Hall Ticket No | | | | | | | | | | |  Question Paper Code: AITB05

# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

**Regulation: R18**

## DESIGN AND ANALYSIS OF ALGORITHMS

**Time: 3 Hours** **(CSE|IT)** **Max Marks: 70**

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**Answer FIVE Questions choosing ONE question from each module**
**(NOTE: Provision is given to answer TWO questions from any ONE module)**
**All Questions Carry Equal Marks**
**All parts of the question must be answered in one place only**

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### MODULE – I

1. (a) What is stable sorting method? Is merge sort a stable sorting method? Justify . **[7M]**

   (b) Identify the tracing steps of merge sort and quicksort and analyze the time complexity for the following data: 33, 44, 2, 10, 25. **[7M]**

2. (a) Define various asymptotic notations used for best case, average case and worst case analysis of algorithms. **[7M]**

   (b) Apply Strassen's matrix multiplication algorithm to multiply two matrices and justify how it is better than normal method. **[7M]**

### MODULE – II

3. (a) Compare the approaches of BFS and DFS methods and derive the time complexities of both methods for the inputs of adjacency lists and adjacency matrix separately. **[7M]**

   (b) Construct DFS and BFS traversal trees of the graph shown in Figure 1. **[7M]**

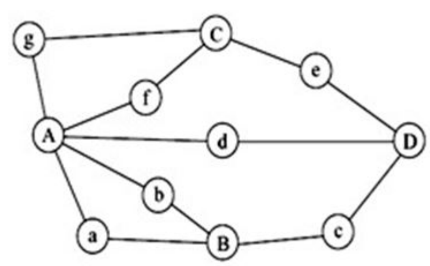


Figure 1

4. (a) Discuss the design steps in Kruskal's algorithm to construct minimum spanning tree. Explain the breadth first search algorithm with suitable examples. **[7M]**

   (b) Construct binary tree from the following inorder sequence: 4, 8, 2, 5, 1, 6, 3, 7 and postorder sequence: 8, 4, 5, 2, 6, 7, 3, 1. **[7M]**

## MODULE – III

5. (a) Explain control abstraction of greedy method, how it is useful for real time problems. **[7M]**

   (b) Choose shortest distances using all pairs shortest path algorithm for the graph shown in Figure 2. **[7M]**

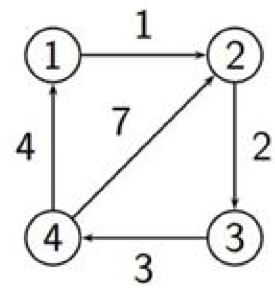


Figure 2

6. (a) Explain the travelling salesman problem and discuss how to solve it using dynamic programming? **[7M]**

   (b) Solve knapsack problem by dynamic Programming method n=6, (p1, p2,...p6)=(w1,w2,...w6) = (100,50,20,10,7,3) and m=165. **[7M]**

## MODULE – IV

7. (a) Explain 8-Queens problem with a backtracking algorithm. Using Backtracking enumerate how can you solve Hamiltonian cycle problem. **[7M]**

   (b) Build the state space tree generated by FIFO knapsack for the instance N=4 , (P1, P2, P3, P4) = ( 10, 10, 12, 18 ), ( w1, w2,w3,w4) = ( 2, 4, 6, 9 ), m=15. **[7M]**

8. (a) What is branch and bound? . With suitable example, demonstrate first in first out branch and bound solution. **[7M]**

   (b) Explain TSP using branch and bound method with example. **[7M]**

## MODULE – V

9. (a) Describe the approximation algorithm for NP-hard problem. Compare P class with NP class. **[7M]**

   (b) Explain non deterministic algorithm for sorting non-deterministic knapsack algorithm. **[7M]**

10. (a) Prove that clique decision problem is NP - Complete. Explain chromatic number decision problem. **[7M]**

    (b) Explain and prove Cook's theorem with suitable examples. **[7M]**

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