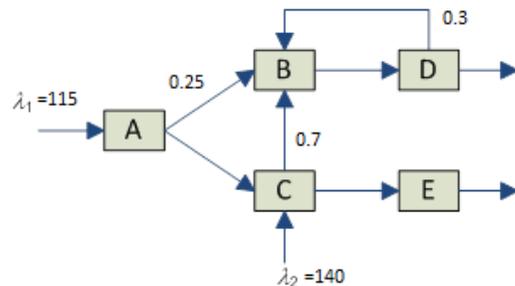


Queueing Networks

This lab involves solving a queueing network problem by hand and in Excel. The Excel model for the queueing network will be used to perform what-if analysis. We will consider the following queueing network for the video part of the lab:



	Station				
	A	B	C	D	E
# servers (c)	1	3	1	4	1
Service rate (μ)	150	120	240	80	80

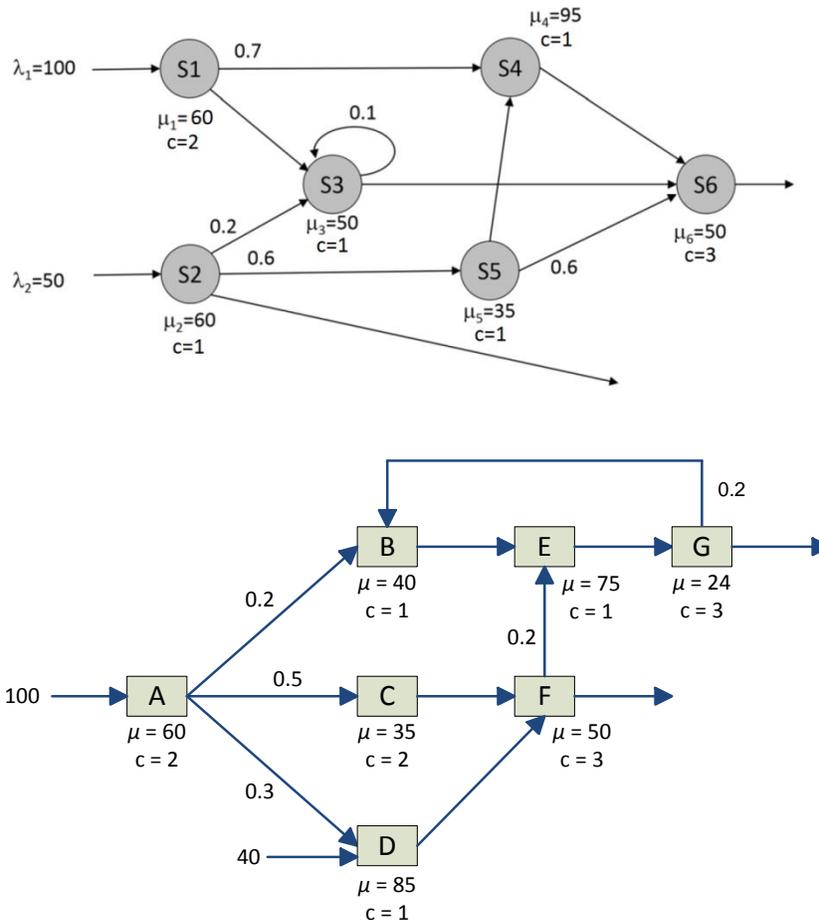
Both arrival processes are Poisson and all service times are exponentially distributed. Also, the arrival rates and service rates are expressed in entities/hour. We would like to solve the queueing network to find the expected number of entities in the system (L), the expected time in system for entities (W), and L_i , W_i , and ρ_i values for each station ($i = A, B, C, D, E$) at steady state. Also, we would like to evaluate performance of the system for different combinations of external arrival rates.

The videos will guide you through:

1. Understanding the basics of queueing analysis
2. Solving the queueing network by hand
3. Using the Excel model of the queueing network to perform what-if analysis (we will use Excel's *Data Table* to accomplish this task)
4. Developing a Simio model of the queueing system to verify our "solution" calculated by hand

Assignments

Solve the following two queueing networks and verify your solutions using simulation. For each network, develop an Excel model and perform what-if analysis for different combinations of arrival rates and determine when the system becomes unstable. The performance metrics of interest are the expected number of entities in the system (L), the expected time in system for entities (W), and L_i , W_i , and ρ_i values for each station. All arrival processes are Poisson and service times are exponentially distributed. Also, the arrival rates and service rates are in entities/hour.



Submission Requirements

The deliverables for the lab include the following:

1. A single word document that includes the “solutions” to the assignment problems, i.e., queueing calculations, Excel models, tables/figures of simulation results and comparison with your queueing solution, simulation run configurations, etc. **You may scan hand-written material but you should put them in the report document and make sure they are readable.** The report is the primary component of your submission that is graded and all other files (such as Excel or Simio models) are just supporting material so make sure your report document is complete by itself and do not simply refer the reader to other files in your submission.
2. All related Simio or Excel models developed as part of the assignments.

All of the files should be zipped together and submitted via Canvas. Make sure you do not submit any other file types such as “.rar”.

If you work in a team of 2, make sure that you both submit the exact same zip file and indicate the name of your partner as a comment.