Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

III SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING) MAKEUP EXAMINATIONS, DEC. 2016

SUBJECT: DATA STRUCTURES [ICT 2103]
REVISED CREDIT SYSTEM
(30/12/2016)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** questions.

❖ Missing data, if any, may be suitable assumed.

1A. Explain different methods of Graph representation with an example for each. Also, write the function for Depth First Search traversal of a graph. **(05)**

1B. What is an expression tree? Construct an expression tree for the expression: A + B - C * D / E + F + G * H with each step of construction shown clearly. Also write the preorder and level order traversal sequence for the constructed expression tree. **(03)**

1C. What is a spanning tree? Draw any two spanning trees for the graph given in Figure Q.1C. **(02)**

2A. Write a complete C++ program to implement basic operations (insert, delete, display) on Priority Queue using circular singly linked list. Each node of the list contains an integer element and its associated priority. Priority varies from 1 (highest priority) to 5 (lowest priority). Multiple elements may have same priority. Display should be according to priority of the elements. **(05)**

2B. Write a user defined function to sort the array elements using quick sort technique. **(03)**

2C. Define sparse matrix. Why does fast transpose take less time compared to normal transpose? **(02)**

3A. List the different rules to convert an infix expression to prefix form. Also write a user defined function to convert an infix expression into prefix form. **(05)**

3B. Write a C++ function to perform following operations on Doubly Linked List (DLL).
    i. Delete a middle node of a DLL by traversing the list only once
    ii. Insert a node at the beginning of the list **(03)**

3C. What is the output of the following error-free C++ code:
```cpp
void main()
{
  int arr[] = {10, 20, 30, 40, 50, 60};
  int *ptr1 = arr;
  int *ptr2 = arr+5;
  cout<<*ptr2<<endl;
  cout<<(ptr1==arr); }
```
(02)

4A. Explain merge sort with steps for the array 123, 67, 9, 23, 875, 30, 561, 222, 177, 18. Also write the function for the same. **(05)**

4B. Define time complexity of a program. Determine the time complexity of a function to multiply two matrices using tabular method. **(03)**

4C. Write a recursive function to search an element using binary search technique. **(02)**

5A. Write the complete class definition for a Binary tree with member functions to perform following operations.
   i. Iterative postorder traversal
   ii. Testing whether two given binary trees are equal
   iii. Convert a given tree into its mirror image **(05)**

5B. Write the uses of **new** and **delete** operators? Explain the syntax with an example for each. **(03)**

5C. Explain the following with examples:
   i. Memory representations of a binary tree
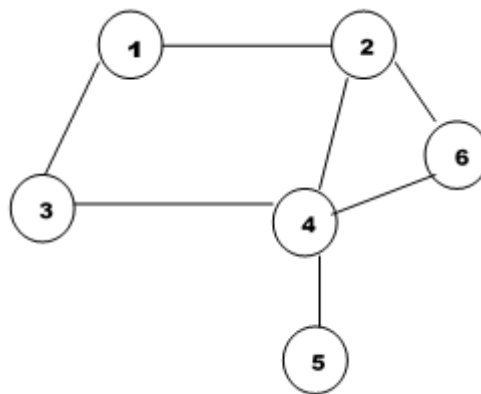   ii. Depth of a binary tree
   iii. Degree of a tree **(02)**

Figure Q.1C