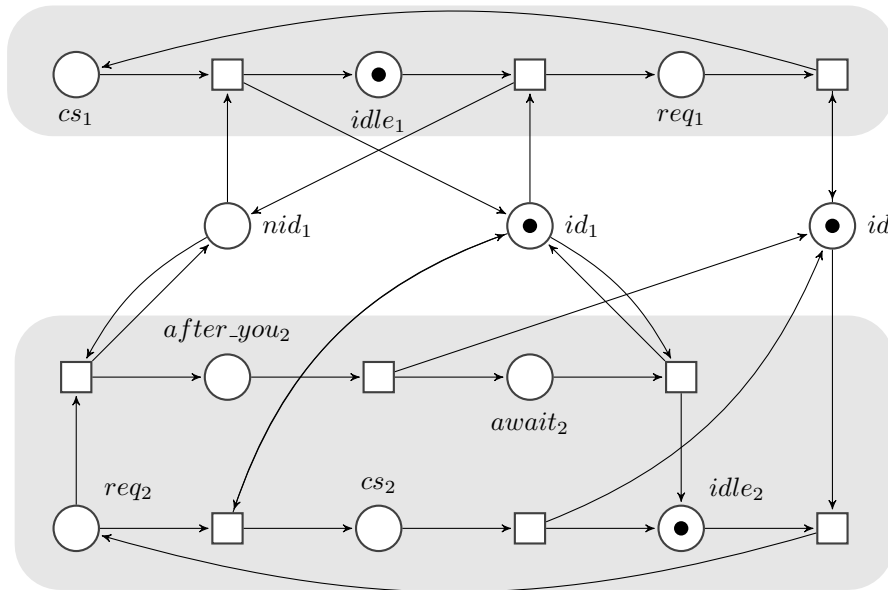# Exercise Sheet 5

Problem 1: Lamport's Mutual Exclusion Algorithm

Consider the Petri net below, describing Lamport's 1-bit mutual exclusion algorithm.

(a) Set up the co-linear property one would want the mutex to satisfy and determine the connectivity and trap matrices of the given Petri net.

(b) Prove that the *basic verification system* is feasible.

(c) Prove that the *enhanced verification system* is infeasible.

How do you interpret the fact that *bvs* is feasible and *evs* infeasible?

Problem 2: Minimal Traps vs Generating Traps

(a) Give a Petri net where the minimal traps are a family of generating traps and describe that family.

(b) Give a Petri net where the set of minimal traps are not generating and describe both the minimal traps and a family of generating traps.

(c) Give a Petri net where the only trap is the empty set.

Problem 3: Family of Generating Traps

Add arcs to the Petri net N below so that its family of generating traps contains exponentially (in N's size) many traps. Once added, describe $N = (S, T, W)$ formally and prove that the family of generating traps is exponential in N's size.

p_1 ◯ p_2 ◯ p_n ◯

     $\boxed{t_{1,2}}$ $\cdots$ $\cdots$ $\cdots$ $\boxed{t_{n-1,n}}$

◯   ◯   ◯

p_{-1} p_{-2} p_{-n}