K J SOMAIYA INSTITUTE OF MANAGEMENT STUDIES & RESEARCH.
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MCA SEM II
Batch : 2018-21

Subject : Data Structures **20/04/2019** **End Term Exam**
Duration: 3 hours **Maximum Marks: 50**

N.B.
(1) Question No. **1** is compulsory.
(2) Answer any two Questions from Question No **2** to **4**
(3) Figures on the right indicate marks.

[Q.1.]

a) Define the characteristics of a B-Tree. How does a B* Tree improvise the working of a B-Tree ? ***Build a B-Tree of order 3*** by inserting the following data arriving in sequence : **[6]**

96, 28, 10, 11, 15, 12, 26, 8, 9, 20, 23, 24, 82

b) Write a C++ program to implement a ***doubly linked list***. The structure will have just one data member called number, with two self referential pointers. Code the structure, the class interface and implement the insertAtBeg and appendLists methods, apart from any other functions you deem fit. Also code a sample client to demonstrate the class. **HINT:** The client call could be …. L3.appendLists(L1, L2);
Where L1, L2 and L3 are all objects of the doubly linked list class. List 2 must be appended at the end of List 1.
[8]

c) Write a C++ program for implementing a ***Binary Search Tree*** for the structure below:

```
struct BinTree
{
        int data;
        struct BinTree *left;
        struct BinTree *right;
};
```

Create a class called BST. Apart from the private data, write only three methods : insertTree(), preOrder(), searchTree() and the constructors. Function main is not required.
[6]

[Q.2]

a) Consider the following 12 numbers :
79, 22, 15, 98, 88, 63, 75, 86, 77, 46, 85, 23

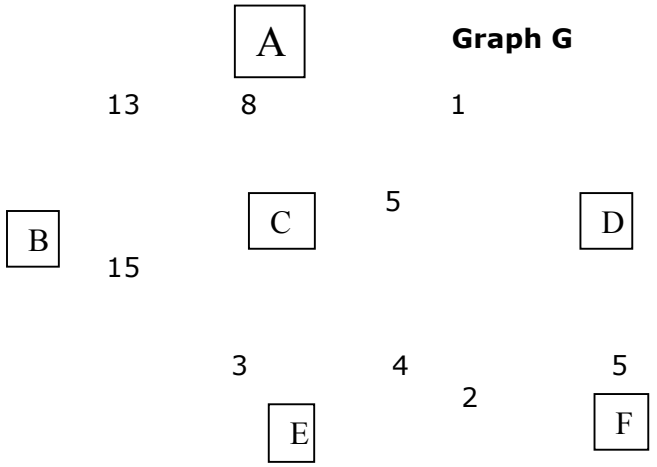
Show a snapshot of the array after **one pass** of :

[9]

(i) ***Quick Sort***

(ii) ***Shaker Sort***

(iii) ***Selection sort***



Define a ***Minimum Spanning Tree*** (MST). With reference to the Graph G above, using Kruskal's method, draw the MST and find the total minimum cost. **[6]**

[Q.3.]

a) Write a C++ program for ***heapsort***, including reHeapUp and reHeapDown. Create a class called Sort with a fixed length array as private. Also code a sample client to demonstrate the class.
[8]

b) How is an ***AVL tree*** more efficient than a Binary Search Tree ? Construct an AVL Tree for the following data arriving in sequence. Show the tree at each step. Each time there's an imbalance, state the youngest ancestor, the case and sub case for re-balancing the tree.

[7]

34, 54, 65, 18, 17, 19, 20, 32, 11, 12, 15, 21, 29

[Q.4.]

a) Draw a ***binary tree***, given the preorder and the inorder traversal :

Preorder : L J G C D A B K H E I F
Inorder : C G A D B J L E H K I F

Also give the ***postorder*** traversal of the tree.
[6]

b) Write a note on the ***performance analysis of algorithms***. Explain the following notations Big O, Big Omega and Big Theta.
[9]