Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (SOFTWARE ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2017/JAN 2018

SUBJECT: ADVANCED DATA STRUCTURES AND ALGORITHMS [ICT 5121]

REVISED CREDIT SYSTEM

(20/12/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.

1A. Merge the two leftist heaps shown in Fig. Q.1A. Show all the steps clearly. Analyse the complexity of Merge in a leftist heap. 5

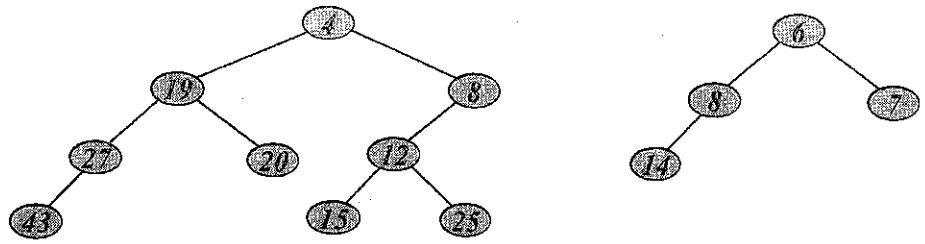

Fig. Q.1A

1B. Show the result of inserting 8, 11, 16, 24, 6, 4, 7, 15, 13, 9, 17, 4, 21, 23, 12, one at a time into an initially empty binary min heap. Determine the time complexity of insertion. 3

1C. Describe the extendible hashing technique with an example. 2

2A. With illustrations, explain the various cases to be considered during deletion of a node in a red black tree and how they are handled. 5

2B. Describe the Strassen's matrix multiplication algorithm. Compare the algorithm with simple divide and conquer matrix multiplication algorithm in terms of complexity. 3

2C. What are randomized algorithms? Explain how randomness can be incorporated in skip lists. 2

3A. Find the maximum flow from 's' to 't' in the network shown in Fig. Q.3A.

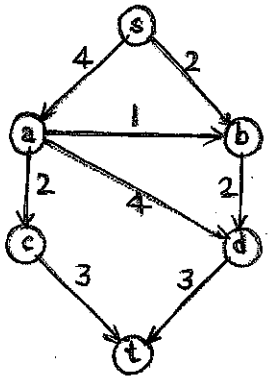

Fig.Q.3A

3B. With an example explain Huffman's coding algorithm. Which algorithm design technique does this exhibit?

3C. Delete P from the B+ tree shown in Fig. Q.3C and add O to it after. Draw the tree after each operation. 2

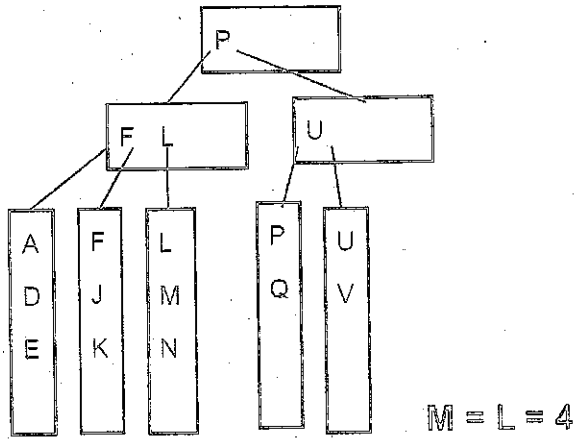

Fig. Q.3C

4A. Construct the minimum spanning tree for the graph shown in Fig. Q.4A using Prim's algorithm. Is the minimum spanning tree same using Kruskal's algorithm? Justify. 5

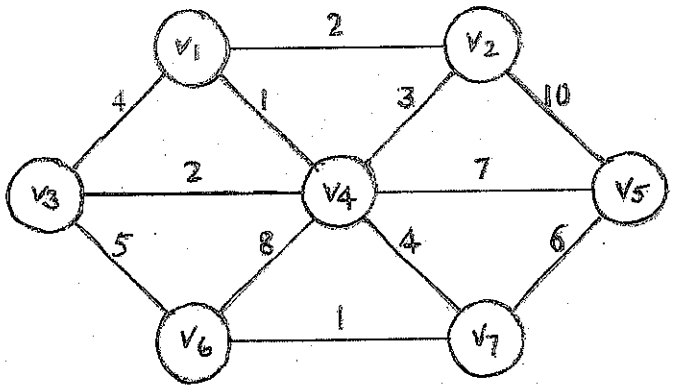

Fig.Q.4A

4B. Explain the dynamic programming method of construction of an optimal binary search tree. **3**

4C. Distinguish between NP hard and NP complete problems. Also explain reducible problems with an example. **2**

5A. Write the complete pseudo code for sorting a list of elements using merge sort. Trace the code for a sample list containing 10 elements. Write the recurrence relation for merge sort and solve it. **5**

5B. Insert the following sequence of keys in an empty splay tree. Show all the steps clearly. **3**
9 2 90 53 4 64 95 59

5C. Differentiate between union-by-size and union-by-height of disjoint sets with suitable examples. **2**