

1994 Paper 5 Question 9

Foundations of Logic Programming

What are Herbrand models and what are their applications to Computer Science?
[5 marks]

Obtain an Herbrand universe, showing all steps, starting from the following set of axioms:

$$(\exists x y)\neg(x < y) \quad (\forall x)(\exists y)x < y$$

Then take two models such that $<$ denotes “less than” on the natural numbers and obtain two distinct Herbrand models.
[8 marks]

A dual form of Skolemisation, called \forall -Skolemisation, is like ordinary Skolemisation except that it exchanges the rôles of the quantifiers. It eliminates universal quantifiers, instead of existential quantifiers, using Skolem functions.

Prove that \forall -Skolemisation preserves validity and discuss its possible applications.
[7 marks]