

## C0-R4.B3: DATA STRUCTURE 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 the differences between array and linked list data structures.
  - (b) Define time complexity of algorithms. Give an example of the algorithm whose time complexity is quadratic in big O notation.
  - (c) Explain encapsulation in JAVA with example.
  - (d) Explain Deque and also mention few of its applications.
  - (e) Explain recursion with a suitable example.
  - (f) What do you understand by constructors and destructors in Object Oriented Programming ? Discuss them in brief.
  - (g) What is TRIE data structure ? Explain in brief.

**(7×4)**

2.
  - (a) Discuss with an example to compute the best case and worst case time complexity of Quick sort algorithm.
  - (b) Evaluate the arithmetic expression P which is written in prefix notation as follows:  
P: + - \* + 2 5 3 / 24 \$ 2 3 / \* 3 6 9, where \$ stands for exponentiation
  - (c) Write JAVA code to implement tower of Hanoi problem for 'n' number of disks.

**(6+6+6)**

3.
  - (a) Write a Java code to reverse a linked list.
  - (b) Ackermann function is a good example of recursion. Using its definition, find A(1,3), where A is Ackermann function.
  - (c) Explain exception handling in Java with a suitable example.

**(8+5+5)**

4. (a) One by one, following integer keys are inserted into an initially empty B-Tree of order 5:  
 1, 12, 8, 2, 25, 6, 14, 28, 17, 7, 52, 16, 48, 68, 3, 26, 29, 53, 55, 45 and 67  
 Show the B-Tree after each insertion and clearly show the splitting of nodes, if any.
- (b) Write a Java code to rotate a linked list counter clock wise by k elements/nodes.
- (c) What is a brute force way of solving problems ? Explain it with one example.

**(6+6+6)**

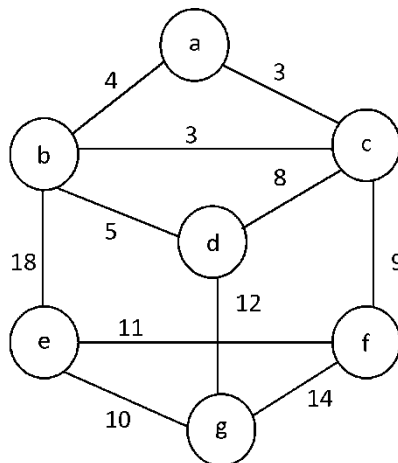
5. (a) Write a Java code to implement insertion sort.
- (b) Write an algorithm to convert an infix expression into a postfix expression.
- (c) A binary tree consists of 11 nodes. The inorder and preorder traversal of the binary tree yields the following sequences of nodes:  
 Inorder: A D K L M F G E B H C  
 Preorder: G A F D L K M C B E H  
 Draw the binary tree from given data.

**(6+6+6)**

6. (a) What do you understand by Extreme Programming ? Mention the core principles one should apply during Extreme Programming.
- (b) Construct AVL tree for the following set of months where months are inserted in the order in to an initially empty AVL tree.  
 March, May, November, August, April, January, December, July, February, June, October, September

**(9+9)**

7. (a) Write Warshal's algorithm to compute the shortest path for a given weighted graph.
- (b) Apply Kruskal's algorithm and compute minimum spanning tree for the graph given below:



**(9+9)**