COM 530500 Network Science Homework #1

班級: 通訊所

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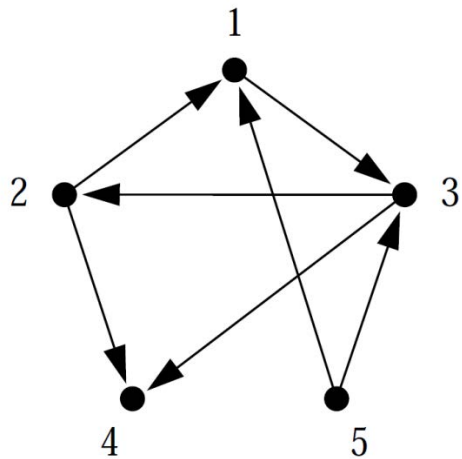
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Figure 1: Network (a).

Problem 1.(10%)

(a) (5%) Write down the adjacency matrix of network (a).

(b) (5%) Write down the cocitation matrix of network (a).
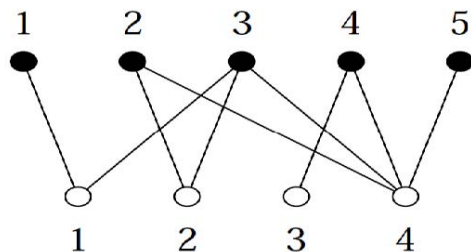
Solution: Type your answer here. ◇

Figure 2: Network (b).

Problem 2.(10%)

(a) (5%) Write down the incidence matrix of network (b).

(b) (5%) Write down the projection matrix for the projection of network (b) onto its black vertices.

Solution: Type your answer here. ◇

Problem 3.(10%) Consider a bipartite network, with its two types of vertices. Suppose there are n_1 vertices of type 1 and n_2 vertices of type 2. Show that the mean degrees c_1 and c_2 of the two types are related by $c_2 = \frac{n_1}{n_2} c_1$.

Solution: Type your answer here. ◇

Problem 4.(20%) Given

$$A = \begin{pmatrix} 0 & 2 & -1 \\ 2 & 3 & -2 \\ -1 & -2 & 0 \end{pmatrix},$$

(a) (10%) Find all eigenvalues of matrix A.

(b) (10%) Find an orthogonal matrix U that diagonalizes A.

Solution: Type your answer here. ◇

Problem 5.(15%) Read the tutorial from Ping-En Lu's GitHub repository to install Python3 and python-igraph (if you need).

Paste your screenshots of "Hello, World!" of both Python 3 (5%) and python-igraph (5%), and write a brief report (5%). (For example, you can write down some problems you encountered, and how you solved them.)

Solution: Type your answer here. ◇

Problem 6.(35%) Please download the **tvshow** dataset from Ping-En Lu's GitHub repository, and find the following information from this dataset.

- Number of nodes. (5%)

- Number of edges. (5%)

- Mean degree. (5%)

- Maximum degree. (5%)

- Diameter. (5%)

You need to upload your **python source code** to iLMS, and **write a brief report (10%) including screenshots, README file, and descriptions of your code** below the solution area. There will be no points for this problem if you do not upload your python source code to iLMS.

Solution: Type your answer here. ◇