

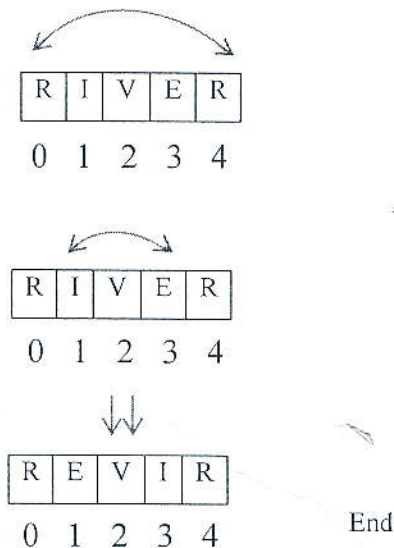


EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SECOND EXAMINATION IN SCIENCE (2012/2013)
FIRST SEMESTER (Apr/May,2015)
CS 201-DATA STRUCTURE AND
DESIGN OF ALGORITHMS

ANSWER ALL QUESTIONS

TIME: TWO HOURS

- 1)
- a. Define "Data structure" and state its importance in solving problems.
 - b. Briefly describe complexity analysis of algorithms and Big-O-notation.
 - c. Compare Abstract Data type (ADT) and Primitive Data Type.
 - d. Describe Circular Linked list and state an application of it.
 - e. Describe the advantages of recursion in algorithm design using a suitable example.
 - f. Consider the following figure in reversing a string



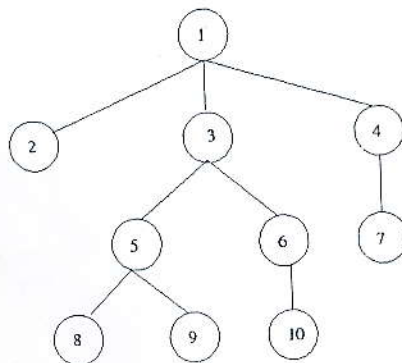
- Using the above steps as guidance write a recursive algorithm to reverse a given string.
- g. Write a recursive algorithm to check whether a given string is a palindrome or not.

- 2) Stack and Queue are two important data structures.
- Describe how a stack can be implemented using an array.
 - State the common stack operations.
 - Write algorithms for the following:
 - To check whether a Circular queue is full;
 - To insert an element into the Circular Queue (EnCqueue);
 - To delete an element from the Queue (Dequeue).
 - Write an algorithm for "Converting decimal numbers to any base" using a "Stack".
 - Write an algorithm for "Postfix conversion" using "Stack".
 - Write an algorithm for "Palindrome checking" using "Stack and Queue".

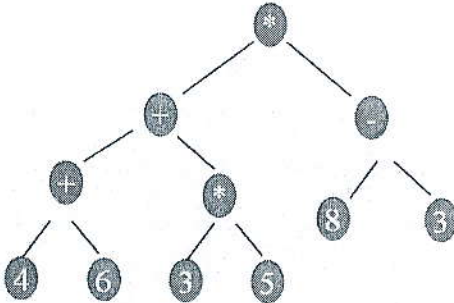
- 3)
- Write the definition for the following :
 - Binary tree ;
 - Complete binary tree;
 - Degree of a tree.
 - Represent the following numbers in a **Binary Search tree**.

14, 15, 4 9, 7, 18, 3, 5, 16

- Briefly explain the following search techniques:
 - Depth first search;
 - Breadth first search.
- Write the **pre-order, post-order, in-order** and **level order** traversals for the following tree:



- e. Write the algorithm for **Pre-order** traversal to visit each node in a binary tree. Apply your algorithm to find the value of an equation represented in the following tree:



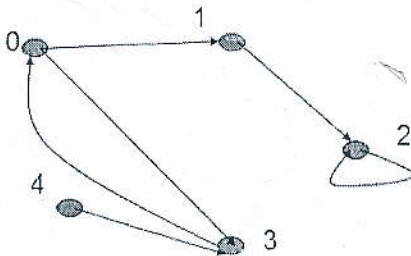
4)

- a. Write the algorithm for “Merge sort” and “Bubble sort”:

- b. Write the definitions for the following:

- I. Graph ;
- II. Complete Undirected graph ;
- III. Adjacency matrix of a graph.

- c. Give the Adjacency matrix for the following graph :



- d. Describe briefly the shortest path problem and how "Dijkstra's Algorithm" finds a solution for that problem.
- e. Find the shortest distance of the nodes 2, 3, 4, 5 and 6 from the source node 1 using "Dijkstra's Algorithm":

