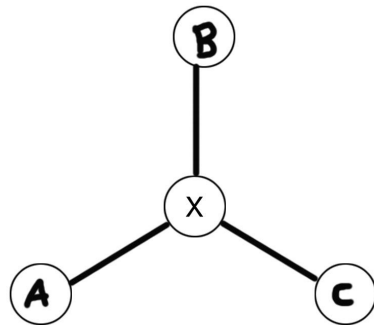


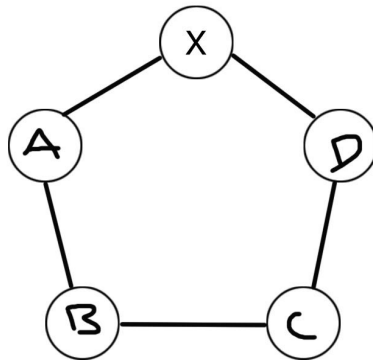
Assignment 2

1.



- a.
- b. X is pivotal for every node because for every set of nodes not including X, such as AB AC BC, X lies on the shortest path for all of them.

2.



- a.
- b. Every node in this graph is pivotal for the pair that connects to it using the shortest distance. For example node D is pivotal for pair XC, etc

3.

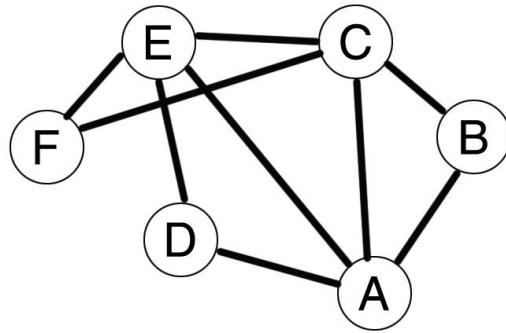
- a. Node E and B are gatekeepers in Figure 1.
- b. Node E is a gatekeeper because the pair of nodes on the left of E are required to pass in order to reach node C and G. Node B is a gatekeeper because it is required to pass in order to reach node A.

4.

- a. Nodes A, C, G are not local gatekeepers.
- b. Nodes C and G are connected by an edge and both are connected to Node E as well, allowing access to either node without restricting a path. Node A is not a local gatekeeper because all paths lead into the node.

5.

- a. Nodes B, E are pivotal.
  - b. Node B will always lie on the shortest path when a node is in a pair with A, for example EA. E will always be lie on the shortest path when a node is paired with either C or G, but will not lie on the shortest path when it is only C and G
6. The network was purposely designed this way so that the whole structure would not have to rely on a single node in order to function. If a gatekeeper goes down then information can not be spread from one set of nodes to another, making this catastrophic in a real time social network. Allowing connection to nodes without depending on one heavily can increase the practicality of the structure.
7.
  - a. Nodes UCSB and STAN
  - b. The hexagon structure on the right ensures that one node will be pivotal for at least one pair of nodes. Nodes UCSB and STAN are not going to be on the shortest distance because UCLA and SRI have an edge that takes off 1 edge to cross compared to going to UCSB or STAN.
8. Triadic closure is a form of transitive property, if node A has a connection to Node B and Node C, then B and C have a likelihood of forming a connection. The closure is more likely to develop even if it does not exist in the current moment due to the ties to node A. If node A is pivotal for B and C to communicate they would form their own connection as well to shorten the distance. It helps social networks grow by forming triadic closures repeatedly until a huge structure of networks results.
9.
  - a. B and C would be labeled as a weak tie.
  - b. B and C do not form any closure with another node therefore they have weak ties.
10.
  - a. B to E and A to E would develop strong ties.
  - b. This link would form because it is the only strong triadic closure on the graph. Other ties are weak and less likely to form a closure.
11.
  - a. Closer friends have strong ties to their job and you, but they are usually limited in amount. Friends of friends have weak ties to you however they are more abundant in a network, since there are more opportunities with people with strong ties to jobs it is usually more helpful.
  - b. Nepotism and friends of friends are usually the best source of job leads. My sister got me an internship and most of the interns there also had a sibling working there.
- 12.



- a.
  - b. Without the triangle on nodes A, C, and E the structure would operate inefficiently, the triangle helps the network become closer together.
- 13.
- a. This network is unbalanced
  - b. the nodes can be divided into two groups. X and y where all the nodes in x and y like each other, but everyone in x is an enemy of everyone in y
  - c. The network is weakly balanced
  - d. The nodes can be divided into groups such that a pair of nodes that like each other hate a pair of nodes belonging to a different group.
  - e. The answer would not differ
  - f. The same groups would form.
- 14.
- a. A, B, X unbalanced  
A, X, C unbalanced  
X, B, C balanced  
A, B, C balanced
  - b. Unbalanced
  - c. X is friends with everyone, although B and C are not friends with A.