no list is present

**Quick Sort:**

* Comparison sort
* In\_place
* Unstable
* Recursive algorithm
* Divide and conquer algorithm
* For ascending order

<smaller values>pivot<bigger values>

* When the left pointer is crossing right pointer at that pointer are moving ahead.

Q.  **Develop a phonebook application using the sorting techniques**