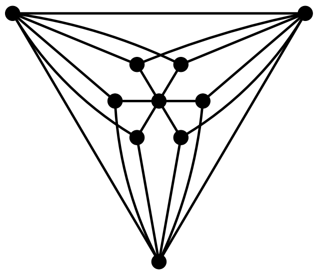
Introduction to Computer Science

Repeated Second Midterm Test, 5/4/2014

1. Determine the chromatic number of the graph below.



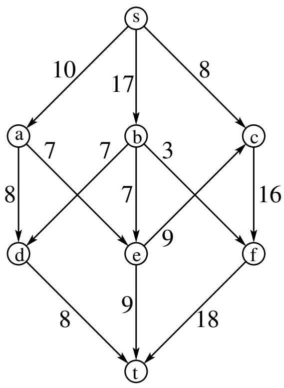
2. Determine the maximum number of independent edges in the graph above.

3. Let G be a simple graph on 7 vertices for which both G and its complement $\overline{G}$ contain a Hamilton-cycle. Prove that the chromatic number of G is either 3 or 4.

4. Let $S = \{a_1, a_2, \ldots, a_n\}$ be an n-element set, and let $S_1, S_2, \ldots, S_m$ be subsets of S. Suppose that each of the subsets contain at least 4 elements, and that each element is contained in at most 3 subsets. Prove that we can select m distinct elements, one from each of the subsets.

5. Show that if G is a simple k-regular graph on 9 vertices then $\chi(G) + \chi(\overline{G}) \geq 10$.

6. Determine a maximum flow and a minimum cut in the network below.



Total work time: 90 min.
The full solution of each problem (including explanations) is worth 10 points.
Grading: 0-23 points: 1, 24-32 points: 2, 33-41 points: 3, 42-50 points: 4, 51-60 points: 5.