Assignment 3

1.

a. Draw a diagram of an example of a graph having at least four nodes in which there is a single node X

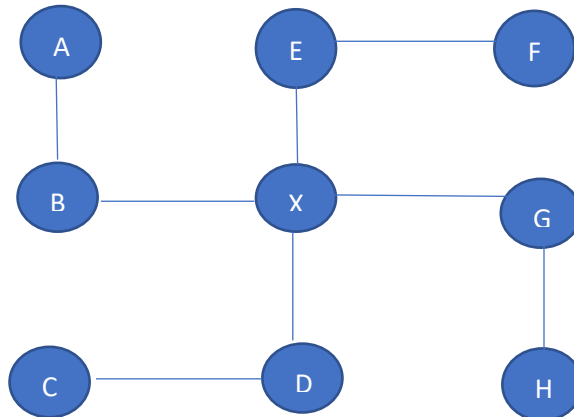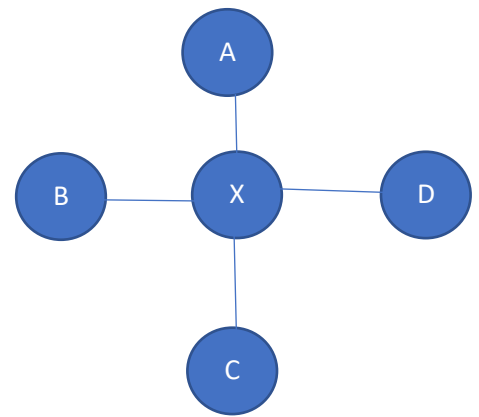that is pivotal for every pair of nodes (not counting pairs that include X).


Fig 1

Fig 2

b. Explain your answer

Here in Fig 1 node X is pivotal to each and every node in the graph, If we want to go from A -> H it has to pass through A->B->X->G->H , if we want to go from C->F , H->A, F->C , it has to pass through X and from B-> G, from D->E , G-> B and E-> D it has to go through X. In this way X is to pivotal for each pair of node.

In fig 2 Each of the node pair has to pass through the shortest path node X which is also Pivotal.

2.

a. Draw a diagram of an example of a graph in which every node is pivotal for at least one pair of
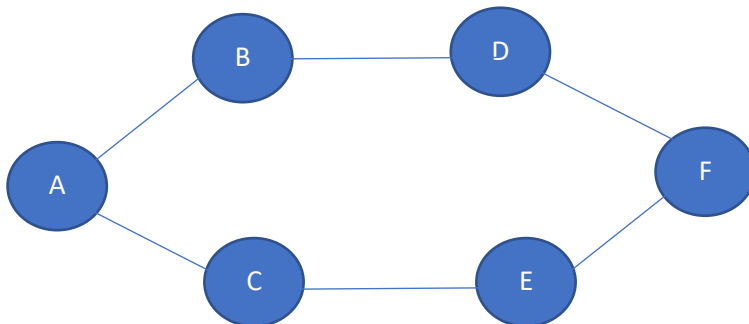
nodes.

 b. Explain your answer.

Here each and every node in this graph is pivotal for its adjacent 2 nodes. A is pivotal for B and C, B is pivotal for A and D and so on for D,C,E,F so each node is pivotal to atleast one pair of nodes.

3.

a. Which node or nodes in Figure 1 are gatekeepers?

Node B and C are gatekeepers in Figure 1

b. Explain your answer.

B is a gatekeeper because it lies for example on every path from A to G, A to F , A to C , A to D , E to G, E to F, E to C and E to D.

C is a gatekeeper because all the nodes have to pass through C to reach D.

4.

a. Which node or nodes in Figure 1 are NOT local gatekeepers?

A,D and E are not local gatekeepers

 b. Explain your answer

Looking at all the nodes individually A has adjacent node B and E but they are connected to each other by an edge that is why A is a not a local gatekeeper, looking a node E it has adjacent node A and B and they are connected to each other by and edge, B is gatekeeper as well as a local gatekeeper because it has node C and F but they are not connected so B is local gatekeeper, C has adjacent nodes B and G and those are not connected to each other so C is local gatekeeper , G has adjacent nodes D and F and they are not connected so G is a local gatekeeper, F has adjacent nodes B and G and they are not connected so F is local gatekeeper , D has only node C that is why it is not a local gatekeeper. So, A, D, E are not local gatekeepers

5.

a. Which node or nodes in Figure 1 are pivotal?

B and C are pivotal in figure 1

 b. Explain your answer.

B and C are pivotal as all the paths have to go through B and C, and it also happens to be the smallest paths for all the node pairs.

A->B-.C-> D, A-> C, A-> G, A-> F and these happen to be the shortest path.

6.

You will notice that there are no gatekeepers in Figure 2 (Darpanet). Explain why the network was purposely designed that way.

There are no gate keepers because the graph was made using darpanet way. In darpenete very node is in a cycle and it was made for redundancy and reliability , if a node goes down or an edge goes down we can still communicate to the other nodes and can get the information through other routes and the information remains consistent. If we have a gatekeeper then the information cannot flow to other node and we cannot expand the network any further.

7.

a. Which node or nodes in Figure 2 are NOT pivotal?

   USCB and STAN are not pivotal in figure 2

 b. Explain your answer.

   USCB and STAN are not pivotal because there is a direct connection between SRI and UCLA, therefore there a shortest path available between them and USCB and STAN do not follow the rule of pivotal node.

8. In your own words: In 2-3 sentences, explain what triadic closure is, and how it plays a role in the formation of social networks. You can draw a schematic picture in case this is useful.

Triadic closure is a concept of having the tendency of the edges in the graph to form triangles. For example if there are is a Person A on facebook who has has two friends B and C and they do not know each other , there is a possibility in the future that they can be friends , and that can create a triadic closure.
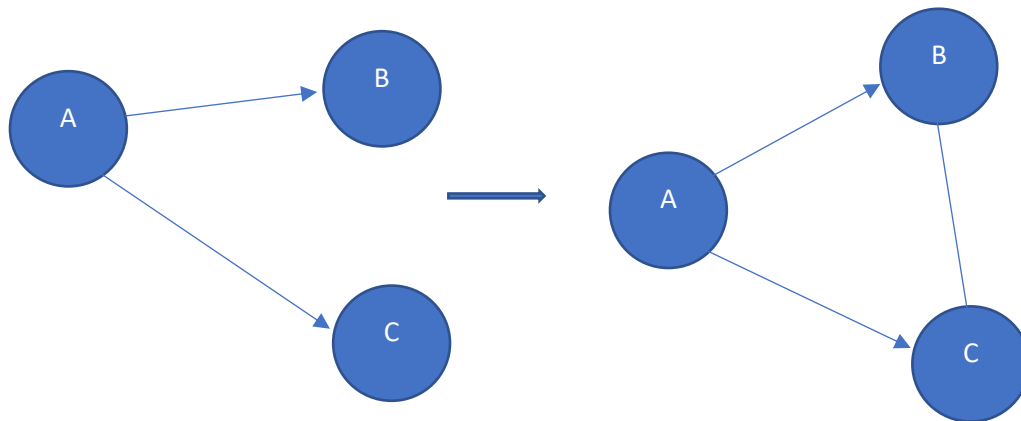
9.

Consider the graph to the right, in which every edge but one is labeled as a strong tie (S) or weak tie (W).

a. According to the theory of strong and weak ties, with the strong triadic closure assumption, how must the edge connecting b and c be labeled (W or S) ?

The edge must be labled as W a weak tie

b. Explain your answer.

Since there is a Strong tie between E and B & C and F , and there is a weak tie between B and A & C and D, we cannot put a strong tie between B and C as it violates the strong triadic closure assumption and therefore we need to put a weak tie.

10.

Consider the graph to the right, in which every edge is labeled as a strong tie (S) or weak tie (W).

a. According to the theory of strong and weak ties, with the strong triadic closure assumption, which other link or links would you expect to form over time, assuming that the links formed have strong ties? (consider more than one iteration over time and identify all links that should form)

There are only 2 ties which can be made I the graph that are AE and BE and both of them will create a strong tie

b. Explain your answer.

The reason that AE and BE will create a strong tie is because: if we go through the 1st iteration AE , A is connected to C and C is connected to E , and both of the edges have a strong tie so there can be connection edge between A and E in the future which can also have strong tie
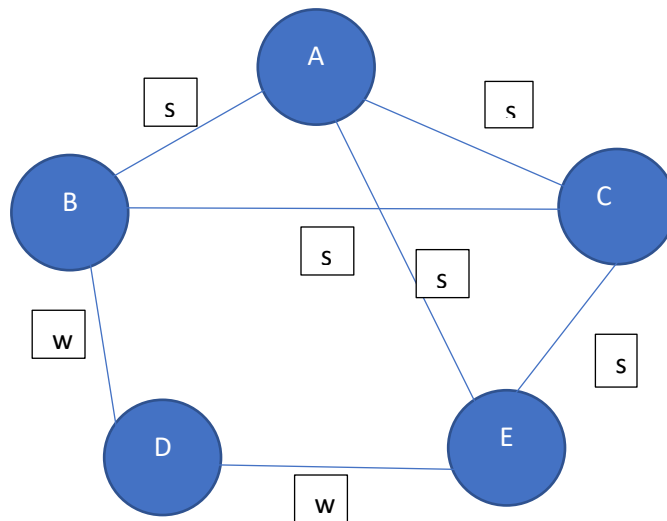
In iteration 2 BE , B is connected to B and D is connected to E , and both of the edges have a strong tie so there can be connection edge between B and E in the future which can also have strong tie
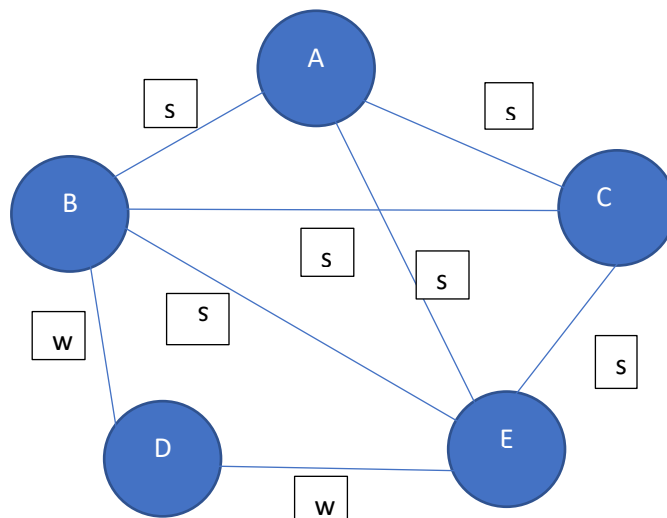
11.

a.   Write a paragraph addressing the reason "friends of friends" are often a better source of job leads than your closer friends. Describe your reasoning in terms of strong and weak ties and local bridges.

As a example of job hunting it is always better to have a large connection because having a closer friend circle will form a strong tie and only lead to having information about new jobs from that network and not having more opportunities information. On the other hand reaching out to someone who is not in your circle can have a lot of information about job opportunities which creates a weak tie. So this creates a local bridge between someone unknow and outside from your group which can give more leads regarding job hunt.

b.   What has been your experience, or what have you observed in others, regarding the source of job leads?

In my experience since I am hunting for internships and FT jobs, I constantly try to reach out someone whom I don't know on LinkedIn, or try to reach out alumina's. I can say that it has been so helpful, reaching out to recruiters and managers really puts your application forward than others and even not knowing someone on a personal level they still refer you that helps a lot. It can be considered as a weak tie.

12.

Consider the affiliation network to the right, with six people labelled A–F, and three foci labelled X, Y, and Z.5

a. Draw the derived network on just the six, joining two people when they share a focus. The derived network should have just the 6 nodes A-F and their interconnections showing shared focus.
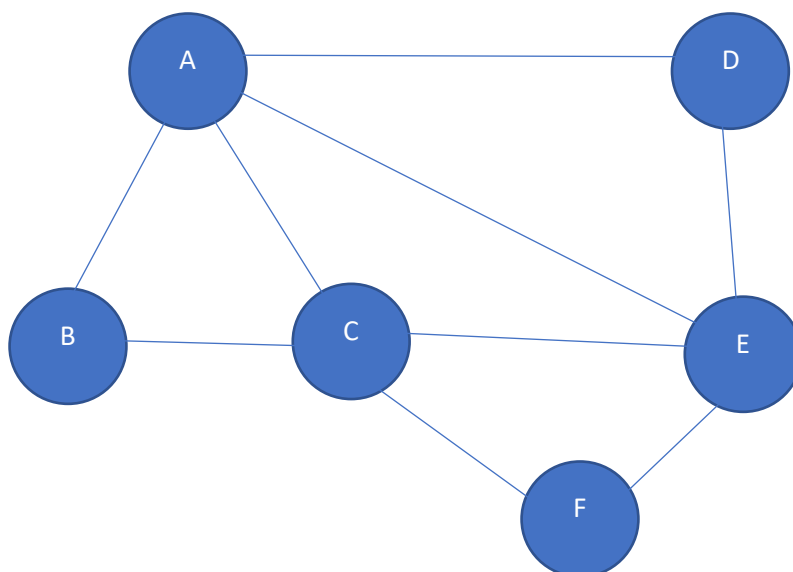
b. In the resulting network on people, can you identify a sense in which the triangle on the nodes A, C, and E has a qualitatively different meaning than the other triangles that appear in the network? Explain your answer.

The triangle ACE do not lie in the same focus, as we can see that ABC lie in the focus X , CFE lie in the focus Z and , ADE lie in the focus Y , but ACE do not share any common focus in them.

13.

For the graph to the right, where each edge is labeled as a positive or negative relationship:

    a. Identify the four 3-node cliques (triangles) and indicate if each is balanced or unbalanced.
        ABC – Balanced
        AXB - unbalanced
        BXC – Balanced
        CXA – unbalanced

    b. Is the entire graph balanced or unbalanced?
        The entire graph is unbalanced
    c. Explain your answer.
        ABC is balanced because it has edges -,-,+ BC are friends and AB, AC are enemies,
        AXB is unbalanced because it has edges +,+,- AX and XB are friends and AB are enemies
        BXC is balanced because it has edges +,+,+ all of them are friends
        CXB is unbalanced because it has edges +,-,+ CX and AX are friends but AC is enemy

        The whole graph is unbalanced since some of its inner triangles are unbalanced.

14.

A team of anthropologists is studying a set of three small villages that neighbor one another. Each village has 30 people. Everyone in each village knows all the people in their own village, as well as the people in the other villages. When the anthropologists build the social network on the people in all three villages taken together, they find that each person is friends with all the other people in their own village, and enemies with everyone in the two other villages. This gives them a network of 90 people (i.e., 30 in each village), with positive and negative signs on its edges.

    a. According to the definitions in chapter 5, is this network on 90 people balanced?
        No it not balanced
    b. Explain your answer.
        If we form a graph of all the people from the villages and they are enemies of each other then we have -,-,-
        between them so it is unbalanced
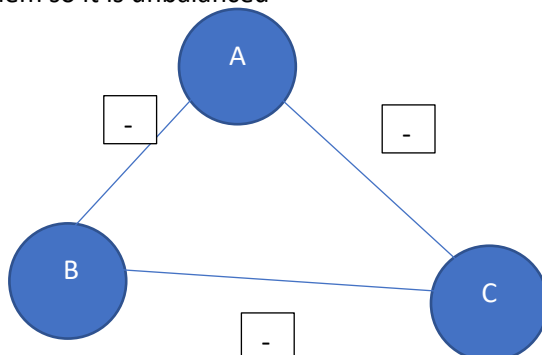
c. Is the network weakly balanced?
    Yes, it is weakly balanced
d. Explain your answer
    It is weakly balanced because there are large number of nodes in the graph and all the villages are enemies of each other(mutually antagonism) and this creates -,-,- edges.

e. Would your answer to (a.) change if there were only two villages of 30 each? How?
    Yes, if we remove one village the graph will be balanced

f. Explain your answer.
    If we remove one village then we will have only 2 village and there will be "–" between them and that will create a balanced graph.