

2011 Paper 6 Question 6

Logic and Proof

(a) *Unification* is used to find a common instance of two terms.

(i) Briefly explain the unification algorithm, outlining non-trivial cases.

[4 marks]

(ii) What is the importance of the *occurs check* in the unification algorithm?

[2 marks]

(iii) Find a most general unifier for each of the following three pairs of terms or explain why none exists. Do not rename variables prior to unification.

$$j(a, z, f(x)) \quad j(y, f(y), z)$$

$$f(g(x, y), a, h(z)) \quad f(z, x, y)$$

$$f(g(x), y, x) \quad f(z, f(z), a)$$

[6 marks]

(b) Prove or disprove the following sequent of S4 modal logic:

$$\Box A, \Box \Diamond \Box B \Rightarrow \Box \Diamond \Box (A \wedge B)$$

[8 marks]