No. of Printed Pages : 3

MCS-021

MCA (Revised)

Term-End Examination

December, 2012

06405

MCS-021 : DATA AND FILE STRUCTURES

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

*Note : Question number 1 is **Compulsory**. Attempt **any three** questions from the rest. All algorithms should be written nearer to 'C' language.*

1. (a) Prove by Induction that :

   (i) The number of leaves in a binary tree of height "h" is less than or equal to 2^h. 5

   (ii) The number of nodes in full binary tree of height is equal to $2^{h+1} - 1$. 5

   (b) Show step-by-step construction of a B-Tree (t=3) resulting from the insertion of the following keys. A, S, T, M, U, K, L, B, G, N Also, show deletion of Key 'U' and 'K' from the B-Tree constructed above. 10

   (c) Write an algorithm to sort "N" numbers using Bubble sort. Also, show that bubble sort algorithm, on average, makes $O(N^2)$ comparisions while sorting a list of N elements. 10

(d) What is a height-balanced tree ? Construct an AVL tree for the following elements : 6, 3, 15, 24, 7, 89, 12, 34, 2 Show all intermediate steps. **10**

2. (a) What is a Dequeue ? Write an algorithm to insert and delete the node in a Dequeue. **10**

(b) Write an algorithm to implement Heap using linked list. The algorithm should clearly perform PUSH and POP operation. **10**

3. (a) Write recursive algorithm for preorder, inorder and post order traversal of a Binary tree. Also, give an example to show the traversals. **10**

(b) Construct a Red-Black tree from the following set of data items. **10**
11, 9, 7, 27, 8, 100, 22, 92
Also, show step - by - step procedure to delete "100" from the constructed tree.

4. (a) Write an algorithm to reverse the order of nodes in a doubly linked list with header node. **10**

(b) Differentiate between the Kruskal's and prim's algorithm based on their principle, operation and running time. Also, write any two applications of minimum cost spanning tree. **10**

5. (a) Differentiate between Indexed file organisation and Indexed sequential file organisation. Also, write any four disadvantages of sequential file organisation. **10**

(b) Write short notes on the following with an example of each : **5x2=10**

(i) Multiple stacks

(ii) AA-Tree