Lab. 10 - Graph Problems (1)

10.1 Graph Reading

Consider the undirected weighted graphs specified in the zip file **graphs.zip**, with the following format

```
nn na
ni nj wij
```

where the first line indicates the number **nn** of nodes and the number **na** of arcs, and the subsequent lines specify all the **na** arcs, each by a triple `<ni, nj, wij>` where **ni** and **nj** are the node identifiers and **wij** the weight of the connecting arc.

Specify a function with signature

```
function M = graph_load(filename)
```

that reads a graph with the above format from a file with name filename, and returns the adjacency matrix M of the represented graph.

Note 1: The files format assume that the nodes are numbered from **1** no **nn**.

Note 2: The graphs are (implicitly) symmetric, and so for any arc between nodes **i** and **j** there is an arc between nodes **j** and **i** with the same weight.

10.2 Subgraph Projection

Consider an undirected graph specified by its adjacency matrix **M**. Implement a function with signature

```
function S = subgraph_projection(M, Nodes)
```

that returns the adjacency matrix **S** of the subgraph of M, obtained by its projection to the nodes **Nodes**

Note: Notice that if **Nodes(i) = j**, then node **j** in graph **M** corresponds to node **i** in the subgraph **S**.

10.3 Connected Subgraph

Consider an undirected graph specified by its adjacency matrix M. Specify a function with signature

```
function [C, C_Nodes, R, R_Nodes] = connected_subgraph(M)
```

that returns the subgraph, **C**, that corresponds to the connected component that contains nodes **C_Nodes** (including node **1)**. The remaining graph, and the corresponding mapping, should also be returned as **R** and **R_Nodes**, respectively.

Note 1: Adapt function `connected` from the slides of class 9 to obtain the nodes of the subgraph, and use function **subgraph_projection**, above, to obtain the subgraphs and corresponding mappings.

Note 2: Test this function with the graphs in files "`graph_6_X.txt`"

10.4 Graph Printing

Consider an undirected graph specified by its adjacency matrix M. Specify a function with signature

```
function graph_store(M, filename)
```

that prints the graph **M** in a file with the given **filename**, with the format explained in question 1.

Note: Test this function with the graphs obtained in the previous question.