BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - IV COMPUTER SCIENCE & ENGINEERING : SUMMER : 2024
SUBJECT: DESIGN OF ALGORITHMS

Day : Friday
Date : 31/05/2024

S-25584-2024

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 labeled diagrams **WHEREVER** necessary.

Q.1 Explain the following Asymptotic notations with suitable diagrams. **(10)**

i) Theta (Θ).

ii) Big Oh (O).

iii) Big-Omega (Ω).

OR

Q.1 Write an algorithm for Insertion Sort. Explain in detail what Loop Invariants are with respect to Insertion Sort. **(10)**

Q.2 Explain the Divide and Conquer strategy to find Simultaneous Minimum and Maximum elements from an array using Divide and Conquer strategy. **(10)**

OR

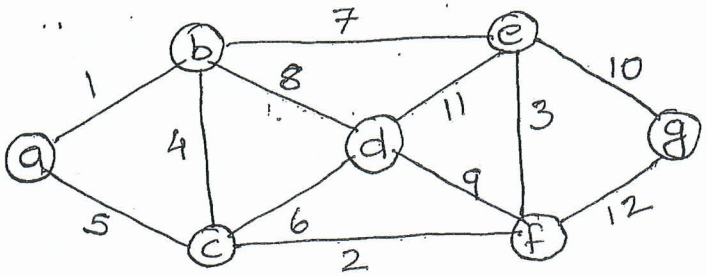
Q.2 Explain the Divide and Conquer strategy to solve problems. Write algorithm for Quick Sort. Also explain the running time of the algorithm in all three cases (best, Average and Worst). Sort using Quick Sort Algorithm: 45, 21, 36, 89, 54, 60, 95. **(10)**

Q.3 What if Fractional Knapsack problem and how to solve it using Greedy strategy. Solve the numerical to find maximum profit. Capacity of the bag M/W is 6. **(10)**

Item Number	1	2	3	4
Profit (P_i)	15	20	30	14
Weight (W_i)	3	2	10	2

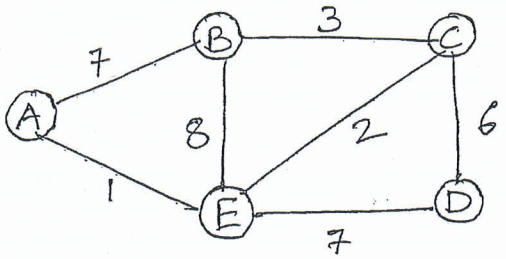
OR

Q.3 Differentiate between Prim's and Kruskal's Minimum Spanning Tree (MST) Algorithms. Find MST for the given graph using Kruskal's algorithm. **(10)**



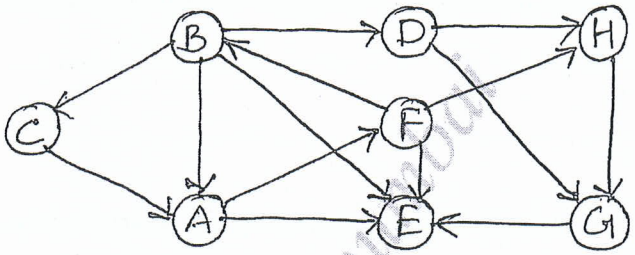
P.T.O.

Q.4 Write an algorithm to find the shortest path in a graph from Single Source that uses Dynamic Programming. Also discuss the running time of that algorithm. Find out the shortest path in the given graph. Consider A as the source node. (10)



OR

Q.4 Write an algorithm for Breadth First Search Graph Traversal. Discuss the running time of that algorithm. Apply on the given graph with starting vertex as C. (10)



Q.5 Explain the Backtracking strategy to solve problems. Take 4 Queen's problems to explain the strategy. Also explain terminologies related to Backtracking. (10)

OR

Q.5 Explain the following with a suitable example (10)

i) FIFO Branch and Bound.

ii) LIFO Branch and Bound.

iii) LC Branch and Bound.

Q.6 Explain with suitable example Polynomial Time Verification and Polynomial Time Reduction. Prove that Ham-Cycle is NP-Complete. (10)

OR

Q.6 Write a note on: (10)

i) Adversary Models.

ii) The Adaptive Online Adversary.

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