Problem set -3

Q1

We have two servers in a queuing system. Each server has a service processing with exponential characteristic. Server 1 and 2 have an average service time of 0.3 and 0.35 and producing a vector of random number X and Y respectively. We would like to generate a service random as Z=X+Y.

  a) Show 1000 random number of Z.

  b) Theoretically show the distribution of Z.

  c) According your theoretical finding estimate the distribution of Z.

Q2

Please use function "p3q2.m" which is (M/U/1) and **modify** it to (M/G/1) where the que length is unlimited.

Assume arrivals for a single server queue follow a homogeneous Poisson process with rate 4/hour, and the service time is exponential distributed with rate 5/hour. Estimate average of the time a customer spends (ST) in the system for 100 and 1000 batches if T=8 hours and show/calculate:

  a) show ST, its histogram, and suggest a distribution for ST data from observing its histogram (Comment/argue your suggestion),

  b) calculate the mean and variance of ST with 95% confidence interval,

  c) calculate the autocorrelation (lag-1) for ST and based on it comment your result in b,

  d) calculate the mean and variance of ST with 99% confidence interval and compare/comment this result with result from b.

Q3

  A) - Simulate the arrival times of a homogenous Poisson process with arrival rate of 12 and maximum time of 15 min. Plot the arrival times.

  B) - Estimate the distribution of inter-arrival time from 3A). Plot the distribution.

Q4

We would like to estimate $\theta = 5e^{2x}$ by simulation. The distribution of x is $U(0.2,0.9)$. Make a 100 batch of your estimation then calculate their means and standard deviations by 95% confidence interval. Show why the results are valid.