MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – DECEMBER 2011

SUBJECT: DATA STRUCTURES (CS 231)

(NEW SCHEME 2011)

Friday, December 16, 2011

Time: 10:00 – 13:00 Hrs.   Max. Marks: 100

- ✎ **Answer any FIVE full questions.**
- ✎ **All programs should be well documented.**
- ✎ **Missing data if any may be suitably assumed.**

1A. What is a template? Give the function template for finding the largest element in a given list of N values and instantiate this template for integers and floating-point values.

1B. Explain with an example, how do you analyze the performance of an algorithm.

1C. Give a comparison between iterative and recursive algorithms. Write a recursive function for tower of Hanoi problem and explain with an example.

(8+4+8 = 20 marks)

2A. Write an algorithm to covert an infix expression into its equivalent postfix form.

2B. Write a complete C++ program to perform the following operations on a Circular Queue:

i)   Insert   ii)   Delete

(12+8 = 20 marks)

3A. What is a doubly linked list? How it is advantageous over singly linked list?

3B. Assuming that the pointer to first node (Nodeptr first) is global, give the algorithms for the following operations on a doubly linked list:

i)   Search(X) – Searches for the node containing the item X and prints whether the search is successful or not.

ii)   InsertFirst(Y) – Inserts an item Y at first.

3C. Write a function to add two polynomials represented by two singly linked lists, A and B and return the new polynomial, C.

(4+8+8 = 20 marks)

4A. Give the algorithm for level order traversal of a binary tree. Explain the algorithm with an example.

4B. Define the following terms and illustrate with an example:

i)   Binary Search tree

ii)   Height Balanced tree

iii)   Strictly binary tree

iv)   Height of a binary tree

(10+10 = 20 marks)

5A. What is an expression tree? Write a function to create a binary tree for given postfix expression.

5B. Explain with algorithm and example, the following tree traversal techniques:
   i) Inorder
   ii) Preorder

(10+10 = 20 marks)

6A. Write and explain the function for Quick Sort. Trace the function for the following input values: 45, 26, 27, 70, 14, 90

6B. What is a heap? Show the step-by-step process of building a heap for the list given below.
25, 17, 36, 2, 3, 100, 1, 19, 7

(10+10 = 20 marks)

7A. Write an algorithm for Binary Search technique. Apply the algorithm on sorted array A with the following elements {11, 22, 30, 33, 40, 44, 55, 60, 66, 77, 80, 88, 99}. Determine the number of key comparisons made while searching for keys 40 and 85.

7B. Given two singly linked lists A and B, representing 2 sorted lists, give the algorithm to create a new linked list C, by merging these two lists.

(10+10 = 20 marks)

8. Write short notes on the following:
8A. Adjacency Matrix
8B. Depth First Search
8C. Open Addressing
8D. Static Hashing

(4×5 = 20 marks)