The deadline is January 15, midnight.

1. Consider the equality symmetry. Prove that for every orbit-finite nominal sets X and Y, for some $n \in \mathbb{N}$ there is an equivariant partial surjective function

$$f : X^n \to Y$$

2. Consider a nondeterministic two-way automaton in the equality symmetry. That is, the transition relation is a subset

$$\delta \subseteq (Q \cup \{\vdash, \dashv\}) \times A \times (Q \times \{\vdash, \dashv\}) \times \{-1, 1\}$$

where $\vdash$ and $\dashv$ stand for start/end markers. For $k \in \mathbb{N}$, an automaton is called k-reversal bounded if on every input, every run (accepting or not) makes at most k changes of direction. (A change of direction is a $+1$ transition followed by a -1 transition, or the other way round.) Prove that the following question is undecidable:

> Is there some $k \in \mathbb{N}$ such that the automaton is k-reversal bounded?

3. Prove that the following problem is decidable: given a nondeterministic two-way automaton (as in the previous exercise) and $k \in \mathbb{N}$, decide if some word is accepted by a run with k reversals.

4. Prove that the symmetry for the Fraisse class of all graphs has least supports.