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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

## III SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING)

## END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: DATA STRUCTURES [ICT 2103]

**REVISED CREDIT SYSTEM**
**(28/11/2016)**

Time: 3 Hours MAX. MARKS: 50

**Instructions to Candidates:**

- Answer **ALL** questions.
- Missing data, if any, may be suitable assumed.

**1A.** Given a Doubly Linked List (DLL) containing 0s and 1s as data values, write a user defined function to find its decimal equivalent. For example, if list is 1 ←→ 0←→0←→0←→1 then the expected output is 17. Decimal value of an empty list is considered as 0. Also write a function to create another DLL, which contains nodes in the following format :< occurrences of the digit, digit>. For the above example the content of newly created list should be (1, 1) ←→ (3, 0) ←→ (1, 1). **(05)**

**1B.** Write a complete class definition to implement a priority queue using heaps with two member functions to perform the following operations:
i. insert an item.
ii. delete an item. **(03)**

**1C.** What is space complexity of a program? Explain with suitable example. **(02)**

**2A.** Write a complete C++ program to perform the following:
i. Read a polynomial and represent it in Circular Singly Linked List (CSLL).
ii. Multiply two polynomials represented using CSLL. **(05)**

**2B.** Write a user defined function to evaluate a postfix expression. Show the stack content at each step for the evaluation of postfix expression: 6 4 3 * + 2 ^ 5 – 4 6 + - **(03)**

**2C.** Construct a binary tree given its inorder and preorder sequence as **B F G H P R S T W Y Z** and **P F B H G S R Y T W Z** respectively**.** Also write the postorder traversal sequence for the constructed binary tree. **(02)**

**3A.** Explain multiple queue concept. Write a complete C++ program to implement multiple queues. **(05)**

**3B.** Explain heap sort algorithm and show the steps involved in sorting the array 67, 34, 90, 2, 13, 45, 123 using heap sort. **(03)**

**3C.** Write a function to delete alternate nodes of a Singly Linked List. **(02)**

**4A.** Explain Breadth First Search (BFS) and Depth First Search (DFS) algorithms with respect to the graph shown in Figure Q.4A. Also write the functions for the same. **(05)**

**4B.** Write a complete class definition for a Binary Search Tree with member functions to perform the following operations.

i. Create a Binary Search Tree.
ii. Delete a node with degree two. Key value of the node to be deleted is input by the user.
iii. Find the level of the tree. **(03)**

**4C.** What is an inline function? List atleast four features of inline function. **(02)**

**5A.** Mention the advantage using a threaded binary tree. Draw the threaded binary tree memory representation of the tree given in Figure Q.5A. Also write a complete class definition to implement a threaded binary tree with a member function to print the inorder traversal sequence for the given threaded binary tree. **(05)**

**5B.** Write a user defined function that takes two sparse matrices A and B as input represented in <row, column, value> format and displays C which is the result of addition of A and B in <row, column, value> format. Also display C in 2D matrix format. **(03)**

**5C.** A book is divided into three chapters. Each chapter is divided into five sections and each section is divided into five subsections. Which data structure according to you is the most suitable way to represent the scenario of book mentioned above? Justify your answer. **(02)**

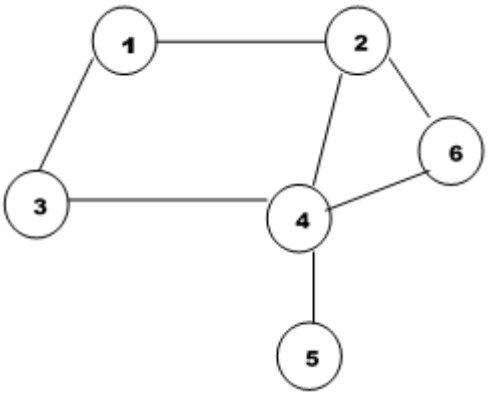


Figure Q.4A

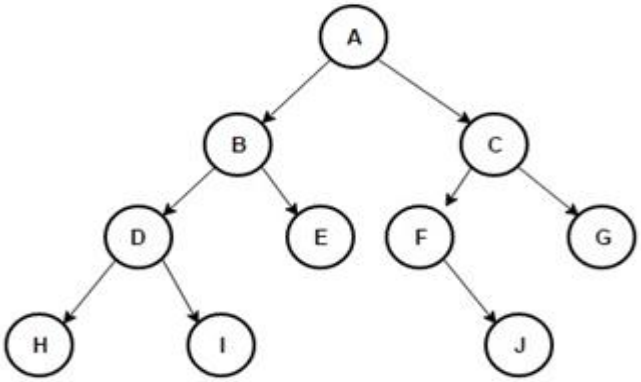


Figure Q.5A