712-S14 Exam and MS comp

Due date: Last day of class, but you can have more time (at the risk of an incomplete).

Start each problem on a new page.
Write clearly or type
Use only one side of the paper (if hardcopy)
Letter size paper (just in case)

Problem 1

Define the reliable broadcast channel (as in hw3.1 and the relevant Piazza comments).

(So if you already have a correct solution from hw3, just use that.)

Problem 2

Write down the inverse of your service program in problem 1.

Problem 3

Use the timestamp mechanism to implement the reliable broadcast channel from problem 1. (Hint: Associate an extended timestamp with every user message sent, and deliver user messages in order of extended timestamps.)

Your answer will consist of two programs (in SESF notation or similar), say `RbDist` and `Rb`. `RbDist` starts a fifo channel and an `Rb` system at each address (as in, e.g., the timestamp-based distributed lock implementation).

Problem 4

Prove that your program in problem 3 implements your service in problem 1. Follow the usual steps.

1. Write the program, say `Z`, of the service inverse and `RbDist` systems.
2. Indicate the atomicity breakpoints in `Rb` to be used when analyzing `Z`.
3. Write the safety and progress assertions that should hold.
4. Prove that the assertions hold. Operational proofs are fine.

Problem 5 (do this only for the MS comp)

Give assertional proofs of the safety properties in step 4 of problem 4.