E-Commerce.  
HW1  
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Question 1:

The vertices that violate STC are B-E since (C, E) and (B, S) have strong ties while (B,E) doesn’t have any tie. In addition D-C violates STC since again (C,E) and (D,E) have strong ties while D-C doesn’t have any.

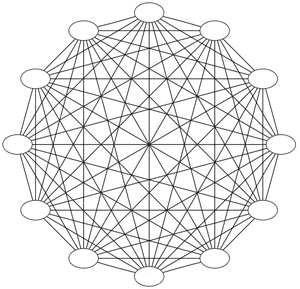
Question 2:

The type of tie BC should be W since we don’t have any tie between EC or BF. Therefore, according to STC strong tie is not allowed between B and C.

Question 3:

1. We look at graph that has one huge clique (say 10000 nodes) and a long chain like part of 1000 nodes. The graph will look like that:

999 nodes



Proof: the diameter of the graph is 101. There for we want to show that the avg distance is lower or equal to 1.

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To prove that if the degree of every node in graph G is between N/2 to N-2 then the diameter is exactly 2 we will prove that the diameter is minimum 2 and maximum 2 as well.

1. Minimum 2:

Choose one node u with maximum N-2 neighbors, there is at least one node v that is not connected to u (we have N-1 other nodes and only N-2 neighbors to u). Therefore the

1. Maximum 2:

We look at 2 nodes: we also have group:

that contains all the other nodes in the G, and

The number of edges goes from is (those are our pigeons) we have N-2 nodes in S (our holes). Therefore according to pigeonhole principle we have at least one hole with pigeons and in our case one node that is connected to both nodes: .

1. If we consider the case that every node has exactly we will be able to calculate the minimal value of the average distance in a graph under the subject to . In this extreme case we can see that for every node there are exactly that are in distance 2 for it and the rest are in distance 2 or more. Therefore the average distance in the graph can be calculated as follows:   
      
   we can see that the lower bound of average distance in this case is 1.5 .