2000 Paper 6 Question 9

Semantics of Programming Languages

What does it mean to say that two configurations of a labelled transition system are *bisimilar*? [3 marks]

Describe a labelled transition system for a language of communicating processes with input prefixing ($c(x) \,.\, P$), output prefixing ($\bar{c}\langle E\rangle \,.\, P$), an inactive process ($\mathbf{0}$), choice ($P + P'$), parallel composition ($P|P'$) and channel restriction ($\nu\, c \,.\, P$). You may assume there is a relation $E \Downarrow n$ which defines when an integer expression E evaluates to an integer n. [7 marks]

For each of the following pairs of processes, say whether or not they are bisimilar. Justify your answer in each case.

(*a*) $\bar{c}\langle 1\rangle \,.\, ((\bar{c}\langle 2\rangle \,.\, \mathbf{0}) + (\bar{c}\langle 3\rangle \,.\, \mathbf{0}))$ and $(\bar{c}\langle 1\rangle \,.\, \bar{c}\langle 2\rangle \,.\, \mathbf{0}) + (\bar{c}\langle 1\rangle \,.\, \bar{c}\langle 3\rangle \,.\, \mathbf{0})$ [4 marks]

(*b*) P and $\nu\, c \,.\, ((c(x) \,.\, \mathbf{0})|(\bar{c}\langle 1\rangle \,.\, P))$, where c does not occur in P [6 marks]