CS 414 Assignment 4
5 points per answer for 2a-f, 10 points per answer for 1, 3, 4a-d and 5 (100 max). Due Friday March 10.

Short-answer questions (just a sentence or two each,please).

1. In class we saw a deadlock avoidance algorithm that breaks circular waits by ordering resources. Assume a total ordering of resources and single instance of each resource type. Assume that processes acquire resources in decreasing order. Does releasing resources before acquiring new resources cause a deadlock? (Provide a short explanation for your answer).

2. In a real computer system, neither the resources available nor the demands of processes for resources are consistent over long periods (months). Resources break or are replaced, new processes come and go, new resources are bought and added to the system. If deadlock is controlled by the banker's algorithm, which of the following changes can be made safely (without introducing the possibility of deadlock), and under what circumstances?

   (a) Increase *Available* (new resources added).

   (b) Decrease *Available* (resources permanently removed from system).

   (c) Increase *Max* for one process (the process needs more resources than allowed; it may want more).

   (d) Decrease *Max* for one process (the process decides it does not need that many resources).

   (e) Increase the number of processes.

   (f) Decrease the number of processes.

3. Compare the loss rate perceived by an application under the following cases (provide a short justification for your answer)

   - application sends large UDP packets (that might require 50 to 100 fragments), trusting the sending host to fragment them and the receiving host to reassemble them.
   - application sends small UDP packets that do not need to be fragmented.

4. Machines A and B are connected by a network that supports the Internet protocols. You have purchased extremely accurate GPS-based clocks, and have begun to measure the delay (latency) for messages sent from A to B, or from B to A.

   (a) You discover that it takes twice as long for messages to get from A to B as it does for them to get from B to A. List some possible explanations.

   (b) You notice that in the A to B direction, the delays vary quite a bit; some messages arrive in as little as 1ms but others need as long as 10ms. What could cause such an issue?

   (c) Suppose that you have more machines: C, D, E, etc. Is it possible that sometimes it would be faster to send a message from A to C and then from C to B (e.g. relayed through C) than to send it directly from A to B? Why?

   (d) The wireless network in your house has a weak signal and reports a lot of packet loss, but still connects machine A to B at 11MBits/second. Yet you test download speeds with TCP and find it running at only 100KBits/second between A and B. What could explain this very slow performance?

5. We move the mail server from 127.64.13.7 to 127.64.13.81 and mail simply dies for 3 days. Explain how DNS might be responsible for the problem. How would you fix the problem?