Network Analysis SS 17
Constrained-based modelling

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Deadline: Friday, 16 June, 08:00 am

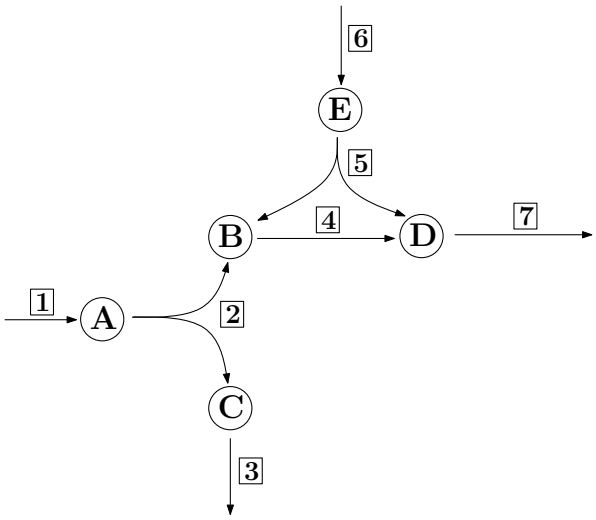
1 Exercise *Tutorial*

Consider a metabolic network $\mathcal{N}$ given by its stoichiometric $(m \times n)$-matrix S and the set of irreversible reactions Irr.

1. What is an elementary flux mode in $\mathcal{N}$?
2. Give a mixed integer linear program to compute a shortest elementary flux mode in $\mathcal{N}$ involving some particular reaction j_0 (you may assume $Irr = \{1, \ldots, n\}$).
3. Give a mixed integer linear program to compute k shortest elementary flux mode in $\mathcal{N}$ involving some particular reaction j_0 (you may assume $Irr = \{1, \ldots, n\}$).

2 Exercise *Tutorial*

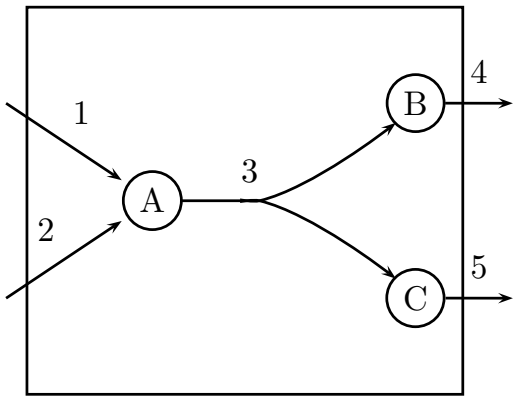
Consider the following network:



1. Give an inequality description of the steady-state flux cone of $\mathcal{N}$, assuming that all stoichiometric coefficients belong to $\{-1, 0, 1\}$.
2. Determine the elementary modes of $\mathcal{N}$.
3. Determine for all pairs of reactions i and j, $i \neq j$, whether i is directionally coupled to j.
4. Which pairs of reactions are fully coupled?

3 Exercise *Homework*

Consider the following network:



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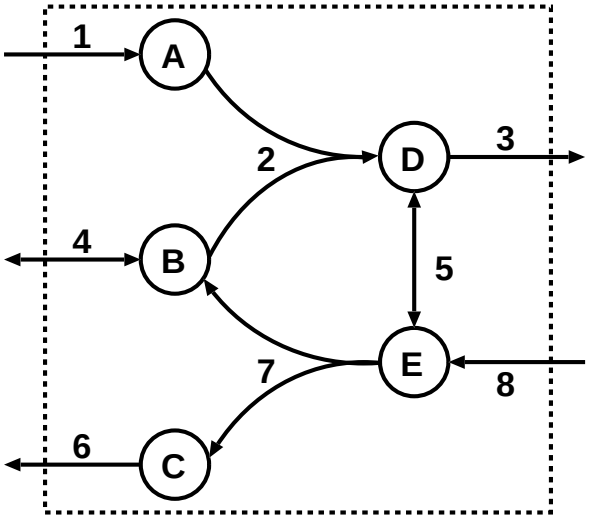

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4. Which pairs of reactions are fully coupled?

Justify your answers and send the solutions for exercise 3 and 4 until Friday, 16. June, 08:00 am to `Annika.Roehl@fu-berlin.de`