i) Convert the expression to postfix notation. Show all the steps.

(5 marks)

ii) Evaluate the postfix notation using stack configuration table if the values of the operands are given as follows:

Z = 514, E = 2, A = 3, L = 2, O = 10, U = 2, S = 4

Show all the steps and the result.

(10 marks)

QUESTION 3

a) Given an arithmetic expression as follows:

((f * g) + k / m - n) / ((a + b) * h)

i) Draw the expression tree of the given arithmetic expression.

(5 marks)

ii) Traverse the tree and write the **PREORDER** and **POSTORDER** traversal.

(5 marks)

b) Given the definition of `Flood`, `TreeNode` and `BSTFlood` ADTs:

```
class Flood
{
      private String state;       //name of state
      private String district;    //name of district
      private int numOfPPS;       //number of PPS(relief centre)
      private int numOfFamily;    //number of family @ PPS
      private int numOfVictims;   //number of victims @ PPS

      /* Definition of the other methods including normal
            constructor, mutators, accessors, processors and
                  printer*/
}

class TreeNode
{
      TreeNode left;    //left node
      Flood data;      //data item
      TreeNode right;  //right node

      /* Definition of the other methods*/
}
```

```
class BSTFlood
{
      private TreeNode root;
      public BSTFlood() {…} //normal constructor
      public void insertNode(Flood) {…}
      public void displayAscending() {...}
      public int countDistrict() {…}
      public void totalFamilyAffected (String) {…}

      /* Definition of the other methods */
}
```

The following table shows monthly reports of flood disaster events in three states for the month of February 2023.

State	District	Number of relief centre	Total number of family	Total number of victims
Pahang	Kuantan	23	1435	4879
	Pekan	4	35	119
	Jerantut	1	5	12
	Raub	1	8	21
	Maran	1	3	14
	Bera	1	8	18
Johor	Mersing	1	1	7
	Johor Bahru	3	131	560
	Kluang	5	93	327
Terengganu	Kemaman	1	8	25

Source: National Disaster Management Agency (NADMA)

Based on the classes and table above:

i) Draw a **Binary Search Tree** diagram for the above data based on district as the key value.

(5 marks)

ii) Write the definition of method `displayAscending()` and its recursive method to display all the districts information in alphabetical order .

(5 marks)

iii) Write the definition of method `countDistrict()` and its recursive method to count number of districts where total family affected is less than 10.

(5 marks)

iv) Write the definition of method `totalFamilyAffected(String)` and its recursive method to calculate and display the total number of families affected with flood in a state that is passed through its parameter.

(5 marks)

c) Assume that all data as shown in the table have been inserted into a tree named `floodTree`. In the main() method, write Java statements to call the methods to display:

- The districts information in alphabetical order.
- The number of districts with total families affected is less than 10.
- The total number of families affected with flood in a state determined by user.

(5 marks)

END OF QUESTION PAPER