R22

Code No: 185BT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January - 2025

DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE, CSE(AI&ML), AI&DS, AI&ML)

Time: 3 Hours **Max. Marks: 60**

Note: This question paper contains two parts A and B.
i) Part- A for 10 marks, ii) Part - B for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of ten questions (numbered from 2 to 11) carrying 10 marks each. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

1.a)	State the purpose of asymptotic notations in algorithm analysis.	[1]
b)	What is priori analysis and Posteriori Measurement.	[1]
c)	What is a priority queue, and how is it different from a regular queue?	[1]
d)	Give any one solution for 4-Queens problem.	[1]
e)	What is an optimal binary search tree**,** and why is it used?	[1]
f)	Briefly describe the Traveling Salesperson Problem (TSP).	[1]
g)	What is the greedy method, and when is it used?	[1]
h)	What is an articulation point? Give example.	[1]
i)	What is the FIFO Branch and Bound approach?	[1]
j)	Is P=NP, Justify your answer.	[1]

PART - B

(50 Marks)

2.a)	Design a divide-and-conquer algorithm for Strassen's matrix multiplication.	
b)	Derive Strassen's matrix multiplication time complexity and compare it with the conventional matrix multiplication algorithm.	[3+7]

OR

3.a)	Sort the following array using the merge sort algorithm for the elements in an Array: [38,27,43,3,9,82,10]. Show all steps of the algorithm.	
b)	Derive the complexity of Merge Sort algorithm.	[5+5]
4.a)	Solve the graph coloring problem for the given graph using backtracking. The graph has 4 vertices and edges as follows: (1,2),(1,3),(2,3),(3,4). Use 3 colors and show the backtracking steps.	
b)	Construct a max-heap for the array: [3,5,9,6,8,20,10,12,18,9] Show the steps for heapifying the array.	[5+5]

OR

5.a) Determine if a subset exists in the set {10,7,1,2,8} that sums to **15**. Draw the state space tree and clearly demonstrate the steps involved.

b) Write the algorithm for Union operation on a disjoint set. [7+3]

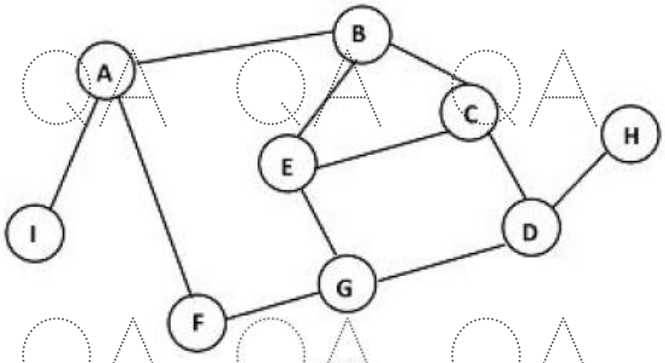
6. Construct the OBST for the instance n=4, (a1, a2, a3, a4) = (do, if, int, while) p(1:4) = (3,3,1,1) and q(0:4) =(2,3,1,1,1) using dynamic programming. [10]

OR

7. Using Dynamic programming, find the shortest path tour to be followed by the travelling sales person for the adjacency Matrix of a Graph G. [10]

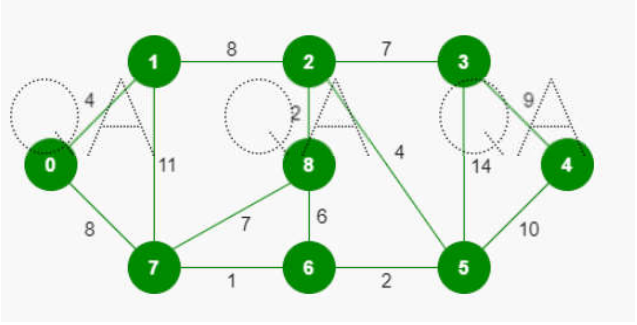
$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

8. Perform BFS and DFS traversal for the following graph starting from the vertex A. Write the algorithm for BFS and DFS traversal and analyze its complexity. [10]



OR

9. Explain the concept of minimum cost spanning tree? What are the different algorithms exist for obtaining minimum spanning tree. Compute the minimum spanning tree using Prim's algorithm for the given graph below. [10]



10. Using FIFOBB find the solution for the following knapsack problem and draw state space tree.

n=4, (p1,p2,p3,p4)=(2,5,8,1), (w1,w2,w3,w4)=(10,15,6,9) and m=30. [10]

OR

11.a) Explain P, NP, NP-Hard and NP-Complete Problems with an example.

b) Is every NP-hard problem also a NP-complete problem? Justify. [7+3]

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