**M.Tech Odd Semester (CBCS) Exam.,
December—2016**

COMPUTER SCIENCE AND ENGINEERING

(1st Semester)

Course No. : MCSECF–02

(Programming and Data Structures)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Attempt *any* **five** questions.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

1. Consider the following list of words :

apple, tree, car, dog, yellow,
frog, gun, harp

(a) Sort the above list in alphabetical order, using insertion sort.

(b) Sort the above list in alphabetical order using bubble sort. How many complete passes are necessary for the bubble sort to ensure the list is sorted? 5+5=10

2. Arrange the following list of elements in ascending order, using quick sort :

44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66

After each step write the value of left pointer *L*, right pointer *R* and LOC. Also draw the current scenario after each step. 10

3. *(a)* Consider the following binary tree :
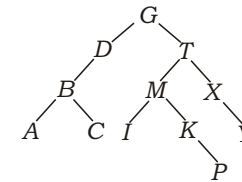
(i) What is the result of a postorder traversal of the above tree?

(ii) What is the result of an inorder traversal of the above tree?

(iii) Is the above tree a binary search tree? Why or why not? 6

(b) How are arrays represented in memory? Explain how address of an element is calculated in an array. 4

4. Write subroutines for a singly-linked list of the following : 2+2+3+3=10
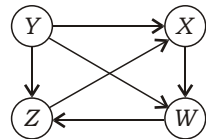
(a) Insert a node at the end

(b) Delete a node from the beginning

(c) Print the items in a reverse order

(d) Reverse the links of the linked list

(3)

5. *(a)* Write an algorithm to traverse a graph using breadth first search.   6

   (b) Explain AVL tree in detail.   4

6. *(a)* What is adjacency matrix? Draw the adjacency matrix of the following graph :   6

   (b) Define data type and abstract data type. Comment upon the significance of both.   4

7. *(a)* How do you find the complexity of an algorithm? What is the relation between time and space complexities of an algorithm? Justify your answer with an example.   6

   (b) How many key comparisons and assignments an insertion sort makes in its worst case?   4

8. *(a)* What do you mean by hashing? Explain any five popular hash functions.   6

   (b) How do collisions happen during hashing? Explain the different techniques for collision resolving.   4

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