

# Data Structures and Algorithms Assignment 6

## 1. What exactly is an application tree?

The Application Tree is a tree-view display of the folders, URLs, and files that AppScan® found on your application.

In the case of applications without a hierarchical URL structure, such as single entry-point applications (e.g. MVC), or applications where the hierarchical structure is not logical, you can create a "content-based" application tree, by defining a set of regular expressions which extract the logical path from the pages.

Each of the various node types in the Application Tree is indicated by its own icon.

## 2. What is pre-order tree traversal and how does it work?

Preorder traversal is used to create a copy of the tree. Preorder traversal is also used to get prefix expression on an expression tree.

Algorithm Preorder(tree)

1. Visit the root.
2. Traverse the left subtree, i.e., call Preorder(left-subtree)
3. Traverse the right subtree, i.e., call Preorder(right-subtree)

## 3. What is the problem with the Hanoi Tower?

Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:

Only one disk can be moved at a time.

Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e. a disk can only be moved if it is the uppermost disk on a stack.

No disk may be placed on top of a smaller disk.

Approach :

Take an example for 2 disks :

Let rod 1 = 'A', rod 2 = 'B', rod 3 = 'C'.

Step 1 : Shift first disk from 'A' to 'B'.

Step 2 : Shift second disk from 'A' to 'C'.

Step 3 : Shift first disk from 'B' to 'C'.

The pattern here is :

Shift 'n-1' disks from 'A' to 'B'.

Shift last disk from 'A' to 'C'.

Shift 'n-1' disks from 'B' to 'C'.

## 4. Can you explain the distinction between linear and nonlinear data structures?

Linear data structure	non-linear data structure
The linear relationship is present between data elements.	Data elements have a hierarchical relationship.
Every element makes a connection to only its previous and next elements.	Every element makes a connection to more than two elements.
We can traverse it in a single run as it is linear.	We can't traverse it in a single run as it is a non-linear structure.
It is a single-level data structure.	It is a multi-level data structure.
The utilization of memory is not efficient.	The Memory utilization is efficient.
Time complexity increases if we need to traverse through the large dataset.	Time complexity doesn't change much if we need to traverse through the large input size.
It is used to build an operating system and compiler design.	All Social networks, telephone networks, Artificial intelligence, and image processing are using non-linear data structures.
Examples: Array, stack, queue, LinkedList	Example: Graph, map, tree, heap data structure
It is easy to implement.	It is complex to implement. However, we can implement it easily, as nonlinear data structures include a powerful algorithm to implement them.

**5. What is the distinction between a list and an array?**

List	Array
Can consist of elements belonging to different data types	Only consists of elements belonging to the same data type
No need to explicitly import a module for declaration	Need to explicitly import a module for declaration
Cannot directly handle arithmetic operations	Can directly handle arithmetic operations
Can be nested to contain different type of elements	Must contain either all nested elements of same size
Preferred for shorter sequence of data items	Preferred for longer sequence of data items
Greater flexibility allows easy modification (addition, deletion) of data	Less flexibility since addition, deletion has to be done element wise
The entire list can be printed without any explicit looping	A loop has to be formed to print or access the components of array
Consume larger memory for easy addition of elements	Comparatively more compact in memory size