

**Ramakrishna Mission Residential College (Autonomous)**  
**Narendrapur, Kolkata – 700103**  
**B.A./B.Sc. Fourth Semester Examinations, 2021**  
**Subject: Design and Analysis of Algorithm (Honours)**  
**Paper: HCOM4CC09LTH**

**Time: 2 hrs.**

**F.M.: 50**

Write your name, College roll, Subject, Paper Code at first page of the answer script. Also specify your name and College roll at the top of each page. Write the answer of the questions (**HANDWRITTEN**). Scan copy of handwritten answer script (as pdf file with file name mentioning your name and paper number, for example **RAKESH\_PAL\_CC09\_THEORY.PDF**) must be submitted **within 30 minutes** after examination completion at the email id **classtest.rkm@gmail.com**. Specify the file names in subject of the email.

Answer *Question No. 1* and *any five questions* from the rest

1. Answer any **five** of the following questions: [2X5=10]
  - a) Define: little o.
  - b) What is the purpose of Recursion-tree?
  - c) What do you mean by Dynamic programming?
  - d) Use the master method to give tight asymptotic bounds for  $T(n) = 2T(n/4) + 1$ .
  - e) What do you mean by Least-Cost Search?
  - f) Differentiate between Randomized Las Vegas Algorithms and Randomized Monte Carlo Algorithms?
  - g) Differentiate between NP-Hard and NP-Complete Problem.
  - h) What do you mean by Satisfiability problem?
  
2. a) Give an algorithm to solve the following problem: Given  $n$ , a positive integer, determine whether  $n$  is the sum of all of its divisors, that is, whether  $n$  is the sum of all  $t$  such that  $1 < t < n$ , and  $t$  divides  $n$ . Hence find its complexity.  
b) Devise a "binary" search algorithm that splits the set not into two sets of (almost) equal sizes but into two sets, one of which is twice the size of the other. How does this algorithm compare with binary search? [4+4]
  
3. a) What do you mean by Divide and Conquer Algorithm?  
b) Discuss Divide and Conquer approach for Quick sort with an example. [2+6]
  
4. a) A set of different points are given:  $\{(2, 3), (12, 30), (40, 50), (5, 1), (12, 10), (3, 4)\}$ . Find the minimum distance from each pair of given points using divide and conquer approach.  
b) What do you mean by Greedy approach? [6+2]

5. a) Differentiate between Backtracking and Branch and Bound.

b) Solve the Assignment problem using branch and bound.

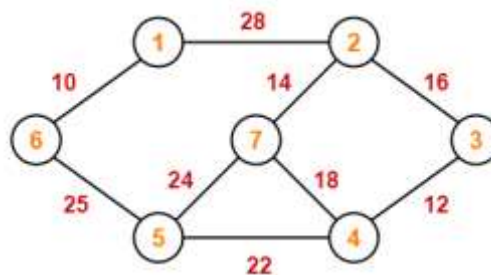
2+6

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

6. a) Obtain a set of optimal Huffman codes for the messages ( $m_1, m_2, \dots, m_7$ ) with relative frequencies ( $q_1, q_2, \dots, q_7$ ) = (4, 5, 7, 8, 10, 12, 20). Draw the tree for this set of code.

b) Find Minimal Spanning Tree of the following graph using Prim's Algorithm:

[4+4]



7. a) What do you mean by Fractional Knapsack problem? Suggest an algorithm to solve Fractional Knapsack problem.

b) Use Fractional Knapsack algorithm to solve the following problem.

[(2+3)+3]

ITEM	$w_i$	$v_i$
$I_1$	5	30
$I_2$	10	20
$I_3$	20	100
$I_4$	30	90
$I_5$	40	160

8. a) What do you mean by Residual Networks?

b) Find maximum flow in the network using Ford Fulkerson algorithm where source is 0 and sink is 5.

[2+6]

