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.

![Graph Image]

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 $t_1, t_2, \ldots t_n$. 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.