EPFL Formal Verification Course Exam, October 2022

The exam is from 15:15 to 18:00. Do not open the exam until we tell you to.
Place your CAMIPRO card on your desk.
Put all electronic devices in a bag away from bench.
Write using permanent pen (no graphite nor heat-disappearing pen).

Write answers to different problems (1–6) on disjoint sheets of white paper that we supply.
Write your name, SCIPER and question number on top of each sheet you return.
Do not write the solutions that you want us to grade on the sheets with exam questions; please take these printed exam sheets with you after the exam.

Each subquestion is scored independently. Wrong answers do not penalize other parts.

We advise you to first solve questions that you find easier. If you expect you are running out of time on a particular problem, try to convince us that you know the right strategy to solve it.

You are allowed to use every true statement (e.g. theorem, equality) from the lecture slides provided that you clearly repeat it and refer to it as "seen in the lecture" (preferably with slide title or lecture name).

The exam is open book in the sense that you are allowed to take with you any printed material. Please do not take slides that are hand-annotated but only original ones or printed annotations.

The maximal number of points on the exam is 40.

Small reminder: the following are the names of some basic properties of a relation r:

- reflexive: $\forall x.\ (x, x) \in r$
- antisymmetric: $\forall x. \forall y.\ (x, y) \in r \land (y, x) \in r \to x = y$
- symmetric: $\forall x. \forall y.\ (x, y) \in r \to (y, x) \in r$
- transitive: $\forall x. \forall y. \forall z.\ (x, y) \in r \land (y, z) \in r \to (x, z) \in r$

Equivalence relation is a relation that is reflexive, symmetric, and transitive.
Partial ordering relation is a relation that is reflexive, antisymmetric, and transitive.