CS 423/523 Assignment 2

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Due: Mar. 8, 2017 (9:00am)

Total: 30 points

Please upload your solutions to classes*v2. To do so, please enter classes*v2, then click the "Assignment" button on your left-hand toolbar, and finally click "Assignment3" to upload your assignment.

Due to the midterm, solutions will be posted immediately after the due date and time for this assignment. For this reason, late submissions will not be accepted.

Any and all resources may be used as long as you cite them, with the exception of collaborating with other people. Please do not copy-paste your definitions from Wiki.

If you have ANY questions, please do not hesitate to let us know (email, office hours, etc.)
Part 1: OS definitions (1-3 line answers, 5 x 2 points each = 10 points)

1. Critical section

2. Semaphore

3. Deadlock

4. Starvation

5. Busy waiting

Part 2: Multiple choice (6 x 2 points each = 12 points)

1. Which of the following is correct about a binary semaphore:
   a. It is a hardware-based synchronization mechanism
   b. It requires busy waiting
   c. Both of the above
   d. None of the above

2. Test and set:
   a. Returns a pointer type
   b. Is interruptible
   c. Both of the above
   d. None of the above

3. Which of the following is not a property of Peterson’s algorithm?
   a. It can handle multiple processes case
   b. Instructions, e.g., load and store, should not be interrupted
   c. It is a reasonable software solution for critical-section handling
   d. None of the above

4. Which of the following is not correct about the semaphore with no busy waiting?
   a. Each semaphore has an associated waiting queue
   b. Block operation places the process on the waiting queue
   c. Wakeup operation directly put the process in the ready queue
   d. None of the above

5. Which of the following is correct about mutex lock?
   a. The value is either 1 or 0
   b. Requires busy waiting
   c. None of the above
d. Both of the above

6. Which of the following is not correct about semaphores?
   a. We can implement a counting semaphore as a binary semaphore
   b. Semaphores offer more sophisticated ways to achieve synchronization than mutex locks
   c. They can be used to implement bounded-buffer problem
   d. They have the same purpose as spinlocks

Part 3: A longer question (4 x 2 points each = 8 points)

The above code is extracted from the pages 42 and 43 of cha5.ppt, i.e., the first version of writer and reader algorithm design for readers-writers problem. Please answer the following questions.

1. What is the key purpose of line 2 and line 6 in the reader algorithm (just explain one purpose)?

2. Why do we need lines 4-5 in the reader algorithm? In other words, without line 4-5, what may happen?

3. Why do we need lines 12-13 in the reader algorithm? In other words, without lines 12-13, what may happen?

4. Does this readers-writers design have the starvation problem? Why?