

CIS 502: Algorithms

SPRING 2008

Homework 2: Due Feb 20th at 3:00pm in class or Levine 502 or 302. You can also submit earlier.

Late submissions (accepted till 5pm, 21st) will lose 25%. The solution will be up by 5pm, 21st (on Blackboard website) and no further submissions will be accepted. ¹.

Ideally you should solve all problems in Chapter 4.

Problem 1 : Exercise 6, page 191.

Problem 2: (see exercise 9 on page 192): Let $G = (V, E)$ be a connected graph with n vertices, m edges, and positive edge costs that you may assume are all distinct. Let $T = (V, E')$ be a spanning tree of G ; we define the *bottleneck edge* of T to be the edge of T with the greatest cost.

A spanning tree T of G is a *minimum-bottleneck spanning tree* if there is no spanning tree T' of G with a cheaper bottleneck edge.

- Is every minimum-bottleneck tree of G a minimum spanning tree of G ? Prove or give a counterexample.
- Is every minimum spanning tree of G a minimum-bottleneck tree of G ? Prove or give a counterexample.
- Give a $O(n + m \log n)$ algorithm using Union-Find data structure.
- Give a $O(n + m \log n)$ algorithm using DFS.

Problem 3 : Exercise 12 on page 193–194.

Problem 4 : Exercise 13 on page 194–195.

Problem 5 : Exercise 20 on page 199-200.

Problem 6 : Exercise 26 on page 202.

Problem 7 : Exercise 29 on page 203.

¹Recall that each of you can discuss the problems with *exactly one other person* but have to write the solutions on your own. Further you have to mention your collaborator. You are expected to think about the problems. You **cannot** use newsgroup or internet resources to solve the problems. If the problem is solved in any of the books suggested in class and your solution is modeled after such, you need to add reference to it.