C0-R4.B3: DATA STRUCTURES THROUGH JAVA

NOTE:

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

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

1.
a) List out and explain classification of Algorithms by implementation means.
b) Write merits and limitations of Object Oriented Programming over Procedure Oriented Programming.
c) Define the term 'Constructor'. Write a piece of code in Java to create a Constructor with an example.
d) Write a recursive algorithm for 'Binary Search'. Explain the algorithm with an example.
e) What is a 'Red-black Tree'? Explain the same with an example.
f) What is 'Depth-first search'? Explain the same with an Example.
g) Trace the 'Bubble sort' algorithm for ascending order for the following data:
   99, 2, 45, -15, 3, 89, 50, 15, 90, 33

(7x4)

2.
a) Explain in detail on 'Inheritance' and 'Polymorphism' features of Object oriented programming with examples.
b) Explain Time complexity and Space complexity of an Algorithm with example.
c) What is the probability that a two digit number selected at random will be a multiple of '3' and not a multiple of '5'? Give explanation to your answer.

(9+6+3)

3.
a) Write a code in Java to implement a single linked list for the following operations:
   i) Create a linked list for a set of elements.
   ii) Insert an element (consider insertion at beginning, end and in between two elements of list).
   iii) Delete an Element (consider deletion at beginning, end and in between two elements of list).
   iv) Display the list.
b) What is a 'Priority Queue' and write its Applications. Write Java code to implement the Priority Queue.

(9+9)

4.
a) Develop an algorithm for 'Towers of Hanoi' trace the algorithm for 4 disks.
b) Develop an algorithm to implement AVL tree. Consider Searching, Insertion and Deletion operations. Write Time complexity in Big-O notation for average and worst cases in respect of Search, Insert and Delete operations.

(9+9)

5.
a) Define the term 'Spanning tree'? Write Java code to implement for Breadth First Search (BFS).
b) Explain the time and space complexity of Breadth First Search (BFS).
c) Write an Algorithm for 'Bruit force string pattern matching' and explain with an example.

(6+3+9)

6.
a)   Write Java code to implement 'Quick sort' and trace it with an example.
b)   Develop 'Heap sort' algorithm and explain with an example.

(9+9)

7.   Write short notes on the following:
a)   Extreme Programming
b)   Asymptotic analysis
c)   Event Handling in Java
d)   Iterative Vs Recursive Programming

(6+3+6+3)