Process Synchronization

Review Questions

Section 5.1

5.1 If the current value of counter = 5, what are its possible values if the producer and consumer processes run concurrently?

5.2 What is the term for describing the situation where shared data may be manipulated concurrently and the outcome of the execution depends upon the order of access?

Section 5.2

5.3 What is the term used to describe the segment of code where shared data is accessed and possibly manipulated?

5.4 What are the three requirements a solution to the critical-section problem must satisfy?

5.5 True or False? A nonpreemptive kernel is essentially free from race conditions.

Section 5.3

5.6 True or False? There are no guarantees Peterson's solution works correctly on modern computer architectures.

Section 5.4

5.7 True or False? All solutions to the critical section problem are based on the premise of locking.

5.8 What are the two general hardware instructions that can be performed atomically?

Section 5.5

5.9 What are the two functions used with mutex locks?

5.10 True or False? A spinlock is a type of mutex lock.

Section 5.6

5.11 True or False? Semaphores can provide the same functionality as mutex locks.

5.12 What are the two operations that can be performed on a semaphore?

5.13 True or False? A binary semaphore is functionally equivalent to a mutex lock.

Section 5.7

5.14 What are the names of the two processes associated with the bounded-buffer problem?

5.15 How many writers may concurrently share the database with the readers-writers problem?

5.16 What is the problem if all philosophers simultaneously pick up their left fork?

Section 5.8

5.17 What are the two operations that can be performed on a condition variable?

5.18 Name at least one modern programming language that has incorporated the idea of a monitor.

Section 5.9

5.19 What are the two states of a Windows dispatcher object?

5.20 What is available in Linux for updating an integer variable without having to use locks?

5.21 True or False? Linux uses spinlocks for both single and multiple processor systems.

5.22 What are the Pthreads operations for locking an unlocking a mutex lock?

Section 5.10

5.23 Provide at least one alternative to mutex locks, semaphores, reader-writer locks, and monitors that provide support for concurrent programming.

Section 5.11

5.24 True or False? The system model for deadlocks first requires a process request a resource, then use the resource, and finally release the resource.

5.25 What are the four necessary conditions for characterizing deadlock?

5.26 Describe one strategy for dealing with deadlocks?

5.27 What is the only reasonable condition that can be used to prevent deadlocks from occurring?