CS594, Python Programming Lab

(https://www.iitg.ac.in/asahu/cs594/)

Assignment II : Based on Fundamental of list, function call and recursion

Deadline : 11.55 PM IST, 28th September 2020

You are allowed to use all the features of python list, function and recursion

- **Part (a) :** Write an efficient **Python program** to find N_{th} power of (1+e), where e is vary small (between 0 to 0.1) either positive or negative number. You are not allowed to use inbuilt power/exp function of Python.

  Sample input : (a) 2002, 0.0001, (b) 365, -0.01 (c) 365, 0.01
  Expected Ans : (a) 1.22163483533, (b) 0.02551796445 , (c) 37.78

  Hint : X^20=X^10 * X^10

- **Part (b) :** Write an efficient **Python program** to find Nth Fibonacci *number using recursion.*

  Sample input : (a) 50 (b) 12, (c) 100, (d) 200

  Hint: 1 : Take idea from Part (a)

$$\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}^n = \begin{pmatrix} F_{n-1} & F_n \\ F_n & F_{n+1} \end{pmatrix}$$

  Hint2 : $F_n=F_{n-1}+F_{n-2}$ Linearization with tail recursion

  Integers in Python 3 are of unlimited size

- **Part (c):** Generate N random data with Poisson/Gaussian distribution in the range 0 to 100 and plot the generated data. Poisson distribution have parameter λ. And the Gaussian distribution have parameter μ and σ. You are not supposed to use the inbuilt Poisson/Gaussian function of Python Library. But you are allowed to use exp/power/factorial function of Python.

  Sample input : (a) 1000, P, 5 (b) 20000, G, 50, 10 (c) 2000, P, 10 (d) 10000, G, 30, 5

```
import random
x=random.randint(0, 100) #generate a random number between 0 to 100, you are allowed to use this function

For plotting, you are allowed to use inbuilt plot function. (see the tutorial). Suppose the generated data contained in a list X.
import numpy
import matplotlib.pyplot as plt
plt.hist (X,100) #put X in 100 bin histogram
plt.show( )
```

  Hint : Probability of a uniform random number x get selected into target list X equals to the PDF(x) of the target dist.

Submission procedure:

- **Send your assignments code in compressed folder (tgx/zip/gz) to asahu < at > iitg < dot > ac < dot > in with "CS594: Assignment<II> , < RollNo > " as subject before the deadline**
- Please embed comments, how to run and required inputs properly in the code, or a separate readme file.