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Computational Logic, WS 2025/2026,
Exercise sheet 7,
due date: **14 December 2025, 23:59 via Moodle**

Problem 31 (20 Points)

Using the basic tableau procedure prove that the following statement is a tautology:

It is necessarily true that if elephants are pink then the moon is made of green cheese or if the moon is made of green cheese, then elephants are pink.

Problem 32 (30 Points)

Consider the following formulas:

- a) $A = \forall x(p(x) \vee q(x))$
- b) $B = (\exists x p(x)) \vee (\forall x q(x))$
- c) $C = (\forall x p(x) \wedge q(x))$
- d) $D = (\forall x p(x)) \wedge (\forall x q(x))$

Using the first-order tableau procedure prove that $A \Rightarrow B$, $C \Rightarrow D$ and $D \Rightarrow C$ are valid.

Hint: Construct first the negation of those formulas and then show that they are unsatisfiable.

Problem 33 (20 Points)

The university canteen have organized their new menu offering varied meals, i.e., there must be meat meal as well as vegetarian one. Use the tableau procedure to prove that it is not possible that only meat meals are offered.

Hint: You need to explicitly state that meat meal is different from vegetarian meal.

Problem 34 (30 Points)

Let a and b be constants, x, y, z, u , and v be variables, p and q be predicates and f and h be functions. Define the most general unifier, respectively demonstrate that not unifiable for the following sets of terms:

- a) $p(a, x, f(g(y)))$ and $p(z, h(z, u), f(u))$
- b) $p(x, x, y)$ and $p(f(z), u, g(v))$
- c) $q(g(a, y), h(b), h(y))$ and $q(x, h(z), h(x))$.