Coding Assignment (20%)

Instructions:

1. This assignment is to be completed in a group of 3 or 4 students.
2. Use *FreeMat* to solve this assignment.
3. The deadline for the submission (report and coding) is on **Monday, 21 March 2022** (Week 12). Demo will be arranged by the respective tutor (either on Week 12 or Week 13).

Marking (20 marks):

1. Mark distribution:
    - Report - 5%
    - Demo - 3%
    - System - 10%
    - Creativity and extra effort – 2%
2. Zero marks will be given for any forms of plagiarism such as copying from the peer's work.

Assignment description:

(A) Coding

A hospital plans to install self-service registration kiosks for patients to complete registration before proceeding to other service counters. As a consultant for the hospital, you have been asked to write a simulator for the queueing system at the kiosks. Implement the following in your project:

1. Auto-generate the table of the service time for the kiosks (maximum two kiosks) and the table of the patient inter-arrival time at the beginning of the simulation. Generate a suitable range of service time and inter-arrival time to obtain the appropriate results of the simulation.
2. In order to generate the random numbers**,** e.g., for the service time and inter-arrival time, define at least two own functions of random number generators. You may use built-in functions in *FreeMat* to generate the seed number for the different generators. Adjust the range of random numbers so that they are within the appropriate range.
3. The queue system can be simulated according to the following waiting line rules:
    (a) Round robin such that the first patient is sent to Kiosk#1, the second to Kiosk#2, the third to Kiosk#1, the fourth to Kiosk#2, etc.
    (b) Send a patient to an idle kiosk. If both kiosks are idle, then sent to Kiosk#1.

    Note: You may define more rules in assigning the patients to the kiosks.
4. The simulator will allow the user to key in inputs such as type of random number generator, number of patients for the whole simulation, and type of waiting line rule.
5. The simulator should properly display messages and tables such as follows:
    (a) Display a welcome message or introduction.
    (b) Exhibit message to demonstrate the arrival and departure of each patient. For example,

    Patient 1 arrives at minute 0, and gets service at minute 0
    Patient 2 arrives at minute 5, and gets service at minute 5

Departure of patient 1 at minute 8.
Departure of patient 2 at minute 8.
Patient 3 arrives at minute 6, and gets service at minute 8
Departure of patient 3 at minute 12.
Patient 4 arrives at minute 15, and gets service at minute 15
…

(c) Display the tables of the service time for different kiosks, table of the inter-arrival time and table of simulation result. Please refer to sample tables in *Chapter 4*. You may consider splitting the results of the simulation into more than one table.

6. Include queueing system performance measures such as waiting time in queue, idle time of kiosks, and some statistics, e.g., average time a patient spends in the system, average waiting time, probability that a patient has to wait, etc.

(B) Report:

1. Prepare a cover page that includes
   - Faculty of Computing Informatics
   - TMA1301 Computational Methods
   - Trimester 2, 2021/2022
   - Title of the simulator
   - Tutorial section
   - Group members (Name and student ID)

2. Your report should include at least the following,
   - Elaboration of your queue simulator.
   - Flow-chart (with explanation) of some important functions.
   - Formulas to obtain columns in the simulation table such as time service begins, waiting time, time spent in system, etc.
   - Print-screen of the simulator (tables and messages).
   - Performance measures. Include discussion on observation, such as the performance of the queueing system when using different waiting line rules.
   - List of the extra efforts added in the project, if any.