



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

II B.Tech II Sem Regular End Examination, July 2022

Design and Analysis of Algorithms

(CSE, CSI, CSM, IT)

Time: 3 Hours.

Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part – A, answer all questions which carries 20 marks.

3. In Part – B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

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|-------|-------------------------------------------------------------------------------------------------------------------------------------|----|-----|-----|
| 1. a) | What is the asymptotic lower bound in determining the complexity of an algorithm? | 2M | C01 | BL1 |
| b) | Express, in recursive equation form, the time required to search an element from an array of n elements using binary search method? | 2M | C01 | BL3 |
| c) | Define Find operation in disjoint sets? | 2M | C02 | BL1 |
| d) | State graph coloring problem? | 2M | C02 | BL1 |
| e) | Explain about optimal solution? | 2M | C03 | BL4 |
| f) | What is job sequencing with deadlines? | 2M | C03 | BL1 |
| g) | Discuss the statement of reliability design problem? | 2M | C04 | BL1 |
| h) | Define Dynamic programming? | 2M | C04 | BL1 |
| i) | What are the additional features required in branch-and-bound when compared to backtracking? | 2M | C05 | BL1 |
| j) | Define State space search tree? | 2M | C05 | BL1 |

PART- B

(10*5 Marks = 50 Marks)

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|------|-------------------------------------------------------------------------------------------------------------------------|----|-----|-----|
| 2 a) | Solve the recurrence relation $T(n) = 27T(n/3) + \Theta(n^3 \lg n)$ | 5M | C01 | BL3 |
| b) | Why do we use asymptotic notations in the study of algorithms? Briefly describe the commonly used asymptotic notations. | 5M | C01 | BL2 |

OR

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|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|
| 3 | Express, in recursive equation form, the time required to search an element from an array of n elements using binary search method. | 10M | C01 | BL3 |
| 4 | Give the statement of sum –of subsets problem. Find all sum of subsets for $n=4$, $(w_1, w_2, w_3, w_4) = (11, 13, 24, 7)$ and $M=31$. Draw the portion of the state space tree using fixed – tuple sized approach | 10M | C02 | BL3 |

OR

- 5 What is backtracking? Find a solution to the 4-Queens problem using backtracking strategy. Draw the solution space using necessary bounding function. 10M C02 BL3
- 6 State the Job - Sequencing with deadlines problem. Find an optimal sequence to the $n=5$ Jobs where profits $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 5, 1)$ and deadlines $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$. 10M C03 BL3
- OR**
- 7 If the Prim's algorithm is used to find minimum cost spanning tree from a weighted connected graph of n nodes, how many edges of the graph will be selected and how many steps will be required to select those edges? 10M C03 BL3
- 8 a) What are the conditions for a problem to be solved using Dynamic Programming? 5M C04 BL1
b) Write two characteristics that distinguishes as dynamic algorithm from greedy algorithm. 5M C04 BL1
- OR**
- 9 Design a recursive solution to the matrix chain multiplication problem. Find an optimal parenthesization of a matrix chain product whose sequence of dimension is 10M C04 BL6
- 10 a) State and explain Cooks theorem in detail? 5M C05 BL4
b) Define P, NP, NP complete and NP-Hard problems. Give examples of each. 5M C05 BL1
- OR**
- 11 Give the 0/1 Knapsack LCBB algorithm. Explain how to find optimal solution using variable - tuple sized approach. 10M C05 BL4

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