**Q1.** Suppose that there is a common room (CR) in the university. When a female student is in the common room, other female students may enter, but no male student, and vice versa. A sign with a sliding marker on the door of the common room indicates which of the three possible states it is currently in:

* Empty
* Female Student present
* Male Student present

Write the following procedures:

female\_student\_wants\_to\_enter

male\_student\_wants\_to\_enter

female\_student\_leaves

male\_student\_leaves

You may use whatever semaphore, counters, and synchronization techniques you like.

Solution:

Note: The proposed solution is similar to the First Readers Writes structure that is presented in section 7.1.2. of the textbook.

semaphore cr\_entry\_mutex = 1; //a binary semaphore

semaphore female\_student\_mutex = 1; //a binary semaphore to ensure mutual exclusion for the variable female\_student\_count

semaphore male\_student\_mutex = 1; //a binary semaphore to ensure mutual exclusion for the variable male\_student\_count

int female\_student\_count = 0; //keeps track of how many female students are in the common room

int male\_student\_count = 0; //keeps track of how many male students are in the common room

Structure of a male student process

while (true)

{

/\*structure of the procedure for “male\_student\_wants\_to\_enter”\*/

wait (male\_student\_mutex);

male\_student\_count++;

if (male\_student\_count == 1)

wait(cr\_entry\_mutex);

signal(male\_student\_mutex);

. . .

/\* Entry in the Common Room\*/

. . .

/\* structure of the procedure for male\_student\_leaves\*/

wait(male\_student\_mutex);

male\_student\_count--;

if (male\_student\_count == 0)

signal (cr\_entry\_mutex);

signal(male\_student\_mutex);

}

Structure of a female student process

while (true)

{

/\* structure of the procedure for female\_student\_wants\_to\_enter\*/

wait (female\_student\_mutex);

female\_student\_count++;

if (female\_student\_count == 1)

wait(cr\_entry\_mutex);

signal(female\_student\_mutex);

. . .

/\* Entry in the Common Room\*/

. . .

/\* structure of the procedure for female\_student\_leaves\*/

wait(female\_student\_mutex);

female\_student\_count--;

if (female\_student\_count == 0)

signal (cr\_entry\_mutex);

signal(female\_student\_mutex);

}