Problem set-6

Queuing Theory

Q1

Please use function "snglsv.m" from the problem set material in this problem. The function simulates a single server queuing system (M/U/1) where the que length is unlimited.
Assume arrivals for a single server queue follow a homogeneous Poisson process with rate 3/hour, and the service time is uniformly distributed between 12 and 18 minutes. Estimate for a single run, average time a customer spends in the system and amount of overtime put in by the server if T = 8 hours.
Plot the arrival and departure events in the same figure. Plot the service time for each arrival person.

Q2

Please use and **modify** function "snglsv.m". The function simulates a single server queuing system (M/U/1) where the que length is unlimited.
Assume arrivals for a single server queue follow a homogeneous Poisson process with rate 3/hour, and the service time is uniformly distributed between 9 and 15 minutes. Estimate for 100 and 1000 batches if T=8 hours:

a) average and variance of the time a customer spends in the system,

b) average and variance of the amount of overtime put in by the server,

c) average and variance of the number of departed persons.

Q3

Please use function "snglsv.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.