

Enrollment No _____

KADI SARVA VISHWAVIDYALAYA

B.E. (IT) SEMESTER – V KSV EXAMINATION APRIL -2025

SUBJECT CODE: - IT504-N

SUBJECT NAME: - Fundamentals of Algorithms

DATE: - 15/04/2025

TIME: - 12:30 pm to 3:30 pm

MARKS: -70 Marks

Instructions:

1. Answer each section in separate Answer Sheet.
2. All questions are compulsory.
3. Indicate clearly, the options you attempted along with its respective question number.
4. Assume suitable data wherever necessary.
5. Use of scientific calculator is permitted.

SECTION-I

- Q-1 (A) Explain Asymptotic notations with examples. [05]
- (B) Write an algorithm of selection sort. Sort the following data using selection sort. [05]
65,75,5,55,25,30,90,45,80
- (C) What is an algorithm? Explain characteristics of an algorithm. [05]

OR

- (C) Give the recursive algorithm to find factorial of a given number. [05]

- Q-2 (A) Trace the Merge sort for given dataset: [05]
70,20,30,40,10,50,60
- (B) Write down the algorithm of bubble sort and derive its time complexity. [05]

OR

- Q-2(A) What is Divide and Conquer technique? Explain Binary Search Tree method. [05]
- (B) Solve the below mentioned recurrence relation using Master's Theorem? [05]
1. $T(n) = 4T(n/2) + n$
 2. $T(n) = 8T(n/3) + n^2$

- Q-3(A) Solve following 0/1 Knapsack Problem using Dynamic Programming algorithm with given capacity $W=5$, Weight and Value are as follows (W, V): (2,3) (3,4) (4,5) (5,6) [05]
- (B) Explain Prim's Algorithm to find the Minimum Spanning Tree on the graph. [05]

OR

- Q-3(A) Find the Solution of the fractional Knapsack Problem $n=3$, $M=50$ kg and Profit Vector (60, 100, 120) and Weight Vector (10, 20, 30) using Greedy approach. [05]
- (B) Explain Kruskal's Algorithm to find the Minimum Spanning Tree on the graph. [05]

SECTION-II

- Q-4(A) Define following terms: (i) Space complexity (ii) Directed Graph (iii) Complete Graph (iv) Time Complexity (v) Principle of Optimality [05]
- (B) Differentiate between Divide and Conquer and Dynamic Programming. [05]
- (C) Given two sequence of characters, $X = \text{BDCB}$, $Y = \text{BACDB}$. Obtain the longest common subsequence. [05]

OR

- (C) Given four matrices, find out optimal sequence for matrix chain multiplication A_1, A_2, A_3 and A_4 be four matrices of dimensions $5 \times 4, 4 \times 6, 6 \times 2$ and 2×7 respectively. [05]

- Q-5(A) What is DFS? Explain with example. [05]
- (B) Explain Pre-conditioning in traversing trees. [05]

OR

- Q-5(A) What is BFS? Explain with example. [05]
- (B) Describe shortest path algorithm with example. [05]

- Q-6(A) Explain Rabin-Karp method for string matching with example. [05]
- (B) Differentiate between NP hard and NP complete problem. [05]

OR

- Q-6 (A) Explain Travelling Salesman problem with example. [05]
- (B) Explain string matching with finite automata with example. [05]

Best of Luck