CS 425/ECE 428 Distributed Systems
Homework 4
Due by 7 p.m., Thursday, February 25, 2016

Type your answers.
Submit via Compass2g.

Total points: 25

(1) (10 points) Consider the approximate consensus algorithm discussed in Lecture 10 (see the notes provided for this algorithm). Suppose that f = 1 (i.e., at most 1 process or node may crash). Suppose that the system contains 4 nodes, with inputs 1, 2, 3 and 4, respectively.

After one round of the approximate consensus algorithm, determine the **largest** and the **smallest** value that the local variable y may take at any of these nodes.

(2) (10 points) Consider any algorithm (discussed in the class) for tolerating f crash failures in a synchronous system. Recall that the algorithm performs f+1 rounds in total.

In this question, assume that f is an even number.

Suppose that in a particular system it is guaranteed that, in any given round, either no process crashes, or exactly 2 processes crash. Also, at most f processes may crash during the entire execution (where f is even).

Answer Yes or No: Under the above assumptions, will the algorithm work correctly if we reduce the number of rounds from f+1 to (f/2)+1 ?

Explain briefly.

Hint: The reason the original algorithm with f+1 rounds works correctly is that there exists at least one round during which no new process fails.

(3) (5 points) Let us consider a certain asynchronous system in which process p_0 never fails, and all the other processes are aware of this fact. Up to f of the remaining process may crash. Is it possible to achieve consensus in this system? If you answer yes, present a correct algorithm, and briefly explain why you believe it is correct.