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IIIRD SEMESTER B.Tech.(Computer Engg.)

END SEMESTER EXAMINATION (Nov. – 2018)

Paper Code: COE-203 Title of the subject: Data Structures

Time: 3:00 Hours Max. Marks: 70

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

1. (a) Implement insertion sort using linked list to perform insertion sort as follows: remove an element from the input list and insert it to the correct position in the output linked list. Write an algorithm for this insertion sort to sort n elements stored in a linked list.

   (b) Describe Overflow (stack full) and Underflow (stack empty) conditions in STACK data structure implemented (i) using array, (ii) using linked list. [8,3+3]

2. Consider a list of numbers: 62, 31, 70, 91, 25, 11, 9, 61, 73, 6
   Show the result of inserting the numbers in the list in the same order specified above into an initially empty **minimum heap**. Note that you need to show how the heap looks like after each number is inserted. [14]

3. (a) You are planning the seating arrangement for a wedding given a list of guests, V. Suppose you are also given a lookup table T where T[u] for u ∈ V is a list of guests that u knows. If u knows v, then v knows u. You are required to arrange the seating such that any guest at a table knows every other guest sitting at the same table either directly or through some other guests sitting at the same table. For example, if x knows y, and y knows z, then x, y, z can sit at the same table. Describe an efficient algorithm that, given V and T, returns the minimum number of tables needed to achieve this requirement. Analyze the running time of your algorithm.

   (b) Describe different methods for handling collision in Hash table. [10,4]

4. (a) Write an algorithm which checks if a given binary tree is a binary search tree (BST) or not. Algorithm should return true/false.

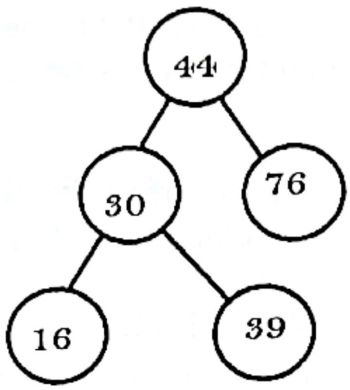
   (b) Write an algorithm that takes two linked lists, sorted in increasing order and merge the two into one sorted linked list, and return it.

   [7,7]

5. Write algorithm to evaluate a postfix expression using suitable data structure. Your algorithm should detect and display error messages if given postfix expression in not valid/correct. **[14]**

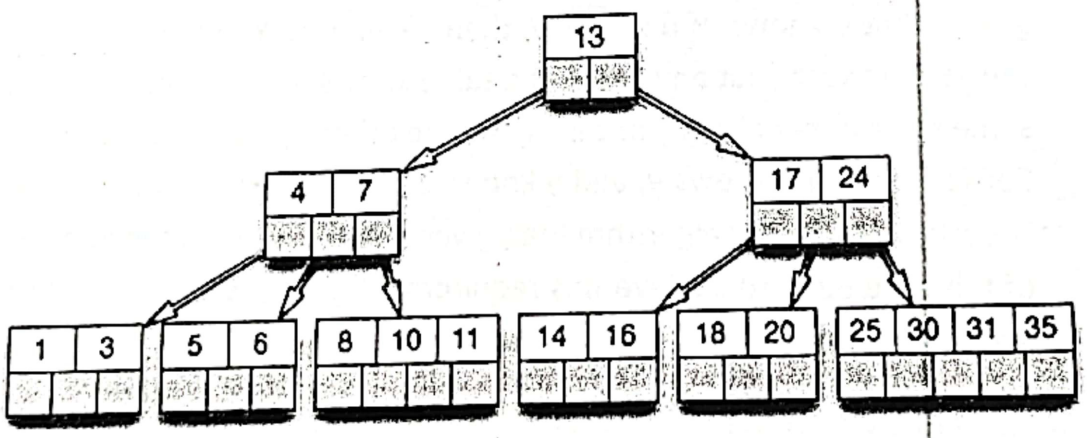
6. (a) Write algorithm which takes input a binary search tree T1 and returns a duplicate tree T2.

(b) Insert key 11 in following AVL tree and draw final AVL tree after required rotation(s) if any.



[7,7]

7. (a) Consider following B-Tree of degree 6 (max 6 children)



(i) Draw tree after deleting key=6.

(ii) Draw tree after deleting key =16 (without applying (i) i.e. key=6 is still present in tree).

(b) A given string contains all types of printable characters. Write an algorithm to remove all characters other than alphabets from string with fixed amount of additional storage area. (e.g. "He4l*l%=O" to be converted to "HellO"). What is time complexity of your algorithm? **[4+4, 6]**

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

(b) Write an algorithm to concatenate two doubly circular linked lists L1 and L2. L1 and L2 are pointers to first node of linked lists respectively. After concatenation (L1 followed by L2), L1 points to first node of final linked list.

[7,7]