Unique Paper Code : 3122611202
Name of the Paper : Data Structure and Design
Type of the Paper : DSC

Semester : II
Programme : B.Tech (Information Technology and Mathematical Innovations)

Duration : 3 Hours **Maximum Marks: 90 Marks**

Instruction for Candidates

1. **Write your Roll No. on the top immediately upon receipt of this question paper.**
2. **Attempt any five questions.**
3. **All questions carry equal marks.**
4. **Use of calculator not allowed.**

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1. Write the code for the following questions by creating a separate function for each question with proper input and output. Each subpart carries equal marks. [9+9]

   a. Given a Linked List, write a function that reverses the Linked List.

   b. You are given an array of 0s, 1s and 2s in random order. Segregate 0s on the left side followed by 1s and all 2 in the last on the right side of the array. The condition to follow is to traverse the array only once. Input array = [1, 2, 0, 1, 0, 2, 1, 1, 1, 0] and Output array = [0, 0, 0, 1, 1, 1, 1, 1, 2, 2]

2. Explain the difference between STACK and QUEUE data structures and demonstrate their implementation. [18]

3. Explain the representation and implementation of a Graph. Explain its basic operations with pseudo code. [18]

4. Draw the binary search tree(BST) by inserting the following numbers with particular instructions. According to instructions, start from the root, if a number is less, go to right else go to left. When you reach a leaf node, insert the new node.

   50 30 25 75 82 28 63 70 4 43 74 35.

   Also, traverse the formed tree and demonstrate with the following rule: 1) Left Root Right 2) Root Left Right 3) Left Right Root. [18]

5. Write the Heap Sort algorithm and sort the following values 66, 33, 40, 20, 50, 88, 60, 11, 77, 30, 45, 65. Discuss the running time and space-time complexity with different input values. [18]

6. The following values are to be stored in a hash table: 25, 42, 96, 101, 102, 162, 197. Describe how the values are hashed by using the division method of hashing with a table size of 7. Use chaining as the method of collision resolution. [18]

7. What is AVL Tree? Discuss its properties with examples and explain its implementation for producing a balanced tree. [18]