

**KADI SARVA VISHWAVIDYALAYA**  
BE SEMESTER-V (New) Examination November -2024

Subject Name: Design &amp; Analysis of Algorithms

Subject Code: CE 504-N

Date: 20/11/2024

Time: \_\_\_\_\_

Total Marks: 70

**Instructions:**

1. Answer each section in separate answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are Compulsory.
4. Indicate clearly, the option you attempt along with its respective question number.
5. Use the last page of main supplementary of rough work.

**Section-I**

**Q-1 (A)** Define following terms: (i) Injective Function (ii) Optimal solution (iii) Space Complexity (iv) Linear inequality (v) Principle of Optimality [5]

**(B)** What is asymptotic notation? Explain in details. [5]

**(C)** Write down the algorithm of Bubble sort and derive it worst case time complexity. [5]

**OR**

**(C)** Write down the algorithm of Quick sort and Trace the Quick Sort for the following data: 4, 3, 6, 1, 9, 8, 2, 5, 7 [5]

**Q-2 (A)** What do you mean by Master Theorem? Explain its all cases with appropriate example. [5]

**(B)** Perform the Radix sort with all the steps on the following data: [5]  
19, 274, 312, 11, 37, 80, 66, 623, 13, 5, 300, 1

**OR**

**(A)** Write down the algorithm of Merge sort and sort the letters of word "EDUCATION" in alphabetical order using Merge Sort. [5]

**(B)** Solve the following recursive relation using Recurrence Tree Method: [5]

$$T(n) = \begin{cases} 2T(n/2) + cn, & n > 1 \\ c, & n = 1 \end{cases}$$

**Q-3 (A)** What is recurrence relation? Solve recurrence equation  $T(n) = T(n-1) + n$  and  $T(1) = 1$  using substitution method. [5]

**(B)** Compare the Greedy Algorithm and Dynamic Programming. [5]

**OR**

**(A)** Solve the following recursive relation using Master Theorem method [5]

$$(i) T(n) = 9T\left(\frac{n}{3}\right) + n \qquad (ii) T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\log n}$$

**(B)** Explain Prim's algorithm to find the Minimum Spanning Tree with an example. [5]

## Section-II

- Q-4 (A) Write down Binary Searching algorithm. Also derive the worst-case analysis with example. [5]
- (B) Solve following fractional knapsack problem using greedy approach with given capacity  $W=60$ , Value and Weight are as follows (V, W): (280, 40), (100, 10), (120, 20), (120, 4). [5]
- (C) Given two sequence of characters,  $X = \{G, U, J, A, R, A, T\}$ ,  $Y = \{J, R, A, T\}$ . obtain the longest common subsequence. [5]

OR

- (C) Define following terms: (i) Directed Graph (ii) Cycle Graph (iii) In-Degree (iv) Out-Degree (v) Adjacency Matrix [5]

- Q-5 (A) Explain the Activity Selection Problem using greedy method with proper example. [5]
- (B) Find out optimal sequence for multiplication: A  $[10 \times 5]$ , B  $[5 \times 20]$ , C  $[20 \times 10]$ , and D  $[10 \times 5]$ . Also give the optimal parenthesization of matrices. [5]

OR

- (A) Differentiate Divide and Conquer Algorithm with Greedy Approach. [5]
- (B) Explain in Brief: (i) P Problem, (ii) NP Problem, (iii) Travelling Salesman Problem, (iv) Min-Max Principle, (v) NP-hard Problem. [5]

- Q-6 (A) What is the concept behind Branch-and-Bound algorithm? Solve the below mention assignment problem using branch and bound technique [5]

		Jobs			
		IT	HR	BDA	FIN
Person	A	9	2	7	8
	B	6	4	3	7
	C	5	8	1	8
	D	7	6	9	4

- (B) Describe Min-Max Principle in details with example. [5]

OR

- (A) Explain Backtracking Method. Give any one solution of 4-Queen problem using backtracking method [5]
- (B) Explain the BFS and DFS with its applications. [5]

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