

Name:

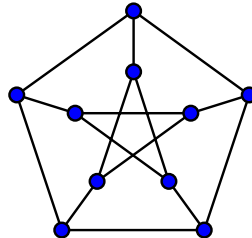
SAMPLE EXAM #2

1. DEGREE SEQUENCES

- a) When do we say that a sequence of numbers can be realized by simple graph?
- b) Using Havel–Hakimi-algorithm, decide if the following sequence can be realized by simple graph or not: 1, 1, 1, 2, 4, 5, 5, 5.

2. MATCHINGS

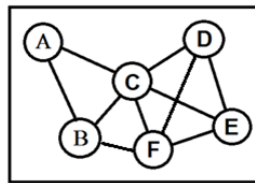
- a) Find a perfect matching in the following graph:



- b) What do we mean on Tutte blocking set?
- c) State Tutte's theorem.

3. VERTEX COLORING

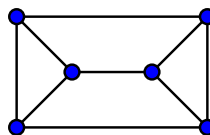
- a) What do we mean on proper vertex coloring? What is the chromatic number of a graph?
- b) Color the vertices of the graph below by the greedy coloring algorithm, in the following order: A, B, C, D, E, F.



- c) State the four color theorem.
- d) What is the connection between the chromatic number of G and the parameter $\omega(G)$? Prove your answer.

4. HAMILTONIAN CYCLE, TRAVELING SALESMAN PROBLEM

- a) What do we mean on Hamiltonian cycle?
- b) Give a Hamiltonian cycle in the following graph.



- c) State Dirac's theorem.
- d) Present the traveling salesman problem, and a 2-approximation algorithm for it (without proving its correctness).