INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal-500043, Hyderabad

B.TECH IV SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - AUGUST 2023

Regulation: UG20

DESIGN AND ANALYSIS OF ALGORITHMS

(COMMON TO CSE | CSE (AI & ML) | CSE (DS) | CSE (CS) | CSIT | IT)

Time: 3 Hours

Max Marks: 70

Answer ALL questions in Module I and II Answer ONE out of two questions in Modules III, IV and V All Questions Carry Equal Marks All parts of the question must be answered in one place only

$\mathbf{MODULE}-\mathbf{I}$

- 1. (a) List the properties of asymptotic notation. Demonstrate time and space complexities of an algorithm. [BL: Understand| CO: 1|Marks: 7]
 - (b) Solve the following recurrence equation F(n)=2T(n/2) + n, F(1)=0.

[BL: Apply| CO: 1|Marks: 7]

$\mathbf{MODULE}-\mathbf{II}$

- 2. (a) Differentiate greedy and dynamic programming design techniques. Give the characteristics of greedy algorithms. [BL: Understand | CO: 2|Marks: 7]
 - (b) Write a non recursive algorithm to traverse a binary tree. Find the pre-order of traversal for the tree given Figure 1. [BL: Apply] CO: 2|Marks: 7]



Figure 1

 $\mathbf{MODULE}-\mathbf{III}$

- 3. (a) Write about optimal binary search tree (BST). Illustrate the job sequencing with deadline algorithm using a suitable example. [BL: Understand| CO: 3|Marks: 7]
 - (b) Find the minimum spanning tree (MST) for the following graph given tree in Figure 2 using Krushkals algorithm. [BL: Apply| CO: 3|Marks: 7]



Figure 2

- 4. (a) State the principle of optimality. Discuss all pairs shortest path algorithm in detail with an example. [BL: Understand] CO: 4[Marks: 7]
 - (b) Find the shortest path using Djikstra's algorithm for the given Figure 3 and write a routine.

[BL: Apply] CO: 4|Marks: 7]



Figure 3

$\mathbf{MODULE}-\mathbf{IV}$

5. (a) Elicidate N-queens problem. Draw decision tree for finding minimum of three numbers.

[BL: Understand] CO: 5|Marks: 7]

- (b) Construct a state space tree for the sum of subset problem applied to the instance $A = \{1, 2, 5, 6, 8\}$ and d = 9 using backtracking algorithm. [BL: Apply] CO: 5|Marks: 7]
- 6. (a) Explain travelling sales person problem using branch and bound method with an example. [BL: Understand] CO: 5|Marks: 7]
 - (b) Construct the state space for the FIFO branch and the bound algorithm for the given knapsack problem given in Table 1 where capacity of knapsack m=10. [BL: Apply] CO: 5|Marks: 7]

| Item | Weight | Profit |
|------|--------|--------|
| 1 | 7 | \$ 42 |
| 2 | 3 | \$ 12 |
| 3 | 4 | \$ 40 |
| 4 | 5 | \$ 25 |

Table 1

$\mathbf{MODULE}-\mathbf{V}$

7. (a) State and prove cook's theorem. Differentiate between first in first out branch and bound.

[BL: Understand] CO: 6|Marks: 7]

- (b) Write the efficiency of Warshall's algorithm. Elucidate chromatic number decision problem and clique decision problem. [BL: Understand| CO:6|Marks: 7]
- 8. (a) Discuss non polynomial-time algorithm with real time examples. Mention some limitations of algorithm power. [BL: Understand] CO: 6|Marks: 7]
 - (b) Summarize the strategy to prove that a problem is NP-hard. Compare NP- hard and NP-complete problems. [BL: Understand] CO: 6|Marks: 7]

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