## Exercise 3:

Consider a traffic regulator that manages the message arrivals at a buffer of a transmission line. Messages arrive according to exponentially distributed interarrival times with mean rate $l$. The message transmission time can be modelled as an exponential distribution with mean rate $\mu$. The traffic regulator acts so that the arriving messages are sent to the transmission buffer with probability $q$, whereas blocking occurs with probability $1-q$. It is requested to determine:

- A suitable model for the buffer.
- The stability condition of the buffer.
- The mean message delay from the arrival to the buffer to the completion of its transmission.

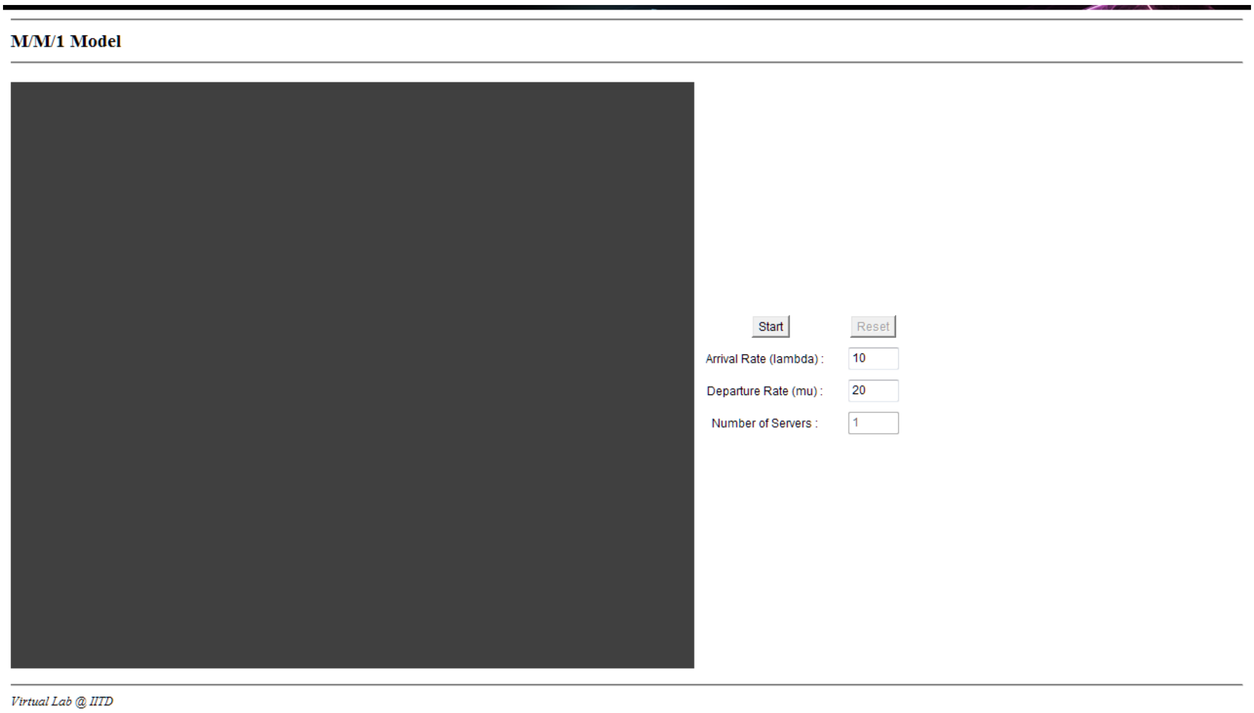
## Solution:

The output of the traffic regulator is still a Poisson process, since it is obtained by splitting a Poisson process. Therefore, the transmission buffer admits a M/M/1 queuing system with mean arrival rate $lq$ and mean completion rate $\mu$. The stability condition on the buffer implies that the quantity $\rho = lq/\mu < 1$ Erlang. The state probability distribution can be derived from the cut equilibrium conditions and the normalization condition. Therefore, the mean number of messages in the buffer, N, can be directly obtained as $\rho/(1- \rho)$, allowing us to compute the mean message delay as $T = N/lq$.

## Simulation:

For a simulation of the transmission buffer as modelled, perform the following steps:

→ Open the page where the simulation is to be performed.
→ Next feed the data as shown. Put lambda ($\lambda$) = 10 and mu ($\mu$) = 20



→ Click Start. The applet will now generate a sample path for the queue.