Sl. No.

C0-R4.B3 : DATA STRUCTURE THROUGH JAVA

NOTE :
1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same questions should be answered together and in the same sequence.**

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

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1. (a) What is Xtreme Programming ? Explain.
    (b) What are different types of Data Structures ? Give two examples of each type.
    (c) List two advantages of using array over linked list and two disadvantages of using array over Linked list.
    (d) Define Prefix and Postfix notations used in an arithmetic expression. Write Prefix and Postfix Polish notation of the given arithmetic expression $((x+y) \times z) - w$.
    (e) Which Data Structure is used for :
        (i)   Representing sparse matrices
        (ii) Sorting n elements
        (iii) Recursive operations
        (iv) Call log in mobile
        (v)   Domain Name Server
    (f) Define Space Complexity of an algorithm.
    (g) Differentiate between Stack and Heap.   **(7x4)**

2. (a) What is an associative array ? How it is different from index array ? Which data structure in Java is used as associative array ?
    (b) What are the advantages of binary search over a linear search?
    (c) What are enqueue and dequeue operations ?
    (d) Define a heap. How can it be used to represent a priority queue ?   **(5+4+4+5)**

3. (a) Give separate examples where Stacks and Queues can be used along with their advantages.
    (b) What are the different types of linked lists ? Explain in brief.
    (c) Write the Java code for finding the power of a number :
        (i)   Using Recursion
        (ii) Without Recursion   **(6+6+6)**

4. (a) List the properties of B-Tree.
    (b) What do you mean by Balance Factor in AVL tree ? Discuss different rotation techniques used to balance unbalanced AVL tree.
    (c) State the difference between the Binary Tree and the Binary Search Tree ?
    (d) What are self-balancing trees and where are they used ?   **(5+5+4+4)**

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5. (a) Define Spanning Tree. Prove the theorem : "A graph is connected iff it has a spanning tree".

(b) Give the DFS and BFS traversal sequence for the given graph
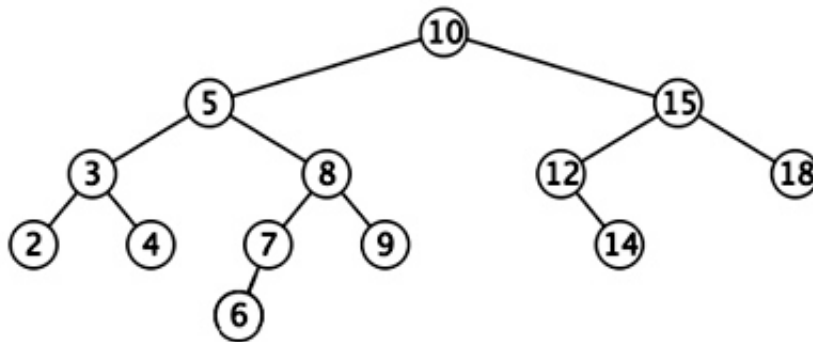
(c) Which Data Structure is used to implement Graph ? Elaborate. Give any two applications of Graph Data Structure.

(6+6+6)

6. (a) What is Trie ? State its properties. Write steps to insert a node in a trie.

(b) Write Java code to return the minimum number of characters inserted at any position of the given string so that the given string becomes a palindrome string.

(c) B+ Tree are used to store the large amount of data which cannot be stored in the main memory, How ? Discuss.

(6+8+4)

7. (a) Define Time Complexity parameter to check the efficiency of any sorting algorithm. Discuss its types.

(b) Why is the Space Complexity of Merge-sort higher compared to Quicksort ? Comment.

(c) Sort the given list using Merge-sort :

38, 27, 43, 3, 9, 82, 10

(d) What is Garbage Collection in Data Structure ?

(5+3+6+4)

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