1 Centrality & Clustering (35%)

Consider a complete graph with n nodes.

1. Compute the degree centrality of each node as a function of n.
2. Compute the closeness centrality of each node as a function of n.
3. Compute betweenness centrality of each node as a function of n.

2 Homophily & Network Formation (30%)

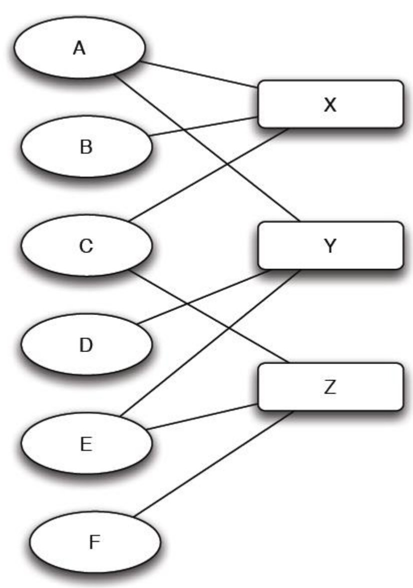
Given an affiliation network G, we define a *match* M in G as a subset of the edges in which no two edges share a common vertex. For example, M={A-X, C-Z, D-Y} is a match obtained from the graph in question 3(a).

Assume that you are given an affiliation network with *weighted* edges where weights indicate the strength of the membership. The weight of a match M is defined as the sum of the weights of its edges. Give an algorithm that can find a match with the *maximum weight* in a weighted affiliation network.

3 Homophily & Network Formation (35%)

Given an affiliation network that shows the membership of people in different social foci, researchers sometimes create a *projected graph* on just the people, where two people are joined if they have a focus in common.

1. Draw a projected graph for the following membership graph treating nodes A-F as people and nodes X-Z as social foci.



2. Suppose that you are trying to infer the structure of a bipartite affiliation network using the projected network on just the set of people shown in the following network. Explain why

any affiliation network capable of producing this projected network must have at least four foci?