

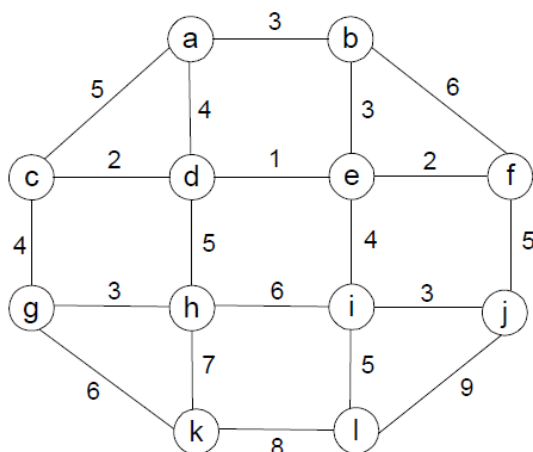
Analysis of Algorithms
CS 375, Spring 2020

Homework: Greedy Algorithms and MST's
Due by 11:59pm Anywhere on Earth, **DATE TBD**

- To submit this HW, please email a PDF named `HW_GreedyAlgos_<yourName>` to `eaaron@colby.edu`.
- **READING:** From your textbook, please read Ch. 16 up to (and including) Section 16.1, and Ch. 23.

Exercises

1. Apply Kruskal's algorithm to the following graph, to find a minimum spanning tree. (Break ties, where applicable, by alphabetical ordering on the endpoints of edges.) For your answer, list all of the edges added to a Minimum Spanning Tree by Kruskal's algorithm. List them in the order in which each edge is added and, for each added edge, give a very brief (1 sentence is fine!) explanation of the reasons behind choosing that edge. You are welcome to include a picture of the MST as part of your answer, but you do not need to; listing the MST's edges in order is sufficient.



2. **Bridge Crossing Revisited!** Consider the generalization of the bridge crossing exercise earlier in the semester (HW1, exercise 6) in which there are $n > 1$ people whose bridge crossing times are $t_1, t_2, \dots, t_n$. All the other conditions of the problem are the same as before: at most two people at a time can cross the bridge (and they move with the speed of the slower of the two) and they must carry with them the only flashlight the group has.
 - (a) Design a greedy algorithm for getting the entire group across the bridge, with the goal of minimizing the total time for the group to cross. Give a very brief explanation of what makes it a greedy algorithm.
 - (b) Show that the greedy algorithm does not always yield an optimal solution (i.e., a minimal crossing time) for every instance of this problem by giving a concrete counterexample **with the smallest number of people** for which it is not optimal.