

1. Consider the following program. Can this program solve the mutual exclusion problem for two processes?

```
1.  boolean blocked[2];
2.  int turn;
3.  void P(int id)
4.  {
5.      while (true) {
6.          blocked[id] = true;
7.          while (turn != id) {
8.              while (blocked[1-id])
9.                  /* do nothing */
10.             turn = id;
11.         }
12.         /* critical section */
13.         blocked[id] = false;
14.         /* remainder */
15.     }
16. }
17. void main()
18. {
19.     blocked[0] = false;
20.     blocked[1] = false;
21.     turn = 0;
22.     parbegin (P(0), P(1));
23. }
```

2. Refer to the solution to the readers/writers problem using semaphore with writers have priority. Assume that a reader is reading and no writer and reader are waiting for the time being.

- a) What will be the values of the semaphores when a writer wants to write while the first reader is reading?
- b) Continue with a), what will be the values of the semaphores when a second reader wants to read while the first reader is still reading?
- c) Continue with b), what will be the values of the semaphores when a third reader wants to read while the first reader is still reading?
- d) Continue with c), what will be the values of the semaphores when a second writer wants to write while the first reader is still reading?
- e) Which one will resume first when the first reader finishes reading, assuming all the semaphores are *strong semaphores*?

Self-test

1. _____ is when the sequence of instruction is guaranteed to execute as a group, or not execute at all, having no visible effect on system state.
 - A. Critical section
 - B. Mutual exclusion
 - C. Atomic operation
 - D. Starvation

2. The requirement that when one process is in a critical section that accesses shared resources, no other process may be in a critical section that accesses any of those shared resources is _____.
 - A. starvation
 - B. deadlock
 - C. mutual exclusion
 - D. atomic operation

3. A _____ is an integer value used for signaling among processes.
 - A. semaphore
 - B. message
 - C. deadlock
 - D. critical section

4. The three operations that may be performed on a semaphore are initialize, _____ and _____.
 - A. semaphore
 - B. message
 - C. deadlock
 - D. critical section

5. A semaphore that does not specify the order in which processes are removed from the queue is a _____ semaphore.
 - A. weak
 - B. general
 - C. strong
 - D. binary

6. Refer to the solution to the bounded-buffer producer/consumer problem using semaphore. Assume that the size of the buffer is 10. What is the value of each semaphore when a producer is inserting data into an empty buffer while no consumer is waiting?
 - A. $s=1; n=0; e=10$
 - B. $s=0, n=0; e=9$
 - C. $s=0; n=1; e=10$
 - D. $s=0; n=1; e=9$