CECS 326-01 Chapter Exam 4 Study Guide

Exam 4 is scheduled on 11/4/2021. Exam questions are mostly objective that include multiple choice, and true or false. The exam covers first part of Lecture Nots 3 - Synchronization (Slides 1-33). It is important to understand, for each of the following terms, what it is, what it is for, and all relevant concepts related to it in operating systems.

- Race condition
- An example of race condition in a bounded-buffer solution for the producer/consumer problem using a counter
- Critical section problem, and requirements of solution to the critical-section problem
- Algorithms for the critical-section problem with two processes: two simple algorithms and their deficiencies, Peterson's algorithm
- Needs of handling of critical sections in OS, approach differs depends on if kernel is non-preemptive or preemptive
- Hardware support for solving critical-section problem in preemptive kernel:
  - Disable interrupts, how it works, and its drawbacks
  - Provide atomic hardware instructions (e.g., test_and_set, swap) to be used to implement "locking" mechanism, how it works, why such instructions are needed, drawbacks
  - Solving critical-section problem using test_and_set:
  - Solution without bounded-waiting
  - Solution with bounded-waiting
- Software support for solving critical-section problem:
  - Mutex lock
  - Semaphore (can be used for enforcing mutual exclusion and other synchronization)
    - With busy waiting
    - Without busy waiting
- Semaphore solution for classical problems of synchronization
  - Bounded-buffer problem
  - Readers and writers problem
  - Dining philosophers problem