**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.**

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**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: 22, 15, 11, 16, 19. Show all the passes. **(05)**

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

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

**Q. 2**

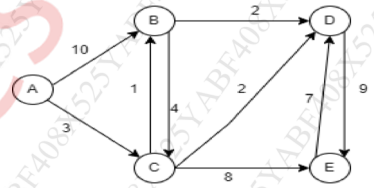
a) Explain O, Ω and Θ notations with appropriate equations and graphs. **(10)**

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

**Q. 3**

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

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 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). **(10)**

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

**Q. 5**

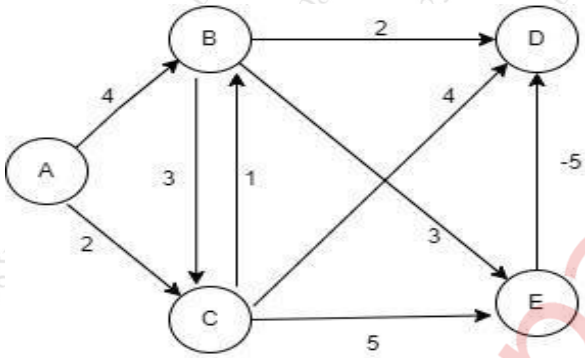
a) Give a suitable algorithm to find minimum and maximum element in a list using divide and conquer approach. Explain the approach with an example (Consider a list having atleast 7 elements). Discuss the time complexity for all cases. **(10)**

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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