

Embeddedness and Betweenness

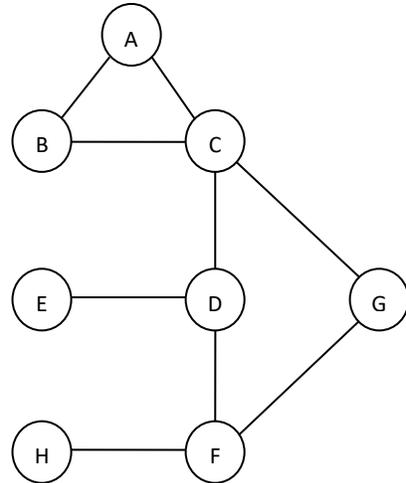
Intro to Web Science

10 points

Name _____

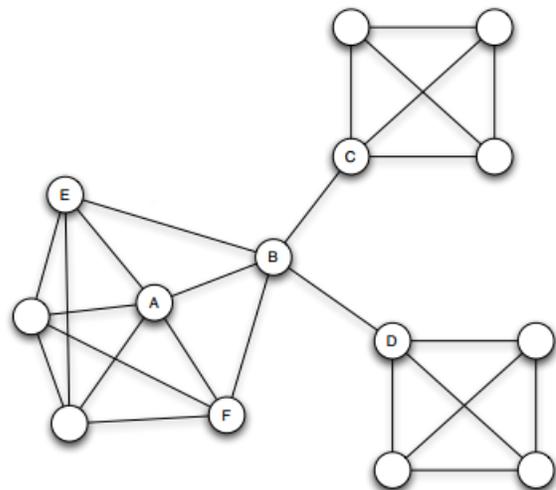
Use the graph on the right to answer questions 1-7 below.

1. (1 pt) Find the **clustering coefficient** of the nodes A and C.
2. (1 pt) Which edge(s) have the **smallest** neighborhood overlap?
3. (1 pt) Which edge(s) have the **largest** neighborhood overlap?
4. (1 pt) Find the **embeddedness** of edges E-D and B-C.
5. (1 pt) Which edges have an embeddedness of **zero**?
6. (1 pt) Find the **betweenness** of edges A-B and F-G.



7. (1 pt) Suppose the network on the right represents the social network of individuals who work in a business that is separated into multiple departments, each represented by the tightly knit components. B manages each of the departments, and as shown by the graph, there is currently no social interaction between the departments.

Suppose E has just been transferred to C's department. Assuming E keeps her previous social network intact, how will the transfer affect B?



8. (3 pts) The **Girvan-Newman** algorithm needs to find the edges of highest betweenness at each step. Chapter 3 of the book *Networks, Crowds, and Markets* (available online [here](#)) describes an efficient technique to determine the flow values beginning in subsection “B. Computing Betweenness Values” of section 3.6.
- a) First, show what the graph above (used for problems 1-6) would look like when ordered by layers using a breadth-first search **beginning at node C**, just like the example in Figure 3.18.
 - b) Then determine the shortest paths from C to each of the nodes, writing the number of shortest paths down next to each node as shown in Figure 3.19.
 - c) Finally, determine the flow values by beginning at the bottom node and working up, and write each flow value next to the edges as shown in Figure 3.20.