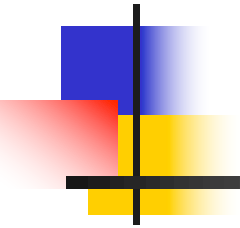

Lab3: Random Variables

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Exercise 1: rv generation

1. Create Simulink functions generating with the inverse-transform method the following rv's
   I. Exponential with parameter a
   II. Uniform on $[a,b]$
   III. Pareto with parameter a_1
   IV. Weibull with parameters a and b
   V. Geometrical with parameter p

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Exercise 1: rv generation

2. Create a Simulink function generating with the convolution method an Erlang-K rv with parameters *K* and *α*
3. Create a Simulink function generating with the composition method a Laplace rv with parameter *α*
4. Create a Simulink function generating with the Box-Muller transform a normal rv with mean μ and standard deviation σ
5. Create a Simulink function generating with the ad hoc method a Poisson rv with mean *α*
6. Create a Simulink function generating with the ad hoc method a binomial rv with parameters *n* and *p*

Exercise 1: rv generation

7. Generate through a Function Caller block a vector of 1000 samples of each rv and save it to workspace ("To Workspace" block)
8. Create in Matlab histograms of the generated rv's and plot them
   - You can verify the correctness of your blocks by using the following Matlab functions:
     - exppdf, gppdf(.,1/a,1/a,1) (for Pareto), wblpdf, geopdf, gammapdf(.,K,a) (for Erlang), normpdf, poisspdf, binopdf

Exercise 1: rv generation

5. Use the generator of uniform rv's over [a,b] (with $a \geq 0$) to generate the service time in the system with infinite buffer capacity and 1 server implemented in Lab2
   - Verify that the average queue length converges to

$$E[L] = \frac{\lambda^2(a^2 + b + 2ab)}{6(1-\rho)}$$

   - where $\lambda = 1/m_G$, $\rho = m_S/m_G$, $m_S = (a+b)/2$, and $m_G > m_S$

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