Exam.Code:0999
Sub. Code: 7287

2123

M.E. (Computer Science and Engineering)

First Semester

CS-8101: Advance Algorithms

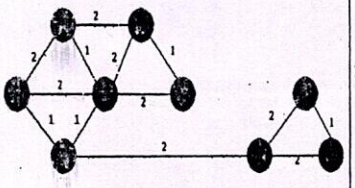
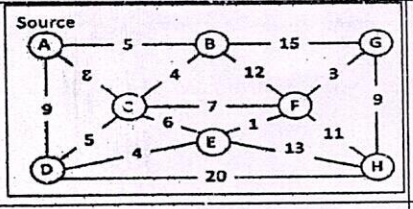
(Common with CSN 8101)

(For UIET Only)

Time allowed: 3 Hours | Max. Marks: 50

NOTE: Attempt <u>five</u> questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions from each Section B-C.

x-x-x

	Section-A	
1.	a) Consider Quicksort implementation where we first find median using an algorithm in O(n) time, and use it as pivot. What will be the worst-case time complexity of this modified Quicksort. b) Why are approximate algorithms important? c) Define and explain the concept of comparison trees in the context of sorting, searching, and merging algorithms. d) Give control abstract for divide and conquer strategy. e) How many minimum spanning trees are possible using Kruskal's algorithm for a given graph? 	10
	Section-B	
2.	a) Order the following functions in increasing order of their growth rate $\log_{10}n$, $\log_2 n$, $\log_e n$, e^n, 4^n, n!, $10n+5\log_e n$. b) Apply Strassen's matrix multiplication algorithm to multiply the following matrices: A= [2. 3 4. 1] B= [5. 7 2. 6] c) Give recurrence relation for computing complexity of Quick sort that divides lists in ratio 2:9 at every step. Solve it	3 3 4
3.	a) Given weighted, connected graph, describe how Dijkstra's algorithm works in finding the shortest paths from a single source vertex to all other vertices. b) Investigate the impact of edge weights on the runtime of Dijkstra's algorithm. Discuss scenarios where the weights being non-negative integers versus real numbers might affect the algorithm's efficiency. 	6 4
4.	a) Given a complete graph with the following edge distances: [0. 2. 1. 4 2. 0. 3. 5 1. 3. 0. 6 4 5. 6. 0] Use Branch-and-Bound algorithm to find optimal traveling salesman tour. b) Write short note on Multistage graph problem. What are the various ways to solve this?	6 4
	Section-C	
5.	a) What is Hamiltonian circuit problem in DAA? b) What is the complexity of n queens problem using backtracking? c) How to solve sum of subsets problem using backtracking?	2 3 5
6.	a) Solve the knapsack problem using dynamic programming for a knapsack of capacity m=20 and the following items: Values: (8, 12, 16, 10). Weights: (5, 7, 10, 8) Guide the solution step by step, explaining the decision-making process at each stage of constructing the dynamic programming table. b) Propose a parallel sorting algorithm for sorting an array using the PRAM model. Explain the steps involved, and analyze the time complexity of your algorithm, considering the number of processors available.	3 3 4
7.	a) Given a text T="ababcababababcababc" and a pattern P="ababc", apply the Robin-Karp algorithm to find all occurrences of the pattern in the text. Provide the hashed values for each window and the final matching positions. b) Consider a decision problem L that can be solved in polynomial time (P). If L is also in NP, what does this imply about the complexity of L? Explain your answer c) Consider a minimization problem where an algorithm produces an approximate solution A with a cost of 120, while the optimal solution is 100. Calculate the absolute approximation error and determine whether A is an overestimate or underestimate.	3 4 3

x-x-x