Due date

10th January 2021 Sunday, 23.55

Goal

In this assignment, you will solve the synchronization problem using semaphores and mutex. You should suffer from deadlock and/or starvation. You are expected to simulate and solve the "COVID-19 Test Unit" synchronization problem, which its details are given.

Implementation Details & Requirements

Today, the units that make Covid-19 tests in medical centers have a very important and critical role. With the increase in cases and patients, this may cause the density in these units after fillation studies. Before the test is applied, people are waiting for a long time at the entrance of the hospitals. Because there is a limited number of test units and healthcare staff. We are launching the "Covid-19 Test Unit" application to facilitate this. This will prevent both people from creating long queues and to lock the waiting rooms before being full. Also it will provide an efficient and fair sharing because units will contain people up to its capacity.

With your simulation and solution with mutex and semaphores students hopefully will no longer wait so long for working.

- Each waiting room has 3 people.
- People will come to the unit in continuous and random periods.
- The hospital has 8 units and also 8 healthcare staff. So, each unit contains one staff.
- The states for each unit:
    - Entry free state: Staff will announce to the people his remaining places to get in the waiting room, if it has one or more people in the room. For example, each room has 2 people and waits for one more person and the staff calls "The last people, let's start! Please, pay attention to your social distance and hygiene; use a mask."
    - Idle (Empty) state: If there are no people in the room, the staff will ventilate the room. Being idle is forbidden for the staff. If any people came, they should open the room. Don't forget that no people are waiting.
    - Full and busy state: If there are 3 people in the room, the room will be in a busy state.
- The states for each people:
    - Waiting in room: When a person comes at room, she/he gets in the nearly full capacity room. If there are no people in the room, the first person alerts the staff if he is ventilating. And the people prepare for the test and fill out the form until the room's full. After the room is full, the test process will be applied to them and together they empty the room.
    - Waiting at hospital: If there is no empty room, she/he's gonna wait for a room at the outdoor waiting hole of the hospital.

- You should not do the same room work constantly so that others can work overtime, so consider the status of starvation.

Submission

Submission will be via Github.

- GitHub Classroom Invitation link:

  https://classroom.github.com/a/rx7_UGqV

- Name your code file as: *StudentNumber.c* (do not use another naming standard.)
- You will lose credit for not naming your submission properly. (15 pts)
- Late submission is not accepted.
- For this assignment you will work individually.
- The POSIX library (pthread) will be used.
- We compile your code with the below line:

```
gcc StudentNumber.c -o StudentNumber -lpthread
```

Academic Dishonesty

Your submissions will be scanned among each other as well as the Internet repository. Any assignments that are over the similarity threshold of a system for Detecting Software Similarity will get zero. We strongly encourage you not to submit your assignment rather than a dishonest submission.

Grading policy

- Submit properly (5 pts)
- Documenting the code and coding style (proper indentation, describe critical functions) (15 pts)
- Implementation of main function (Thread creation, join and semaphore initialize) (20 pts)
- Implementation of multi-thread structure (45 pts)
- Simulate each room on the console (15 pts)
  - For example you draw each room into a line

For Questions

For any questions about the assignment, please use the forum in the SAKAI system. Before asking your question, please check carefully previous questions and answers, where similar questions were already asked by someone else already answered.

- **No private questions via email will be answered!!!**
- Use forum public messages to ask questions, where someone else may benefit from and learn something from your question and its answers.
- We will try to answer any of your questions as soon as possible.

Good luck!!!

Read all of the instructions carefully, if you find something UNCLEAR, please ask help to CLARIFY it!