Lab. 9 - Stochastic Discrete Simulation

Do the exercises below in the Octave IDE. Make sure the files and the programs are in the same working directory.

1. Implement an Erlang distribution

Implement an Erlang (or Gamma) distribution with the following pdf (probability density function)

$$f(t; k, m) = \frac{t^{k-1} e^{-t/m}}{m^k (k-1)!}$$

a) Use the accept/reject method, truncating **t** to $\mathbf{t_{max} = 10mk}$, and **M** to $\mathbf{M_{max} = 2}$. Check your distribution with k = 2 and m = 3.

```
function t = erlang_1(m,k)
```

b) Since the Erlang (m,k) distribution corresponds to a sequence of k events following a exponential distribution with mean m, specify an alternative generator timing of events following an erlang distribution (suggestion: use the inverse methods to specify an exponential distribution).

```
function t = erlang_2(m,k)
```

2. Complete the Queueing System

Complete the implementation of the queueing system with 1 server and 1 buffer, provided in the web page (cf. slides of class 9), namely the functions invoked by the simulate and transition functions.

Make unitary tests to the specified functions to be ascertained that they are correct.

3. Complete the Queueing System

Check the behaviour of the system with arrival requests following an exponential distribution (assess the behaviour with different mean values), and a server timing following an Erlang(k,m) distribution (again, assess the behaviour with different k and m values).

Note: Make sure you simulate the system for a sufficient large time so as to obtain a good approximation of the stationary behaviour of the queue system.