

**BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)**  
**B. Tech. Sem - IV Computer Science & Engineering AI & ML : SUMMER : 2025**  
**SUBJECT: ALGORITHMS ANALYSIS & DESIGN**

Day : Thursday  
 Date : 29/05/2025

S-23948-2025

Time : 10:00 AM-01:00 PM  
 Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

**Q. 1** State the Master's Theorem and describe its three cases. (10)

OR

**Q. 1** What is recurrence relations and Masters theorem? Apply Masters Theorem on following: (10)

- i)  $T(n) = 2T(n/2) + n/\log n$       ii)  $T(n) = 3T(n/3) + n/2$

**Q. 2** Explain Merge Sort and find its worst case, average and best case complexity. (10)

OR

**Q. 2** Write the binary search algorithm and apply it on following to search the key element: 45. (10)  
 25, 2, 24, 39, 45, 40, 51, 56, 92.

**Q. 3 a)** Find the optimal solution for the fractional knapsack problem making use of greedy approach. Consider (05)

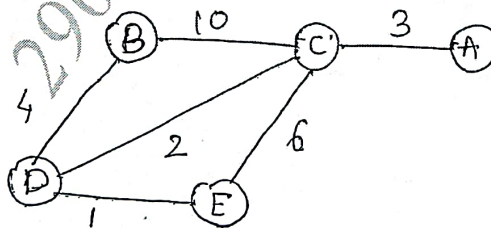
$n = 5$

$w = 60 \text{ kg}$

$(w_1, w_2, w_3, w_4, w_5) = (5, 10, 15, 22, 25)$

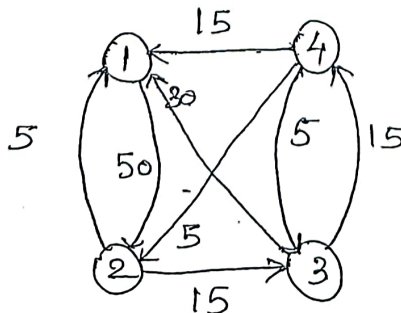
$(b_1, b_2, b_3, b_4, b_5) = (30, 40, 45, 77, 90)$

**b)** What is a minimum spanning Tree? Apply Kruskals algorithm on following graph to find MST. (05)



OR

**Q. 3** Write Floyd-Warshall All pair Source shortest path algorithm and apply it on following: (10)



P.T.O.

- Q. 4 a) What are multistage graphs? Give examples. (05)  
b) What is Travelling Salesperson problem and what are its applications? (05)

OR

- Q. 4 What is Longest common Subsequence problem? Find LCS for the following: (10)  
INDIAN  
BRANDING

- Q. 5 Write short note on: (10)  
a) Self-Balancing tree  
b) B Tress, B + Tress

OR

- Q. 5 What is string matching? Explain Rabin Karp Algorithm with suitable examples. (10)

- Q. 6 Discus Quantum Algorithm and Parallel algorithms in detail. (10)

OR

- Q. 6 Explain the following complexity classes of algorithms: PN NP, NP -Hard, NP-Complete. (10)

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