

Coding Assignment (20%)

Instructions:

1. This is an assignment done in groups for 4 to 5 students.
2. The due date of the submission is on **Friday of Week 13**. Please submit the FreeMat code and the report. The interview/demo will be conducted throughout **WEEK 14**. Please refer to the respective tutor for the further arrangement.
3. For the report, prepare a cover page, elaborate the details of your simulation, construct the diagram such as flow-chart, provide the explanation for the implementation of some important source codes and print-screen the table (service time, inter-arrival time and simulation) and results (evaluation results).
4. Creativity and extra effort will grant the higher marks.
5. Plagiarism is not accepted under any circumstances. Zero marks will be given for any form of plagiarism such as copying from the peer's work.

Queue simulator

Create a simulator for customer arrivals at checkout counters for any supermarkets. The simulation system should be able to simulate a queuing system for three counters. Assume that there are two normal checkout counters and one express checkout counter(**for customers who have fewer items**). Randomly generate the number of items acquired by each customer. For those customers with fewer items, they are most likely queue up at the express counter. For another two counters, the customers will queue up based on the preferences such as which lane is shorter, the lane with the lesser items acquired by the customers and so on. Firstly, generate the table of the service time for three servers and inter-arrival time for the customers.

Counter 1:

Service Time			
Probability			
CDF				
Range				

Counter 2:

Service Time			
Probability			
CDF				
Range				

Counter 3:

Service Time			
Probability			
CDF				
Range				

Inter-arrival Time		
Probability		
CDF			
Range			

For generation of random numbers for service time, inter-arrival time and number of items acquired by each customer, you can consider **rand** function from FreeMat, linear congruential generators or other generators. User should be able to choose the type of random number generator to be used before the simulation. Use **rand** function to generate the seed number(initial value) for the different generators. Adjust the range of random numbers so that they are within the appropriate range. For further details please refer to **Chapter 4**. After the generation of the service time and inter-arrival time table,

- user should be able to input the number of customers,
- exhibit the message for arrival, departure and so on from time to time. For example:

Arrival of second customer at minute 2 and queue at the counter 2

Departure of first customer at minute 4.

Service for second customer started at minute 4.

- then generate the overall simulation table at the end:

n	RN for Inter-arrival time	Inter-arrival time	Arrival time	Number of items acquired
1	-			
2				
3				
4				
5				

You can separate the simulation table based on the different counters as following:

Counter 1:

n	RN for service time	Service time	Time service begins	Time service ends	Waiting time	Time spends in the system
1						
3						
5						

Counter 2:

n	RN for service time	Service time	Time service begins	Time service ends	Waiting time	Time spends in the system
2						

Counter 3:

n	RN for service time	Service time	Time service begins	Time service ends	Waiting time	Time spends in the system
4						

- d) lastly evaluate the results of the simulation, for example average waiting time of a customer, average inter-arrival time, average arrival time, average time spent, probability that a customer has to wait in the queue and average service time for each server (refer to the example in the notes).