**Birla Institute of Technology & Science, Pilani**

**Work-Integrated Learning Programmes Division**

**Second Semester 2020-2019**

**M.Tech (DSE)**

**END -Semester Test (EC-3 Regular)**

Course No. : DSECLZG519

Course Title : DATA STRUCTURE ALGORITHMS AND DESIGN

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| No. of Pages = 2 No. of Questions = 10 |

Nature of Exam : Open Book

Weightage : 40%

Duration : Min

Date of Exam :

Note:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.
4. Solve the following recurrence relation: f(n) =4f(n/2)+(n) with f(1) =(1). [Master theorem shouldn’t use to solve this problem] [3M]
5. Given a chain of four matrices A1,A2,A3,A4 with P0=5,P1=4,P2=6,P3=2 and P4 =7 . find M[1,4]. [5M]
6. Construct an unbalanced K-D tree for the following data (6,2) (7,1) (2.9) (3,6) (4,8) (8,4) (5,3) (1,5) (9,5) and plot the graph. [4M]
7. Draw an AVL tree as each of the following keys are added in the order given. Show intermediate steps {43,18,22,9,21,6,8,20,63,50,62,51}. [4M]
8. You are given a directed graph, duplicated in the first column below for each subproblem so that you may mark it up with notes. [1.5+1.5=3M] ![A picture containing photo, sitting, hanging, pair

   Description automatically generated]()
   1. In what order are the nodes visited by DFS, starting from vertex a?
   2. In what order are the nodes visited by BFS, starting from vertex a?

1. Suppose that every operation on a data structure runs in O(1) amortized time. Then what is the running time for performing a sequence of n operations on an initially empty data structure? Give your answer with reason. [3M]
2. Describe an O(nlogn) time algorithm that given a set of n real number x, determines whether or not there exist two elements in S whose sum is exactly x.[hint: Doing a binary search in a sorted list can be done in O(logn) time). [4M]
3. Run the Floyd -Warshall algorithm on the weighted directed graph of fig:1. Show the matrix Dk that results for each iteration. [5M]

![A picture containing photo, table, looking, hanging

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1. Consider the following directed, weighted graph :

![A picture containing map, photo, table, sitting

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Steps through Dijkstra’s algorithm to calculate the single source shortest path from A to every other vertex, and give the total cost of that path from A to I. [5M]

1. Design a binary tree where its post-order is D, H, I, E, B, J, F, G, C, A and In-order D, B, H, E, I, A, F, J, C, G. and write the pre-order of the construction binary tree. [4M]

###All The Best ###