**UNIVERSITY COLLEGE OF ENGINEERING (BIT CAMPUS)**

**TIRUCHIRAPPALLI-620 024**

**Third Internal Assessment Test**

**Department of CSE / IT**

**Subject Code :**EC8393 **Subject Name :** FUNDAMENTALS OF DATA STRUCTURES IN C

**Date&Duration :**16.10.2018& 1.30Hrs**Marks: 50**

**Degree/Branch:** B.E/ECESec’A’ **Year/Semester:** II / III

**PART-A**

**Answer *All* Questions 7 x 2 = 14**

1. What is meant by internal and external sorting?

In **internal sorting** all the data to **sort** is stored in memory at all times while **sorting**is in progress.

In **external sorting** data is stored outside memory (like on disk) and only loaded into memory in small chunks.

1. Write any four applications of queues.

1.CPU scheduling

2.Disk Scheduling

3. IO Buffers,

4. pipes

3. What is the advantage of linked list over arrays?

1. Size is not an issue as compared to arrays.
2. Addition/Deletion of an element from the list at any index which is an O(1) operation in Lists as compared to Arrays.
3. They can be used as underlying data structures for search trees, etc. I.e. you construct a search tree, whose lowest level consists of the linked list because lists express better properties as far as insertions are concerned.
4. Define complete binary tree.

A **full binary tree** (sometimes proper **binary tree** or 2-**tree**) is a **tree** in which every node other than the leaves has two children. A **complete binary tree** is a**binary tree** in which every level, except possibly the last, is completely filled, and all nodes are as far left as possible.

1. Define binary tree and give binary tree node structure.

A "**binary search tree**" (BST) or "ordered **binary tree**" is a type of **binary tree** where the **nodes** are arranged in order: **for** each **node**, all elements in its left subtree are less-or-equal to the **node** (<=), and all the elements in its right subtree are greater than the **node**(>).

1. Sort the following numbers using insertion sort- 3,1,4,1,5,9,2,6,5
2. What is hashing?

Hashing is generating a value or values from a string of text using a mathematical function.Hashing is one way to enable security during the process of message transmission when the message is intended for a particular recipient only. A formula generates the hash, which helps to protect the security of the transmission against tampering

**PART-B**

**Answer any three Questions 3 x 12 = 36**

1. What is stack?Explain about the implementation of stack using Linked list.

Stack Data Structure (Introduction and Program)

* **Push:**Adds an item in the stack. If the stack is full, then it is said to be an Overflow condition.
* **Pop:** Removes an item from the stack. The items are popped in the reversed order in which they are pushed. If the stack is empty, then it is said to be an Underflow condition.
* **Peek or Top:** Returns top element of stack.
* **isEmpty:**Returns true if stack is empty, else false.

**Time Complexities of operations on stack:**

push(), pop(), isEmpty() and peek() all take O(1) time. We do not run any loop in any of these operations.

**Applications of stack:**

* [Balancing of symbols](https://www.geeksforgeeks.org/check-for-balanced-parentheses-in-an-expression/)
* [Infix to Postfix](http://quiz.geeksforgeeks.org/stack-set-2-infix-to-postfix/) /Prefix conversion
* Redo-undo features at many places like editors, photoshop.
* Forward and backward feature in web browsers
* Used in many algorithms like [Tower of Hanoi,](https://www.geeksforgeeks.org/recursive-functions/) [tree traversals](https://www.geeksforgeeks.org/618/), [stock span problem](https://www.geeksforgeeks.org/the-stock-span-problem/), [histogram problem](https://www.geeksforgeeks.org/largest-rectangular-area-in-a-histogram-set-1/).
* Other applications can be Backtracking, [Knight tour problem](https://www.geeksforgeeks.org/backtracking-set-1-the-knights-tour-problem/), [rat in a maze](https://www.geeksforgeeks.org/backttracking-set-2-rat-in-a-maze/),[N queen problem](https://www.geeksforgeeks.org/backtracking-set-3-n-queen-problem/) and [sudoku solver](https://www.geeksforgeeks.org/backtracking-set-7-suduku/)
* In Graph Algorithms like [Topological Sorting](https://www.geeksforgeeks.org/topological-sorting/) and [Strongly Connected Components](https://www.geeksforgeeks.org/strongly-connected-components/)

**Implementation:**  
There are two ways to implement a stack:

* Using array
* Using linked list

1. Explain in details about the binary tree traversals.

# Binary Tree Traversals

## 12.5.1. Binary Tree Traversals

Often we wish to process a binary tree by "visiting" each of its nodes, each time performing a specific action such as printing the contents of the node. Any process for visiting all of the nodes in some order is called a [**traversal**](https://opendsa-server.cs.vt.edu/ODSA/Books/Everything/html/Glossary.html#term-traversal). Any traversal that lists every node in the tree exactly once is called an [**enumeration**](https://opendsa-server.cs.vt.edu/ODSA/Books/Everything/html/Glossary.html#term-enumeration) of the tree's nodes. Some applications do not require that the nodes be visited in any particular order as long as each node is visited precisely once. For other applications, nodes must be visited in an order that preserves some relationship.

### Preorder Traversal

### Postorder Traversal

### Inorder Traversal

### Implementation

### Postorder Traversal Practice

1. How do we represent the graph? Write a short on following:

i. Breadth first traversal

ii. Depth first traversal

1. Explain aboutquick sort and write a c program.

**Quicksort** (sometimes called partition-exchange **sort**) is an efficient sorting**algorithm**, serving as a systematic method for placing the elements of an array in order. Developed by Tony Hoare in 1959 and published in 1961, it is still a commonly used **algorithm** for sorting.

1.\* **C Program** to Perform **Quick Sort** on a set of Entries from a File.

2.\* using Recursion.

3. void **quicksort** (int [], int, int);

4. int list[50];

5. int size, i;

6. printf("Enter the number of elements: ");

7. scanf("%d", &size);