**Year 2**

## Data Structures and Algorithms – IT2070

**BSc (Hons) in Information Technology**



# Tutorial 4 – Trees 2022

## Question 1

Arrange the following sequence of integers into a binary search tree

280 308 180 416 298 350 156 255 580 275 12

## Question 2

Print the elements in the tree built in Question1 using the following traversing methods.

1. inorder
2. preorder
3. postorder

## Question 3

Consider the Node class and Tree class given below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **Node** | | int iData  double dData  Node leftChild  Node rightChild | | void displayNode( ) | | |  | | --- | | **Tree** | | Node root | | Node find( int key)  void insert(int id, double dd)  boolean delete(int id)  void descOrder( )  Node minimum() | |

1. Implement a method called **minimum( )** to find the minimum node in a tree.
2. Implement a method called **descOrder()** to display the values in the tree in descending order

## Question 4

Draw the tree structures for the binary tree created in Question 1 for each of the following delete commands.

1. Delete(255)
2. Delete(308)
3. Delete (180)
4. Delete(280)

**Additional Exercises**

**Question 1**

Write a java program to implement a Binary Expression Tree

1. Implement a **Node** class to store characters. In the same class implement displayNode ( ) method to display the character stored in a Node.
2. Implement a **StackX** class to store objects from the Node class. Implement the constructor, push( ) and pop( ) methods for the StackX class.
3. Implement the **Tree** class with the following data members and methods.

|  |
| --- |
| Tree |
| Node root |
| void insert( char ch)  void inOrder( ) |

1. In your application, read a mathematical expression in a post fix form (eg: A B C + \* D / ) and evaluate the expression using the above implemented Tree and StackX classes.

**Question 2**

Write a java program to implement the following.

1. Implement a **Node** class to store a height of a child. In the same class implement displayNode ( ) method to display the data stored in a Node.
2. Implement the **Tree** class with the following data members and methods.

|  |
| --- |
| Tree |
| Node root |
| void insert( char ch)  Node minimum( )  Node maximum ( )  void descendingOrder ( ) |

1. In your application, enter the height of 10 children in a class from the key board and store them in a tree. Use the above implemented methods to display the height of the tallest child, shortest child in the class. Also display the height of all ten children in descending order.