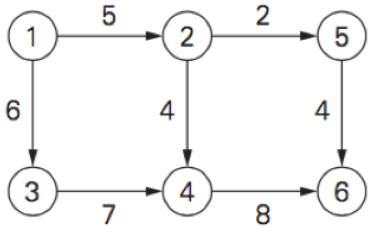
CS 3623

Homework 10: due Nov. 30th.

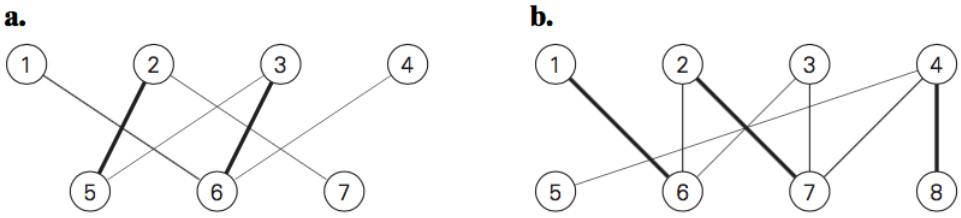
Exercise 1 [5 pts] Can we apply the simplex method to solve the knapsack problem (see Example 2 in Section 6.6)? If you answer yes, indicate whether it is a good algorithm for the problem in question; if you answer no, explain why not.

Exercise 2 [10 pts] Apply the shortest-augmenting path algorithm to find a maximum flow and a minimum cut in the following networks.



Exercise 3 [10 pts] *Dining problem* Several families go out to dinner together. To increase their social interaction, they would like to sit at tables so that no two members of the same family are at the same table. Show how to find a seating arrangement that meets this objective (or prove that no such arrangement exists) by using a maximum-flow problem. Assume that the dinner contingent has p families and that the i^{th} family has a_i members. Also assume that q tables are available and the j^{th} table has a seating capacity of b_j .

Exercise 4 [10 pts] For each matching shown below in bold, find an augmentation or explain why no augmentation exists.



Exercise 5 [10 pts] Suppose there are five committees A, B, C, D, and E composed of six persons a, b, c, d, e, and f as follows: committee A's members are b and e; committee B's members are b, d, and e; committee C's members are a, c, d, e, and f; committee D's members are *b*, *d*, and *e*; committee E's members are b and e. Is there a *system of distinct representatives*, i.e., is it possible to select a representative from each committee so that all the selected persons are distinct?