

# Project No. 3

## Simulation of a Finite M/M/1 Queue

ECE 642  
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### Part I

In this project we simulate a finite M/M/1 queueing system using MATLAB. Consider the problem in Project 2 and assume the queue to have a maximum capacity of 20 packets ( $N = 20$ ). All other system parameters are as in that Project. That is, Poisson arrival and exponential service time, the link with a capacity of 155 Mbps, the length of packets exponentially distributed with mean packet size of 2325 bits. Simulate the system for the desired utilizations of  $\rho = 0.3, 0.50, 0.9$  and  $\rho = .95$  and obtain Probability of blocking, expected delay, and expected waiting time vs. throughput. In the same graph plot the analytical results.

### Part II

Consider the departure process of the above finite M/M/1 queueing system. For the utilizations of  $\rho = 0.3, 0.50, 0.9$  and  $\rho = .95$ :

Find the pdf (i.e., the normalized histogram) of the inter-departure times (the time interval between the departure times). Find the mean value of inter-departure times and compare the pdf of inter-departure times with that of an exponential random variable with the same mean. Compare the two distributions and describe how close they are.