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IIIRD SEMESTER
SUPPL. EXAMINATION

Roll No.....
B.Tech.(Computer Engg.)
(Feb.–2019)

Paper Code: **COE-201**
Title of the subject: **Data Structures**
Time: 3:00 Hours
Max. Marks: 40

Note: Answer any five questions. Write pseudo code/C code for all algorithms asked. Assume suitable missing data, if any.

1. (a) Write an algorithm to evaluate a postfix expression.

   (b) Consider two strings $X=x_1,x_2,..x_m$ and $Y=y_1, y_2,...y_n$ where x_i, $1<=i<=m$ and y_i, $1<=i<=n$ are members of finite set symbols. Write an algorithm to generate a string by taking 1 element from each list. When any one string is exhausted, the output string should store rest of the elements of other string. **[4,4]**

2. Consider a list of numbers: 62, 31, 70, 91, 25, 11, 9, 61, 73, 6
   Write an algorithm to convert this array into a Max-Heap and show the application of the algorithm on given array/list. Show heap construction after every swap operation. **[8]**

3. Let the key of a node in a binary search tree be X (let's also call this node, "node X"). Please give a definition of inorder Predecessor(X), and inorder Successor(X). Given that you are at node X write algorithm Predecessor(X), and Successor(X). Assume each node is having a parent pointer and root node address is always available. **[8]**

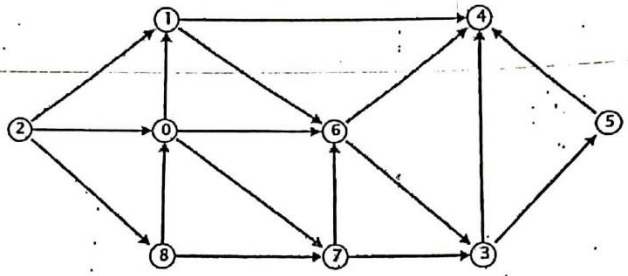
4. (a) Given two linked lists a and b, each containing n distinct numbers, design two different algorithms (possibly with different efficiency) to determine whether the two lists contains precisely the same set of numbers (but possibly in a different order).

   (b) Write an algorithm to reverse a singly linked list. **[6,2]**

5. A priority queue is a data structure that supports storing a set of values, each of which has an associated key. Each key-value pair is an entry in the priority queue. The basic operations on a priority queue are: insert(k, v): insert value v with key k into the priority queue, removeMin(): return and remove from the priority queue the entry with the smallest key. Write complete implementation of this priority queue. **[8]**

P.T.O

6. Consider the following acyclic digraph. Assume the adjacency lists are in sorted order: for example, when iterating through the edges pointing from 0, consider the edge $0 \rightarrow 1$ before $0 \rightarrow 6$ or $0 \rightarrow 7$.



Give topological sorting order for this graph. Also give DFS and BFS output starting from vertex 2. **[4+2+2]**

7. (a) Explain properties and structure of a B-tree. Draw a B-tree of degree 4 or more having atleast three levels.

(b) Explain BFS graph traversal technique. Write an algorithm for BFS traversal such that along with traversal it also computes single source shortest path for a given unweighted graph. **[4,4]**

8. (a) Write an algorithm to count number of non-leaf nodes (internal nodes) in a given binary tree.

(b) Write an algorithm to add two polynomials using array of structures. **[4,4]**