CSCI 40300/ECE 40800
Operating Systems– Fall 2016
Quiz 6
Solutions

Name: _____

Question:	1	Total
Points:	15	15
Score:		

Normalized Total to $100 = 100 \times \text{Total}/15 =$ _____ (what will appear in Canvas gradebook).

1. The following producer/consumer solution for a bounded buffer of size 1 sometimes stops working. (Assume that the program is syntactically correct.)

```
semaphore mutex(1), empty(1), full(0);
int ResultBuffer[1];  // The shared buffer
producer() {
   while (1) {
      mutex.P();
      empty.P();
      ResultBuffer[0] = whatever;
      mutex.V();
      full.V();
   }
}
consumer() {
   while (1) {
      mutex.P();
      full.P();
      whatever = ResultBuffer[0];
      mutex.V();
      empty.V();
   }
}
```

Please look at next page for the questions.

Name: _____

(a) (5 points) What's wrong with it?

Answer: If producer runs two consecutive iterations in a row it will be stopped at the `empty.P()` of the second iteration. But the `mutex.P()` was executed by producer so that the consumer can not go past the `mutex.P()`. The system is deadlocked. On the other hand, if consumer runs first, it locks the mutex and is stopped at `full.P()`. Then the producer can't proceed since it will be stopped at `mutex.P()`.

(b) (5 points) Explain how to fix it?

Answer: Switch the `mutex.P()` and `empty.P()` in producer and switch `mutex.P()` and `full.P()` in consumer.

(c) (5 points) Explain why your fix works?

Answer: (1) A producer will be stopped at the `empty.P()` if it runs two consecutive iterations. A consumer can then pass the `mutex.P()` and proceed. (2) If consumer runs first, it is blocked at `full.P()` without locking the mutex. The producer can then proceed.