TUTORIAL 11

Submit a single PDF containing all the required parts on Google Classroom. Make sure to provide the correct question number, and part number. Plots and code (wherever required), are to be attached along with the explanation for the same and not at the end.
There is no need to cite the online resource(s) in case you consult any.
All the Scripts covered in Tutorial can be found here: Scripts
You are free to use these codes and modify them to solve the following questions.

1. For each question, change all parameters/inputs (except for the number of samples) one by one. Take 3 values for parameters - extremely small, medium, large and compare their plots. (In families of RVs, where there are 2 parameters, say Binomial(n, p), take p i.e the probability of "success" to be a medium value and depict variation with n - small, medium, large)
Add plots, values of parameters chosen and a short explanation for each to the PDF (Explanation need not be greater than 1-2 lines).

Note:

- **You just need to add three screenshots(low, medium and high value of the chosen parameter) of the plots and write 1-2 lines explaining why the variation is observed.**
- **There is no need to write an explanation for each value of a parameter.**
- **Eg. For Binomial RV there should be 3 plots and then an explanation (1-2 lines only) for the difference(s) in the plots.**
- **No need to perform this question for families of RV with <2 parameters**

What needs to be done:

1. **Change n for Binomial RV**
2. **Change alpha for Poisson RV**
3. **Change mean and standard deviation for Gaussian RV**
4. **Change lambda(λ) for Exponential RV**

2.

a. Demonstrate that the plot of 3 independent exponential RVs is erlang RV.

1. Plot an erlang RV (say n=3 and $1/\lambda = 2$) .
2. Now generate n (=3) independent exponential RV ($1/\lambda = 2$).
3. Sum all n (=3) to generate a sample for a new RV Y.
4. Repeat 2. and 3. to generate m (say 1000) samples of Y.
5. Now plot Y.
6. Compare the 2 plots. Are they the same? Briefly explain your observations.

Add your code and plots to the PDF.

b. Demonstrate the Central Limit Theorem using the sum of Binomial RVs.

1. Generate m (say 100) independent samples of Binomial RV with any parameters (n, p).
2. Sum all m (=100) to generate a sample for a new RV Y.
3. Repeat 1. and 2. to generate say 1000 samples of Y.
4. Plot these values of Y.
5. What does the shape of your plot look like?

Add your code, plot and the answer of part 5 to the PDF.