Reg. No.										

Manipal Institute of Technology

(Constituent Institute of Manipal University)

Manipal – 576 104

THIRD SEMESTER M. C. A. (Lateral) END SEMESTER EXAMINATION – DEC 2013

SUBJECT: ADVANCED DATA STRUCTURES AND ALGORITHMS (MCA 585)

07-12-2013

Time : 3 hours

Max. marks : 50

Instructions to Candidates

1. Answer any 5 FULL questions.
2. All questions carry equal marks.
3. Assume missing data, if any. Mention the same.

1A What do you mean by infix and postfix forms of a mathematical expression? Write the algorithm to convert an infix expression to postfix form. Using this algorithm, convert the infix expression (A + B) * C – (D / E) ^ (F * G) + H to postfix form.

1B What is a sparse matrix? Give an example. Illustrate how this matrix can be represented using a 1-D array.

1C Define a data structure. Differentiate between primitive and non-primitive data structures. Give an example for each.

(5 + 3 + 2)

2A Explain the use of asymptotic notations? Explain the meaning and significance of big-oh (O) and omega (Ω) notations. Give an example each.

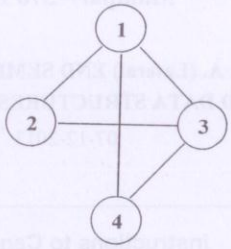
2B What is a recurrence equation? Obtain the recurrence equation for finding the sum of elements of an array using recursion.

2C What do you mean by time complexity of an algorithm? What are its two components? Explain.

(5 + 3 + 2)

3A What is a binary search tree? Explain, with an example, the method of deleting an element from a binary search tree for the three cases – deleting a leaf node, deleting a node with one child and deleting a node with two children.

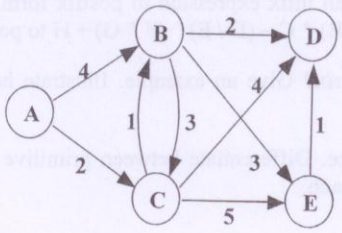
3B Explain the adjacency list and adjacency matrix representation of an unweighted graph. Write the adjacency list and adjacency matrix for the following graph:



3C Explain the open-addressing method of resolving collision during hashing. Give an example.

(5 + 3 + 2)

4A Write Dijkstra's algorithm for solving the single-source shortest-paths problem. Illustrate the same for the following graph, assuming A as the source vertex:



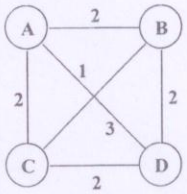
Show each step.

4B What is a max heap? Create a max heap for the following set of elements: 20, 12, 35, 15, 10, 80, 30, 17, 2 and 1. Show each step in the process of heapification.

4C What is a bipartite graph? Give an example.

(5 + 3 + 2)

5A For the following 4-vertex network, draw the solution space for the Traveling Salesperson problem, with A as the starting point.



Solve problem using backtracking method. Show each step.

5B Differentiate between FIFO and Max-Profit (or Least-Cost) based Branch and Bound strategy.

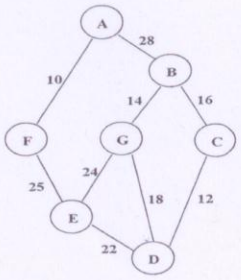
5C Sort the following sequence of integers using natural merge sort technique: A = [4, 8, 3, 7, 1, 5, 6, 2]

(5 + 3 + 2)

6A Write the recurrence equation for the optimal solution of a 0/1 Knapsack problem using Dynamic Programming technique. Using this, solve the following problem:

n = 3, c = 116, w = [100, 14, 10], p = [20, 18, 15]

6B What is a minimum spanning tree. Obtain the minimum spanning tree for the following graph using Prim's algorithm:



6C What do you mean by a complete binary tree? Give an example of a complete binary tree of depth 3.

(5 + 3 + 2)

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