DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER IV [INFORMATION TECHNOLOGY]
SUBJECT: (IT-406) DATA STRUCTURE & ALGORITHMS

Examination	: Second Sessional	**Seat No.**	: _____
Date	:16/02/2018	**Day**	: Friday
Time	: 10:00 to 11:15	**Max. Marks**	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1   Do as directed.

(a) The maximum number of nodes in complete binary tree of level 5 is _____.   **[1]**

(b) The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42.   **[2]**
Which one of the following is the postorder traversal sequence of the same tree?
(I) 10,20,15,23,25,35,42,39,30   (II) 15,10,25,23,20,42,35,39,30
(III) 15,20,10,23,25,42,35,39,30   (IV) 15,10,23,25,20,35,42,39,30

(c) Construct the Binary Search Tree from the following set of strings: **[3]**
MAR,MAY,NOV,AUG,APR,JAN,DEC,JUL,FEB,JUN,OCT,SEP.

(d) Here is an array which has just been partitioned by the first step(pass) of quicksort: **[2]**
identify which can be the pivot element .Justify your answer.
   5,2,1,10,15,12.

(e) Given the two arrays below which are to be merged into a single array sorted in ascending   **[2]**
order? What are the total number of comparisons required to merge these arrays in single
pass of mergesort :   A1 = (10, 20, 30, 40, 50, 60,70,80,90)   A2 = (15, 25)

(f) You are given a sorted array A of size 200 elements. Five values are appended at the end of   **[2]**
the array. Which sorting algorithm would be a better candidate for sorting the whole array?
Insertion sort or Merge sort? Why?

Q.2   Attempt Any Two from the following questions.   **[12]**

(a) Sort the following data using LSD radix sort technique. Clearly give the output after each   **[6]**
pass ,and explain the logic used. :
   " office , access, accept, offers "

(b) Suppose that you are sorting an array containing the following 4 equal keys (the subscript   **[6]**
is not part of the key (its purpose is to uniquely identify each of the equal keys).   "
2a,2b,2c,2d" . What is the result of running "quick sort "on this data? Clearly show the
trace of all passes. Also explain the partition logic used.

(c) Suppose following data is sorted logically using links.   **[6]**
(26,5,77,1,61,11,59,15,48,19) . Suppose that "List sort "and "Table sort" are being used to
physically rearrange the records "in place", so as to ensure they are in correct sorted order.
Now ,answer following questions:
   (I)   Draw the initial setup of the required data in each method.
   (II)   Show separately the results after the first pass of each method on the initial
            setup.

Q.3 (a) (I) Consider the following code snippet in C. The function print() receives root of a Binary Search Tree (BST) and a positive integer k as arguments. **[4]**

What is the output of print(root, 3) where root represent root of the following BST.

```
// A BST node
struct node {
   int data;
   struct node *left, *right;
};
int count = 0;
void print(struct node *root, int k)
{
   if (root != NULL && count <= k)
   {
      print(root->right, k);
      count++;
      if (count == k)
        printf("%d ", root->data);
      print(root->left, k);
   }
}
```

```
        15
       /  \
     10    20
     /\    / \
    8 12  16 25
```
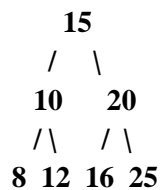
(II) For the above question what is the functionality of print function? **[2]**

(b) Write an algorithm for the following: **[6]**
    (i)   Insertion in Binary Search Tree.
    (ii)   Searching an element in Binary Search Tree

OR

Q.3 (a) (I) Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap? **[2]**
(A) 25,12,16,13,10,8,14
(B) 25,12,13,16,10,8,14
(C) 25,14,16,13,10,8,12
(D) 25,14,12,13,10,8,16

(II) What is the content of the array after two delete operations on the correct answer to the previous question? **[4]**
(A) 14,13,12,10,8
(B) 14,12,13,8,10
(C) 14,13,8,12,10
(D) 14,13,12,8,10

(b) Write an algorithm to insert a Right node in Threaded Binary Tree. Give example. **[6]**