**Savitribai Phule Pune University**

Dept. of Scientific Computing, Modeling and Simulation

End Semester Examination May. 2023

Course No.: SC – 101

Subject: PPL-I

**Duration: 2.5 Hrs Marks: 50**

**Date: 8 - 6 - 2023**

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**Q1. Attempt ALL** [10 Marks]

1. List down the characteristics of an algorithm
2. Compare Flowchart and pseudocode, the two methods for writing algorithms.
3. Compare Greedy and Dynamic programming algorithms
4. For each of the following, what is the time complexity considering the fastest algorithm that can be written?
   1. In a sorted array, search for a number
   2. Select the top 10 numbers from a set of n (n > 10000), unsorted numbers
5. List the following functions according to their order of growth from lowest to highest.

log(n), log (log n), n2, 2n, n.logn

**Q2. Attempt any 5** [35 Marks]

1. Write the Bellman-Ford shortest path algorithm and work out its time complexity
2. Write Prim’s algorithm for the minimum spanning tree and work out its time complexity
3. What is the Branch and Bound technique? Explain the 3 variations of the Branch & Bound state space tree search method
4. Write the Selection sort algorithm and work out its time complexity
5. Write the Quick sort algorithm and work out its time complexity
6. Write the Merge sort algorithm and work out its time complexity
7. Write the Insertion sort algorithm and work out its time complexity using the table method
8. Write a non-recursive and recursive binary search algorithm and make an analysis of running time.
9. Write Dijkstra’s shortest path algorithm and work out its time complexity

**Q3. Solve any 2** [5 Marks]

For each of the following, is the Master Method application? If yes, mention which case is applicable and solve it.

1. T (n) = 4T (n/2)+ n2
2. T (n) = 3T (n/4)+ nlogn
3. T (n) = 2n T (n/2) + nn

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