SE/IV/COMP+ AI&DS + CSE/DEC-2024/04-12-2024.

Time: 3 Hours   Max. Marks: 80

N.B. (1) Question one is Compulsory.
   **(2) Attempt any 3 questions out of the remaining.**
     (3) Assume suitable data if required.

Q. 1

a) What is job sequencing with deadlines? Let the number of jobs be n=4, with profits (P1, P2, P3, P4) = (100,10,15,27) and deadlines (d1, d2, d3, d4) = (2,1,2,1). Solve the problem to find the optimal solution using greedy method. **(05)**

b) Write algorithm for insertion sort and sort the following elements using the same: **(05)** 22, 15, 11, 16, 19. Show all the passes.

c) Give the algorithm to solve the N-Queen Problem using backtracking. Give any 2 **(05)** solutions for the 4-Queen Problem.

d) Show the steps and find number of shifts to find the Pattern "aabc" in the Text **(05)** String "abaaabccb" using Naïve String Matching Method.

Q. 2

a) Explain O, Ω and Θ notations with appropriate equations and graphs. **(10)**

b) Solve the sum of subsets problem using backtracking for the following: n=4, **(10)** m = 17, w = {2,7,8,15}. Show the entire state space tree and find all the solutions.

Q. 3

a) Write an algorithm for Merge Sort. Derive its time complexity using the **(10)** substitution method. Sort the following elements with using Merge Sort: 25, 11, 8, 39, 13, 12

b) Find the single source shortest path for the following graph using Greedy Method. Take vertex A as the source vertex **(10)**
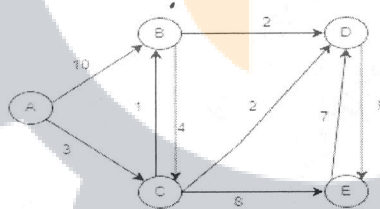
Q. 4

a) Write algorithm for 0/1 knapsack using dynamic programming and obtain the **(10)** solution to following 0/1 knapsack problem where: n = 4, Knapsack Capacity M = 5, Weights (W1, W2, W3, W4) = (2, 3, 4, 5) and profits (P1, P2, P3, P4) = (3, 4, 5, 6).

b) Explain with an example how the Travelling Salesman Problem can be solved **(10)** using Branch and Bound method.

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Q. 5

a) Give a suitable algorithm to find minimum and maximum element in a list using divide and conquer approach. Explain the approach with an example (Consider a list having atleast 7 elements). Discuss the time complexity for all cases. **(10)**

b) Give an algorithm to find Longest Common Subsequence between two sequences using Dynamic Programming. Also, find the LCS for the following strings: X = "SAVANT" **(10)**

Y = "ADVENT"

Q. 6

a) Give an algorithm to solve the All-pairs shortest path problem using dynamic programming. What is its time complexity? Find the All-pairs shortest path for all the vertices for the following graph. **(10)**
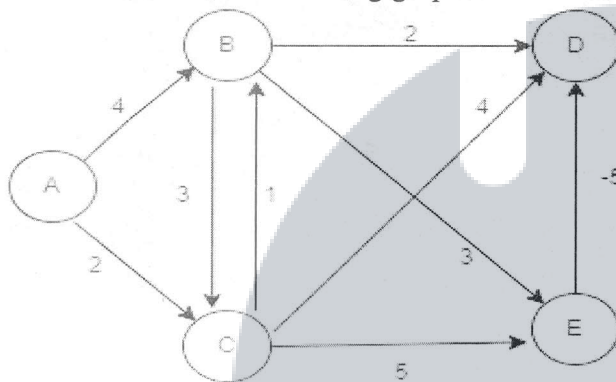
b) Give the Rabin-Karp Algorithm for string matching. Explain its working with a suitable example. List a few areas where String Matching Algorithms can be applied. **(10)**

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