**1.Write a Java program to find the nodes which are at the maximum distance in a Binary Tree.**

**import** java.util.ArrayList;

**public** **class** MaxDistance {

**public** **static** **class** Node{

**int** data;

Node left;

Node right;

**public** Node(**int** data){

**this**.data = data;

**this**.left = **null**;

**this**.right = **null**;

}

}

**public** Node root;

**int**[] treeArray;

**int** index = 0;

**public** MaxDistance(){

root = **null**;

}

**public** **int** calculateSize(Node node)

{

**int** size = 0;

**if** (node == **null**)

**return** 0;

**else** {

size = calculateSize (node.left) + calculateSize (node.right) + 1;

**return** size;

}

}

**public** **void** convertBTtoArray(Node node) {

**if**(root == **null**){

System.***out***.println("Tree is empty");

**return**;

}

**else** {

**if**(node.left != **null**)

convertBTtoArray(node.left);

treeArray[index] = node.data;

index++;

**if**(node.right != **null**)

convertBTtoArray(node.right);

}

}

**public** **int** getDistance(Node temp, **int** n1) {

**if** (temp != **null**) {

**int** x = 0;

**if** ((temp.data == n1) || (x = getDistance(temp.left, n1)) > 0

|| (x = getDistance(temp.right, n1)) > 0) {

**return** x + 1;

}

**return** 0;

}

**return** 0;

}

**public** Node lowestCommonAncestor(Node temp, **int** node1, **int** node2) {

**if** (temp != **null**) {

**if** (temp.data == node1 || temp.data == node2) {

**return** temp;

}

Node left = lowestCommonAncestor(temp.left, node1, node2);

Node right = lowestCommonAncestor(temp.right, node1, node2);

**if** (left != **null** && right != **null**) {

**return** temp;

}

**if** (left != **null**) {

**return** left;

}

**if** (right != **null**) {

**return** right;

}

}

**return** **null**;

}

**public** **int** findDistance(**int** node1, **int** node2) {

**int** d1 = getDistance(root, node1) - 1;

**int** d2 = getDistance(root, node2) - 1;

Node ancestor = lowestCommonAncestor(root, node1, node2);

**int** d3 = getDistance(root, ancestor.data) - 1;

**return** (d1 + d2) - 2 \* d3;

}

**public** **void** nodesAtMaxDistance(Node node) {

**int** maxDistance = 0, distance = 0;

ArrayList<Integer> arr = **new** ArrayList<>();

**int** treeSize = calculateSize(node);

treeArray = **new** **int**[treeSize];

convertBTtoArray(node);

**for**(**int** i = 0; i < treeArray.length; i++) {

**for**(**int** j = i; j < treeArray.length; j++) {

distance = findDistance(treeArray[i], treeArray[j]);

**if**(distance > maxDistance) {

maxDistance = distance;

arr.clear();

arr.add(treeArray[i]);

arr.add(treeArray[j]);

}

**else** **if**(distance == maxDistance) {

arr.add(treeArray[i]);

arr.add(treeArray[j]);

}

}

}

System.***out***.println("Nodes which are at maximum distance: ");

**for**(**int** i = 0; i < arr.size(); i = i + 2) {

System.***out***.println("( " + arr.get(i) + "," + arr.get(i+1) + " )");

}

}

**public** **static** **void** main(String[] args) {

MaxDistance bt = **new** MaxDistance();

bt.root = **new** Node(1);

bt.root.left = **new** Node(2);

bt.root.right = **new** Node(3);

bt.root.left.left = **new** Node(4);

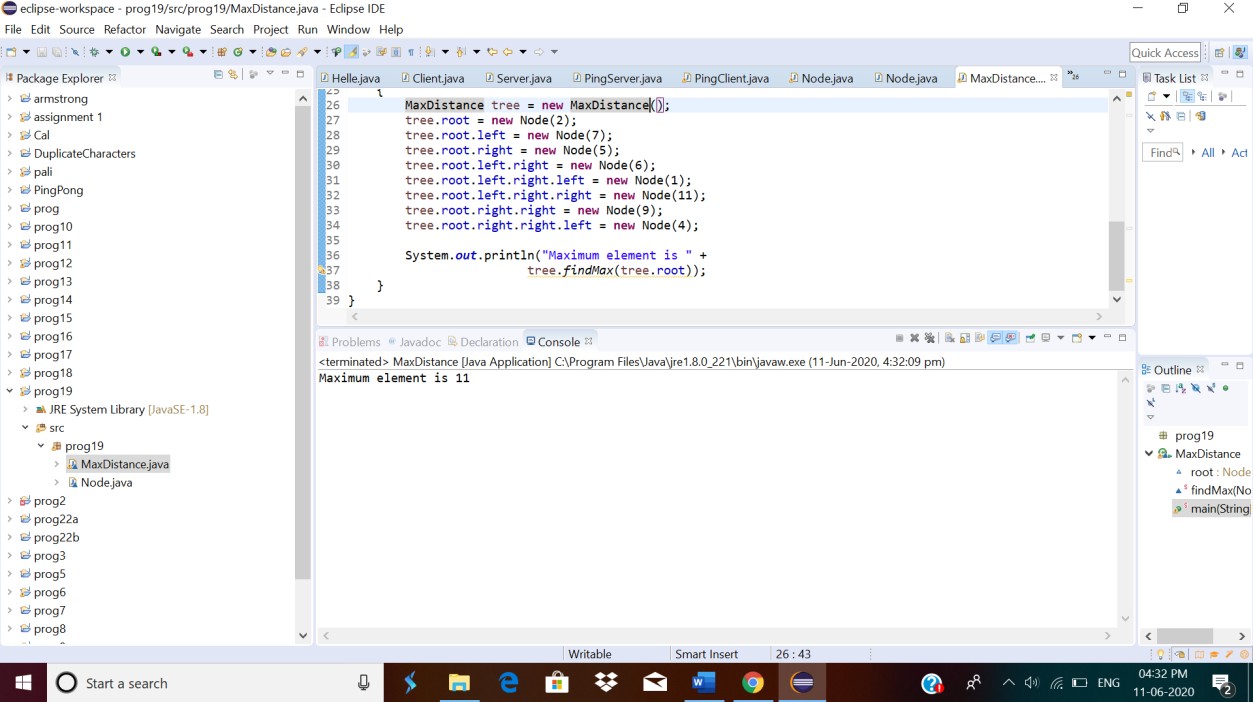
bt.root.left.right = **new** Node(5);

bt.root.right.left = **new** Node(6);

bt.root.right.right = **new** Node(7);

bt.root.right.right.left = **new** Node(8);

**Output:**



1. **Write a python function that converts a string to all uppercase, provided it contains at least 2 uppercase characters in the first 4 characters. Else print the string as it is.**

# 1)Input:

Given string is : HeLlo Output string is: HELLO

2. Input:

Given string is : Hello Output string is: Hello

**Program**

def to\_uppercase(str1):

num\_upper = 0

for letter in str1[:4]:

if letter.upper() == letter:

num\_upper += 1

if num\_upper >= 2:

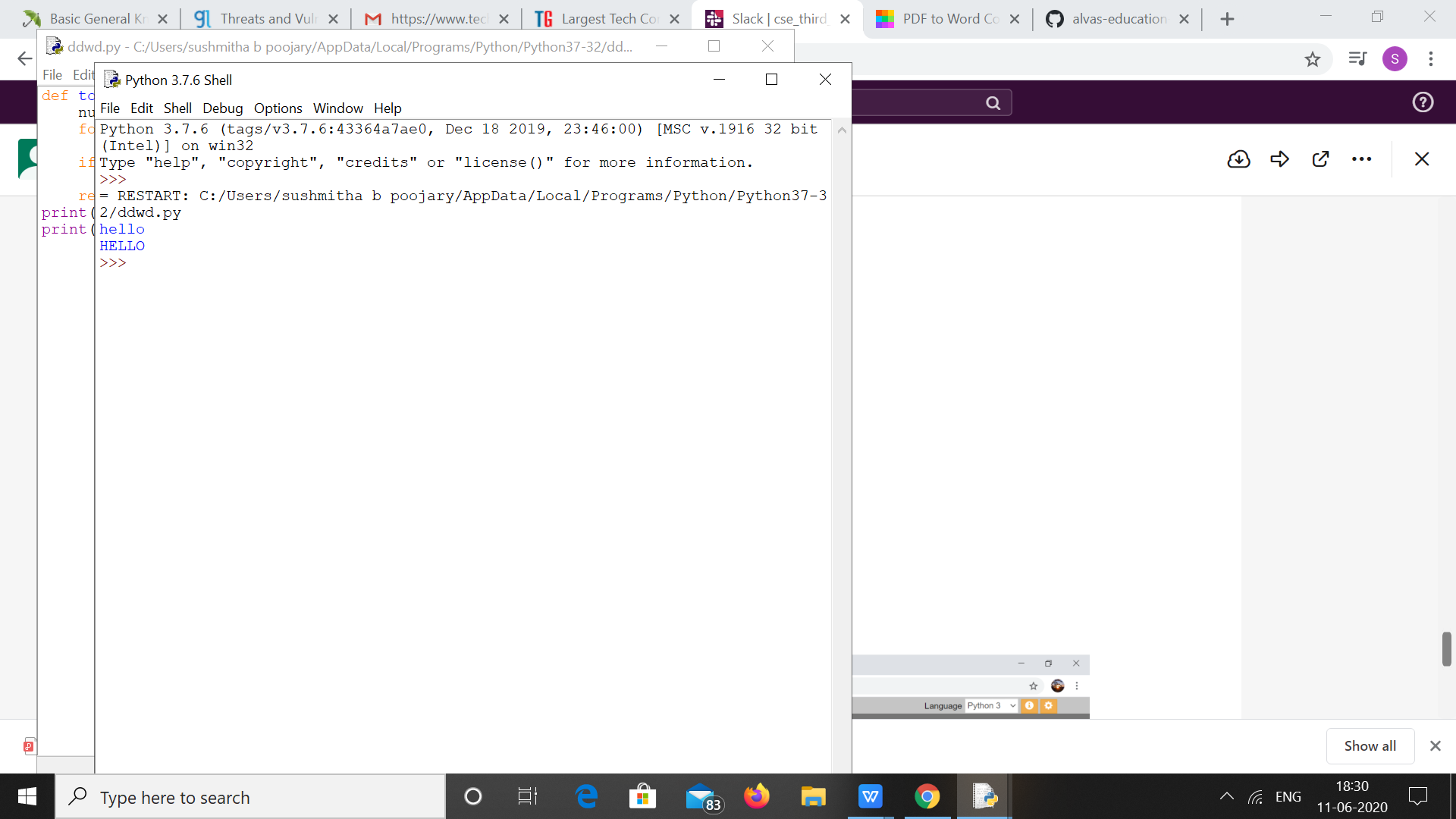
return str1.upper()

return str1

print(to\_uppercase('hello'))

print(to\_uppercase('HelLo'))

**Output:**

****

**3. Python Program to find the average of all Items in a Dictionary Step1: Get the name as key and marks as value for n students Step2: find the average of the marks of all the students and print it.**

d = dict()

n = int(input("Enter The Number Of Students: "))

for i in range(n):

name = input("Enter The Name Of Student: ")

d[name] = int(input("Enter The Marks Of Student: "))

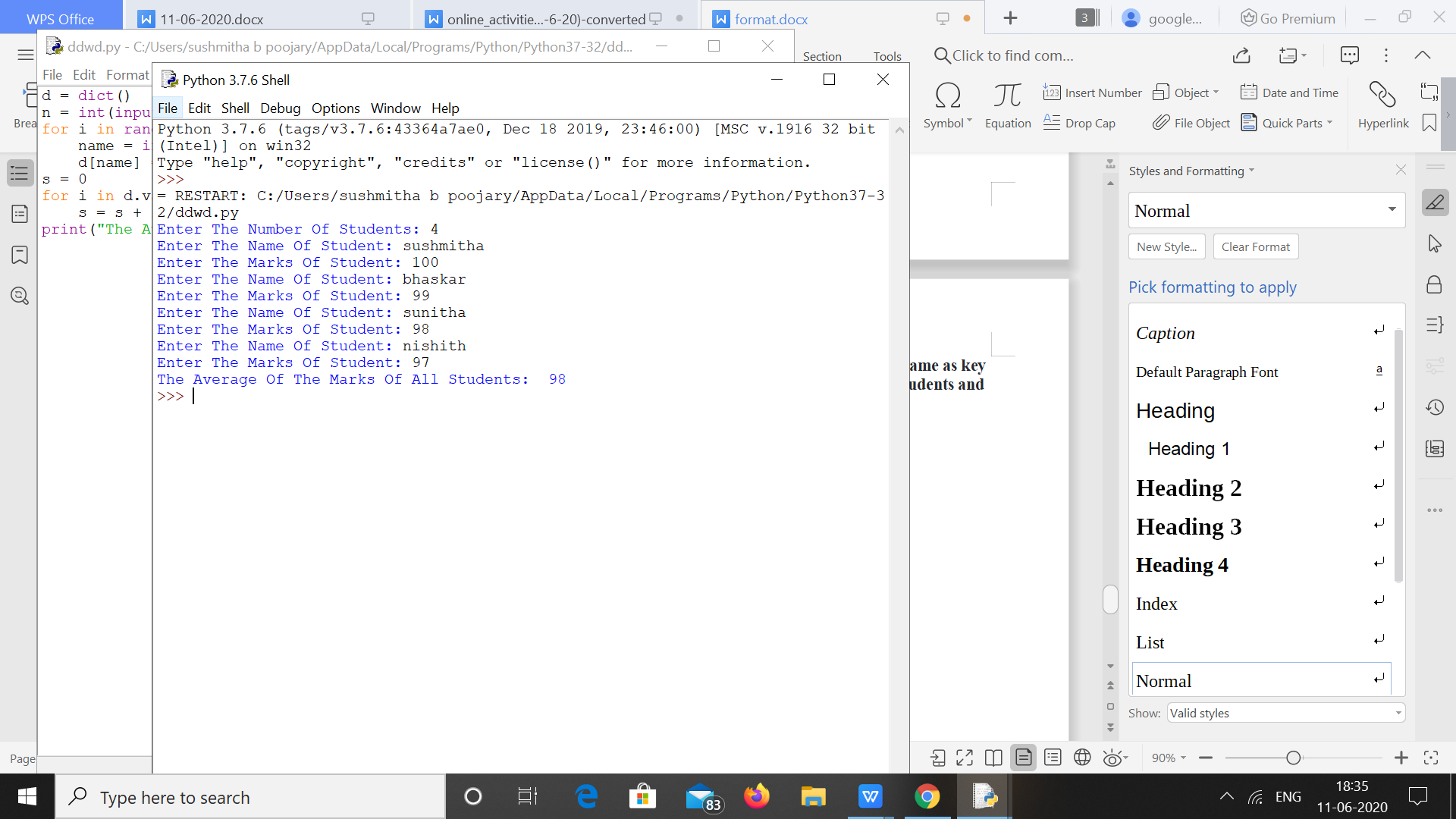
s = 0

for i in d.values():

s = s + i

print("The Average Of The Marks Of All Students: ", s//n)

**OUTPUT**

****