

Coding Assignment (20%)

Instructions:

1. This is an assignment done in groups of 4 students.
2. The deadline for submission is on **Friday** of Week **13**. Please submit the coding and the report together. Interviews or demos will be scheduled throughout **Week 14**. Please refer to the respective lecturer for 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

Develop a car arrival simulator for a car wash center with three wash bays. The simulator should model a queuing system where cars line up in a single lane and proceed to an available wash bay. Each car owner may opt for a different car wash service, with service types randomly generated for each owner. Begin by generating a table detailing the service times for the three wash bays and inter-arrival times for cars.

Wash bay 1:

Service Time				.....
Probability				.....
CDF				
Range				

Wash bay 2:

Service Time				.....
Probability				.....
CDF				
Range				

Wash bay 3:

Service Time				.....
Probability				.....
CDF				
Range				

Inter-arrival Time			.....
Probability			.....
CDF			
Range			

Car wash service	Type 1	Type 2	.....
Probability			.....
CDF			
Range			

For generation of random numbers for service time, inter-arrival time and service type requested by each car owner, 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 cars,
- exhibit the message for arrival, departure and so on from time to time. For example:

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

Departure of first car at minute 4.

Service for second car started at minute 4.

c) then generate the overall simulation table at the end:

n	RN for Inter-arrival time	Inter-arrival time	Arrival time	Service type
1	-			
2				
3				
4				

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

Wash bay 1:

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

Wash bay 2:

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

Wash bay 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 car owner, average inter-arrival time, average arrival time, average time spent, probability that a car owner has to wait in the queue and average service time for each server (refer to the example in the notes).