Algorithmic Game Theory  
Winter Term 2021/22  
Tutorial Session - Week 12

Exercise 1:
Consider the following instance of the house-allocation problem. There are six agents $a,...,f$ and their preferences are given by:

\[
\begin{align*}
    a : & b > d > f > e > c > a, & b : & d > a > c > e > f > b, \\
    c : & e > f > a > c > b > d, & d : & e > a > b > c > d > f, \\
    e : & f > e > c > b > d > a, & f : & d > a > b > c > f > e. 
\end{align*}
\]

Find a stable allocation $\pi$ using the Top Trading Cycle Algorithm.

Exercise 2:
Consider the problem of Pairwise Kidney Exchange by Matching from Lecture 22. The graph below depicts an instance of agents (that is, patient-donor pairs) and possible pairwise exchanges, i.e. nodes represent patient-donor pairs with an edge connecting two nodes if an exchange between the two patient-donor pairs is possible.

Use the mechanism of Section 4 from Lecture 22 and consider agents in ascending order of agent indices (which is independent of the reports) to determine the set of maximum matchings $M_5$. 

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**Diagram:**

```
  5
 /|
/  |
1---4
    |
    |
  2---3
```