



**MANIPAL**  
UNIVERSITY  
JAIPUR

**SCHOOL OF COMPUTING & IT**

Department of IT/CSE/CCE

III Semester; Second Sessional Examination, November 2016

Course: B.Tech. IT/CSE/CCE

**OPEN BOOK EXAMINATION**

Subject Code: CS1303

Max. Marks: 20

Subject Name: Data Structures

Duration: 1 hour.

**Instructions:**

1. All 5 questions are compulsory.
2. Missing data, if any, can be suitably assumed.
3. Numbers in [ ] indicate marks.
4. Calculators are not allowed.

1. Given a queue Q, write a method `FindMax(queue Q)` that will find and return the maximum element in the queue. You may only use queue operations such as `Q.enqueue(x)`, `Q.dequeue()` and `Q.size()`. No other data structures can be used other than queues. The queue Q must remain intact after finding the maximum element. Assume the elements in the queue are integers, so that the operators such as `<`, `=`, etc can be used in the pseudocode. [4]

2. In the following questions, consider the list of ten numbers [7]

62, 31, 70, 91, 25, 11, 9, 61, 73, 6.

(a) Show the result of inserting the numbers in the list in the same order specified above into an initially empty binary search tree (BST). Note that you need to show how the binary search tree looks like after each number is inserted.

(b) Using the binary search tree you created in part (a), delete the number 62. What is the resulting binary search tree?

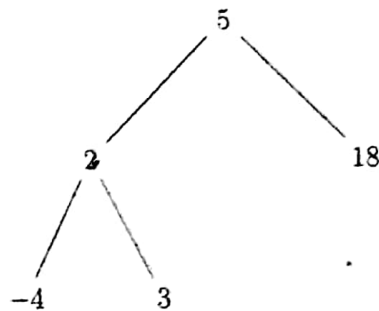
(c) Show the result of inserting the ten numbers in the list in the same order specified above into an initially empty AVL tree. Note that you need to show how the AVL tree looks like after each number is inserted.

(d) Using the AVL tree you created in part (c), delete the number 62. What is the resulting AVL tree? [4]

3. Illustrate the operation of heap sort on the array [63, 30, 70, 92, 22, 11, 9, 60, 74, 7] by sorting the array into ascending order using max-heaps. [4]

4. Find the return value of the func1 function if the function call is for the binary tree shown below. [2]

```
int func1(struct node* node)
{
    if (node == NULL)
        return 0;
    if (node->left == NULL && node->right == NULL)
        return 1;
    else
        return (func1(node->left) + func1(node->right));
}
```



5. A node structure for the tree is defined as follows: [3]

```
struct tree {
    int info;
    struct tree *p1;
    struct tree *p2;
    struct tree *p3;
}
```

Suppose a tree is constructed with such a node structure. Write pseudocode to implement a function IsBinaryTree (struct tree \*root) to check whether the tree is binary or not.