Output Data Analysis

CSE412: Simulation and Modeling Sessional

Assignment 4

Specifications

A spreadsheet simulation for single-server queueing system is to be done for output data analysis.

- 1. Consider rho is 0.9 and interarrival times has a mean of 60 seconds. Create a simulation of the attributes Interarrival Time (s), Arrival Time, Service Time(s), Time Service Begins, Time Service Ends, Waiting Time in Queue (Delay) with at least m = 500 customers. Example shown in figure 1 for m=10.
- 2. Then, simulate only the **Delay** value for m = 500 customers, for at least n = 1000 replications (runs) for each customer, using what-if analysis. Example shown in figure 2 for n=9.
- 3. The simulation described in step 1 and 2 should be repeated for different starting conditions. The starting conditions should be varied with the number of customers, s = 0, 5, 10, 12, 15. Here s represents the number in system at time zero. (For example, s=5 means 5 customers will arrive at the system at time zero, so their interarrival time, arrival time these attributes should be set to zero.)
- 4. For each starting condition, show the plot of convergence of the transient mean, E(Di) for n = 250, 500, 750, 1000 replications in a single graph considering m = 500 customers.
- 5. Finally, show the plot of E(Di) for n = 1000 replications and m = 500 customers for different starting conditions s in a single graph.

Submission Guidelines

- Create a folder having the same name as your 7-digit student id. Put one or all your xlsx files inside the folder.
- Zip the folder and submit it in Moodle.

Please note that usage of any unfair means will be duly punished and will result in a -100% mark.

Submission Deadline: Sunday, 4 February, 2024 11:55 PM

Supporting Materials

Customer	Interarrival Time (s)	Arrival Time	Service Time(s)	Time Service Begins	Time Service Ends	Waiting Time in Queue (Delay
1	0	0	18.63771942	0	18.63771942	0
2	87.64442919	87.64442919	10.77137776	87.64442919	98.41580695	0
3	34.43899181	122.083421	10.98666426	122.083421	133.0700853	0
4	54.62989214	176.7133131	18.63375516	176.7133131	195.3470683	0
5	74.10155804	250.8148712	56.67932749	250.8148712	307.4941987	0
6	59.82834223	310.6432134	61.93744377	172.3456476	189.2001506	0
7	12.64091766	133.4465674	52.42933114	189.2001506	263.3783982	49.29653
8	3.496819565	146.552305	2.302728667	292.3654911	308.8395911	98.22904
9	24.15448219	223.1105927	18.29472809	308.8395911	335.414369	76.37728
10	9.26892908	303.7875778	11.55947254	335.414369	352.0794096	85.40308

Figure 1: Example simulation shown for 10 customers

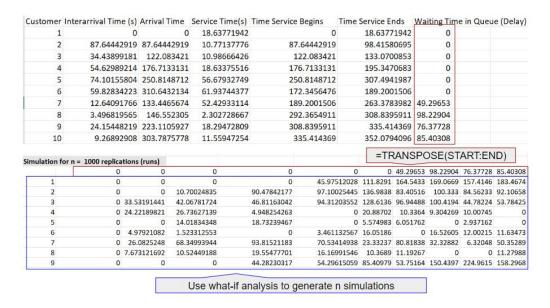


Figure 2: Example delay simulation shown for n=9

Refer to chapter 4 and 9 of the textbook (Law). (Specifically, Example 4.19, Example 4.22, Example 9.2)

- $InterArrivalRate(\lambda) = \frac{1}{Inter\ Arrival\ Time\ (Mean)}$ [Inter Arrival Time (Mean) is given here, which is 60 seconds]
- $\rho = \frac{\lambda}{\omega}$ [Rho = 0.9 is given]
- $InterServiceRate(\omega) = \frac{1}{Inter\ Service\ Time\ (Mean)}$. It should now be clear how to calculate the Inter Service Time (Mean).
- To generate values from a given mean, we have previously used the formula -mean * ln(U). You can use this idea for both the interarrival time and service time attributes in the simulation.
- To calculate the **Delay** values, utilize the formula explained in Example 4.19.
- To create a graph in Excel, first select the data, then go to Insert, and then Recommended Charts.