Reg. No.										

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Manipal
INSPIRED BY LIFE

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

SECOND SEMESTER M.Tech (S/W Engg.) DEGREE MAKEUP EXAMINATIONS, JUNE – 2016
SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS – ICT 524
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **28/06/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer any **FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

1A. How can you apply randomization to quick sort problem. Derive the time complexity.
1B. Describe shell sort algorithm and discuss its worst case time requirement.
1C. Derive the time complexity of find and delete operations in a B+ tree. (5+3+2)

2A. Compare and contrast the normal method and Strassen's method of matrix multiplication. Derive the time complexity of Strassen's matrix multiplication method.
2B. Explain the following hashing techniques with examples.
i. Double hashing
ii. Rehashing
2C. What is meant by a d-heap? Discuss the time requirement to insert a node into it. (5+3+2)

3A. Using dynamic programming method, solve the following instance of matrix multiplication chain. q=5 and r=(8, 6, 4, 5, 4, 7)
3B. Write Prim's algorithm and trace it for the graph whose cost adjacency matrix is given as follows. Also determine its time complexity.

0	11	∞	∞	∞	8	∞
11	0	21	∞	∞	∞	12
∞	21	0	12	∞	∞	∞
∞	∞	12	0	21	∞	19
∞	∞	∞	21	0	25	24
8	∞	∞	∞	25	0	10
∞	12	∞	19	24	10	0

3C. What are NP-hard problems? How are they different from NP-Complete problems. Give examples. (5+3+2)

4A. Illustrate with an example why Dijkstra's algorithm fails to find the shortest path in a graph with negative edges? Suggest and write a suitable algorithm to overcome this drawback.
4B. Write an algorithm to find topological order sequence of nodes in a Graph. Determine its time complexity. Trace your algorithm by taking a suitable graph.
4C. Prove or disprove the following:

i. $2^{n+1}=O(2^n)$
ii. $2^{2n}=O(2^n)$ (5+3+2)

5A. With neat diagrams explain Flynn's architectural classification schemes of parallel computers.
5B. Merge the leftist heaps given in Fig. Q.5B

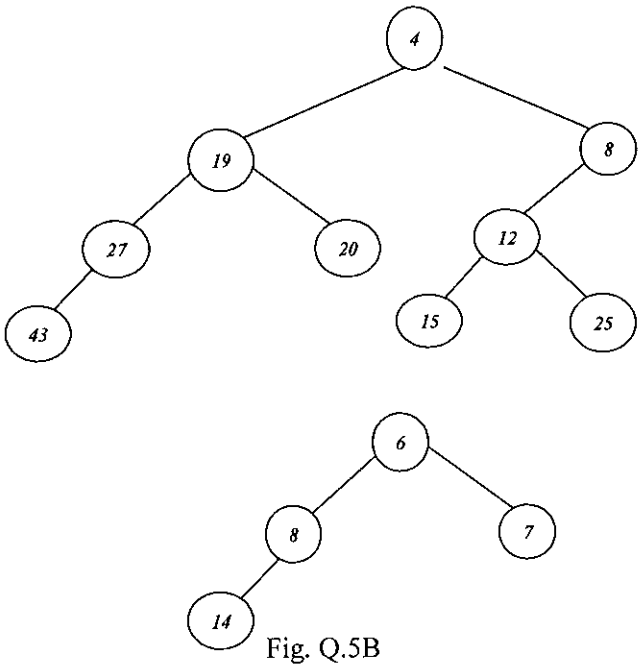

Fig. Q.5B

5C. Explain pseudo random numbers. What is its role in randomised algorithms? Explain with an example. (5+3+2)

6A. Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13, 2, one at a time, into an initially empty binary min heap. Also describe how to delete the minimum element from it. Determine the time complexity of both the operations.

6B. Construct an expression tree for the expression: (5+7*3-4/(2+6))

6C. In a red-black tree, if the length of a root-to-external node path is the number of pointers on the path and P and Q are two root-to-external node paths, then prove that length(P) $\leq$ 2. length(Q). (5+3+2)

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