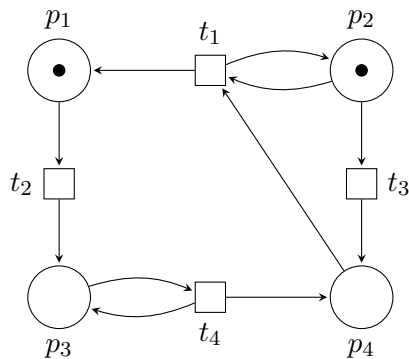# Homework 11

To hand in on December 20th at the beginning of the exercise session, or by mail (before 14:00) at `marie.fortin@lsv.fr`.

Answers can be written in french or in english.

Exercise 1.

1. Construct a coverability graph for the Petri net below:

2. Give an example of a net $\mathcal{N}$ and two possible coverability graphs of N that are non-isomorphic to each other. In each case, indicate the order in which nodes were treated in the worklist.

Exercise 2.

1. Let $\mathcal{N} = \langle P, T, F, W, m_0 \rangle$ be a Petri net. Show that if $\mathcal{N}$ has an invariant x such that $x(p) > 0$ for every place $p \in P$, then there exists k such that $\mathcal{N}$ is k-safe.

2. Let $\mathcal{N}$ be the following Petri net:
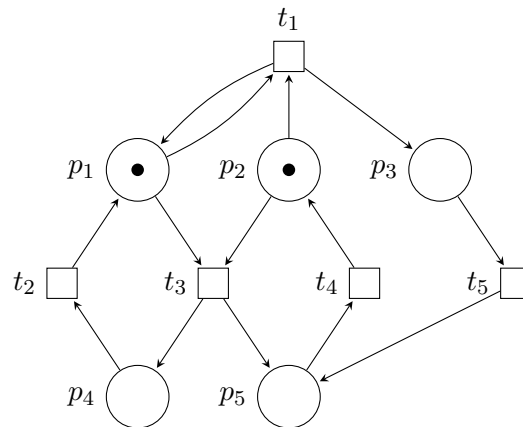
(a) We say that a trap $S \subseteq P$ is *minimal* when there is no other trap S' such that $\emptyset \subsetneq S' \subsetneq S$. Give an example of a minimal marked trap in $\mathcal{N}$.

(b) Give examples of two (linearly independant and non-null) invariants.

(c) Using invariants and traps, prove that p_3 and p_4 cannot be marked concurrently in any reachable marking.