Solutions to Week5-Assignment1

1: C

In a graph having 'n' nodes, there can be $\binom{n}{3}$ triangles, which is equal to $\frac{n(n-1)(n-2)}{6}$.

2: B

In triangle (b), 'A' seems to be friends with 'B' because 'B' is an enemy of his enemy, i.e. 'C'. The same is true for why 'B' seems to be friends with 'A'. Due to the social belief 'Enemy of my enemy is my friend', this sort of triangle stays stable.

3: B

Structural balance involves studying the interplay of positive and negative relationships among the nodes over time. It also illustrates a nice connection between local and global network properties; and attempts to understand the tension between the two opposing forces, i.e. friendship and antagonism. However, it never offers ways of equating the number of positive and negative edges in a network.

4: B A triangle where two enemies have a common friend, is an Unstable triangle.

5: D

Stable triangles are the ones where the number of positive edges are either 1 or 3. Hence (a) and (b) are stable triangles.

6: D

A graph is said to be balanced if all its triangles are balanced.

In graph (a): the three triangles have parity (-, +, -), (-, +, -) and (-, -, +) respectively. This indicates that all the triangles have one positive edge, which means they all are balanced. Hence graph (a) is balanced.

In graph (b): the three triangles have parity (+, -, +), (-, -, +) and (+, +, -) respectively. This indicates that two out of three triangles have 2 positive edges, which means they are not balanced. Since all the triangles of graph (b)

are not balanced, this graph will be imbalanced.

7: B

A graph that is balanced, can be divided into two components such that all the nodes inside one component are friends to each other, all the nodes in the second component are also friends to each other, however, the nodes in the first component are enemies to the nodes in the second component. Hence, only the first graph is balanced.

8: B A signed graph is balanced if and only if it contains no cycle with an odd number of negative edges.