HW1

Hu, CSE 101, Fall 2002

Part a

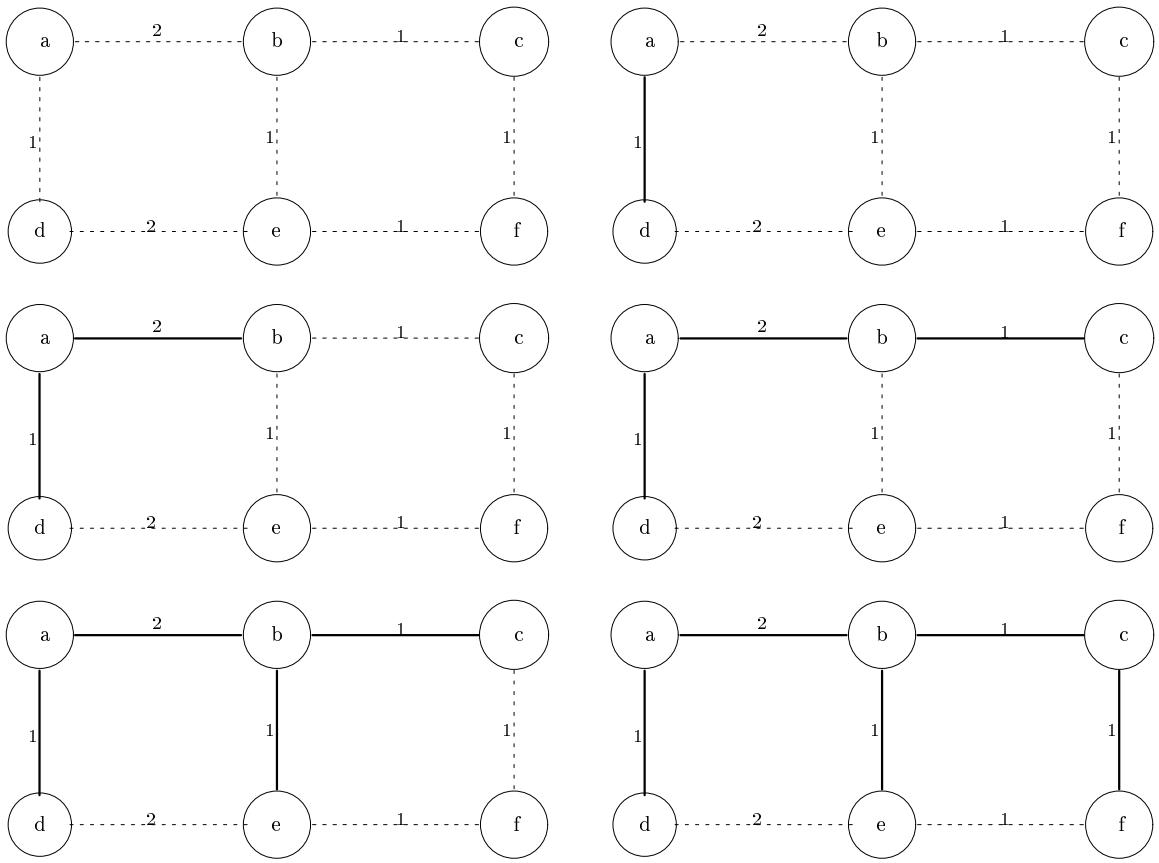

Figure 1: The progression of Dijkstra's algorithm for part a. Note: This is not the only correct solution

Figure 1 has the progression of Dijkstra's algorithm for the sequence given in part a, along with one of the correct weightings. There were many other correct weightings which may, amongst other things, cause edge (e, f) to be used instead of edge (c, f).

Part b

It turned out that this sequence was impossible to achieve. Here is the argument why:
We are given the sequence (b, c, d, f, e). Recall that we are only allowed to use edge weights of 1 or 2. So to force Dijkstra's to pick the first three nodes in that order requires that

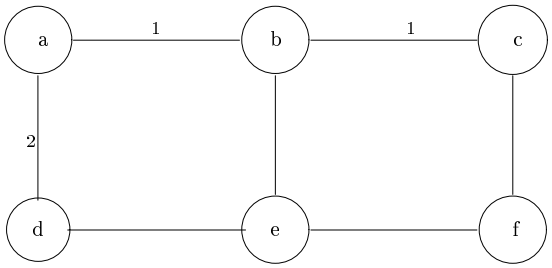

Figure 2: A partial weighting for part b.

we weight the edges (a, d), (a, b) and (b, c) as in Figure 2. Now observe that the maximum weight the path (a, e) can have is 3, using the node b as an intermediate node. Also observe that the smallest weight path (a, f) could have is also 3, using b and c as intermediate nodes. So the best possible case we get is a tie. Unfortunately to get the above ordering we want f to win that tie. This is impossible since ties are broken alphabetically by predecessor nodes. The predecessor of e is b, while the predecessor of f is c. So f loses, making the sequence unattainable.

Part c

This sequence, (b, e, f, d, c), is also impossible to achieve given the limitation in edge weights. Here observe that the minimum weight of (a, f) is 3. While the maximum edge weight of (a, d) is 2. Thus d will always be picked before f, making the sequence unattainable.