Homework Exercise #6
Due: November 17, 2011

6. Consider an asynchronous shared-memory system where any number of processes may experience halting failures.

An m-valued conflict detector has two operations:

- m-ANNOUNCE(v) (where $v \in \{0, 1, \ldots, m-1\}$) returns ack

- m-DETECT returns true if two *different* values have previously been announced and false otherwise.

(a) Give a formal sequential specification of an m-valued conflict detector.

(b) Let $k = \lceil \log_2 m \rceil$. Suppose you have 2-valued conflict detectors $C_0, C_1, \ldots, C_{k-1}$. Is the following implementation of an m-valued conflict detector correct (i.e., linearizable)? Prove your answer is correct.

```
m-ANNOUNCE(v)
    let v_{k-1}v_{k-2}...v_1v_0 be the binary representation of v
    for i ← 0..k − 1
        C_i.2-ANNOUNCE(v_i)
    end for
end m-ANNOUNCE

m-DETECT
    for i ← 0..k − 1
        if C_i.2-DETECT then return true
    end for
    return false
end m-DETECT
```