Reg. No.										

MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – DECEMBER 2015

SUBJECT: DATA STRUCTURES (CS 231)

(BRANCH: CE/CS)

Friday, December 11, 2015

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

✍ **Answer any FIVE questions.**

1A. What are class templates? Write a template class for implementing Stack with push, pop isEmpty and isFull member functions. Show the instantiation of Stack class for integer and float types. Use dynamic memory allocation and de-allocation.

1B. What is space complexity of program? Explain briefly the components of space complexity.

1C. What is Big oh notation?

(10+6+4 = 20 marks)

2A. What is a recursive function? Give the properties of the same. Define a recursive function to find factorial of a number.

2B. Write an algorithm for evaluation of prefix expression using stack. Also show the steps for evaluating -*+4325 prefix expression using the above algorithm.

2C. Write a C++ function to convert infix expression to postfix expression using Stack.

(4+8+8 = 20 marks)

3A. What are the advantages and disadvantages of linked lists over arrays?

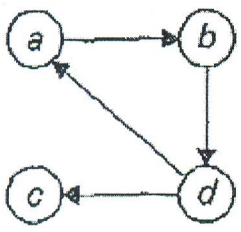
3B. Write a member function to find union of two unsorted singly linked lists with the signature, void list :: getUnion (list l1, list l2) { ...} . Also write appropriate comments.

3C. Write a recursive function to search for an element in an array of integers using binary search. Compare its time complexity with linear search in best and worst cases.

(6+8+6 = 20 marks)

4A. Write an algorithm for DFS of a graph. Also write its time complexity.

4B. Find the adjacency matrix and transitive closure of the following graph:



4C. Write an iterative member function for in-order traversal of a binary tree.

(8+4+8 = 20 marks)

5A. Write an iterative function for removing largest element from maximum heap.

5B. Show all the steps to sort the following numbers using quick sort:
5, 3, 1, 9, 8, 2, 4, 7

(10+10 = 20 marks)

6A. What is the drawback of linear queue? How is it solved using circular queue?
Implement a circular queue class with the following data members, member functions with appropriate constructor and destructor.
int rear, front, count;// private data
isEmpty(), isFull(), cqInsert, cqDelete(), cqDisplay() functions

6B. Write the following member functions for the doubly linked list class with a single private data member 'first' that points to the first node of the list.
void DLL :: ins_at_rear(int x){ }
void DLL ::inv_list(){ } to reverse a list only by changing the links.

(10+10 = 20 marks)

7A. Write a recursive member function to construct an Expression tree for the given prefix expression.

7B. Convert the following infix expression into prefix form and construct an Expression tree (manually) for the prefix expression obtained.
A^B*C-D+E/F/(G+H)

7C. Write a recursive function to check whether the two binary trees are equal or not by returning true or false. Use the following prototype.
bool tree_compare(node *t1, node * t2);

(7+6+7 = 20 marks)

8. **Write short notes on the following:**

8A. AVL trees and four different rotations

8B. Graph representation

8C. Overflow handling methods in hashing.

(5+5+10 = 20 marks)