Coding Assignment (20%)

Instructions:

1. This is an assignment done in groups of 4 or 5.

2. The due date for the submission is on **Monday of Week 14**. Please upload the report together with the FreeMat code. The demo will be in **Week 14**. All the group members MUST attend the demo. Demo will be arranged by the respective tutor.

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 a service centre. Choose a service centre such as Maxis, Huawei and so on. Due to movement control order (MCO), only limited customers are allowed to be in the service centre. The simulation system should be able to detect number of the customers inside the centre. Randomly generate the temperature for each person. Only those with the normal temperature are allowed to enter the centre. Please set the temperature within the appropriate range.

Firstly, auto-generate/predefine the table of the service time for different counters(maximum two service counters) and table of the inter-arrival time at the beginning of the simulation. Please ensure that you generate/predefine the appropriate range of service time and inter-arrival time to generate the appropriate results of the simulation.

Inter-arrival time	Probability	CDF	Random number range
…….	……..	…….	…….

Service time for Counter 1	Probability	CDF	Random number range
…….	…….	…….	…….

Service time for Counter 2	Probability	CDF	Random number range
…….	…….	…….	…….

In order to generate the random numbers for the temperature, service time and inter-arrival time, you can consider ***rand*** function from the FreeMat, linear congruential generators or other generators. 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**.

At the beginning of the simulation,
a) User should be able to choose the type of random number generator to be used.

b) User should be able to enter the number of customers for the whole simulation and maximum number of customers that allowed to be in the centre.

c) Exhibit the message arrival, entering the centre and departure of the customers and so on from time to time on the FreeMat's command window. For example:

Customer 1 arrived at minute 0 and entered the centre at minute 0

Customer 2 arrived at minute 2 and entered the centre at minute 2

Departure of customer 1 at minute 4.

Customer 3 arrived at minute 5 and was not allowed to enter the centre

d) Display the table of the service time for different counters and table of the inter-arrival time.

Assume that once the customer entered the centre, the customer will be served immediately as long as the server is available. Total customer in the centre is counted right after the arrival time of the current customer. The following is the example for the simulation of 1 counter and at one time only two customers are allowed to be in the centre. You may set more conditions such as limited number of customers that can queue at one counter and so on.

Customer no.	Temperature (Celsius)	Random number for inter-arrival time	Inter-arrival time	Arrival time	No. of customers in the centre	Time entering the centre	Random number for service time	Counter 1			Waiting time	Time spent
								Service time	Time service begins	Time service ends		
1	36.4	-	-	0	0	0		5	0	5	0	5
2	36		2	2	1	2		4	5	9	1	
3	36.1		4	6	1	6		5	9	14	3 (9-6=3)	8
4	36.5		2	8	2	9		6	14	20	6 (14-8=6)	12
5	38		4	13	-	-		-	-	-	-	
6	35.8		3	16	1	16		5	20	25	4	9

You may consider to split the results of the simulation into 2 table if you have problem to display them in one table.

Customer no.	Temperature (Celsius)	Random number for inter-arrival time	Inter-arrival time	Arrival time	No. of customers in the centre	Time entering the centre
1						
2						
3						

Customer no.	Random number for service time	Counter 1			Counter 2			Waiting time	Time spent
		Service time	Time service begins	Time service ends	Service time	Time service begins	Time service ends		
1									
2									
3									

Then evaluate the results of the simulation, for example average waiting time , average time spent , probability that a customer has to wait and average service time for each counter (refer to the example in the notes). Please exclude those customers that weren't allowed to enter the centre into your calculation.