IE 324 SIMULATION
SPRING 2020 LAB STUDY 5

Procedure:

- Download the excel file from the course web site.
- Feel free to ask the TA about any part you did not understand.
- This lab study will not be graded.

RANDOM VARIATE GENERATION

1. Consider the classroom example we discussed on Acceptance Rejection Technique.

$$f(x) = \begin{cases} 16x, & 0 \le x \le \frac{1}{4} \\ 8 - 16x, & \frac{1}{4} < x \le \frac{1}{2} \\ 0, & o.w. \end{cases}$$

You may find the template on worksheet A-R for Triangular Distribution. Examine the worksheet and determine if the theoretical result for the expected number of iterations per one variate holds.

Modify this worksheet to generate variates from the following distribution:

$$f(x) = \begin{cases} \frac{2}{3}x, & 0 \le x \le 1 \\ 1 - \frac{1}{3}x, & 1 < x \le 3 \\ 0, & o.w. \end{cases}$$

2. Suppose that you are working for a consulting company and you are in a project with a Car retailer. Car retailer records the number of arrivals per day for the past 200 days. You can see an analysis of the data by ARENA's input analyzer in Figure 1. Simulate the system for 20 days i.e. generate 20 Poisson variates to see a sample run from the system.

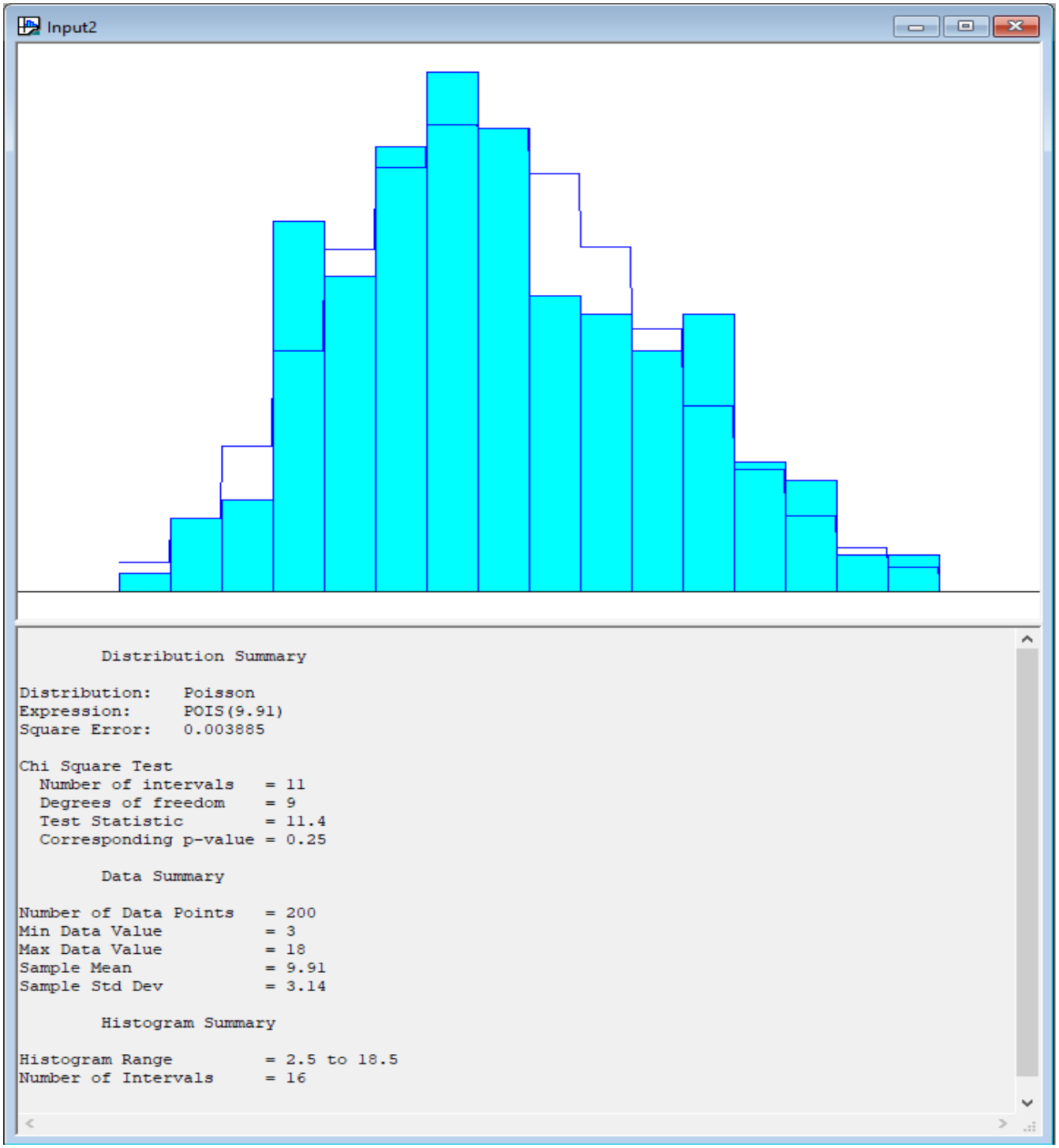

Figure 1. Histogram and test statistics for fitting Poisson with mean 9.91

BASIC QUEUEING SYSTEM MODELING WITH ARENA

We consider a system with one server and one arrival process, which is a Poisson process, and use ARENA to model and simulate the system. If you have studied basic queueing theory before, this exercise will be a nice demonstration of the correspondence of the theoretical results and computational results using the simulation idea.

Recall that an M/G/1 queue denotes a system which there is one server whose service times are from a general distribution (G) and exponential interarrival times (M) (Illustrated in Figure 2).

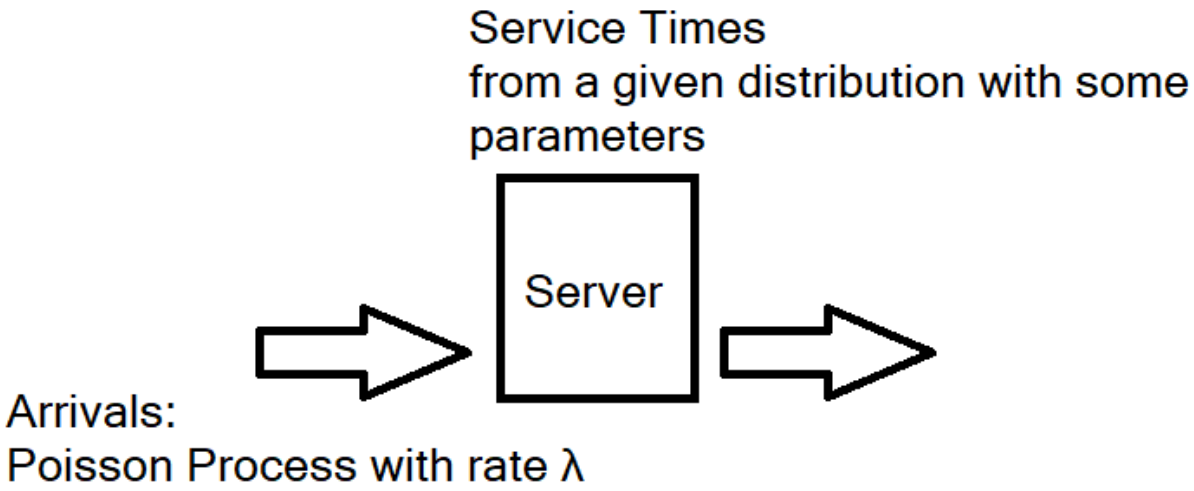

Figure 2. Illustration for M/G/1 Queueing System

Suppose now that the customer interarrivals are exponential with **Mean = 5 minutes**. Service times form a triangular distribution with **Min = 2 minutes Most Frequent = 5 minutes** and **Maximum = 6 minutes**.

Run this system for **10 hours** and report the following statistics utilizing the reports generated by Arena:

P	Number of customers served	
N	Number of customers passed through the queue	
$\frac{\sum WQ}{N}$	Average time in queue	
$\frac{\sum TS}{P}$	Average time in system	
$\frac{\int Q(t)}{T_E}$	Average number of customers in queue	
$\frac{\int B(t)}{T_E}$	Server utilization	
$\frac{\int Q(t)+B(t)}{T_E}$	Average number of customers in system	