GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Computing Science and Engineering

Bachelor of Science in Computer Science
Mid Term Examination - Nov 2023

Duration : 90 Minutes
Max Marks : 50

Sem III - E1UJ301B - Design and Analysis of Algorithms

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Find the time complexity of the given iterative program: for (i = 1; i <= n; i++) { for (j = 1; j <= n; j += i) { for (k = 1; k <= n; k++) { // basic_step } } } K2 (2)

2) Differentiate between priori and posteriori Analysis K1 (3)

$$f1 = 10^n,$$
$$f2 = n^{10}, f3 = n^{\sqrt{n}}$$

3) Constrast the Iterative program for Power calculation and discuss its time complexity. K2 (4)

4) Calculate the time complexity using Substitution Method: K2 (6)

$$T(n) = \begin{cases} 2T\left(\frac{n}{2}\right) + n\log_2 n & ,if\ n > 1 \\ 1, & if\ n = 1 \end{cases}$$

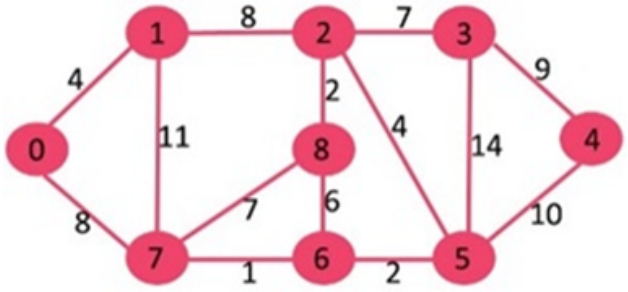
5) Perform a step-by-step Quick Sort on the following array, and show the intermediate steps: Original Array: [9, 7, 5, 11, 12, 2, 14, 3, 10, 6] K3 (6)

6) Draw the Recursive Tree and find the time complexity for the given Recurrance Relation: K3 (9)

$$T(n) = T\left(\frac{n}{10}\right) + T\left(\frac{9n}{10}\right) + n$$

7) What is a Knapsack problem? Explain with the help of an algorithm, how greedy technique is used to solve the fractional knapsack problem? Given a weight vector (2, 3, 5, 7, 1, 4, 1), profit vector (10, 5, 15, 7, 6, 18, 3) and a Knapsack of capacity 15, then find one feasible and an optimal solution for the problem? K4 (8)

8) Write an algorithm using bottom-up dynamic programming approach to solve 0/1 Knapsack problem? Hence apply the same for finding the maximum profit for the below given items, with a Knapsack capacity of 8, using Tabulation method: K4 (12)



OR

Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Entry Wij in the matrix W below is the weight of the edge {i, j}. What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T using Prims and Kruskals? K4 (12)

Item No.	Weight	Profit
1	3	25
2	4	20
3	1	15
4	4	40
5	5	50