

COMPUTER SCIENCE TRIPOS Part IA – 2013 – Paper 1

4 Discrete Mathematics I (SS)

- (a) Write down the introduction and elimination rules for the universal quantifier (\forall), the existential quantifier (\exists) and negation (\neg) in structured proof. [6 marks]
- (b) Write down the introduction rule for implication (\implies) in structured proof. [1 mark]
- (c) Write down a structured proof of the following sentence.

$$(\forall x. \neg P(x)) \implies \neg \exists x. P(x)$$

[5 marks]

- (d) Write down a structured proof of the following sentence. Clearly state any proof rules that you use in addition to those included in part (a) and part (b).

$$(\neg \forall x. \neg P(x)) \implies \exists x. P(x)$$

[8 marks]