**STAT 8060 – Assignment#1- Due Monday 10/2 by Midnight**

Reminder: Your programs will need to be well-documented and neatly-written. Your output should also be neatly written to the screen for our inspection. There will be a dropbox on eLC for submitting your work. You should a single file that contains all of your Python code (clearly marked and separated) and a single pdf file that shows output and your discussion of output.

1. Write a Python program that uses built-in functions to generate a sample of size 1000 from each of the following distributions:

a. Unif[0,1]
b. Exp$(\theta)$, $\theta \neq 1$
c. Standard Cauchy
d. $N(\mu, \sigma^2)$, not Standard Normal
e. $\chi^2(5)$
f. Bin(*n*,*p*)
g. Geo(*p*)
h. Gamma$(\alpha, \theta)$, $\alpha > 1, \alpha$ not an integer.

For parameter values, you choose your own within the stated restrictions. Compute the sample means and sample variances and compare them to what you expect in each case. Do not write the generated variables to the screen, but do write the sample means and sample variances along with their expected values to the screen. Also, output a histogram for each case. Inspect the histograms of each of these to be sure you're getting what you expect.

2. Use Python and repeat 1a-g where you write your own random number generator using an appropriate method. You should write a function for each random number generator. For the uniform distribution, use a multiplicative congruential generator, but you do NOT have to use Schrage's algorithm or do any shuffling. This means that the generator may fail on occasion, but we won't worry about that. Use Box-Mueller for the repeat of 1d; use the exponential version for 1g. Use Python's uniform random number generator for parts b-g.

3. Use Python to sample from the Beta(2, 2) using the Rejection Method. Choose the distribution you sample from, derive the required constant, and turn in this derivation as a PDF file.

4. Use Python to repeat 1h using Whittaker's Method.