Assignment Number 5
Discrete Event Simulation of a Queue

In this simulation assignment, a single server M/M/1 queueing system will be simulated. The inter-arrival and service times are exponentially distributed. The essential code is given in the handout on simulation. This code is given in C language.

1. Use any language to code the algorithm. That is, you can use either C or C++ or Java or Python or ….
2. Use the algorithm given in class for generating uniformly distributed random numbers between 0 and 1.
3. **Use two different streams for arrival processes and service times.** That is use two different seed for these streams. Use the seeds given in Table 26.2 on page 455. **You need to track two random streams.**
4. Given Ta = 200 time units, Ts = 100 time units.
   - Compute the theoretical values of X, U, L, and W. Use the formulae for the M/M/1 queue.
   - For te = 100, 1000, 10000, 100000, 1000000, and 10000000 time units, simulate the queue and note the values of X, U, L, and W. Present results in a tabular form. Note that te is the simulation period.)
5. Given Ta = 200 time units, te = 10000000 time units. Vary Ts.
   For Ts = 5, 10, 20,40,60,80,100,120,140,160,180 time units:
   - Using M/M/1 formulae compute X, U, L, and W. These results are independent of te!
   - Run simulation program and observe X, U, L, and W.
6. Present your results in a table. For te = 10000000
   - Plot U versus L, simulation and theoretical results on the same graph. Note that U is the independent variable, therefore it should be on the x-axis. There should be two curves in this graph.
   - Plot U versus W, simulation and theoretical results on the same graph. Note that U is the independent variable, therefore it should be on the x-axis. There should be two curves in this graph.