3E1 Problem Sheet 16

April 5 – 11, 2004

Lecturer: Claas Röver

1. (a) Determine the adjacency matrix of the graph in Fig. 1.

   (b) What is the maximum number of edges in a graph with n vertices? Justify your answer.

2. (a) Sketch the graph whose adjacency matrix is

$$\begin{pmatrix} 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \end{pmatrix}$$

   and decide whether it is the same graph as the one in Fig. 1.

   (b) The graph you sketched in part (a) should have precisely two vertices, say u and v, which are incident to exactly two edges. Perform Moore's algortithm to find a shotest path between u and v and show your work in the sketch, i.e. show the labels and highlight a shortest path.

3. Consider the graph G in Fig. 2 whose edges have the shown lengths. Perform Dijkstra's algorithm on this graph in order to find the length L_j of a shortest path from vertex 1 to vertex j. Make a table whose columns are labelled by the vertices and whose rows contain the corresponding vertex labels before each execution of Step 2, underlining temporary labels. The first row of the table is $0\ \underline{2}\ \underline{\infty}\ \underline{\infty}\ \underline{\infty}\ \underline{2}\ \underline{7}\ \underline{\infty}\ \underline{\infty}$ and altogether there should be nine rows.

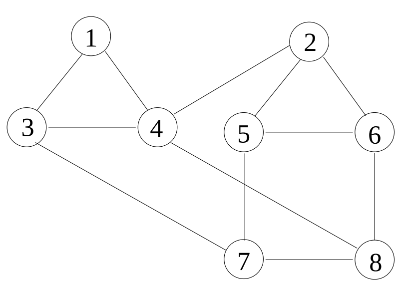

FIGURE 1

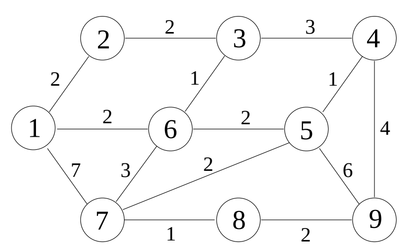

FIGURE 2