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INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

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

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III B.Tech II Sem Regular End Examination, June 2022

Algorithms Design and Analysis
(Information Technology)

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) | Solve the average case time complexity of $f(n) = 3n(n^2 - n) + 2n + 5$ | 2M | C01 | BL3 |
| b) | Write the applications of Binary Search | 2M | C01 | BL1 |
| c) | Write an algorithm of Find | 2M | C02 | BL1 |
| d) | What is the constraint of n-queen problem | 2M | C02 | BL1 |
| e) | What is principle of optimality | 2M | C03 | BL1 |
| f) | What is the time complexity of Travelling sales person in dynamic programming | 2M | C03 | BL1 |
| g) | What is feasible solution | 2M | C04 | BL1 |
| h) | Write an algorithm of Greedy Knapsack problem | 2M | C04 | BL1 |
| i) | Distinguish between P and NP | 2M | C05 | BL2 |
| j) | What are the applications of Brach and Bound | 2M | C05 | BL1 |

PART- B**(10*5 Marks = 50 Marks)**

- | | | | | |
|-------|--|----|-----|-----|
| 2. a) | Explain about the Strassen's matrix multiplication | 5M | C01 | BL4 |
| b) | Solve the following recurrence relation | 5M | C01 | BL3 |

$$T(n) = \begin{cases} 1 & \text{if } n = 0 \text{ or } n = 1 \\ \sqrt{\frac{1}{2}T^2(n-1) + \frac{1}{2}T^2(n-2) + n} & \text{otherwise} \end{cases}$$

OR

- | | | | | |
|---|--|-----|-----|-----|
| 3 | Write an algorithm of Merge sort and also analyze the time complexity of the same in all cases | 10M | C01 | BL5 |
|---|--|-----|-----|-----|

- 4 a) Explain how graph coloring problem is solved by using the backtracking 5M C02 BL4
 b) Write an algorithm of Weighted Union 5M C02 BL1
- OR**
- 5 W= {15, 7, 20, 5, 18, 10, 13}, m=35. Find all possible subsets of W that sum to m by using sum of subsets. Draw the portion of state space tree that is generated. 10M C02 BL3
- 6 a) Explain about Reliability design 5M C03 BL4
 b) Write an algorithm of All pairs shortest path 5M C03 BL1
- OR**
- 7 Design a three stage system with device types D1, D2, D3. The costs are \$30, \$15, \$20 respectively. The cost of the system is to be no more than \$105. The reliability of each device type is 0.9, 0.8 and 0.5 respectively 10M C03 BL6
- 8 a) Explain the single source shortest path with an example 5M C04 BL4
 b) Write an algorithm of Greedy Knapsack and also analyze the time complexity of the same 5M C04 BL5
- OR**
- 9 Write an algorithm of Prims minimum cost spanning tree and also analyze the complexity of the same 10M C04 BL3
- 10 a) Explain how to solve the Travelling Sales Person problem by using Branch and Bound method 5M C05 BL4
 b) Write a Non deterministic algorithm of satisfiability problem 5M C05 BL1
- OR**
- 11 Draw the portion of the state space tree generated by LCBB for the following knapsack instances: $n=5$, $(P_1, P_2, P_3, P_4, P_5) = (10, 15, 6, 8, 4)$, $(W_1, W_2, W_3, W_4, W_5) = (4, 6, 3, 4, 2)$ and $m=12$ 10M C05 BL3