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<br>Answer ONE out of two questions in Modules III, IV and V<br>All Questions Carry Equal Marks<br>All parts of the question must be answered in one place only

## MODULE - 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 $\mathrm{F}(\mathrm{n})=2 \mathrm{~T}(\mathrm{n} / 2)+\mathrm{n}, \mathrm{F}(1)=0$.
[BL: Apply| CO: 1|Marks: 7]
MODULE - II
2. (a) Differentiate greedy and dynamic programming design techniques. Give the characteristics of greedy algorithms.
[BL: Understand| CO: $2 \mid$ 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
MODULE - 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

## MODULE - 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 $\mathrm{A}=\{1,2,5,6,8\}$ and $\mathrm{d}=9$ 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 $\mathrm{m}=10$.
[BL: Apply| CO: 5|Marks: 7]
Table 1

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

## MODULE - 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]
