

## IS 604 – Homework #6

1) At a driver's license facility, applicants arrive at a rate of approximately 10/hour. At check-in, a single clerk checks the applicant's driving history (if any) and gives the applicant the initial paperwork. Check-in takes approximately 5 minutes. The written exam is administered by one of two exam clerks. When an applicant arrives, s/he waits for an available clerk and, once one is available, takes the exam with the clerk. The exam requires approximately 8.8 minutes. At check-out, the applicant completes the process using one of two check-out computers and receives his/her temporary license. Check-out takes approximately 9 minutes.

- a. How many 'source', 'server', 'sink' do we need to develop this model, what do those objects stand for in the real system?
- b. Develop your model in Simio. Show your screenshots including the parameters used in the model (e.g., interarrival time, capacity of the server, etc.)
- c. Run the model and obtain the performance measures: Server Utilizations, Time in System, and Number in System. Determine the model run time and provide your supporting reason.
- d. The facility is considering to add an optional "computerized exam kiosk" to replace one of the two clerks. Applicants would have a choice between the exam administered by a human clerk and the computerized exam. The computer kiosk will support two exam-takers at a time. How would you modify the current Simio model? Show your related screenshots. (You do not have to run the model for this question)

2) Use both Simio and your own developed queueing simulation program to conduct a simulation study for a M/M/1 queue where the mean inter-arrival time equals to 10 minutes and the mean service time is about 7 minutes. Compare the following performance measures: *system utilization rate ( $\rho$ )*, *expected number of customers in the queue ( $L_Q$ )*, *expected system time ( $W$ )* obtained from the above simulators to the analytical solution and make your comments.

### Note:

- You may make your own assumptions, if needed, such as total period of simulation time when running the simulation experiments.
- Please submit the comparison results and comments together and upload your simulation program as supplemental material.
- You may use R, Matlab or Python to develop your own program. Please be sure to include the program code.

3) DES Textbook Problems: 6.1, 6.2