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:

\[ 4 \$ 2 \times 3 - 3 + 8 / 4 / (1 + 1) \] 8

(d) Why Stack is called a linear data structure? 1
4. (a) Define Priority Queue.

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

```c
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.

(c) Why is Deque required over simple Queue?

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

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

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

```
Arr 1 5 6 2 7 10 12 \0 \0 14
```

(c) What would be the sequence of items of the tree mentioned in 5(b) using post-order traversal?

(d) Write a function for inorder traversal of a binary tree.
6. (a) Define Binary Search Tree. What would be the minimum and maximum depth of a BST with 'n' number of nodes?  

(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  

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

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

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

(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.  

Internal Assessment — 30