CSE 466 Exam II **16 March 2006**

Name: _____ ID#: _____

Please read through the *entire* examination first! This exam was intended to be completed in 50 minutes. There are 3 problems for a total of 100 points. The point value of each problem is indicated in the table below. There will be generous partial credit so make sure to get to every problem.

Each problem is on a separate sheet of paper. Write you answer *neatly* in the space provided. Do not use any other paper to hand in your answers.

Good luck.

Problem	Max Score	Score
1	30	
2	30	
3	40	
TOTAL	100	

1. TinyOS Terms (30 points)

Define the following terms related to features of the TinyOS operating system and provide a basic definition as well as an example of when each feature would be used. Relate your examples to the Flock project, if possible.

a) Asynchronous code

b) Posting a task

c) Active messages

d) “HPL” designated files

e) Components and interfaces

f) Parameterized interface

2. Flock Improvement (30 points)

During the flock concert, it became clear that we needed a more effective way of specifying which birds should perform a command. Our current method specified a range of nodeIDs. The protocol required the node to check whether the node's ID was within the specified range, before performing the command it received. If not, it ignored the packet. However, the nodes we wanted to control were not in a contiguous range making the process of selecting a set of nodes difficult and we ended up sending individual messages to each node.

a) Suggest a way that we could easily assign a node to a set that we could later refer to in the command packets. Describe the communication between the node and controller during this process and what would be the key payload elements of each packet sent between them.

b) Describe how you would go about setting up three different sets, then get two of these sets to execute the same command, and the third to do a different one, and, finally, get each of the three sets of birds to sing a different song. Consider a total of 6 birds, 2 in each set to start but then discuss how your approach scales to larger flocks (is the number of packets linear in the number of birds, linear in the number of songs we want to get them to sing, etc.).

3. Radio Protocols (40 points)

In the Flock project, AdjustGlobals packet were broadcast from the controller (node 0) to all the birds. The assumption was that all birds would be within radio range. Let's consider how to handle a much larger flock where many nodes are not in range of the controller. Clearly, a bird receiving an AdjustGlobals packet may have to rebroadcast it.

Discuss the following aspects of this problem:

a) How would you forward the AdjustGlobals packet? Would you change anything in the packet payload?

b) How would you ensure that the propagation of the packet will eventually end? Do you need to add to or change the payload of the packet to help with this issue?

c) Does your approach guarantee that each node will eventually receive the packet (assuming there is at least one path connecting it to the controller)? How much waste is there in your scheme (that is, how many times might a node hear the same AdjustGlobals packet get repeated)?