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Computational Logic, WS 2025/2026,
Exercise sheet 3,
due date: **9 November 2025, 23:59 via Moodle**

Problem 11 (20 Points)

Imagine the following situation. On Halloween night, you meet two old ladies, a saint and a witch. The saint always tells the truth, and the witch always lies. You ask the first one if she is a saint, and she mumbles such that you may not understand her answer. The second lady then looks at you and says: *She said yes*. Then she adds: *But she is a witch*. Using the resolution method help yourself to determine which one is the saint who always tells the truth.

Problem 12 (20 Points)

Let P , Q and R be propositional variables. Given the following formulas:

- $(\neg P \vee Q) \wedge \neg Q \wedge P$
- $P \wedge Q \wedge R$
- $(P \vee Q) \wedge \neg Q$
- $(P \vee Q) \wedge (R \vee Q) \wedge \neg R \wedge \neg Q$
- $(P \vee Q) \wedge (\neg P \vee Q) \wedge R$
- $(P \vee Q) \wedge (\neg P \vee Q) \wedge (\neg R \vee \neg Q) \wedge (R \vee \neg Q)$

Using DPLL, check if any of them is satisfiable (provide a derivation tree and also demonstrate any applications of unit propagation and pure literal elimination) and if yes provide a satisfying assignment.

Problem 13 (20 Points)

In our group at the university we have the following situation: *If Anton fails the English exam, then Prof. Bean will be disappointed. If Clara fails the Mathematics exam, then Prof. Doors will be disappointed. If either Prof. Bean or Prof. Doors is disappointed, then the rector will be notified. The rector has not heard from either of the two professors. Anton passed the English exam and Clara passed the Mathematics exam.*

- a) Express the above problem in propositional logic and construct the CNF of this formula (show the intermediate steps);
- b) Using DPLL check if it is satisfiable. You need to supply the derivation tree (also demonstrate any applications of unit propagation and pure literal elimination).

Problem 14 (20 Points)

Let p , q , s and t be propositional variables. Given the formula

$$((p \Rightarrow q) \Rightarrow (s \wedge t)) \Rightarrow ((p \Rightarrow s) \vee (q \wedge t)).$$

- a) Construct the CNF of this formula (show the intermediate steps);
- b) Using MiniSat check if it is satisfiable. You need to supply screenshots of your input and output files integrated into the pdf file of your solution.

Problem 15 (20 Points)

There is an old Spanish recipe for preparing Hola-Guacamole. The book with that recipe is lost and professor Diaz is trying to recover it from the memories of local people. The following facts are known:

- a) As a main ingredient exactly one of the following products is used: papas, artichoke and asparagus.
- b) Exactly one of the following is used as the predominant flavor: mole, curry, salsa.
- c) Hola-Guacamole is cooked in exactly one of the following types of cookware: pot, wok, saucier.
- d) Hola-Guacamole is cooked in a pot exactly when curry is used for flavoring it or artichoke is the main ingredient.
- e) Hola-Guacamole is cooked in a wok or asparagus is the main ingredient.
- f) Hola-Guacamole is cooked in a saucier if and only if salsa is used for flavoring it.
- g) If Hola-Guacamole is flavored with mole or curry, then papas is used as a main ingredient.
- h) If Hola-Guacamole is flavored with salsa, it is ***not*** cooked in a saucier.

Using Limboole, help professor Diaz to find out what the main ingredient is; which flavor is used; in which type cookware is cooked. You need to supply screenshots of your input and output files integrated into the pdf file of your solution.