Communicating Automata

Define the notion of weak bisimulation over a labelled transition system. [3 marks]

A one-cell buffer $B$ can be defined by $B \overset{\text{def}}{=} \text{in}.B'$, $B' \overset{\text{def}}{=} \text{out}.B$ (the content of messages being ignored).

Define the linking operator $\bowtie$, in terms of basic operators, so that $B \bowtie B$ represents two buffer cells in sequence.

Derive $B \bowtie B \xrightarrow{\text{in}} B' \bowtie B$ from the basic transition rules, and draw the complete transition graph of $B \bowtie B$. [3 marks]

A lossy buffer cell $L$ (like $B$ except that it may lose messages) can be defined by $L \overset{\text{def}}{=} \text{in}.L'$, $L' \overset{\text{def}}{=} \text{out}.L + \tau.L$. Draw the complete transition graphs of both $B \bowtie L$ and $L \bowtie B$. [4 marks]

Show that $B \bowtie L \not\approx L \bowtie B$, by considering the state $L \bowtie B'$ (accessible from $L \bowtie B$) and showing that no appropriate state of $B \bowtie L$ can be observation equivalent to $L \bowtie B'$. [4 marks]

Is $L \bowtie L \approx B \bowtie L$ true? Outline an argument to prove or disprove it. [3 marks]