Reg. No.									

Manipal Institute of Technology

(A Constituent Institute of Manipal University)

I SEMESTER M. C. A.

END SEMESTER EXAMINATION – NOV/DEC 2015

SUBJECT: ADVANCED DATA STRUCTURES AND ALGORITHMS [MCA 4102]

01-12-2015

Time : 3 hours

Max. Marks : 50

Instructions to Candidates

1. Answer ANY FIVE FULL questions.
2. Missing data may be suitably assumed.

1A What is the use of asymptotic notations? Explain the meaning and significance of big-oh (O) and omega (Ω) notations. Give an example each.

1B Differentiate between FIFO and Max-Profit (or Least-Cost) based Branch and Bound strategy.

1C What do you mean by a strongly connected graph? Explain with an example.

(5 + 3 + 2)

2A Differentiate between infix and prefix forms of a mathematical expression? Write the algorithm to evaluate a prefix expression. Using this algorithm, evaluate the prefix expression – * + A B C / D E, given A = 5, B = 8, C = 3, D = 4 and E = 2. Show each step of evaluation.

2B Construct a binary tree whose inorder and postorder sequences are as follows.

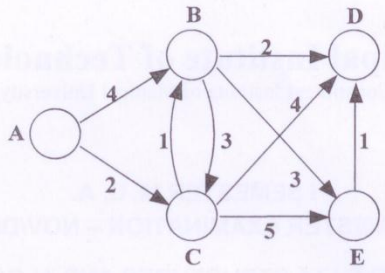
Inorder: E A C K F H D B G
Postorder: E C K A H B G D F

Write the preorder traversal sequence for the same.

2C What is a bipartite graph? Give an example.

(5 + 3 + 2)

3A Explain the Dijkstra's algorithm for solving the single-source shortest-paths problem. Illustrate the same for the following graph, taking A as the source vertex.



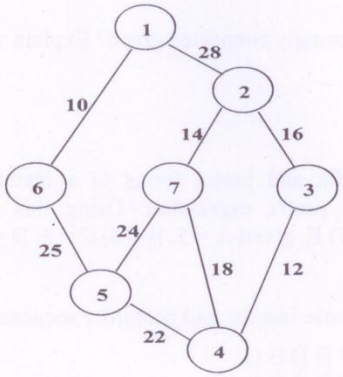
3B What do you mean by time complexity of an algorithm? What are its two components? Explain.

3C Write any two advantages of a linked list over an array.

(5 + 3 + 2)

4A 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.

4B What is a minimum spanning tree? Obtain the minimum spanning tree for the following graph using Prim's algorithm. Show each step in the process.

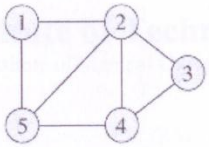


4C Sort the following sequence of integers using natural merge sort technique: A = [4, 8, 3, 7, 1, 5, 6, 2]

(5 + 3 + 2)

5A Write the solution space tree for the 0/1 Knapsack problem, given n = 3, c = 30, w = [20, 15, 15] and p = [40, 25, 25]. Solve the problem using backtracking method.

5B Explain the adjacency matrix representation of an unweighted graph. Write the matrix for the following graph:



5C Explain the open-addressing method of resolving collision during hashing. Give an example.

(5 + 3 + 2)

6A What is topological sort of a directed acyclic graph? What is its significance? Draw the graph for the pre-requisites of taking up a course in a University curriculum as specified in the following table.

Course	Prerequisites
C1	None
C2	None
C3	C1, C2
C4	C2
C5	C3, C4

Also draw the graph representing the topological sort sequence of the resulting graph.

6B 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.

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

(5 + 3 + 2)