DOCUPHASE

Engineering Code Test

Last Revised: November 26, 2019

Instructions

Expectations

- ✓ You have 7 days, from the receipt of this test, to complete and return your response.
- ✓ Using the C# language to answer any two (2) of problems 1 through 5, then also for problem 6: for a total of 3 answers.
- ✓ Please provide source code for each project in its own folder: named for the respective question that is being answered (q1, q2, q3, etc.), Then, compress those folders into a single zipped file, and return that to DocuPhase.
- ✓ Each program should accept a file as input: the full path of which should be a parameter passed into your program.
- ✓ The output should be sent to standard out.
- ✓ Each problem below includes sample input and sample output. Please conform your input and output to the samples provided. Also note that the "***" characters are for delineation only, and should not be included as input or as output.

EXAMPLE

```
C:\MyProjects\StringManip.exe C:\Temp\Strings.txt
```

IMPORTANT!

Elegant design <u>and</u> clean coding style are considered to be equally important as a correct solution. This solution should be considered production code: meaning that whatever quality control, unit testing, comments, etc., you would put into production code, should be included in your Code Test solutions in this test.

Problems

#1 – String Manipulation

Write a function to compact a string in place: A. strip whitespace from the string. B. remove duplicate characters if they are next to each other.

EXAMPLE

If the input is:	Then, the output should be:
*** abb cddpddef gh ***	*** abcdpdefgh ***

#2 – Spiral printing

Write a function to print a 2-D array (n x m) in spiral order (clockwise).

EXAMPLE

If the input is:

```
***
1   2   3
4   5   6
7   8   9
***
```

Then, the output should be:

```
***
1 2 3 6 9 8 7 4 5
***
```

#3 - Sub-Trees

✓ Write a function to check the following:

- If binary tree 1 is a subtree of another binary tree 2
- Tree 1 is a subtree of Tree 2, if (and only if) we can find a subtree in Tree 2 with the same structure as Tree 1; in addition, each node must have the same value.

✓ Input for this problem will use a breadth-first heap style representation.

EXAMPLE A

```
4,2,5                               Represents this tree:
                                              4
                                            /   \
                                           2     5

Which is a subtree of:
1,5,4,,3,2,5,,,,,,,,0,8                      1
                                           /   \
                                          5     4
                                          \   /   \
                                           3 2     5
                                                  / \
                                                 0   8

But it's not a subtree of:

1,5,4,,3,2,9,,,,,,,,0,8                      1
                                           /   \
                                          5     4
                                           \   /  \
                                            3 2    9
                                                  / \
                                                 0   8
```

EXAMPLE B

If the input is:

```
***
1,5,4,,3,2,5,,,,,,,,0,8
4,2,5
***
```

Then, the output should be:

```
***
Yes
***
```

TIP

To see how to create a binary tree, visit: http://cslibrary.stanford.edu/110/BinaryTrees.html

Sample struct and function in C:

```
        typedef struct {
                int val;
                Node *left;
                Node *right;
         }Node;

         Node *subtree(Node *t1, Node *t2);
```

#4 – Min/Max Stack

Write your own implementation of the stack data structure that allows a user to determine the minimum and maximum value in the stack.

- ✓ Include the following methods: Pop(), Push(item), Peek(), IsEmpty(), Min(), Max()
- ✓ You may assume that all data in the stack will be numeric
- ✓ For input, the file may contain each data item on a separate line

#5 – Ordered Number Sequence

Write a function that takes an array of numbers as input, and outputs an array of numbers where

- ✓ There are no duplicates, and
- ✓ The original order of the numbers is preserved

EXAMPLE

If the input is:	**Then, the output should be:**
`[1, 2, 1, 1, 5, 6, 4, 4, 3, 2]`	`[1, 2, 1, 5, 6, 4, 3, 2]`

#6 – Data Processing

Write an application that takes a text file with the following format as input:

```
TableName Column 1 Name, Column 2 Name, Column 3 Name, … Column N Name Item1, Item2, Item3, Item5, Item4,
some other data, etc.
```

- ✓ Where the first line of the file has the name of a database table, and
- ✓ The second line has the columns of the table, and
- ✓ Lines 3 through N have the data lines for that table
- ✓ All data is comma separated, and
- ✓ Results in the following
  - Once the file is parsed, it should create a database table with the proper columns and data types, as well as insert the data from the file into those columns.
  - Validation or processing errors must not cause the program to crash: you should be able to log an entry into a log file, and continue processing the file.

NOTE

The connection to the database may be stored in a configuration file, and there may or not be any tables in the database before the application is executed.