MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – MAY/JUNE 2012

SUBJECT: DATA STRUCTURES (CS 231)

(NEW SCHEME)

Thursday, May 31, 2012

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

- **Answer any FIVE full questions.**
- **All functions and programs should be well documented.**

1A. Given two polynomials, write an algorithm to perform polynomial addition.

1B. What is Big-Oh notation in algorithm analysis? Derive the average case time complexity in finding the factorial of a number.

1C. Write a C++ program to perform bubble sort. Use the concept of templates.

(8+6+6 = 20 marks)

2A. Define Stack data structure and discuss its application related to recursion.

2B. Show the steps of evaluating the following postfix expression using stack.

12+3-21+3^-

[Note: Each of the above is a character string having numbers in the range 0-9 and ^ denotes exponentiation]

2C. Write an algorithm to convert an infix expression to its postfix form.

(6+8+6 = 20 marks)

3A. What is the disadvantage of an ordinary queue? How can you overcome it?

3B. Considering all necessary conditions, write a CPP program to add and delete an element in a circular queue. Use class definition.

3C. List four general applications of queue as a data structure.

(6+10+4 = 20 marks)

4A. Illustrate the linked list representation of binary trees by taking an example.

4B. Write a C++ program to insert the record of a student (name, rollno, age) in a Doubly linked list at a node specified by position.

4C. Write C++ program to implement a linked stack.

(4+8+8 = 20 marks)

5A. Given a list of numbers, 22,7,6,1,60,11,77,59,19,20,17. Show each phase of creating a Binary search tree using them, starting from 22.

5B. Suggest a suitable method to get a sorted list from a Binary search tree without using any sorting algorithm.

5C. Given a postfix expression, write the algorithm to create an expression tree.

(10+2+8 = 20 marks)

6A. Write a C++ program for binary search technique. Express its average case time complexity in Big Oh notation.

6B. Give the algorithm for level order traversal of a binary tree.

6C. What are height balanced trees? Explain with an example.

(8+6+6 = 20 marks)

7A. Write a C++ program to sort the elements of an array using partition exchange sort technique. Express its average case time complexity in Big Oh notation.

7B. Use a suitable algorithm to show each step in sorting an array using heap sort for the data {11,22,99,88,33,44,77,66,55}

(8+12 = 20 marks)

8A. With suitable examples, explain adjacency list and adjacency matrix of a directed and undirected graph.

8B. Define hash function. List and explain any three hash functions.

8C. Write short notes on the following:

i) Tree traversals

ii) Graph operations

(8+6+6 = 20 marks)