

(PRINT) Name: _____ Student No.: _____

Signature: _____ Total Mark: _____ /30

CSC 200—Social and Economic Networks

Quiz 2 Sketch of Solutions

Answer all questions on this paper. You are allowed to use one, two-sided 8.5” by 11” sheet of *hand-written* notes. No other materials or aids of any type are permitted.

Time: 20 minutes; Total Marks: 30

Consider the social affiliation network given below.

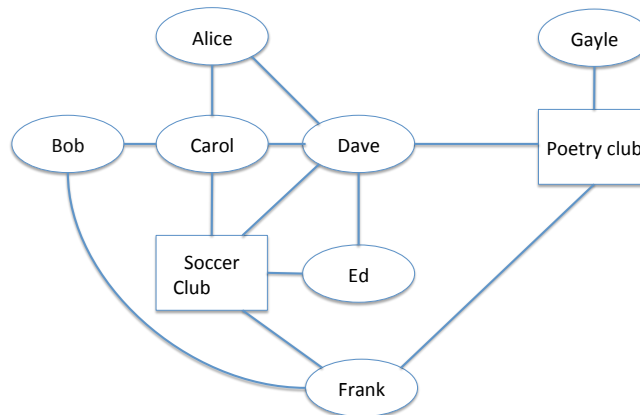


Figure 1: A social-affiliation network

Assume that triadic, focal and membership closures can occur in any given day.

10 points List all the new friendships that can take place after one day.

Solution:

By triadic closure:

Bob's new friends are Alice and Dave; Ed's new friends are Carol and Alice;

Note: we are only mentioning a new freindship once; e.g. it follows that Alice's new friends are Bob and Ed, etc.

By focal closure:

Ed's new friends are Frank and Carol; Gayle's new friends are Dave and Frank; Dave's new friend is Frank; Carol's new friend is Frank.

In total, 9 new friendships are happening in the first day.

10 points List all the additional friendships that can take place on the second day (assuming every possible closure including membership closure took place on the first day).

Solution:

The additional membership closures on the first day are:

Bob joins the soccer club; Ed joins the Soccer Club and the Poetry Club

However, on the second day all missing friendships can be realized by triadic closure without the use of these membership closures.

For example, consider Gayle. She can become friends with all remaining people by triadic closure via David.

The easiest way to see that 2 days is sufficient to make all friendships possible is to verify that the social-affiliation network has diameter 4.

In total, 6 additional new friendships are happening in the second day.

10 points Suppose all closures have the same probability p of occurring. What is the most likely new friendship that will occur on the first day?

There are three friendships that are equally likely. We will accept any one of the for full credit and 2 bonus points for naming all three.

Solution 1: By inspection, we can see that Ed and Carol have two reasons to become friends, namely triadic closure via Dave and focal closure via the soccer club.

Solution 2: we can see that Frank and Dave have two reasons to become friends, namely focal closure via poetry club and focal closure via the soccer club.

Solution 3: we can see that Frank and Carol have two reasons to become friends, namely triadic closure via Bob and focal closure via the soccer club.