1997 Paper 9 Question 15

Communicating Automata and Pi Calculus

Define the notions of *sort* and *sorting* for the π-calculus, and explain what is meant by the assertion that a process P *respects* a sorting. Give *two* reasons why sorting is useful. [7 marks]

Simple data values can be represented as abstractions in the π-calculus. In particular, if *True* and *False* are abstractions representing the two truth-values, then $b.True$, $b.False$ are processes in which each truth-value is located at b.

Define the abstractions *True* and *False*. Also, for arbitrary processes P and Q, define the abstraction $CASES(P, Q)$ such that

$$CASES(P, Q)\langle b\rangle \mid b.True \longrightarrow^* P$$
$$CASES(P, Q)\langle b\rangle \mid b.False \longrightarrow^* Q$$

and demonstrate these reductions. Give a sorting respected by all these constructions. [6 marks]

Discuss, with technical details, the general method by which π-calculus abstractions may also be used to represent compound data structures such as lists. [7 marks]