CS1760: Multiprocessor Synchronization	Due 29 September 2022

Homework 1

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Problem 1. For each of the following, state whether it is a safety or liveness property. Identify the bad or good thing of interest.

1. Patrons are served in the order they arrive.

2. Anything that can go wrong, will go wrong.

3. No one expects the Spanish Inquisition.

4. Two things are certain: death and taxes.

5. As soon as one is born, one starts dying.

6. If an interrupt occurs, then a message is printed within one second.

7. If an interrupt occurs, then a message is printed.

8. I will finish what Darth Vader has started.

9. The cost of living never decreases.

10. You can always tell a Harvard man.

Problem 2. In the producer-consumer fable, we assumed that Bob can see whether the can on Alice's windowsill is up or down. Design a producer-consumer protocol using cans and strings that works even if Bob cannot see the state of Alice's can (this is how real-world interrupt bits work).

Problem 3. Running your application on two processors yields a speedup of S_2. Use Amdahl's Law to derive a formula for S_n, the speedup on n processors, in terms of n and S_2.

Problem 4. You have a choice between buying one uniprocessor that executes five zillion instructions per second, or a ten-processor multiprocessor where each processor executes one zillion instructions per second. Using Amdahl's Law, explain how you would decide which to buy for a particular application.