# **Assignment 6** – deadline: lab 7 (week 13 - 14)

Solve 1 of the 16 problems below (assigned to you in the Attendance Table) using the graph that you implemented in Assignments 1 and 2.

1) Given an undirected graph and a natural number k, find a clique of size k using backtracking.

2) Given an undirected graph, find all cliques of maximum size.

3) Given an undirected graph and a natural number k, find all independent sets of size k using backtracking.

4) Given an undirected graph, find all the maximum independent sets.

5) Given an undirected graph, find an approximation of the maximum independent set using the following heuristic: always add the vertex with smallest degree then remove the neighbors of the added vertex from the graph.

6) Given an undirected graph, find a Hamiltonian cycle using backtracking.

7) Given an undirected graph, find all the minimum dominating sets.

8) Given an undirected graph, find an approximative minimum dominating set using the following heuristic: always add the vertex with highest degree, then remove all of its neighbors from the graph.

9) Given a weighted undirected graph with negative cycles, find the minimum cost path between 2 given vertices.

10) Given a weighted undirected graph, find the minimum cost Hamiltonian cycle. (solve the Travelling Salesman Problem).

11) Given an undirected graph, find all the minimum vertex covers.

12) Given an undirected graph, find an approximation of the minimum vertex cover using the following heuristic: always add the vertex with highest degree then remove all incident edges from the graph.

13) Given an undirected graph, find an approximation of the minimum vertex cover using the following heuristic: choose a random edge that is not covered then add its 2 endpoints to the vertex cover.

14) Given an undirected graph and a natural number k, find a k-coloring of the graph (colors are from 1 to k) using backtracking.

15) Given an undirected graph, find the approximation of the chromatic number (c') and a c'-coloring of the graph using the following heuristic: always select the highest degree uncolored vertex and color it with the minimum color that does not conflict with its neighbors.

16) Given an undirected graph, find the chromatic number of the graph (c), and a c-coloring of the graph.