Homework Assignment 4.

Due: September 13, 2004 at class.

Problem 1:

Define the Consensus object type (i.e., describe its interface and provide the sequential specification).

Problem 2 (Attiya and Welch, Exercise 5.19):

Show that the Consensus problem cannot be solved in a system with only test-and-set variables and three processes, if two processes may fail by crashing. The proof may follow the same framework as that used in class to prove the wait-free impossibility for read/write registers.

Define $C \overset{\neg\{p_1,p_2\}}{\sim} C'$, to mean that state C is indistinguishable from C' to all processes but processes p_1 and p_2.

Prove that for any two $C \overset{\neg\{p_1,p_2\}}{\sim} C'$, C_1 is v-valent iff C_2 is v-valent, for $v \in \{0, 1\}$.

Use the above result to show that there exists an initial bivalent state.

Complete the proof by showing that the Diamond Lemma holds in this model. (This is where the most of the work is.)