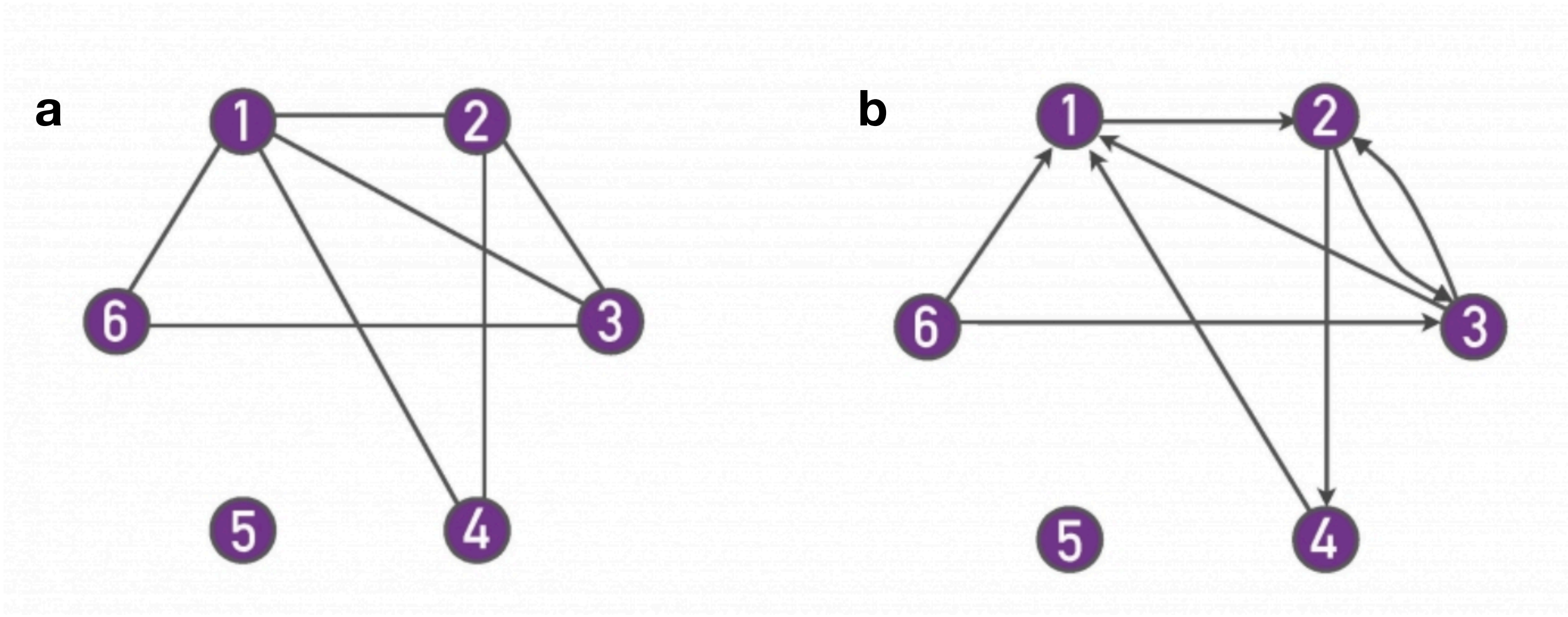
Exercise



- The corresponding adjacency matrices.
- The corresponding link lists.
- Determine the average clustering coefficient of the network shown in a
- If you switch the labels of nodes 5 and 6 a, how does that move change the adjacency matrix? And the link list?
- What kind of information can you not infer from the link list representation of the network that you can infer from the adjacency matrix?
- In the (a) network, how many paths (with possible repetition of nodes and links) of length 3 exist starting from node 1 and ending at node 3? And in (b)?
- Count the number of cycles of length 4 in network b

Exercises

The following 6 reactions describe the intracellular kinetics of a generic virus:

$$
\begin{aligned}
gen &\xrightarrow{k_1} tem \\
tem &\xrightarrow{k_2} \emptyset \\
tem &\xrightarrow{k_3} tem + gen \\
gen + struct &\xrightarrow{k_4} \emptyset \\
tem &\xrightarrow{k_5} tem + struct \\
struct &\xrightarrow{k_6} \emptyset
\end{aligned}
$$

where *gen* represents the genomic viral nucleic acids, *tem* the template of viral nucleic acid transcribed to synthesize every viral component, and *struct* the viral structural protein. In details, reaction k_1 models the integration of the genomic viral nucleic acids into the host genome to form templates. Furthermore *gen* can be packaged (i.e. reaction k_4) within structural proteins to form progeny virus as described by the fourth reaction. After the initial virus infection, the amplification of the viral template is modeled by reaction k_3. Then, the synthesis of the viral structural protein is represented by reaction k_5. Finally, reactions k_2 and k_6 represent the degradation of *tem* and *struct*, respectively. The

1. Draw the corresponding Stochastic Petri Net (SPN) model;
2. Write P, T, and C for the SPN model defined at point 1;
3. Assuming the M_0 = gen(1)+struct(2) list the transitions enabled in M_0
4. Assuming the M = gen(2)+struct(2)+tem(3) shows system evolution due to the consecutive firings of transitions k2→k2→k3→k4. (Reports all the intermediate markings.)

Exercises

The following 12 reactions describe the intracellular signalling pathway involved in neuroinflammation, a key mechanism in numerous brain diseases [

name	description	init. values
A	Axin2 protein	0
A_m	Axin2 mRNA	0
G	GSK3 protein	$50 \cdot N$
L	LRP5/6 coreceptor	$20 \cdot N$
B	free β-catenin	0
AL	Axin2-LRP5/6 complex	$50 \cdot N$
GA	GSK3-Axin2 complex	0
C	GSK3-Axin-β-catenin complex	0

$$R_1 : C \xrightarrow{k_1} B + GA$$

$$R_2 : C \xrightarrow{k_2} GA$$

$$R_3 : B + GA \xrightarrow{k_3} C$$

$$R_4 : A + G \xrightarrow{k_4} GA$$

$$R_5 : GA \xrightarrow{k_5} G + A$$

$$R_6 : \varnothing \xrightarrow{k_6} B$$

$$R_7 : Am \xrightarrow{k_7} A + Am$$

$$R_8 : A + L \xrightarrow{k_8} AL$$

$$R_9 : AL \xrightarrow{k_9} A + L$$

$$R_{10} : 2B \xrightarrow{k_{10}} 2B + Am$$

$$R_{11} : Am \xrightarrow{k_{11}} \varnothing$$

$$R_{12} : AL \xrightarrow{k_{12}} L$$

1. Draw the corresponding Stochastic Petri Net (SPN) model;
2. Write ODEs for B a A and Am
3. Write the initial marking according to the third column and the enable transitions in this marking.