Sr. No. 602201

August/September 2022

MCA II SEMESTER

Analysis Design of Algorithms (MCA-20-102)

Time: 3 Hours

Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) What do you mean by pseudocode? (1.5)

(b) What are the types of algorithm efficiencies? (1.5)

(c) What is the complexity of Quick sort? (1.5)

(d) What is complexity of Binary Search? (1.5)

(e) What do you mean by NP-Hard and NP-complete problems? (1.5)

(f) Explain important properties of B-Tree. (1.5)

(g) Specify the difference between divide and conquer strategy and dynamic programming. (1.5)

(h) Distinguish Greedy method and Dynamic Programming. (1.5)

(i) What is tree edge and cross edge? (1.5)

(j) What is the complexity of Selection sort? (1.5)

PART -B

Q2 (a) Write and explain merge sort algorithm using divide and conquer strategy. Also analyze the complexity. (10)

(b) Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Entry Wij in the matrix W below is the weight of the edge {i, j}. What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T? (5)

$$W = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

Q3 (a) Write down Prim's algorithm and analyze the complexity. (5)

(b) Write the algorithm for general iterative backtracking method and explain various factors that define the efficiency of backtracking. (10)

Q4 Explain how 4 Queen problem can be solved using backtracking. Draw the state space tree corresponding to 4 Queen problem. (15)

Q5 (a) Explain subset-sum problem and discuss the possible solution strategies using backtracking. (5)

(b) Define Travelling Salesman Problem (TSP). Explain the basic steps that are to be followed to solve TSP using branch and bound. Illustrate with an example. (10)

Q6 (a) State knapsack problem. Give an algorithm for knapsack problem using greedy strategy. (10)

(b) Find an optimal solution to the knapsack problem for an instance with number of items 7, Capacity of the sack W=15, profit associated with the items (p1, p2,...,p7)= (10,5,15,7,6,18,3) and weight associated with each item (w1,w2,...,w7)= (2,3,5,7,1,4,1). (5)

Q7 Describe the algorithm for Hamiltonian cycles and determine the order of magnitude of the worst-case computing time for the backtracking procedure that finds all Hamiltonian cycles. (15)

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