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Printed Pages : 4 **MCA – 202**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1467 Roll No. | | | | | | | | | | |

M.C.A.

(SEM. II) EXAMINATION, 2008-09

DATA AND FILE STRUCTURE USING 'C'

Time : 3 Hours] *[Total Marks : 100*

***Note** : Attempt **all** questions.*

1 Answer any **four** of the following : **5×4=20**

(a) Define and explain the following :

(i) Algorithm

(ii) Abstract Data types

(iii) Big Oh (O) Notation.

(b) Obtain an addressing formula for the element A $[i_1]$ $[i_2]$, ..., $[i_n]$ in an array declared as A $[l_1, ..., u_1]$, $[l_2, ..., u_2]$, ..., $[l_n, ..., u_n]$. Assume a row major representation of the array with one word per element and α the address of A $[l_1]$ $[l_2]$, ..., $[l_n]$.

(c) Write an algorithm to evaluate a postfix expression. State the assumptions, if any, you make regarding the input.

(d) Write the postfix and prefix form of the following expressions :

(i) A * B/C + D/E

(ii) A &&B || C || (E > F)

Assume C precedence of operators.

(e) Write a recursive algorithm to compute greatest common divisior (GCD) of two integers.

(f) What do you understand by sparse matrices ? Discuss the representation of these matrices using a type of storage allocation other than sequential allocation.

2 Answer any **four** of the following : **5×4=20**

(a) Write an algorithm which reverses a singly linked list only by manipulating the pointers.

(b) Write an algorithm to insert and delete an element in a circular queue.

(c) Write a function which deletes the fifth node in a doubly linked list.

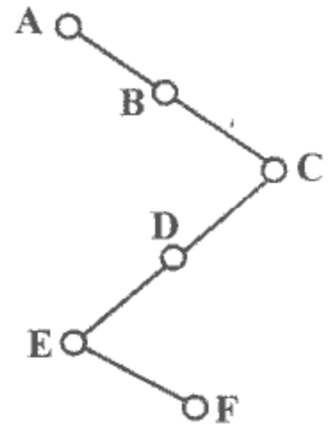
(d) What is generalized linked list ? Suggest a mechanism to represent a generalized linked list.

(e) Write short notes on garbage collection.

(f) How can a stack be realized using singly linked list ? - Describe.

3 Answer any **two** parts of the following : **10×2=20**

(a) (i) Write preorder, inorder and postorder traversal of following binary tree :



(ii) Show that in any binary tree, the number of leaves is one more than the number of nodes of degree two.

(b) (i) Suppose characters a, b, c, d, e, f have probabilities 0.07, 0.09, 0.12, 0.22, 0.23, 0.27 respectively. Find an optimal Huffman code and draw the Huffman tree. What is average code length ?

(ii) What is a inorder threaded binary tree ? Write an algorithm for preorder traversal of a inorder threaded binary tree.

(c) What is hash function ? Discuss various kinds of hash functions with suitable examples. Further, describe the approaches used to handle collisions.

4 Answer any **two** parts of the following : **10×2=20**

(a) Write the C program for sorting a list of integers using Quicksort algorithm. Obtain the worstcase and average case time complexity of this algorithm. Show the trace of the algorithm for following key sequence :

62, 22, 36, 6, 79, 26, 75, 13, 31, 76.

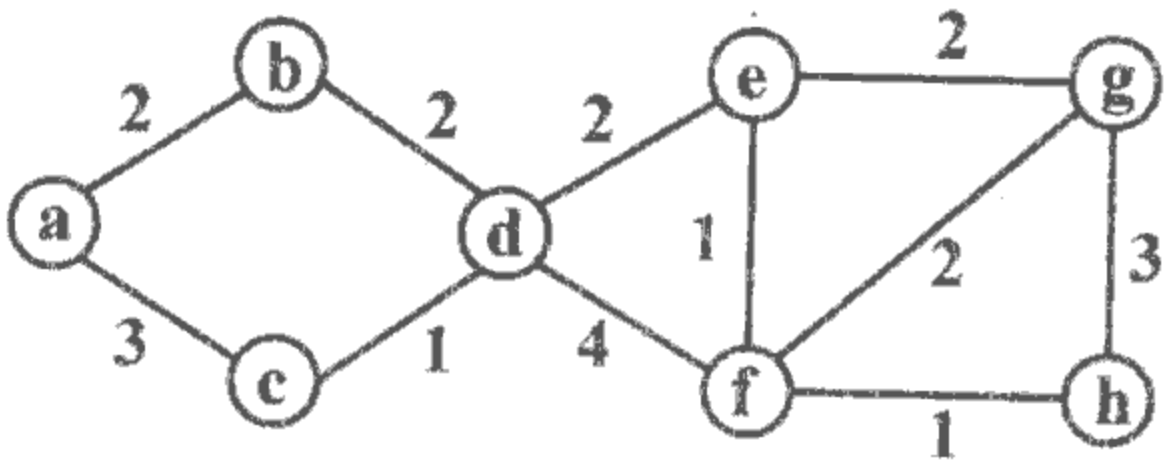
(b) What is a Binary search tree ? Define. Draw the Binary Search Tree when following keys are inserted in order in the initially empty binary search tree.

5, 75, 19, 36, 8, 62, 49, 84, 12, 18, 25. How can a Binary Search Tree (BST) be used for sorting of the keys ?

(c) What is an AVL tree ? Discuss the various kinds of rotations done for rebalancing the tree after insertion. Choose suitable examples for illustration.

5 Answer any **two** parts of the following : **10×2=20**

(a) Find minimum cost spanning tree of given graphic using



(i) Prim's algorithm

(ii) Kruskal's algorithm.

Further give the adjacency matrix representation of the graph.

(b) Write an algorithm to find the number of connected components in a graph.

(c) Write notes on B Tree.
