COMPUTER SCIENCE TRIPOS Part II – 2023 – Paper 8

13   Types (nk480)

Consider Gödel's T, the simply-typed lambda calculus with function and natural number types, with zero, successor and iterator term formers for the natural number type.

(*a*)   Define a logical relation suitable for establishing the termination of closed programs in this language.   [5 marks]

(*b*)   State the fundamental lemma for this language.   [3 marks]

(*c*)   State formally what it means for a set of terms X to be "closed under reduction".   [2 marks]

(*d*)   Prove the fundamental lemma holds for the iterator case.   [10 marks]