



**THIRD SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND
COMMUNICATION ENGINEERING)**

END SEMESTER EXAMINATIONS, NOV 2018

SUBJECT: DATA STRUCTURES [ICT 2103]

(REVISED CREDIT SYSTEM)

(24/11/2018)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates:

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

1A. Write a complete C++ program to do the following:

- Read a 2D matrix from user.
- Represent all the non-zero values in the form (row, column, value) in a Singly Linked List.
- Construct another Singly Linked List such that it holds the transpose of represented list.
[Note: The row-wise order of matrix should always be maintained.]
- Display the contents of both the lists along with proper messages.

5

1B. Write a user defined function to find the fast transpose of a sparse matrix. Trace the function for the following matrix MAT:

$$MAT = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 2 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 5 \\ 0 & 0 & 9 & 8 \\ 7 & 0 & 2 & 9 \end{pmatrix}$$

3

1C. Write a user defined function to read a string and store each character of the string as the node value. For example: if the input string is "STRUCTURES", then the SLL will look like S→T→R→U→C→T→U→R→E→S→NULL. Check if the list is palindrome or not. (Do not use array or stacks or queues)

2

2A. Write a complete C++ program to convert an infix expression to prefix form along with implementation of appropriate stack operations. Trace the program for the following expression:
(A + B) * (C * D - E) * F / G

5

2B. Write a recursive user defined function to search for an element in a given array using binary search technique. Trace the function with a suitable array and key.

3

- 2C. Given the adjacency matrices for an undirected graph and a directed graph, how do you find the degree of a vertex? Explain with suitable example. 2
- 3A. Given an array $ARR = \{25, 78, 45, 23, 15, 91, 3, 1, 65\}$, illustrate the merge sort technique to sort the elements of ARR. Also, write a user defined function to sort the elements of ARR using merge sort technique. 5
- 3B. Write an iterative user defined function to perform postorder traversal of the binary tree. Trace the function for the tree in Figure Q.3B. 3
- 3C. Construct max heap and min heap for the input: 35, 33, 42, 10, 14, 19. Show each step of the construction. 2
- 4A. Write the user defined functions to perform the following: 5
- i) Insert an element into sorted circular doubly linked list with header node
 - ii) Delete alternate nodes in a circular doubly linked list with header node
 - iii) Reverse the circular doubly linked list without using additional nodes
- 4B. Write a user defined function to perform Breadth First Search(BFS) on a graph. Also, write the DFS sequence for the graph given in Figure Q.4B 3
- 4C. Write the two functions required to implement stack using singly linked list. 2
- 5A. Write user defined functions to perform following operations on a binary tree. 5
- i) To insert an element
 - ii) To copy a binary tree
 - iii) To print ancestors of a node
 - iv) To count leaf nodes
- 5B. Write a user defined function to implement queue using stacks. 3
- 5C. What is time complexity? Find the time complexity for multiplying two matrices using tabular method. 2

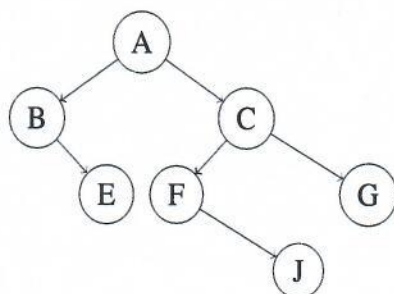


Figure Q.4B

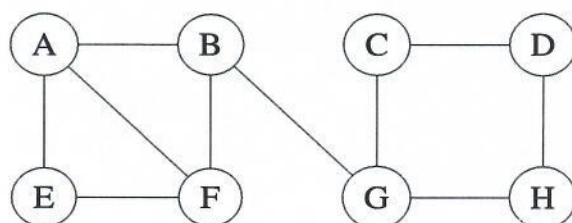


Figure Q.3B