Reg. No. :

K 3504

M.C.A. DEGREE EXAMINATION, JANUARY 2008.

First Semester

MC 1604 — DATA STRUCTURES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A 2 Dimensional array A (1:u1, 1:u2) may be interpreted as u1 rows, each row consisting of the u2 elements stored in row major order. If α is the address of A (1, 1), then find the address of A(i,1) and A(i, j).

2. List any two operations that are possible for general linked list, but not allowed for either stacks or queues.

3. What is tree traversal? List the steps involved in pre order traversal.

4. Represent an algebraic expression into a tree. A + (B–C) * (E+F) / G.

5. Sort the following numbers using merge sort.

   5, 15, 30, 6, 3, 95

6. Define AVL tree and give an example of binary search tree, which is not AVL.

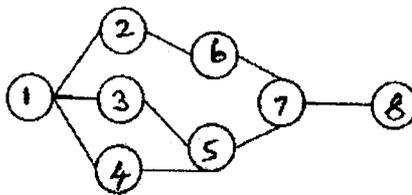7. Find the connected components of the following.

8. Draw the BFT of the Graph given below.

9. Define Garbage collection and compaction.

10. How do you represent a string in memory?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the Linked List representation of generalized List. (6)

    (ii) Explain the compaction algorithm with suitable example in detail. (10)

    Or

    (b) (i) Write an algorithm to implement queues in a linear array with two indices front and rear, such that when rear reaches the end of the array, all the items are moved to the front of array. (8)

    (ii) Write an algorithm that will split a linked list into two linked lists, so that successive nodes go to different lists (the first, third, and all odd-numbered nodes go to the first list, and 2nd, 4th and all even-numbered nodes go to the second.) (8)

12. (a) (i) Describe the basic operation of queue with an example. (6)

    (ii) Explain any two applications of stack in detail. (10)

    Or

    (b) (i) Write algorithms to merge any two linked list. (8)

    (ii) Design an algorithm to copy a sparse matrix. (8)

13. (a) Write procedures to perform the following operations on binary tree.
    (4 × 4 = 16)

    (i) creation of new tree

    (ii) Insertion of a node

    (iii) deletion of a node

    (iv) search a particular node.

    Or

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(b) (i) What is binary search tree? Write an algorithm to add a node into a binary search tree. Show the resulting binary search tree if the elements are added into it in the following order.

50, 20, 55, 80, 53, 30, 60, 25, 5 (12)

(ii) How can you represent a binary tree in memory? Explain it with example. (4)

14. (a) (i) Write an algorithm to perform the Quick sort and explain it in detail. (8)

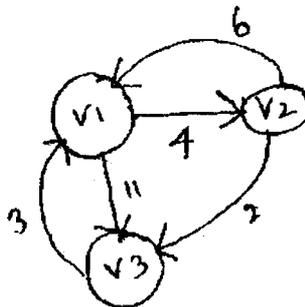(ii) Sort the following number using quick sort procedure. (8)

25, 57, 47, 35, 10, 90, 83 and 31.

Or

(b) Explain any four hashing functions with an example in detail. $(4 \times 4 = 16)$

15. (a) (i) Write an algorithm to display all minimum cost paths between all pairs of nodes in a graph with all its edges labeled. (8)

(ii) Find the minimum cost paths between all pair of nodes in the following graph. (5)

(iii) Discuss the complexity of the above algorithm. (3)

Or

(b) (i) Explain the various representations of a graph in memory with suitable example. (8)

(ii) Explain any one application of graph in detail with suitable example. (8)

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