10 Semantics of Programming Languages (PMS)

Explain the issues involved in the design of type systems with subtyping for a language with types

\[ T ::= \text{INTEGER} | \text{REAL} | \text{BOOL} | \text{UNIT} | T_1 \rightarrow T_2 | \{ \text{lab}_1 : T_1, \ldots, \text{lab}_k : T_k \} | T \text{ REF} \]

You should include precise rules for subsumption and for the definition of the subtype relation \(<::\). You should also include examples as appropriate, but there is no need to include the standard operational semantics or expression typing rules.

[20 marks]