

## IE 306.02 Spring 2019 Assignment 3

**Due Date: Sunday, May 19<sup>th</sup> 2019**

You will use ARENA for this assignment. You are asked to conduct a simulation-based analysis for the following problem:

*You are going to simulate moviegoers in a local cinema. The cinema has three theaters showing science fiction movies 'Captain Marvel', 'Captive State' and 'Avengers: Endgame' once a day. Each theater can hold 50 people. People arrive at the cinema at random times. The inter-arrival times (in minutes) are recorded in the past and you can use this data to fit a distribution to the common arrival process. There is a single counter that sells tickets for all three films. People line up in a single queue in front of the counter. If they arrive at the counter they try to buy a random number of tickets distributed as uniform integer between [1–4] for a randomly chosen movie with equal probability. If not enough tickets are left, they argue with the teller for a fixed amount of time and leave. If at most one ticket is left after the moviegoer bought her tickets, the “sold out” event for this movie is triggered. When a movie is sold out, all people waiting to buy a ticket for that movie renege (leave the queue). The counter stays open for 120 minutes before the films start showing and it is observed that the counter service time shows no variability and can be taken to be a constant of one minute per customer. The statistics to collect are: for each movie, average time before the movie is sold out, average number of people reneged when the movie is sold out, and utilization of the personnel who is selling the tickets.*

The historical interarrival times and a sample Arena model are given as separate files. The task is:

1. Fit a distribution to the given inter-arrival times.
2. The sample model is built for a 2-movie case. Modify it for the 3-movie case as described above.
3. Simulate the base scenario for thirty independent replications and collect relevant statistics. Create confidence intervals for the collected statistics at a confidence level of 95%.
4. Increase the counter capacity to three, and dedicate each counter to a movie. One personnel will be assigned to each counter, and a counter will sell tickets of a single movie. Arriving customers are assumed to know which queue to join. For all practical purposes the counter service is identical and takes one minute. Make thirty independent replications. Create confidence intervals for the collected statistics at a confidence level of 95%.
5. Increase the inter-arrival rate you have found from part (1) by %50 and repeat the analysis of steps 2-4.
6. Under the conditions of step 5, can you have the counters open for only 60 minutes instead of 120 minutes?

You will need to submit

- A well-written report detailing your input analysis, assumptions, simulation logic, and output analysis along with your comments and interpretations;
- Your code(s) and analysis files.