

**2015**

**MCA**

**2nd Semester Examination**

**DATA STRUCTURE**

**PAPER—MCA-201**

*Full Marks : 100*

*Time : 3 Hours*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

*Answer any five questions.*

1. (a) Define Big Oh (O) notation for time complexity. Give a suitable example. 2+1
- (b) Draw a 3×4 array using the following row major arrangement. 2  
31, 2, -9, 4, 5, 8, -2, 12, 0, 11, 2, 18
- (c) What is the sparse representation of a diagonal matrix where all the non-zero elements are 5? 3

*(Turn Over)*

- (d) Write down the algorithm for Tower of Hanoi problem.  
What would be the minimum steps required to shift 5 disks for this problem? 5+1
2. (a) What are the advantages of Linked List over array? 3
- (b) Write a function in C to display all the elements of a Linked List with the following prototype:  
void display(struct node \*) 5
- (c) Why is the Doubly Linked List required over Single Linked List? 2
- (d) Write a program (function) to create a Linked List C that contains only those elements that are common in Linked Lists A and B. 4
3. (a) Why Stack is called as LIFO? What are the basic operations of a stack? 1+1
- (b) Write a small function to check the "underflow" condition for Linked List representation of Stack. 3
- (c) Convert the following Infix to Postfix form:  
 $4 * 2 * 3 - 3 + 8 / 4 / (1 + 1)$  8
- (d) Why Stack is called a linear data structure? 1

4. (a) Define Priority Queue. 2

(b) Write a function using the following prototype to add elements to a Queue.

```
void add Q (int[], int ,int *, int *)
```

First argument is the array; second item is the value to be added; third and fourth elements are the pointers to the Front and the Rear of the Queue.

6

(c) Why is Deque required over simple Queue? 2

(d) How do you check the overflow condition for a Circular Queue? 4

5. (a) Define Complete Binary Tree with an example. Find out the depth of your example tree. 3

(b) Draw the tree using the following array representation of a binary tree.

Arr	1	5	6	2	7	10	12	'\0'	'\0'	14	3
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(c) What would be the sequence of items of the tree mentioned in 5(b) using post-order traversal? 3

(d) Write a function for inorder traversal of a binary tree.

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6. (a) Define Binary Search Tree. What would be the minimum and maximum depth of a BST with 'n' number of nodes? 2+2

(b) Draw the Binary Tree using the following sequences:

In-order traversal: 4, 7, 2, 8, 5, 1, 6, 9, 3

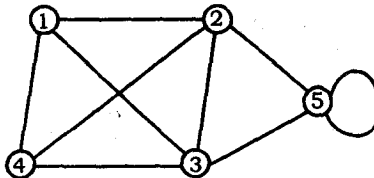
Pre-order traversal: 1, 2, 4, 7, 5, 8, 3, 6, 9 5

(c) Explain the properties of B-Tree. Write a basic difference of B-Tree and 2-3 Tree. 3+2

7. (a) What is the worst case time complexity of Quick sort? When it would produce worst case complexity? 1+2

(b) Write a program to implement a binary search on a sorted array. 5

(c) What is the adjacency list of the following Graph:



(d) What would be the output of BFS for the graph shown in question 7(c) when the traversal starts from node 1. 3

### Internal Assessment — 30

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