CS-E3190 Principles of Algorithmic Techniques

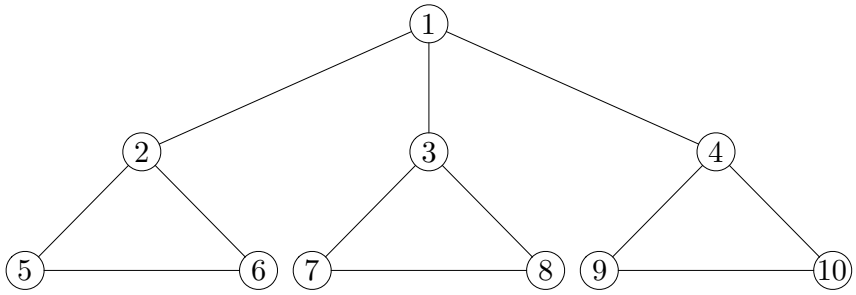
01. Graph Bootcamp – Graded Exercise

Please read the following **rules** very carefully.

- Do not consciously search for the solution on the internet.
- You are allowed to discuss the problems with your classmates but you should **write the solutions yourself**.
- Be aware that **if plagiarism is suspected**, you could be asked to have an interview with teaching staff.
- Each week the second exercise is an *individual exercise*, and the teaching staff will not give hints or help with them. You are allowed to ask for hints for the first exercise.
- In order to ease grading, we want the solution of each problem and subproblem to start on a **new page**. If this requirement is not met, **points will be deduced**.

1. **Graph theory proofs.**

   (a) (3p.) Prove that the size of the maximum matching for the following graph is four. Give a maximal matching that is not maximum.



   (b) (2p.) Using Handshaking lemma, prove that the average degree of any tree is $O(1)$.

2. **Individual exercise: Graph coloring.** (5p.) Prove that the chromatic number of the following graph is 4.