Class Test (Set-01)

Course Title: Computer Algorithms

Time: 30 minutes **Marks: 10**

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1. a) The VU Library is arranging 50 new books on a shelf based on their publication year. Each book has a year of publication (an integer). The librarian wants the books to be arranged in ascending order of years. Since the librarian receives books one by one and the shelf is initially empty, a simple algorithm that inserts each book in its correct position as it arrives is ideal. **3**

Select an appropriate algorithm to arrange the books. Then asymptotically determine the time and space complexity of your selected algorithm.

b) Consider the following equations representing recurrence relation of different algorithms: **4**

i) $$T(n) = \begin{cases} 1 & , \ if\ n = 1 \\ \frac{64}{27} T\left(\frac{3n}{4}\right) + \theta(n^3\ log\ n), & if\ n > 1 \end{cases}$$

ii) $$T(n) = \begin{cases} 1 & , \ if\ n = 1 \\ T\left(\frac{n}{2}\right) + O(n^2), & if\ n > 1 \end{cases}$$

Determine the time complexity of each algorithm and rank them by efficiency.

c) Considering that Selection Sort takes 10 ms for an input size 50, determine its approximate required time for an input size 150. **3**

Class Test (Set-02)

Course Title: Computer Algorithms

Time: 30 minutes **Marks: 10**

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1. a) The CSE Department, VU has 40 exam papers to arrange in ascending order of student roll numbers. The papers are initially placed randomly on a desk. The staff can compare two adjacent papers at a time and swap them if they are in the wrong order.This process is repeated until all papers are sorted. **3**

Select an appropriate algorithm to arrange the books. Then asymptotically determine the time and space complexity of your selected algorithm.

b) Consider the following equations representing recurrence relation of different algorithms: **4**

i) $$T(n) = \begin{cases} 1 & , \ if\ n = 1 \\ \frac{25}{16} T\left(\frac{4n}{5}\right) + \theta(n^2\ log\ n), & if\ n > 1 \end{cases}$$

ii) $$T(n) = \begin{cases} 1 & , \ if\ n = 1 \\ 7\ T\left(\frac{n}{2}\right) + O(n^5), & if\ n > 1 \end{cases}$$

Determine the time complexity of each algorithm and rank them by efficiency.

c) If an algorithm runs in 25 μs for an input size of 100, estimate its execution time for an input size of 1000, given an $O(n^3)$ complexity. **3**