

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
 End Semester Examination, April/May 2024
 BCA, Semester IV, 2023-24

Roll No.....

CS1126: Algorithm Design and Analysis

Time: 2.5 hours

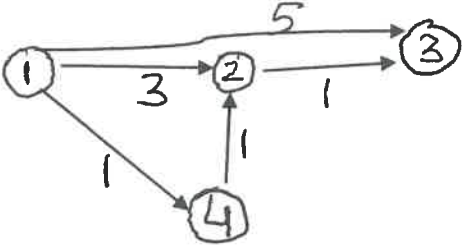
Max. Marks: 35

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

Q.1.1	Consider the following sequence <2, 6ac, 8b, 8, 12a>. Sort using Radix sort . <u>Show every step.</u>	2 (CO1)
Q.1.2	A. Sort the list <1, 2, 3, 3, 4, 2, 1, 0, 5> using Counting Sort. <u>Show every iteration and all the intermediate changes in the arrays.</u> B. Give an example of where Radix sort can be used and counting sort cannot be used OR A. What is the difference between Max Heap and Min Heap. Using an example, draw the heaps to explain the difference. B. Consider the following unsorted array <23, 1, 6, 19, 14, 18, 8, 24, 15>. Perform Heap sort to arrive at an array sorted in an increasing order? <u>Show every step of the process.</u>	2+1 (CO1) 1+2 (CO1)
Q1.3.	Consider the following graph. Perform Topological Sort. <u>Show every step</u>	1 (CO1)
Q.2.1	Find the optimal solution for Knapsack Binary 0/1 using the Dynamic Programming approach where knapsack capacity is 4. There are three items with the weights as {1,2,3} and corresponding value as {4, 12, 15} . From the table obtained, perform backtracking and arrive at the solution set.	(3) (CO5)

Q.2.2	Find the optimal solution for the knapsack problem where knapsack capacity is 25. There are three items with $w = \{4, 15, 40\}$ and corresponding value/profit = $\{60, 100, 120\}$. Show every step. A. Use Binary 0/1 and the Greedy approach B. Use Fractional approach C. Does the Greedy Approach always give an optimal solution? In which of the two cases, binary or fractional does it not? Justify your answer OR Given 10 connected components from 0,1,2,3,4,5,6,7,8,9. Connect (5,4), (4,3), (7,4), (1,2), (5,3), (1,3). Show each intermediate array and connected components that you arrive at and perform the Union operation by a. Applying the Quick Find Algorithm b. Applying the Quick Union Algorithm	3+2+1 (CO3) 3+3 (CO2)
Q3.1	A. Convert the substring “cats” into “fast” using Levenshtein distance. B. Perform Backtracking for the matrix obtained above, and arrive at the cost matrix.	2+1.5 (CO5)
Q3.2	Using the concept of Divide and Conquer, find the max and min in the sequence $\langle 11, 2, 34, 23, 38, 45, 22 \rangle$ OR What is bucket sort? Use an example to explain it. What is its complexity?	2 (CO4) 2 (CO1)
Q3.3	What is the difference between Greedy approach, Divide and Conquer and Dynamic Programming?	1.5 (CO3)
Q4.1	Consider the following graph: Showing <u>every iteration</u> of Prim's Algorithm, find the MST and the total cost.	3 (CO3)

Q.4.2	Consider the following graph:  Showing every iteration, obtain all pair shortest path using Floyd Warshall's Algorithm for given weighted graph.	3 (CO5)
Q.5	(i) Rank the functions according to their growth from slowest to fastest growing $n, n^2, 2^n, (3/2)^n$ (ii) Rank the functions according to their growth from slowest to fastest growing $\log_2 n, \log_8 n, n \log_2 n, n \log_6 n$ (iii) Draw the graph for $f(n) = \theta(g(n))$. How is it defined? (iv) A fully connected graph $G(V, E)$ with n vertices has _____ number of edges and _____ number of edges in its minimal spanning tree (MST). (v) What are the differences between Prim's and Kruskal's algorithms? For each of the following pairs of functions $f(n)$ and $g(n)$, determine whether $f(n) = O(g(n))$, $g(n) = O(f(n))$, or both. (vi) $f(n) = n \log n, g(n) = n\sqrt{n}/2$ (vii) $f(n) = \log n + 5 \log n, g(n) = \log n + 5$	7 (CO1) (CO3)

