

Department of Computer Science

University of Delhi

MCAC 201: Design and Analysis of Algorithms (CIA-I)

Maximum Marks: 15

Time: 1 hour

March 20, 2024

1. List the following functions by increasing asymptotic growth rate. If two functions have the same asymptotic growth rate, state that fact.

$$\begin{array}{llllll} \lg n & 1.1^n & nlgn & n(\lg n)^2 & 3\lg n & 2^5 \\ -6 & 1.1^6 & 64 \times 6 & 64 \times 36 & 3 \times 6 & 32 \end{array}$$

$$n=64 \quad 6 \quad 2 \quad 4 \quad 8 \quad 3 \quad 9 \quad 7$$

[2]

2. Write down the steps you would take to sort the following array of integers using Counting Sort.

$$A = [4, 2, 4, 1, 0, 2, 3, 4, 1, 3]$$

[3]

3. Consider Quick Sort algorithm (QA) to sort integer in non-decreasing order, employing the last element as a pivot. Let C_1 and C_2 be the number of comparisons made by QA for the given input $\{10, 20, 30, 40, 50, 60\}$ and $\{40, 10, 30, 50, 60, 20\}$, respectively. What are the values of C_1 and C_2 ?

$$\frac{C_1 + C_2}{2} = 15$$

[5]

4. Consider the given class schedules, where each pair (S_i, F_j) represents the start and end time of lecture j . Determine the minimum number of classrooms to schedule all lectures so that no two occur at the same time in the same room. Additionally, your solution must include the schedule for each classroom.

$(08, 13), (16, 23), (20, 26), (07, 14), (24, 27), (21, 25), (15, 19), (03, 10), (11, 17), (00, 05), (12, 18), (06, 22), (01, 04), (02, 09)$

[5]