**MACHINE PROBLEM 4**

**BINARY TREE**

***Instructions:***

* ***Answer the given Machine Problem.***
* ***Include brief comments in your source code for readability***
* ***Include the names of group members as a comment in the source code. Put it at the start of the code***
* ***This MP is equivalent to 130/100 points.***

**Machine Problem:**

Write a Java program that will display the given menu:

|  |
| --- |
| Menu  1. Create a Binary Search Tree(BST)  2. Create a Syntax Tree for an Arithmetic Expression  3. Display Binary Tree  4. Traverse Binary Tree  5. Search a Node in BST  6. Insert a Node in BST  7. Delete a Node in BST  8. Quit |

* When 1 is chosen, construct a BST using top-down approach.
* When 2 is chosen, construct a syntax tree for an arithmetic expression using bottom-up approach
* When 3 is chosen, display binary tree.

Sample output:

|  |  |
| --- | --- |
| Chart, box and whisker chart  Description automatically generated | Chart, line chart  Description automatically generated with medium confidence |

Display also the following information:

a. internal nodes

b. external nodes

c. height of the tree

d. number of edges

* When 4 is chosen, display the PREORDER, INORDER, and POSTORDER sequences. If it is a syntax tree, display the result of the arithmetic expression.
* When 5, 6, or 7 is chosen, check if the existing tree is a BST, if true proceed with the chosen operation, otherwise, create a BST, then proceed with the chosen operation.
* When 8 is chosen, end the program.
* If choice is 3,4,5, 6, or 7, if tree does not exist, prompt the user that a binary does not exist.

**Other program specification:** 1. Include exception handling and data validation on all your inputs.

* For BST , node data can only be a letter or an integer.
* For syntax tree, node data can only be a number or an arithmetic operator(+,-,\*,/)

2. Outputs(letters) should be capitalized.

3. This program will be executed in the command prompt.

**Submission Requirements**

* Algorithm(in pseudocode form, must be handwritten) – use the answer sheet below
* Source code(MP4.java) and object code(MP4.class)
* The 3 files (MP4.java, MP4.class, MP4Pseudocode.pdf) must be uploaded to BB **before** **10:30 AM, Thursday, May 5, 2022**. Penalty for late submission : **-2 per minute late**

**-DO NOT GIVE THE LINK OF THE FILES.**

**Note:**

**-Identical/similar codes(methods) or pseudocodes : score = 0**

**Point Distribution: (total points – 130/100)**

**Pseudocode - 60**

**Source code – 60**

**Brief comments – 5**

**Format - 5**

***Pseudocode answer sheet(submit in pdf format)***

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| MACHINE PROBLEM 4  BINARY TREE  **PSEUDOCODE OF THE PROGRAM**  Submitted by:  1. SURNAME, FIRSTNAME - contribution  2. SURNAME, FIRSTNAME – contribution  **Note**: 1. The task should be divided equally  2. If a member did not contribute, do not include his/her name in the list.  3. contribution – mention the methods the member wrote and other specific tasks.  4. names must be in alphabetical order |
| **main():**  //attach picture of handwritten pseudocode |
| method 1 : |
| method 2 : |
| :  :  : |
| method n : |