CSc11300 Programming Languages Final Exam

Tuesday 19th May, 2020

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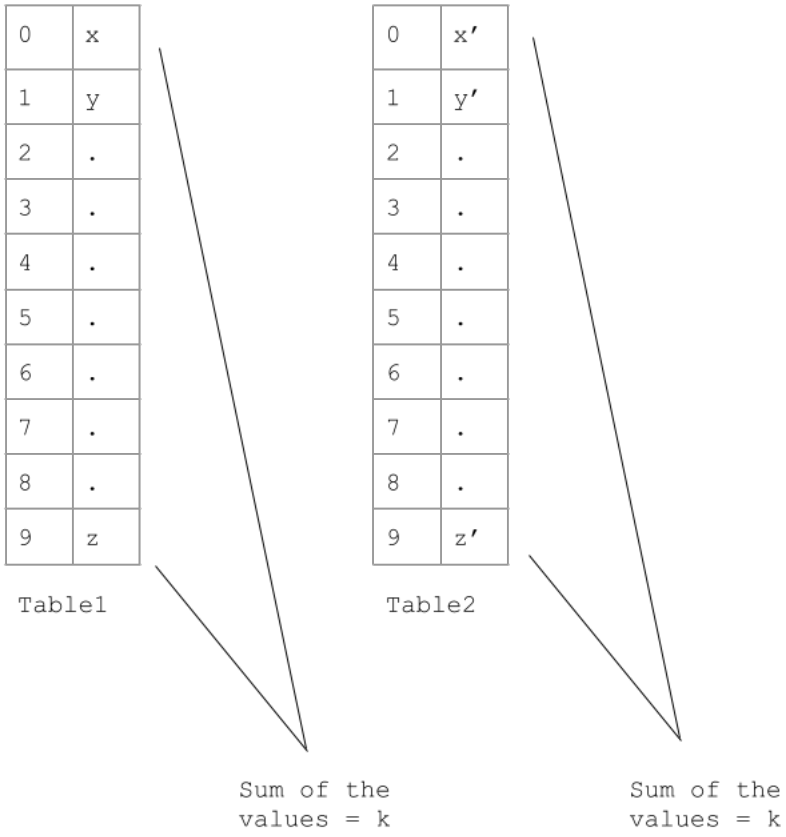
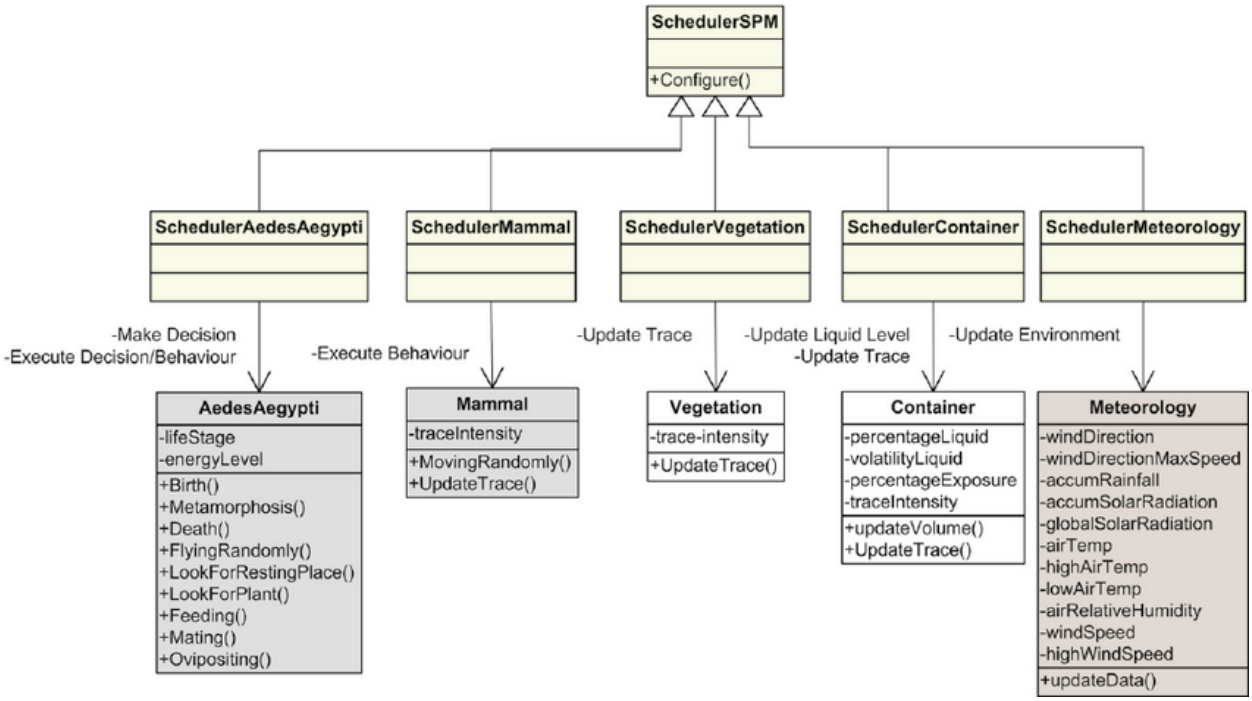
Deadline: 11:59PM Thursday 21^{th} May, 2020

Use Python3 to solve the following programming problems. Make a script file for each question(7 script files). Incorrect format, and late submission will result in score penalty. No teamwork/internet code/internet modules are allowed.

1. (20 points) Suppose you are given 2 lists of user defined size n, named Table1, Table2. Make a Python3 program to distribute random probability values to the table cells. The sum of each table entries must be 1 (k=1 for Table1, k=1 for Table2).



2. (20 points) Design the classes based on the UML diagram given below, including string representation and the initialization of the each class. You must pay attention to the classes and their relationship as well as the variables and the methods in the classes.



3. (20 points) Suppose you are given a text file. Design a Python3 program to encrypt/decrypt that text file as follows:

   If the character is an upper case character then shift that character forward, s characters forward in the alphabet.

   If the character is an lower case character then shift that character backwards, s characters backwards in the alphabet.

   If the character is a numeric character then shift that character also backwards, s characters backwards in the 1-digit numbers set $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

   You must design two functions; one to encrypt. The other one is to decrypt. All white space and punctuation marks must be ignored(cannot be changed). If you reach Z, or A, the shifting may continue as a cycle(A comes after Z, Z comes before A). Both files (original text file and the encrypted text file) must be stored in the working directory of Python.

   An example;

   Let s=1 and the text file:

   11300Hello World

   Then encoded text file;

   00299Idkkn Xnqkc

4. (10 points) Let A be a 'matrix' in Python containing randomly assigned values, belongs to custom created matrix class, an instance of customly designed class named 'matrix'. Write a Python3 program to rotate A clockwise (the 1st column becomes the 1st row) n times and prints it to the screen.
   If $n = 4$ then the result is the initial matrix A, if a negative number given for n then rotate the matrix counterclockwise.

5. (10 points) Make a user interface to get 3 points from the user which will be placed on the coordinate plane. Then write a Python3 function to check whether the points entered forms a right triangle. And another Python3 function to check whether the points entered forms a equilateral triangle. Call your functions for three user-entered points on the coordinate plane.

6. (10 points) Let A be a 2D list in Python containing randomly assigned values where its size is also randomly generated up to 10 rows and 10 columns. Let B be another 2D list in Python containing randomly assigned values where its size is also randomly generated up to 10 rows and 10 columns. Write a Python3 program to check if we can multiply these two lists as matrices (We are checking matrix multiplication rule).

7. (10 points) Define a custom error class named 'EmptySet' in Python3. And design a function to perform cartesian product of two sets. If at least one the sets given to the function, is an empty set then raise that error, and give some information to the user and continue until two proper sets are given, after successfully computing the cartesian product; print the result.

Good Luck.