2003 Paper 8 Question 14

Denotational Semantics

(a) Explain the meanings of *soundness*, *adequacy* and *full abstraction* for the operational and denotational semantics of PCF. Why does the denotational semantics of PCF fail to be fully abstract? [10 marks]

(b) State Scott's principle of fixed-point induction. [2 marks]

(c) Let D and E be domains, and $h : D \to E$ a strict continuous function, i.e. such that $h(\bot) = \bot$.

Show that the property $h(x) = y$, in $x \in D$ and $y \in E$, is admissible. [3 marks]

(d) Let $f : D \to D$ and $g : E \to E$ be continuous functions such that $g \circ h = h \circ f$. Prove
$$h(fix(f)) = fix(g)$$
by fixed-point induction. [5 marks]