

Homework Assignment #3 (100 points)

Due: Part on April 3 (Ex 1-4); Part on April 10 (Exercise 5).

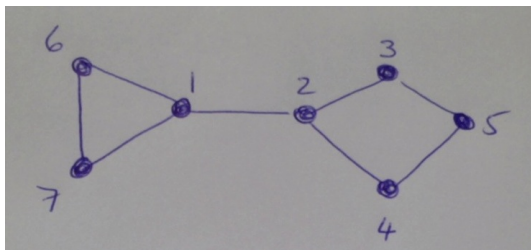
1. (50 points) **Heuristic searches for Maximum cliques** (written question)
Develop a hill-climbing algorithm, a simulated annealing algorithm and tabu search algorithm for the Maximum Clique problem (the problem of finding a clique of maximum cardinality in a graph).

Before giving the **pseudocode** for each algorithm, describe your choices for neighbourhood function. If some of these features are common to more than one algorithm, please explain them only once, indicating in which algorithms they will be used.

For each algorithm, write a paragraph explaining which parameter variations you recommend to be tried in order to experiment with each algorithm.

You will be marked for clarity, conciseness, and quality of algorithm design.

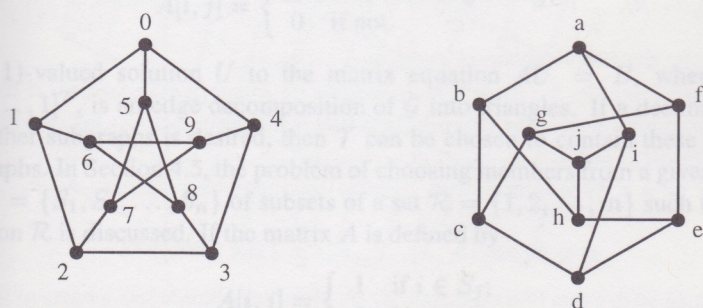
2. (5 points) **Finding isomorphism by hand**
Do exercise 7.1 of the textbook.
3. (10 points) **Certificate for trees**
Do exercise 7.2 of the textbook. Simulate the algorithm by hand computation, showing your tree and labels at each step.
4. (10 points) **Reverse the certificate for a tree**
Do exercise 7.3 of the textbook. Show how the tree is built step by step.
5. **Certificate for graphs** (25 marks) Show the state space tree that results from running Algorithm 7.8 CERT1() on the following graph. At each node of the state space tree, show the original ordered partition and the ordered partition after running REFINE() and the result of *Res*. For leaves of the state space tree, also show *Num*.



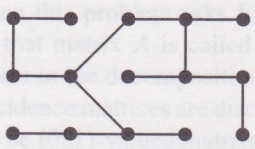
Exercises of the textbook included.

Exercises

7.1 Find an isomorphism between the following two graphs. (These are two different representations of the Petersen graph.)



7.2 Use the algorithm described in Section 7.3.1 to compute the certificate for the tree given below



7.3 Use the algorithm described in Section 7.3.1 to compute the tree whose certificate is 000010111001010110011100001110001111.