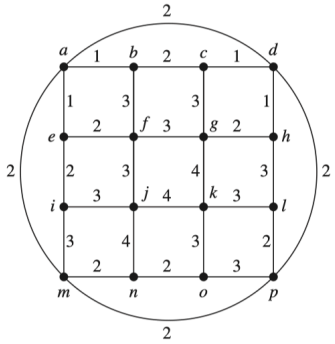
Exercise Sheet 18

Discrete Mathematics, 2021.12.7

1. ([R], Page 802, Exercise 4) In Exercises 4 use Prim's algorithm to find a minimum spanning tree for the given weighted graph. You can pick any vertex as your starting point and you should describe: on every step, which edge is added. (Proof is not needed.)



2. ([R], Page 802, Exercise 8) Use Kruskal's algorithm to find a minimum spanning tree for the weighted graph in Exercise 4. You should describe: on every step, which edge is added. (Proof is not needed.)

3. ([R], Page 803, Exercise 19) Show that there is a unique minimum spanning tree in a connected weighted graph if the weights of the edges are all different.

4. ([R], Page 770, Exercise 24) Use Huffman coding to encode these symbols with given frequencies: A: 0.10, B: 0.25, C: 0.05, D: 0.15, E: 0.30, F: 0.07, G: 0.08. What is the average number of bits required to encode a symbol? (Please also write down intermediate results after every "merge".)

5. ([R], Page 770, Exercise 26(a)(b)(exclude variance))
   a): Use Huffman coding to encode these symbols with frequencies a: 0.4, b: 0.2, c: 0.2, d: 0.1, e:0.1 in two different ways by breaking ties in the algorithm differently. First, among the trees of minimum weight select two trees with the largest number of vertices to combine at each stage of the algorithm. Second, among the trees of minimum weight select two trees with the smallest number of vertices at each stage. (Please also write down intermediate results after every "merge".)

   b):Compute the average number of bits required to encode a symbol with each code.