R20

Code No: R20A0505

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Design and Analysis of Algorithms

(CSE, IT, CSE-AI&ML, B.Tech-AIDS & B.Tech-AIML)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 ***A*** Explain Pseudo code conventions for designing an algorithm with help of example. **[7M]**

B Discuss about binary search with an algorithm **[7M]**

OR

2 ***A*** Describe about merge sort with an example. **[7M]**

B How quickly can you multiply a $kn \times n$ matrix by an $n \times kn$ matrix, using Strassen's multiplication algorithm. **[7M]**

SECTION-II

3 ***A*** Suppose we start with n sets, each containing a distinct element. Show that at most $n - 1$ unions can be performed before the number of sets becomes1. **[7M]**

B For the following expression obtain an expression tree. Label the nodes with their MR value and obtain the optimal code generated by CODE2 for the two cases N = 1 and N = 2. Assume that no operator is either commutative or associative. a * b* c/(e - f + g*(h - k)*(l + m)). **[7M]**

OR

4 ***A*** Solve job sequence problem for given n=7, (p1, p2, p3, p4, p5, p6, p7) = (100,10,15,27,120,55,40) and deadlines (d1, d2, d3, d4, d5,d6, d7) = (2,1,2,1,4,3,1). **[7M]**

B Solve the following knapsack problem where M=40 and N=4 using greedy technique. Weights [W1, W2, W3, W4] = [20, 25, 10, 15] **[7M]**

Profits [P1, P2, P3, P4] = [20, 40, 35, 45]

SECTION-III

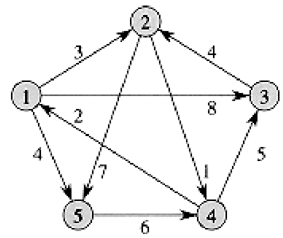
5 ***A*** Describe about minimum spanning tree using Prim's algorithm. **[7M]**

B Write an algorithm to construct the optimal binary search tree T given the roots $R(i, j), \leq i < j \leq n$. Show that this can be done in time O(n). **[7M]**

OR

6 ***A*** Explain briefly about dynamic programming. List out the differences between dynamic programming and greedy method. **[7M]**

B Find all pairs shortest paths for the following graph. **[7M]**



SECTION-IV

7 ***A*** Determine the order of magnitude of the worst-case computing time for the backtracking procedure that finds all Hamiltonian cycles. **[7M]**

B Construct portion of state space tree for the following integers n=5, W = {5, 6, 11, 13, 22} and m = 22 using sum of subsets problem. **[7M]**

OR

8 ***A*** Generate all possible 3 colouring for the graph with 3 nodes using state space tree. **[7M]**

B The N-queens problem is to place n-queens on an n x n chess board. What are the constraints in placing n-queens? Explain how backtracking can be used to solve the problem. **[7M]**

SECTION-V

9 ***A*** Write the algorithm for 0/1 knapsack problem using LC branch and bound technique. Trace the algorithm to find optimal solution to the knapsack instance of n = 4, m=10, profit (p1, p2, p3, p4) = (10, 10, 12, 18), weights (w1, w2, w3, w4) = (4, 7, 5, 3). **[7M]**

B Consider the following matrix and find optimal tour by using travelling salesperson problem by using branch and bound. **[7M]**

∞	10	8	9	6
8	∞	5	3	4
8	4	∞	4	8
8	7	5	∞	5
6	9	4	5	∞

OR

10 ***A*** Prove or disprove: If there exists a polynomial time algorithm to convert a Boolean formula in CNF into an equivalent formula in DNF, then P = NP. **[7M]**

B What is the relationship between NP-Hard and NP-complete problems? Discuss with an example. **[7M]**

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