1. Consider the minimum cost spanning tree problem pictured in Figure 4 of the Glover article from Interfaces. Using the starting solution given perform four iterations of tabu search with a tabu list of length three containing dropped edges only and an aspiration criterion of the best cost yet found.

2. A tabu search code for the P-median problem and a 100 by 100 shortest path distance matrix spd100.unfrm will reside in ∼rrkinc/homework/ and on my homepage shortly. The C code generates an initial median solution randomly using Park’s random number generator and a subroutine called CONFIG. Please run the following 4 computational experiments.

   a. \( nLoc = 15, \ SEED = 777, \ MEMSIZE = 35 \) and \( MAXIT = 150 \).

   b. \( nLoc = 15, \ SEED = 777, \ MEMSIZE = 5 \) and \( MAXIT = 150 \).

   c. \( nLoc = 15, \ SEED = 777, \ MEMSIZE = 35, \ MAXIT = 150 \) and remove the lines of code that check the aspiration criterion.

   d. \( nLoc = 15, \ SEED = 777, \ MEMSIZE = 5, \ MAXIT = 150 \) and remove the lines of code that check the aspiration criterion.

I want you to spend some time analyzing the results. First, a graphical plot of iteration number versus objective function value should be constructed. R can do this, but you may do it anyway you wish. Here are some of the issues I want you to address. Compare and contrast the performance with and without the aspiration criterion. At what iteration did tabu moves appear? How did this vary between the four runs? At what iteration did a move first satisfy the aspiration criterion? How did this vary between the two runs? How did the total number of moves that met the aspiration criterion vary between the two runs? When did each of the 4 runs uncover its first local optimum? How did this vary between the four runs? How high was the peak that led out of the first local optimum (i.e. what was the largest objective value that occurred after the first local optimum and the next iteration in which an improved objective value was found)? For each individual run, at what iteration were the best 3 solutions uncovered? Compare and contrast these results between the four runs. Can you detect any cycles in the four runs? If so, explain why and give an example. Any other ways you want to compare and contrast the computational results are welcome.

3. As a result of your extensive tabu search experience I’d like you to find as good as solutions as you can for the 150 node data set (spd150.galvao in the usual location) for the p-median problem with \( p = 15, 20 \) and 25. The optimal objective values are 7390, 6454 and 5875, respectively. The tabu search code, tabu3.c, in ∼rrkinc/homework/ is setup to solve this problem. Please comment on the parameter values (including SEED choices) that led to your best solutions.