No. of Printed Pages : 4

Sl. No.

C0-R4.B3 : DATA STRUCTURE THROUGH JAVA

DURATION : 03 Hours **MAXIMUM MARKS : 100**

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

Name of Candidate : _____ **; Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- **Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.**
- **Parts of the same question should be answered together and in the same sequence.**
- **Questions are** to be answered in the **ANSWER SHEET** only, supplied with the Question Paper.
- **Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. (a) Differentiate between linear and non-linear data structures.

(b) How encapsulation is achieved in Java ? Briefly discuss.

(c) What do you mean by a constant time algorithm ? Briefly discuss.

(d) Briefly discuss the following types of queues : simple or linear queue, circular queue, priority queue, dequeue.

(e) Why stack overflow error occurs in recursion ? Explain it with an example.

(f) One by one, insert following elements into initially empty Binary Search Tree (BST) : 6, 2, 5, 1, 8, 9. Show the BST after insertion of each listed elements.

(g) Present the best-case and worst-case time complexity of the brute force pattern matching algorithm. **(7x4)**

2. (a) What is Extreme programming ? Briefly discuss along with the basic principles of Extreme programming.

(b) We can perform polymorphism in Java by method overloading and method overriding. Discuss method overloading and method overriding in Java with the help of examples. **(9+9)**

3. (a) Write a Java program to implement enqueue and dequeue operations of a circular queue. Also, write the display function to display the elements present in the circular queue. Consider linked list-based implementation of the circular queue while writing the Java program.

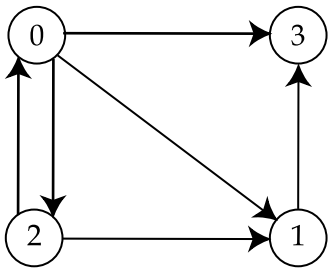
(b) It is desired to count the number of nodes in a given singly linked list. Propose following approaches to accomplish the desired task :

(i) An iterative approach for finding the length of the singly linked list.

(ii) A recursive approach for finding the length of the singly linked list.

(iii) Recursive approach for finding the length of the singly linked list using constant space. **(9+9)**

4. (a) You have been given a directed graph as follows :



Propose a scheme to find all paths between source vertex 2 and destination vertex 3. Also, write a Java program to implement the proposed scheme.

(b) How does Tree data structure work ? Discuss it through an example by storing the words "and" and "ant" in the Tree data structure. **(9+9)**

5. (a) Analyse the best-case and worst-case time complexity of bubble sort using appropriate examples. Also, analyse the space complexity of bubble sort.

(b) Briefly discuss the key idea behind radix sort and analyse its time and space complexity. Further, sort the array [170, 45, 75, 90, 802, 24, 2, 66] using radix sort. Show the results of all the intermediate steps. **(9+9)**

6. (a) Compare between the adjacency matrix and adjacency list representation of graph.

(b) Briefly discuss asymptotic notations along with following asymptotic notations : Big-O notation and Theta notation.

(c) You have been given a singly linked list. It is desired to check whether the singly linked list is sorted in descending order or not ? Propose iterative and recursive approaches to accomplish the desired task. **(6+6+6)**

7. (a) Briefly discuss the following components of a recursive function using an example : base case and recursive case.

(b) Differentiate between the Red Black tree and the AVL tree.

(c) Prim's and Kruskal's are the two widely used approaches to find the Minimum Spanning Tree (MST) in a weighted, connected, and undirected graph. Highlight the major differences between them (Prim's and Kruskal's). **(6+6+6)**

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SPACE FOR ROUGH WORK