Exercises for Statistical analysis of network data-Sheet 5

1. Consider the network with adjacency matrix

$$A_1 = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}.$$

   Please form the $n \times n$ symmetric matrix of all the distances between the nodes in this network. Label at will. Please compute closeness centrality and the harmonic centrality for all nodes in this network.

2. Consider the network with adjacency matrix

$$A_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}.$$

   Please form the $n \times n$ symmetric matrix of all the distances between the nodes in this network. Label at will. Compute the closeness centrality and the harmonic centrality as well as the efficiency of the network.

3. Consider the network with adjacency matrix

$$A_3 = \begin{pmatrix} 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{pmatrix}.$$

   Please form the $n \times n$ symmetric matrix of all the distances between the nodes in this network. Label at will. Please compute closeness centrality and the harmonic centrality for all nodes in this network.

4. Count the number of triangles, and the number of 3-paths in the three networks above. What is the clustering coefficient of these networks?

5. Compute the efficiency of the three networks given above.