

Logic and Databases, COMP0009,

From a previous exam question.

Marks for each part of each question are indicated in square brackets.

Calculators are NOT permitted.

1. This question is about first-order tableaux.

a. For each of these formulas state if the formula is an α -formula, β -formula, δ -formula, γ -formula, or a literal.

1. $\neg P^2(x, y)$
2. $\exists x(P^2(x, y) \vee P^2(y, x))$
3. $\neg \exists x \forall y P^2(x, y)$
4. $\neg(\forall x P^2(x, x) \vee \neg \exists y P^2(x, y))$

[8 marks]

b. Explain how to expand a δ -formula in a tableau.

[7 marks]

c. Describe a good method of scheduling the expansion of nodes in a tableau. In particular, say which nodes should be expanded first and how you should schedule the expansion of γ nodes.

[8 marks]

d. For each of these formulas construct a tableau with the formula at the root and state whether the formula is satisfiable or not.

1. $(\forall x \forall y (P^2(x, y) \rightarrow \neg P^2(y, x)) \wedge \exists x P^2(x, x))$
2. $(\exists x Q^1(x) \wedge \forall x \exists y P^2(x, y)).$
3. $\exists x \forall y P^2(x, y) \wedge \neg \forall x \exists y P^2(y, x).$

[10 marks]

[Total=33 marks]